

Columbia University
Journal of Bioethics
Fall 2007

Special Edition:
BIOCEP 2007

**Columbia University Journal of Bioethics
And Supplement on BIOCEP
Volume VI. No 1, Fall 2007**

Editorial Board

Editors-in-Chief

Ashley Pandolfi

Michael Peluso

Copy Editors

Kim Atiyeh, Soo Han,

Ashley Pandolfi, Ben Stern,

Kathryn Vreeland,

Alisha Sachchathep,

Zahrah Taufique, Diana Zhou

Faculty Editors

Dr. John D. Loike

Dr. Ruth L. Fischbach

Cover Design: "Entwine"

Dana Balitzer,

Dr. John D. Loike

Please send your comments

to Dr. John D. Loike

at: jd15@columbia.edu

Web Version is available through the undergraduate page: <http://www.columbia.edu/cu/>
Or through <http://www.bioethicscolumbia.org/>



Copyright 2007 by: Columbia University Center for Bioethics
NO PART OF THIS JOURNAL MAY BE COPIED OR USED WITHOUT PERMISSION.
All views in the articles reflect those of the authors only.

TABLE OF CONTENTS

Acknowledgements.....	5
Introductions by Dr. John Loike and Dr. Ruth Fischbach.....	6-7

Section I: Genetics

The Twist about Gene Patenting	Elizabeth Cedars Kimberly Atiyeh	8-11
Athletics and Stem Cells	Dana Balitzer Mikilena Greusel.....	12-14
Generation XY	Mikilena Greusel Benjamin Stern.....	15-16

Section II: Reproductive Medicine

Full Stop: The End-of-Line for Periods?	Kimberly Atiyeh Benjamin Stern.....	17-20
Prevalence of Birth Defects in ART Infants	Emily Jordan Mary Colavita.....	21-26
A Not So Normal Request	Heidi Emrani.....	27-30
Ethical Issues in Oocyte Donation	Professor Laura Bothwell.....	31-33
Fetal Reduction	Aina Fuller.....	34-39
e-BABY: Your Source for Designer Babies	Frontiers in Bioethics Class of 2007.....	40-41

Section III: Neuroethics

A New Drug Boosts Up Cognitive Capabilities	Amanda Harris Elizabeth Cedars.....	42-45
Taking an (Incomplete) Trip Down Memory Lane	Matt Nguyen Sophia Lin.....	46-48
Images of Immorality	Michael Peluso Gabriella Rothberger.....	49-53

TABLE OF CONTENTS (continued)**Section IV: Contemporary Issues**

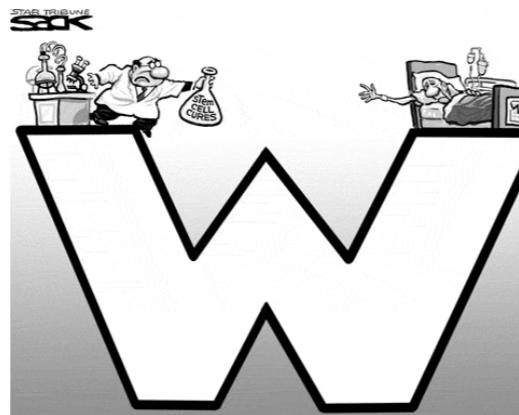
Silent Continent, Silent Spring: DDT	Matthew Nguyen Michael Peluso.....	54-55
Organs for Sale	Raymond Raad.....	56-57
Does Your Food Wear Designer Genes?	Alison O'Neill Nikki Learned.....	58-61
Teen Obesity Operations	Rob Deiches Nikki Learned.....	62-64
Animal Use In Medical Research	Dana Balitzer Laura Rusky.....	65-67
Redefining Disease	Rob Deiches Adil Ahmed.....	68-71
Navigating the Maise Maze	Ashley Pandolfi Alex Port	72-74

Supplemental Section: BIOCEP

BIOCEP: Cross Cultural Education in Bioethics	Dr. John D. Loike.....	75
Luxurious Resort & Your Perfect Baby	Ashley Pandolfi Shanshan Tang.....	76-78
Family Planning in Thailand	Patcharapol Jitramontree.....	79-81
Ethical Stances in Post-Menopausal Pregnancy	Chatchanit Arif	82-84
Bone Marrow Transfer and Stem Cells	Krysten Chin Lulan Wang.....	85-88
The Balancing Act: Cultural Attitudes Towards Human Embryonic Stem Cell Research	Kathryn Vreeland Tina Lo.....	89-92
Alternative East Meets Conventional West	Rajiv Agarwal, Sanhajutha Amnajhankij, and Zahrah Taufique.....	93-97
To Treat or Not to Treat?	Michael Peluso Yoon Joo Kang	98-100
Medical Tourism	Jonathan Sury Prakaikaew Montriwat	101-104
GMOs: an International Issue	Alisha Sachchathep Dana Balitzer.....	105-109

Acknowledgements

Columbia University Journal of Bioethics would like to acknowledge the following individuals and organizations for their advice and support to help publish this journal: Dr. Deborah Mowshowitz, Director of Undergraduate Programs; Marilyn Castaldi, Chief Communications Officer of the Department of External Relations; Anna Sobkowski, Director of Science Communications of the Department of External Relations; Dr. Ruth Fischbach, Director of the Center for Bioethics, Columbia University College of Physicians and Surgeons; Ms. Jana Bassman, Center for Bioethics, Dr. John D. Loike, course director for *Topics in Biology: Frontiers in Bioethics* (W3995); and all the students and guest faculty who contributed to this Journal.



Introduction

In the spring of 2007, bioethical issues related to reproductive medicine, brain imaging, and genetic testing were publicized in both the public press and in scholarly journals. The authors of papers published in this Journal have voiced their opinions and proposed innovative insights and solutions in response to these issues. These student contributors are aspiring scientists, physicians, lawyers, and philosophers whose thoughts and opinions are the heartbeat of this Journal. These students will emerge as the front line of scientific and medical discovery. Their future innovative research and ability to communicate science to the public will elicit and inspire bioethical debates. Furthermore, they will become essential players in helping society resolve many bioethical dilemmas. In addition, this year we have included guest faculty from Columbia University to write for our Journal.

This year's Journal volume includes a special supplement from Columbia University students and students from Mahidol University in Bangkok, Thailand, who participated in an innovative cross-cultural educational program called Bioethical Cross-cultural Educational Program (BIOCEP). Seventeen CU students and ten Mahidol students attended a special two week program in Bangkok, Thailand exchanging ideas and learning how culture and religion influence bioethical dilemmas. Their articles reflect some of the lessons derived from this program. Specifically, students were exposed to various cross-cultural humanistic values that impact how bioethical conflicts are discussed and resolved.

John D. Loike, Ph.D. Course Director– Frontiers in Bioethics,
Co-Director of Graduate Studies, Department of Physiology,
Director of Special Projects, Center for Bioethics, Columbia University College of Physicians
and Surgeons



"YOU CAN ASSURE THEM THAT IRRADIATED AND GENETICALLY-MODIFIED FOODS ARE ALL PERFECTLY SAFE."

Preface

With the Fall 2007 edition of the *Columbia University Journal of Bioethics*, we have reached new heights. Besides the edition almost doubling in page length compared to our former years, the diversity of ethical dilemmas, research questions, and policy implications contained in these pages has increased exponentially. And in terms of diversity of authors, one faculty member has been added to the mix of undergraduate, graduate, and medical students. But most impressive of all, is the representation of student-authors from Mahidol University in Bangkok, Thailand who join with their Columbia counterparts to challenge us with their serious thinking from a varied global perspective.

The authors who have submitted the articles in this Journal have distinguished themselves with a panoply of insights and perspectives that is astonishing. To whet your appetite, take these provocative questions that they pose for reflection: Why could sex selection prove to be a threat to humanity? Does patenting genes influence the pursuit of scientific knowledge? How do you respond when friends ask you to be the egg donor for their child? What about athletes banking their stem cells to replace injured or worn out joints? What does pre-implantation genetic diagnosis imply about the status of the disabled? Is it ethical for individuals to benefit from increased capabilities because of a drug-induced chemical surge? In the future, when children ask "Where do babies come from?" will we say "Ordered with every option from the e-BABY designer Web site"? Should we disregard cultural and religious influences on the practice of healthcare to establish one global art of medicine?

We are in an era where breathtaking advances in emergent technologies call for careful and dispassionate consideration. The bioethical questions found here are going to be some of the most critical facing our society in the future. They will need to be resolved by the best minds available. The authors of these remarkable articles have already demonstrated their brilliance by focusing our attention onto these profound and complex issues and explicating both their promises and their perils. In times to come, these are the minds that we will rely on as new discoveries stretch the limits of our knowledge and boundaries of our imagination. Fortunately, we can be assured that the authors of these articles are the concerned, sensible, and prepared leaders of tomorrow. As they pursue their careers, I trust that they will remain accountable and uphold the Bioethics mantra: *It is not what you can do, rather it is what you should do.*

Ruth L. Fischbach, PhD, MPE
Professor of Bioethics
Director, Center for Bioethics
Columbia University College of Physicians and Surgeons

I. Genetics

The Twist About Gene Patenting: How the Plan to Push Research Forward is Holding it Back

By Elizabeth Cedars and Kimberly Atiyeh

In a recent New York Times op-ed piece by Michael Crichton entitled *Patenting Life*, the sub-headline stated that “one-fifth of the genes in your body are privately owned, and the results have been disastrous” (Crichton, 2007). What followed was an elaboration of the most shocking negative consequences of gene patenting. While such sensational “gene-hyping” stories are attention-grabbing, the truth is that, like most issues in bioethics, there are multiple factors that must be considered and evaluated before an outright endorsement or condemnation of the practice of gene patenting can be given. After looking at the reasons gene patents were first granted and whether they still achieve those aims, it becomes clear that gene patenting is a procedure that should be abandoned, but not because of any immorality in the practice. Rather, the practice should be stopped because the consequences of patenting genes today actually inhibit the attainment of the noble goals toward which they were conceived. Patents are granted by the U.S. Department of Commerce to the first person to invent a product or technique, so long as the invention is useful, novel, non-obvious, and

described well enough so that a professional can use it for the designated purpose. Among other things, raw and natural goods are generally not admissible for patents. Since genes are incontrovertibly found in nature, patents on genes were not legal, until the 1980 Supreme Court ruling of *Diamond v. Chakrabarty*. Chakrabarty had modified a bacterial gene, and succeeded in patenting it since it was not naturally found. This decision opened the door to the patenting of other genes; they were no longer considered exclusively a part of nature. Instead, a patent could be granted for engineered genes. In an application for a patent on a gene, the scientist must fulfill not only the above general criteria for the patent, but must address other issues such as:

- 1) identifying novel genetic sequences,
- 2) specifying the sequence's product,
- 3) specifying how the product functions in nature and therefore its use, and
- 4) enabling one skilled in the field to use the sequence for its stated purpose (Human Genome Program, 2007).

Once a patent has been granted, the inventor is given sole use of the product



for twenty years. Any scientist who wishes to study the gene must pay for the right to do so. Anyone who studies the gene or part of the gene without paying, whether intentionally or unintentionally, is subject to penalty by law. Since the Supreme Court ruling, genetic patenting has become increasingly popular. There were 1,175 patents on human genes between 1981 and 1995, and the number of "DNA-based" patents exceeded 25,000 in the year 2000. The desire to develop the biotechnology industry was likely a factor in the flood of patents granted, since large amounts of both public and private funds were being invested in the field by the early 1990s (Williams-Jones, 2007). As of 2005, 63% of patents on human genes were licensed to private companies (Jensen, 2007).

Supporters of gene patents have pointed out that the patenting of genes has several benefits. Because information that is patented must be revealed, patenting genes leads to disclosure of discoveries. New information about a gene will be made public, preventing secrecy and ensuring that everyone has access to the data. Since data are available to everyone and since it is illegal to study patented material, redundant research is prevented, and research is pushed into new, uninvestigated areas. Economic incentive will also force research into new areas, since the patenting of discoveries provides monetary compensation through the fact that others cannot utilize discoveries without payment. The compensation researchers gain is incentive for them to invest resources in their efforts, and the income from gene patents can be used to further their research. Additionally, since inventors are granted monopolies on the genes that they isolate, in theory, researchers will be less secretive about discoveries, which can lead to additional and more effective collaboration and flow of information.

The arguments in favor of gene patenting therefore stem mostly from economic considerations and interest in developing new biotechnologies. However, such arguments do not seem to have firm grounding; economic interests are not necessarily in the best interest of society, and the genes or sequences being studied are frequently patented with little



understanding of what they do and then abandoned so that researchers can identify new genes for patenting (Abate, 2000). Also, although theoretically the system aims for less secrecy amongst researchers, sharing of information becomes monetarily costly, leading to less collaboration to avoid economic loss. While the patents are made public for researchers, they only become available once the patent has been granted. Until then, they are strictly confidential. Considering that there are over three million genetic patent applications that have been filed, genetic research is risky. If a patent is granted while research is being done on that particular sequence, scientists face injunctions or monetary penalties and

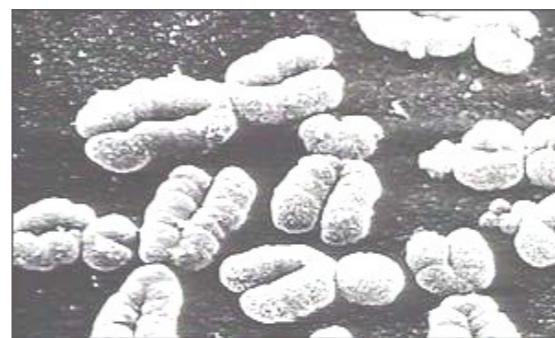
potential setbacks to scientific advancement (Williams-Jones, 2007). Other economic losses are incurred when scientists must not only pay for patent licensing but they also must invest in determining which patents apply. Inefficiencies such as patent stacking occur when multiple patents involve two identical or similar sequences of DNA in multiple forms. One of the strongest arguments opposing gene patenting is that researchers are rewarded for the wrong thing. They are given economic incentive primarily for isolating sequences, which is a relatively routine procedure, rather than for the development of applications from the sequence or the determination of the function and significance of the gene. Instead of encouraging creativity in applications, patents cause economic inefficiencies and hinder progress toward an end product that will benefit humankind.

Therefore, while the initial reason for these patent laws may be to focus on the misusage of nature that occurs in the patenting of a natural component of life, there are clearly many practical arguments against the patenting of genes. Examining these practical arguments further will help to clarify why the practice of gene patenting should be abandoned.

The initial intentions of genetic patenting were valiant in their efforts to protect and reward those who dedicate tremendous efforts to isolate or modify a gene. It is hard to argue against rewarding researchers for their discoveries and against the aim to make patented information public. However, it has been nearly three decades since the first ruling allowing genetic patenting. When the first patents were given for genes, the process of discovering and characterizing DNA sequences was much more time-consuming and labor-intensive than it is today. The economic reward of patenting was therefore a needed impetus. The faster pace of gene characterization

brought on by newer technology renders that economic motivation superfluous. The difficult part of genetic research is not so much isolating genes as it is finding useful and creative applications. This change in what scientific advancement really means has not been reflected by a change in patenting laws. Current patenting practices that reward the quick identification of a gene rather than investigations into its function result in placing the economic reward above the knowledge itself. A more appropriate patenting law would no longer protect the DNA sequences that are now relatively easy to isolate, but instead protect the use of applications invented or discovered by scientists.

Additionally, one of the initial goals of gene patents was to ensure that information would be shared immediately. Since the first issuing of gene patents, the number of applications for patents has



grown exponentially. The sharing of information can more easily be facilitated by publication, due to the slow nature of the patent application process. The timeline from discovery to granted patent is on the order of years. Though in the 1980's patents may have made discoveries more visible and useful to the scientific community, this function has been obliterated. The delay between patent application and patent that protects scientific

advances under a cloak of confidentiality now just adds another set of inefficiencies to the system. Further, at a time when so many genes have been identified, the goal of research should be to understand their function, their role in disease, and how they can be utilized rather than to push investigation into broader areas. Rather than limiting genetic research through patents, resources and efforts should be spent in collaborative efforts to study genes of interest. While the aims of establishing the practice of gene patenting may have been quite noble, it seems that with the present technology gene patents prevent exactly the kind of research they were initially intended to promote. Patents should no longer be given for identification of a gene, but only for the specific design of the product that uses it.

This might mean eliminating the first three of the above requirements for obtaining a gene patent, leaving those to be claimed only through the realm of publishing. The information most valuable for the scientific community will therefore be made public much more quickly than if it were to go through the patenting process, eliminating the secrecy that slows research progress. The fourth requirement, stating a potential use for the gene, should be the only patentable information. Patents should protect DNA-based objects that more closely resemble the traditional patented inventions and ingenuity, such as tests for diseases, and interfere less with the pursuit of scientific knowledge.

References

Abate, T. "Call it the Gene Rush: Patent Stakes Run High." San Francisco Chronicle, April 25,

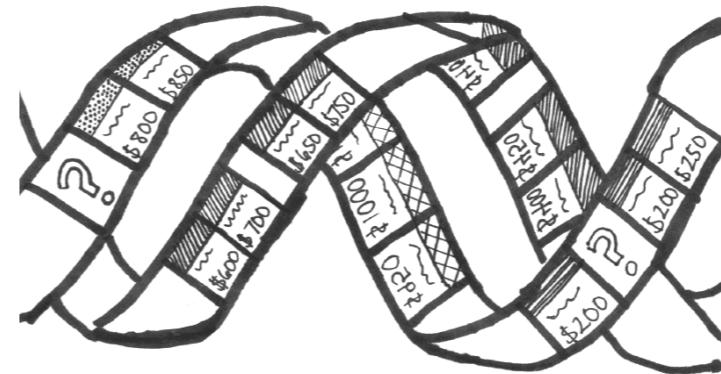
2000.

Crichton, M. "Patenting Life." New York Times
13 February 2007. 21 Feb. 2007.

Jensen, K., F. Murray. "Intellectual Property Landscape of the Human Genome." *Science*, 310: 239-240, 2005.

The Human Genome Program of the U.S. Department of Energy Offices of Science. "Human Genome Project Information." 28 Feb 2007. Aug 2006. <genomics.energy.gov>.

Williams-Jones, B. "History of a Gene Patent: Tracing the Development and Application of Commercial BRCA Testing." *Health Law Journal*, 10: 126, 2002.



Need a Knee? Athletics and Stem Cells

By Dana Balitzer and Mikilena Greuse

The research staff at the Hospital for Special Surgery in New York City predicts that within 3-5 years, stem cell replacement therapy will be utilized for tissue regeneration (Pennington, 2007). Although there have been incredible scientific advances in the study of stem cells for these purposes, several technological barriers still remain between current studies and actual implantation. Yet, many people may question the moral implications of possibly invisible forms of sports-doping that could create all new standards for athletic ability. Because of its moral implications and additional risks to society, stem-cell replacement therapy needs to be carefully monitored and guidelines should be established for its application in clinical settings.

Stem cell therapy could have astounding consequences in sports, medicine, and general orthopedics. As such, the proposed procedure has ample support in the medical and athletic communities and would allow a means of therapy for common injuries in tissues that do not normally regenerate—for example, the spinal cord. But debilitating spinal cord injuries could potentially be remedied by using stem cells to replace damaged cells. In animal models of spinal injury, implanted neural stem cells have been shown to improve motor capability (Bagaria et al., 2006). In different areas of the body, mesenchymal stem cells differentiate into cartilage and bone, and may improve procedures such as bone grafting and cartilage repair (Bagaria, et al., 2006). Such

technology is already being implemented in equine orthopedics to treat race horses (Hirschler, 2007).

If put to regulated use, stem cell replacement technology will eliminate the need for many risky orthopedic surgeries such as torn or damaged rotator cuffs that are common in aging adults. This technology could greatly improve the quality of life for elderly patients who are at higher risk for surgical complications and would offer a less painful recovery. Aside from general medical conditions, stem cell therapy would provide a means by which professional athletes could work past the current age of athletic retirement, as injuries and wear and tear will be readily healed. Athletes, after storing their stem cells in an appropriate bank, or using umbilical stem cells after pregnancy, would have the greatest insurance policy for their careers – an almost endless supply of healthy cells to not only mimic, but completely replace and improve their worn, used, and damaged tissue (Pennington, 2007). The source of stem cells always presents ethical challenges in the development of stem cell technology. Some oppose the technology because of their own moral beliefs surrounding the use of fetal tissue. Others, like athletes, may be tempted to have children for the sole purpose of providing a compatible source of stem cells: the placenta (Pennington, 2007). Parents may also be impelled to store away their children's stem cells in case of injury years later – they may even do so in hopes of fostering the next Tiger

Woods or Steffi Graf.

Apart from all of the fetal tissue controversy, stem cells can be derived through various areas of the adult body as well. Although mature cells can be isolated from the same donor for re-implantation, "they are not the best source of cells for tissue repair" since these differentiated cells "have low proliferative potential" (Vats, 2004). Bone marrow provides perhaps the best source of adult stem cells. Mesenchymal cells, derived from bone marrow, also have the potential "to



differentiate into ... cartilage, bone, fat and muscle" (Vats, et al., 2004). Some researchers suggest that "bone marrow stem cells can be isolated from both pediatric and adult populations, and potentially utilized for therapeutic interventions" (Maher, et al., 2006).

But even using bone marrow as a source of stem cells has potential downfalls. It is unclear that bone marrow extraction would yield enough cells at a high enough concentration to be effective therapeutically (Bagaria, et al., 2006). Obtaining these cells would require a major surgical procedure. In addition, both adult stem cells and embryonic stem cells could also potentially form tumors. Scientists have proposed that the risk of unwanted or

cancerous tissues can be controlled. One paper suggests that the stem cells could be engineered to "express a suicide gene, which render[s] the cells susceptible to a particular drug" (Vats, et al., 2004). Yet, it may be many years until athletes reap the proposed benefits of stem cell replacement technology. Even though scientists have yet to fully differentiate and successfully use stem cells for therapy, they remain optimistic for the future.

Apart from technological barriers, stem cell therapy also poses other moral dilemmas. The procedure would be very expensive and so would not be immediately available to all patients – most likely only to high-profile athletes. If these pro-athletes can all be reconstructed after injury, how might professional sports be affected?

Misuse of this technology could extend far beyond the realm of therapy. Taken to the extreme, the process would allow individuals to store sufficient cells to provide for enough surgeries, procedures, or whatever else would be necessary to maintain their youth. With advancements in plastic surgery and cosmetics, people who can afford costly operations are already presenting stretched skin, artificial joints, chemically injected faces, and enhanced breasts or other body parts. In our society, the elderly yearn for procedures that correct or delay aging. Stem cell replacement therapy, for these individuals, would only perpetuate their quest for eternal youth – presumably, it would allow them to run, walk, and dance like they did in their thirties. But cheating death and creating sixty-year-old recharged bodies may complicate and disturb the natural order of life as we know it. Stem cells are not plastic, fake, or cloned cells. They could represent a dangerous link to newborn cells, to a fresh start, or a blind quest for Ponce de Leon's fountain of youth.

The expense of the surgery also

raises ethical issues of class discrimination. Going one step further, the surgery would only be available in economically stable countries and therefore cause a skew in international athletic advantages. In addition, this technology could potentially be abused by athletes who want unnatural strength, capacities, and durability. Such abuse by athletes would be extremely difficult, if not impossible, to track, since the cells can be derived from their own tissue.

Obviously, the dangers that stem cell replacement therapy generates need to be curbed by strict regulations. Even before the technology is introduced to the medical community for use, the ethics must be taken into consideration so that guidelines can be set. Who will be allowed to use stem cell replacement therapy? What criteria will be set for a patient to qualify for the treatment? Will athletes or athletic companies be able to buy rights to its use? Where will the technology be made available?

Despite its many barriers, it is likely that stem cell therapy technology can resolve the moral dilemmas it poses. Insurance companies can be encouraged to cover the costs, to reduce the chance of the technology exclusive availability to wealthy patients. The cost of this technology will most likely be reduced, once the process has been further developed and industrialized. Strict guidelines for the use of stem cell technology should be created to avoid scandals in competitive athletics. Such technology could only be used as a prescribed treatment, not one that can be bought without need. In addition, it may not be possible to monitor the usage of stem cells, even those derived from the same individual, should guidelines for use be set. The creation of technology to track illegal usage of stem cell therapy in athletes (studies are currently underway to track the metabolic changes that would possibly signal the presence of implanted stem cells)

would be essential in regulating the new therapies.

Stem cells have an incredible potential to revolutionize the field of orthopedics and sports medicine. Enhancing the motility of handicapped patients would ensure a priceless improvement in their quality of life. All new technologies have the potential to be abused, and it is our social responsibility to set ethical guidelines so that those who truly need to utilize this technology can reap its benefits.

References

- Bagaria V., Patil N., et. al. Stem cells in orthopedics: Current concepts and possible future applications. Indian J Med Sci 60:162-169,2006.
- Hirschler, B. Horses lead humans in stem cells race, Scientific American April 25, 2007.
- Maher S.A., Hidaka C., Cunningham M.E., Rodeo SA. Specialty update: What's new in orthopaedic research. J. Bone and Joint Surgery, 88:2314-2321, 2006.
- Pennington, B. For Athletes, the Next Fountain of Youth? New York Times, March 29, 2007.
- Vats, A., Tolley, N.S., et al. The stem cell in orthopaedic surgery. J Bone Joint Surg Br 86:159-164, 2004.



Generation XY

By Mikilena Greusel and Benjamin Stern

Attention men: if you want to have a male child, tie off – even remove – your left testicle, wait for the rising tide of the waxing moon, recite a chant during intercourse while you lie on your left side, wear boots and hang your underpants on the right side of the bed. If you are a woman, you must adhere to a specific diet, climax first only during the second round of intercourse, and lie on a bed facing in a north-south direction. Many ancient cultures used these obscure rituals and relied on natural phenomena to increase their chances of conceiving male heirs. Notably, there are not nearly as many suggestions to improve the chances of a female conception. Fortunately for today's couples, gone are the days of testicle amputation; science has matured past these occult practices into a new generation of gender selection.

Sex selection has been possible for decades using selective abortion, and for many years using embryos generated for in vitro fertilization. Each embryo's DNA can be tested and only those matching a specific gender implanted in the uterus. However, a much simpler and seemingly benign technique is now available. Each sperm carries either an X or a Y sex chromosome. If a sperm containing an X chromosome fertilizes an egg, the fetus will be female. Correspondingly, a Y-carrying sperm produces a male. Because the X chromosome is larger than the Y, male and female generating sperm can be separated by size and inserted using standard artificial insemination techniques. This technology is cheaper and safer than in vitro fertilization and is already common for livestock breeding. Sex selection, using sperm

selection, therefore, has been practiced and deemed a safe procedure. However, even though the technology itself is not dangerous, it may prove to be a threat to humanity.

Forget the ultrasound and amniocentesis – even before conception, the color of the nursery can be chosen immediately. But watch out, one pink bedroom down the hall may lead to a whole floor of pink bedrooms, or a whole street of blue. Imagine your neighbors trying to line up unborn suitors for your potentially beautiful daughter, or perhaps a little-league team for your future all-star.

There are some benefits to this new technology, such as limiting the risk of certain inherited sex-linked genetic diseases. However, widespread use of gender selection poses many dangers to society. Concerns about misogyny, sexism, and gender stereotypes are already spurring debate. After decades—if not centuries—of struggle, as women and men finally approach equal footing both socially and economically, these issues would threaten years of progress. In societies where women have achieved or are nearing equal rights, regression is a distinct possibility. In cultures where women's rights are negligible or just beginning to emerge, gender selection would perpetuate continued male dominance and oppression.

In Asia, where overpopulation is reaching alarming levels, "gendercide" has already become a reality. In China, where there is a one-child policy and a strong cultural preference for male children, there are approximately 120 boys born for every hundred girls according to a January 2007

brief in *The New York Times*. Similar ratios appear in Vietnam and Taiwan. In India the sex ratio is 113 boys for every hundred girls, with observed ratios in some areas as staggering as 156 to 100. The Chinese government is attempting to reduce the occurrence of sex-selective abortions, but disturbing numbers of female fetuses are still being aborted. Chinese physicians, in an effort to limit the rate of female abortions while adhering to population controls, are banning their medical staff from disclosing the gender of embryos before birth. With new sex-selection technology, however, the issue of selective abortion may soon be moot. Freely accessible sperm sorting will only increase the rate of male births, further skewing the gender population. According to a *New York Times* report from July 2004, social anthropologists and political scientists believe that this will produce a generation of permanently single men, large populations of which are a strong predictor of militancy and increased warfare.

Even "equitable" sex selection presents societal risks. First of all, the technique is not perfect: the rate at which girls are conceived "by mistake" is higher than the opposite case. Even if parents select boys and girls at equal rates, a skewed population could result. Furthermore, selected children may be seen as commodities in a newly commercialized reproduction market. Girls, viewed by some cultures as disappointments, may eventually be seen as second choices or gendered castoffs. Parents who elect not to partake in sex selection, or those who cannot afford it, may project their own disappointment on their children. Finally, families that choose male children are increasing the overall risk of sex-linked diseases. Because of this fact, and because boys are more accident-prone, insurance companies may refuse to cover the procedure for male children.

Throughout human history, evolution has maintained the balance of the sexes. Human psychology, culture and society emerged and developed in this biological state of affairs; tinkering with such a fundamental and cogent force will set the stage for economic, political, and social disaster. Before we get ready to put away our lunar charts and begin to purchase do-it-yourself sperm sorting kits, we must consider the severe global dangers of gender selection.



II. Reproductive Medicine

Full Stop: The End-of-Line for Periods?

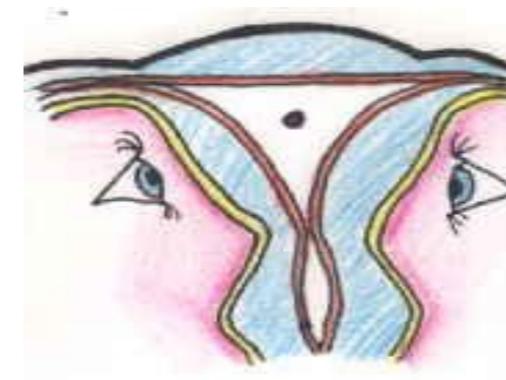
By Kim Atiyeh and Benjamin Stern

More than any other method of contraception, “the pill” helped bring about the sexual revolution. When introduced, oral contraceptives gave women unprecedented freedom, including the ability to control their own reproductive processes and decide when or when not to have children. Though its use as a primary form of birth control has waxed and waned over the years because of sexually transmitted infections (STIs), it is widely used in many countries, including the United States. The pill works by preventing ovulation, but normally allows menstruation on a monthly basis. Now, modern society is facing the advent of a new type of pill, Lybrel, one that could give women even more control over their own bodies and sexuality by eliminating menses.

There are actually two monthly cycles experienced by women: ovulation and the menstrual cycle. Eggs come from structures called follicles in ovaries. Ovulation is controlled by follicle-stimulating hormone and leutinizing hormone (FSH and LH) released from the pituitary gland in response to gonadotropin-releasing hormone (GnRH) from the hypothalamus. FSH causes an ovarian follicle to prepare to release an egg. In response, this follicle releases estrogen, which causes the uterine lining to thicken. A spike in LH triggers ovulation and a change in the follicle known as *leutenization*. In addition to the continued release of estrogen, this leutenized follicle then releases progesterone, which prepares the uterine lining for implantation of a fertilized egg. If a fertilized egg does not implant, the leutenized follicle is degraded,

causing estrogen and progesterone levels to fall. This hormonal drop makes the uterine lining slough off, producing the menstrual flow.

Birth control pills work by halting the ovarian cycle at the very highest level of control: the brain. Because the pills contain artificial hormones similar to estrogen and



progesterone, the body “thinks” it’s at the stage of the ovarian cycle where both estrogen and progesterone levels are high: after ovulation, but before menstruation. With high perceived levels of estrogen and progesterone, the hypothalamus does not release GnRH, so the pituitary is never stimulated to release FSH and LH. As a result, ovulation never occurs. Normally, hormone-containing pills are taken for 21 days and then replaced by a hormone-free placebo pill. This allows the uterine lining, which had thickened only slightly in response to the artificial hormones, to be

period, though most of the usual symptoms accompany this form of menstruation (Mayo Clinic Staff, 2005).

Though traditionally indicated with this monthly regimen of active and placebo pills, contraceptive pills need not be taken in this manner. If estrogen and progesterone levels never decrease—that is, the placebos are eliminated—bleeding will generally not occur (some women experience spotting). Though this fact has been clear for decades, only recently have pharmaceutical companies formulated a regimen for anything but monthly bleeding. Already on the market is Barr Pharmaceuticals' Seasonale, which allows women to have periods every three months. The uterine lining does not build up past a critical amount, and bleeding experienced by women is the same as with a normal "pill period" (Palo Alto Medical Foundation, 2007). Now, Wyeth Pharmaceuticals of Madison, NJ has gained FDA approval of Lybrel, the first non-cyclic oral contraceptive indicated for continuous use without any placebo phase. In clinical trials, women used the pill for 18 months. Bleeding was halted entirely in 71% of the women. When treatment was halted, 99% of women had a period within three months (Wyeth Pharmaceuticals, 2007). The risks are similar to those of traditional oral contraceptives, including nausea at the beginning of treatment, blood clots, stroke, and heart attack. As with the traditional pill, Lybrel is expected to reduce the risk of ovarian and uterine cancer (Canadian Cancer Society, 2007).

Understandably, the elimination of a natural cycle worries many. No drug comes without health risks and ethical ramifications. Currently, no studies longer than two years have been undertaken, so the true long-term effects of Lybrel are unknown. The cautionary position is that naturally, a woman's hormone level in her body is meant to cycle regularly, and interfering with that

cycle could be dangerous. Supporters of the new pill counter that what is unnatural is the number of periods women in modern societies have. Women in developed nations are having far fewer children than in past generations, the average age of first menses has gone down, and the average age of motherhood has risen. All these factors mean women are having many more periods than their ancestors just a few generations ago (Silidker, 2007). Of course, this does not mean eliminating menses is safe, but it does mean the number of periods that women now experience is unprecedented.

Undoubtedly, one of the most promising indications for Lybrel is the elimination of the many physically and emotionally uncomfortable effects, including severe pain, cramping, fatigue, and emotional swings associated with menses (Mayo Clinic Staff, 2007). Lybrel would eliminate the annoyances of restricting their clothes since a period can mean a woman cannot wear any light colored pants, skirts, or dresses. Many women simply cannot function during menses and are physically and/or emotionally crippled for as many as seven days of the month. For these women, menstruation may not be seen as a symbol of womanhood and health but rather the opposite—an oppressive and chronic illness. Simply put, treating the cause of PMS will eliminate its symptoms, a feat that for some would mean more than just convenience—it would mean new freedom.

Getting rid of the period would have secondary medical benefits as well. Eliminating PMS will decrease reliance on diuretics, anti-inflammatories, opiates, and other drugs to treat symptoms. There would be no risk of toxic shock syndrome from tampons and a lowered risk of rashes and urinary tract infections from pads. Indeed, these personal items products would rarely be necessary. As insurance covers the cost of birth control but not hygiene products

and over-the-counter remedies, women would end up saving money.

Not having a period would mean simple convenience: no emergency trips to the restroom, clothes fitting more consistently because of less water retention, and a personal life unshackled from a prohibitive monthly cycle.

The benefits don't end with physical convenience and better health. Lybrel and its future equivalents could have tremendous implications on how women function in society. Some might see eliminating menstruation as a chance for women to become more competitive with men in all areas of life. Academic testing, athletic performance, and musical ability would be unencumbered by PMS. Job performance might also get a boost if monthly personal days are eliminated. Women might even be viewed by men in the workplace as more reliable and rational decision-makers with the stabilization of hormonal levels. Lack of physical symptoms and a more stable mood could enhance a woman's ability to balance her career and her personal life, as well as improve all-around parenting ability if she chooses to have children.

One serious medical and ethical concern is that the absence of a period is traditionally used as a clear indicator that a woman is pregnant. With the ability to turn off their periods, women simultaneously lose this important indicator. As with traditional birth control, ovulation can occur if a woman skips her pill for just a few days. Normally, if this happens and a pregnancy results, she will not have her period during the placebo week—allowing her to investigate into her health and make informed decisions. However, with the new pill, it may be much longer before a woman finds out if she is pregnant. Continued use of hormones during an unwanted pregnancy can be harmful, and there is a higher incidence of

complications such as tubal pregnancies when a woman becomes pregnant while on the pill (Mayo Clinic Staff, 2005). As noted earlier, current studies indicate that even after ceasing treatment with Lybrel, it takes as long as three months to resume normal menstruation, during which time pregnancy can occur. To address this issue, Lybrel and similar drugs should be packaged with a pregnancy test, covered by insurance, for routine self-tests.

The pills' packaging itself brings up another important issue. Current birth control pills come in monthly packages, and each woman has in her possession only a few months' worth of pills. To save money, pharmaceutical companies might choose to sell the new pill in bulk. This creates a greater risk of redistribution and abuse as a secondhand, unprescribed "morning-after" treatment in which a pregnant woman knowingly overdoses to medically abort her child. This risk can be mitigated by limiting the frequency of refills and advising women about their options should they become pregnant.

The societal impact of the new pill may be far-reaching. The issue of women's equality is currently a hotbed of controversy. On one hand, there is pressure for women to have equal treatment, equal opportunity, and equal pay. On the other hand, there is a push for men to be more accepting of women's issues – for example by granting maternity leave and providing day care. Menstruation is a phenomenon unique to women and one that has always been closely identified with womanhood. A woman who rejects menstruation, according to some, would be rejecting her body and her feminine identity. But if women's differences are to be embraced, how can society keep pushing to eliminate them? Similar issues arose when the birth control pill first became available. Women were given more power over their own bodies.

They were sexually liberated, able to enjoy sex without the risk of pregnancy—no longer forced to settle down in order to express their sexuality. Women's newfound sexual power was perceived by some as male-like, with a whole gamut of interpretations of the pill's significance. AIDS and other STIs made the pill less effective in this regard, but the revolution had begun. In America, Europe, and east Asia, there was no turning back.

At the crux of the issues raised by the new pill is a woman's right to control her own body. While a woman in a Western society will likely have just a few children in her lifetime, her uterus will prepare every month for a fertilized egg. If long-term risks are minimal, there is little reason why a woman should not be able to prevent herself from undergoing seemingly pointless hormonal swings, painful side effects, and less-than-pleasant bleeding. The only serious risk currently known is undetected pregnancy in the case of failure or noncompliance, and this can be addressed with simple non-invasive pregnancy tests. The choice to eliminate such a fundamental part of womanhood is not an easy one. Undoubtedly, many women will choose to continue with their natural cycle, their hormone levels waxing and waning with the phases of the moon. Some, though, will choose stability—and rid themselves of a needless encumbrance that interferes with everyday life and overall well-being.

References

Canadian Cancer Society. "The Birth Control Pill and Cancer." 2006. <http://www.cancer.ca/ccs/internet/standard/0,3182,3649_1480588928__langId-en,00.html>

Mayo Clinic Staff. "Birth Control Pill FAQ." Mayo Foundation for Medical Education. 2005. <http://www.mayoclinic.com/health/birth-control-pill/WO00098>

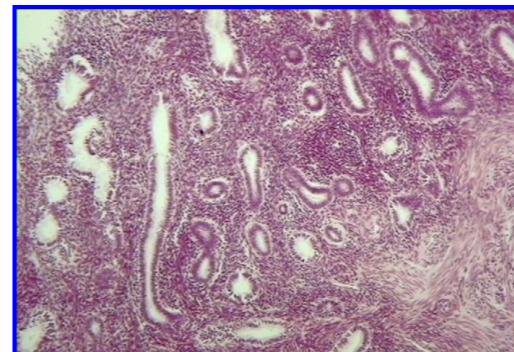
Mayo Clinic Staff. "Premenstrual Syndrome." Mayo Foundation for Medical Education and Research. 2006. <<http://www.mayoclinic.com/health/premenstrual-syndrome/DS00134/DSECTION=2>>.

Palo Alto Medical Foundation. Birth Control Seasonale. Sutter Health. <<http://www.pamf.org/teen/sex/birthcontrol/seasonale.html>>

Sherwood, L. *Human Physiology: From Cells to Systems*; 6th ed, Brooks/Cole: Pacific Grove, CA, 2001.

Silidker, J. "Are Monthly Periods Necessary?" 2000. Health Link, Yale-New Haven Hospital. <<http://www.ynhh.org/healthlink>>.

Wyeth Pharmaceuticals, Inc. "New Findings From Two Studies on Lybrel Presented at ACOG." 2007. <http://www.wyeth.com/news?nav=display&navTo=/wyeth_html/home/news/pressreleases/2006/1147122267860.html>.



Ovarian follicles

Prevalence of Birth Defects in ART Infants

By Emily Jordan and Mary Colavita

In 2006, 1% of all American babies were born via assisted reproductive technologies (ARTs). During the same year in Sweden, 2% of the infant population was born through using IVF alone (Schimmel, 2006). With such a high usage of these procedures, especially IVF, it is important to understand the medical implications that ART's may involve.

There are a multitude of unknown risks for both the offspring produced via any ART and the women who use them. Women who receive in-vitro fertilization, and those that receive intracytoplasmic sperm injection, (ICSI) are prescribed hormone-based drugs that enhance ovulation and promote a nurturing environment for embryo development. Some ART researchers claim that this hormone treatment increases the patient's risk for ovarian and breast cancer; however, this hypothesis has not yet been supported by research because assisted reproductive technologies are still in their formative years (Powell, 2003).

Since the birth of Louise Brown, the first IVF baby, in 1978, a long list of possible defects resulting from IVF has been compiled. Over the past five years, evidence has emerged that suggests increased risk of birth defects, low birth weight (even in singleton babies), genetic disorders, and possibly even cancer in children born through IVF and ICSI.

"Birth defects" are defined as: "abnormalities that are probably of prenatal origin, including structural, chromosomal, and genetic defects" (Hansen, 2002). Various studies have tentatively linked IVF and ICSI to increased risk of mental retardation, upper limb defects, cerebral palsy, epilepsy, behavioral problems,

convulsions, long hospital stays, infections, tumors, asthma, sleep disturbances, congenital malformations, cancers, urogenital defects, diseases of the skin and subcutaneous tissue, respiratory system diseases, conditions involving the eyes and ears, heart malformations, muscoskeletal anomalies, and other disorders that may show up at birth or later in life (Schieve, 2005; Källén, 2005). According to a principal study performed in Western Australia between 1993 and 1997, 26 of the 301 infants conceived with ICSI and 75 of the 837 infants conceived with in vitro fertilization had a major birth defect diagnosed by one year of age, as compared with the 168 of the 4000 naturally conceived infants. As a result, infants conceived via IVF or ICSI were twice as more likely to have a major birth defect (as defined above) than were naturally conceived infants (Hansen, 2002).

Some critics claim that these major birth defects were more evident in ART children, since they were under closer surveillance than were the naturally conceived children, but more recent research has elucidated trends in ART children that should not be taken lightly.

Our paper explores relevant research to get an overview of the concerns and risks, though many studies attempting to expose the risks of IVF contradict each other, or have come up with statistically insignificant data due to small subject pools and short durations. For example, a Taiwanese study in *Developmental Psychology* showed that there were fewer behavioral problems in IVF children, and a Finnish study in *Pediatrics* showed an increased risk of behavioral problems (Golombok, 1999).

The association between IVF and an increased risk of birth defects is controversial. Early studies suggesting that IVF was safe with respect to birth defects are difficult to interpret owing to small size, lack of appropriate controls, and inconsistent methods for detecting birth defects in the treated and control groups" (Olson, 2005). Unfortunately, there are few American studies that explore the IVF connection to birth defects because of policy constraints in the United States that prevent funding allocation to these areas. Thus, we will rely on data from other nations and focus on the most statistically sound studies available. However, because of the small amount of available data, it is difficult to draw conclusions at present (Finnstroem, www.who.int/reproductive-health/infertility/23.pdf).

Birth Defects Resulting From Multiple Births

One of the most widespread potential causes of birth defects in IVF babies is multiple ovulation induction. In most IVF procedures, multiple embryos are injected into potential mothers to ensure that at least one embryo is transferred successfully. This, of course, increases the risk of multiple pregnancies (Wennerholm, 2000). Other risks associated with this practice, include preterm delivery, low birth-weight, and even miscarriage (Wennerholm, 2000). A study in late 2006 showed that a total of 35% of IVF children and 2.2% of control children were multiple births, and the health of multiple births was worse than that of singletons (Staessen, 2004). This problem is potentially dangerous. Preterm and multiple births are known risk factors for brain damage, causing cerebral palsy, epilepsy, and behavioral problems. These babies are at an increased risk for other problems, such as infections and convulsions, separate from

preterm birth (Källén, 2005).

Currently, more than 20% of total ART pregnancies result in multiple births. This can be attributed to ART treatments (Finnstroem, www.who.int/reproductive-health/infertility/23.pdf). A study in Sweden showed that of all ART children born in Sweden from 1982-1998 (2% of all children), the risk of preterm birth and low birth weight increased after ART pregnancies, and correlated with the high occurrence of multiple births (www.who.int/reproductive-health/infertility/report_content.htm). The study also showed an increased risk of perinatal mortality in ART babies for the same reason.

One study at the University of Iowa showed no difference in birth defects of twins, but showed that in higher-order multiple births there was an increased risk for defects in IVF babies, as well as in



singleton IVF babies (Olson, 2005). These three separate studies in three separate nations all concur that multiple pregnancies are a risk to the health of IVF children.

This conclusion was contradicted by a 2006 study in Israel, which showed that when data was adjusted for many similar confounding variables there was no increased rate of neonatal mortality or morbidity in IVF infants (Schimmel, 2006). Yet, a similar study from 2006 focusing on data from Finland found, in contrast, that, "Adjustment for mothers' background characteristics did not change the results.... the indicators of perinatal health showed

much worse health of IVF children, which was explained partly by plurality." The paper also found that for multiple births "... the total mortality rate up to the age of 2 years was twofold higher among IVF children, compared with control children..." and that these deaths were caused mainly by malformations (Staessen, 2004).

Thus, despite sporadic and sometimes contradictory research, even studies that carefully take possible confounding variables into account uncovered statistically significant increased risks for IVF children. (Schieve, 2005). While many health problems of IVF children can be linked to multiple births, disease and increased morbidity have also been linked to increased instances of specific diseases in IVF children (Staessen, 2004). Of the birth defects that are associated with ARTs, there are a number of chromosomal disorders that have higher incidence in IVF and ICSI children. Approximately fifty genes are differentiated according to their origin, and these imprinted genes have significant roles in development and tumor suppression. For example, Dutch investigators report that retinoblastoma, an inheritable tumor of the eye, is more frequent in ART children than those who are naturally conceived (Powell, 2003).

The imprinting disorders, Angelman syndrome and Beckwith-Wiedemann syndrome, are also more prevalent in ART children. Patients with Angelman syndrome often display severe mental retardation, motor defects, and lack of speech that is linked with the maternal allele *UBE3A* on chromosome 15. Patients with Beckwith-Wiedemann syndrome have abnormalities at chromosome 11p 15. They display organ overgrowth and abdominal wall defects, in addition to an increased risk of tumors. Angelman and Beckwith-Wiedemann syndrome are both associated with imprinted gene clusters, and what is often

referred to as an "epigenetic defect," which involves a loss of methylation of the maternal allele. This alters gene regulation (Gosden, 2003).

A 2003 *Lancet* article reported that Beckwith-Wiedemann syndrome occurs in approximately one out of 15,000 births, and that there is a significant 4.2 fold increase in the risk of Beckwith-Wiedemann syndrome associated with ARTs in Western countries (Gosden).

Risks Associated with ICSI

With respect to ICSI, some studies suggest that a man's sperm defects can manifest themselves in his offspring by affecting kidney function. Some observers wonder if the injection of the sperm into the egg might damage the egg's mechanisms for cell division and that it bypasses natural selection. Furthermore, by circumventing natural selection, ICSI can pass infertility problems to the next generation, and that the defects that cause male infertility are just part of a vaster spectrum of genetic and developmental abnormalities that can be carried by defective sperm (Powell, 2003). Such is the case with hypospadias, a condition in which the male's urethra opens under the surface of the penis. This is suggested to result from progestin exposure during organogenesis. Because this condition is more common in ICSI males, rather than IVF males, and because both therapies use progestin and progesterone therapy, there is stronger evidence to suggest that it is a condition related directly to paternal "subfertility," since ICSI involves direct insertion of the sperm into the egg (Wennerholm, 2000).

Pre-implantation Genetic Diagnosis (PGD)

Various forms of prenatal diagnosis,

such as chorionic villus sampling and amniocentesis, have been used to determine potential genetic fetus abnormalities at as early as ten to thirteen weeks of gestation. One form of genetic testing, referred to as PGD, involves the removal and genetic analysis of one cell from the embryo at the 8-cell stage. In theory, this process better enables a patient's decision to selectively implant healthy embryos. In 1990, PGD was first reported for screening male embryos that might carry a specific sex-linked disorder. Since then, however, patients and scientists have become concerned that PGD is being overused and that it may, in fact, not increase the number of healthy babies. Perhaps even removing a single cell might impair an embryo and negatively impact the health of potential offspring (Goldman, 2007).

Often, PGD is used to test for aneuploidy, or abnormal chromosome counts. With increasing age, such defects rise rapidly in female eggs, and in turn, embryos with aneuploidy are believed to be more likely to miscarry or produce offspring with birth defects. PGD is applied with the intent to reduce miscarriage rates by allowing doctors to transfer fewer healthier embryos. More than two-thirds of several thousand PGD procedures in the United States test for aneuploidy, and there is evidence that such screening can reduce the proportion of pregnancies lost in women with recurring miscarriage. One study showed a drop from eighty-seven percent to seventeen percent in miscarriage rate, using PGD (Munné, 2005). Similarly, Yury Verlinsky, a leader in PGD, found that the miscarriage rate fell from sixty-eight to twenty-eight percent with PGD, with an increase in the number of "take home babies" (Goldman, 2007). In Verlinsky's 1999 analysis of the effects of PGD on neonatal outcome of 103 infants who underwent PGD, there was no correlation or

pattern between PGD and decreased birth length or weight, birth defects, or frequency of small gestational age infants (Strom, 2000). Some researchers question the validity of these studies, since its subjects are not randomly assigned to the screening, and since there is no strong control group: "They're really picking and choosing who they're looking at and what they're writing about" (Goldman, 2007).

A strongly controlled study performed on women ages 37 and older in Belgium seems to offset Munne and Verlinsky's findings.

In the Belgium study, Staessen found that women who had PGD gave birth to fewer offspring than the control group (Staessen, 2004). Since half of all human embryos exhibit a combination of chromosomally normal and abnormal cells, perhaps good embryos are being unnecessarily discarded after being identified as faulty during PGD (Goldman, 2007). One-third of embryos that were abnormal on the third day of development, appeared normal when viewed on the fifth day (Goldman, 2007).

Of the children that have already been born after having had the PGD procedure, thousands have displayed no obvious health problems. It is important to note, however, that the oldest of the PGD babies are in their teens, and the less obvious effects of the procedure may not be apparent until later in life. Clearly, more research needs to be done.

Conclusions

This paper aimed to illustrate the current debates involving IVF and birth defects. Despite contradictory and limited evidence, as well as intense political complications, many researchers agree that there is some risk of birth defects associated with IVF, whether in the form of specific diseases and genetic problems, or as the result of multiple

progress despite these risks, and according to one researcher, "...IVF is associated with an increase in birth defects but the effect is small. Findings to date are not likely to dissuade many couples from pursuing infertility treatments" (Olson, 2005). So, explaining the relation of IVF and birth defects faces certain urgency.

There are efforts that have been suggested that could immediately reduce the risks IVF poses for child health. Reducing the number of transferred embryos is one very obvious solution (Staessen, 2004). A law in Sweden limiting implantations to two embryos at one time successfully reduced birth defects and multiple births in the last ten years, a critical period, as IVF was gaining popularity (Finnstroem). However, additional studies should also explore the effect of IVF specifically on singleton babies as well as the long-term health implications for all IVF babies.

In terms of PGD, researchers at Yale note that 85 percent of embryos transferred in IVF do not lead to live births. This fact highlights the need to improve methods for identifying viable embryos. Recent data on success of embryos tested via PGD is inconclusive, since the many studies that indicate that a decrease in miscarriage rate does not account for the decreased number of "take home babies" (Goldman, 2007). Further, these reports display bias, since the samples studied are not necessarily randomly collected. From an ethical standpoint, however, it is unlikely that institutional review boards would approve studies that either disallowed or required PGD screening of certain embryos, since its application conditional; it cannot be generalized to the entire population of ART embryos, since some are at greater risk than others. Nonetheless, PGD screening research is needed on this topic, as well as archival information on birth defects

resulting from IVF.

Improved precision and accuracy in the collection of information, research projects, and studies on all ART attempts, both nationally and internationally, would advance our knowledge of ART. Organization of this data by country, state, ART procedure, biological/environmental risk factor, and birth defect would efficiently, yet concisely afford prospective parents and medical professionals a vaster knowledge of ART results. Data collection would be most efficient in the form of a longitudinal study, wherein subject sets would be observed repeatedly, through adulthood. This information would be available to the public, and it thereby, would allow couples and medical professionals to make more informed decisions based on this widespread data.

References

- Finnstroem, O. "Outcome of Multiple Pregnancy Following ART: The Effect on the Child."
- Goldman, B. "The First Cut." *Nature*, 445:479-480, 2007.
- Golombok, S., C. Murray, P. Brinsden, H. Abdalla. "Social versus Biological Parenting: Family Functioning and the Socioemotional Developmental Development of Children Conceived by Egg or Sperm Donation." *Journal of Child Psychology/Psychiatry*, 40:519-527, 1999.
- Gosden, R., J. Trasler, D. Lucifero, M. Faddy. "Rare congenital disorders, imprinted genes, and assisted reproductive technology." *The Lancet*, 361:975-1977, 2003.
- Hansen, M., J.J. Kurinczuk, C. Bower, S. Webb. "The Risk of Major Birth Defects After Intracytoplasmic Sperm Injection and In Vitro Fertilization." *New England Journal of Medicine*, 346:725-730, 2002.
- Källén, B., O. Finnström, K. Nygren, P. Otterblad

- Olausson. "In vitro fertilization in Sweden: child morbidity including cancer risk." *Fertility and Sterility*, 84: 605-610, 2005.
- Munné, S., S. Chen, J. Fischer, P. Colls, X. Zheng, J. Stevens, T. Escudero, M. Oter, B. Schoolcraft, J. Simpson. "Preimplantation genetic diagnosis reduces pregnancy loss in women aged 35 years and older with a history of recurrent miscarriages." *Fertility and Sterility*, 84: 331-335, 2005.
- Olson, C. K., K. M. Keppler-Noreuil, P.A. Romitti, et. al. "In vitro fertilization is associated with an increase in major birth defects." *Fertility and Sterility*, 84:1308-1315, 2005.
- Powell, K. "Seeds of Doubt." *Nature*, 422: 656-58, 2003.
- Schimmel, M.S., C. Hammerman, A. Lusky, B. Reichman. "Very low-birth-weight-infants conceived by in vitro fertilization are not at higher risk for mortality and morbidity: a population-based study." *Fertility and Sterility*, 85: 907-912, 2006.
- Schieve Ph.D., Laura A., Sonja A. Rasmussen M.D., and Jennita Reefhuis Ph.D.. "Risk of birth defects among children conceived with assisted reproductive technology providing an epidemiologic context to the data." *Fertility and Sterility*, 84:1320-1324, 2005.
- Staessen, C., P. Platteau, E. Van Assche, et. al. "Comparison of blastocyst transfer with or without preimplantation genetic diagnosis for aneuploidy screening in couples with advanced maternal age: a prospective randomized controlled trial." *Human Reproduction*.19:2839-2858, 2004.
- Strom, C.M., R. Levin, S. Strom, et. al. "Neonatal Outcome of Preimplantation Genetic Diagnosis by Polar Body Removal: The First 109 Infants." *Pediatrics*, 106:650-653, 2000.
- Wennerholm, U.B., C. Bergh, L. Hamberger, et. al. "Incidence of Congenital Malformations in Children Born After ICSI." *Human Reproduction*, 15: 944-948, 2000.



A Not So Normal Request

By Heidi Emrani

A not so normal request was asked of me a few months ago over dinner and drinks with two of my best friends, Pete and Jason. The conversation went from "How's your pasta? It looks amazing," to "we want your eggs." My friends went on to tell me about how they put a lot of thought into it and that they would prefer me over everyone else they knew to be the egg donor for their child. They had another close friend who had offered to be their surrogate host but they preferred to use my egg over her egg. Needless to say I don't think anyone is prepared to seriously make a decision like that on the spot.

My first reaction was to want to say yes because I love Pete and Jason and I think they would be wonderful parents. The thought of being able to help two of my best friends fulfill their dream is an unbelievable feeling. I have to admit it is a huge compliment. I was a bit flattered as well; I mean, to be told that your friends love you so much that they want your genes to be a part of their family is a huge compliment. But after the wine wore off, I woke up the next morning thinking about what a huge decision it is to donate my eggs.

I wasn't even sure where to start, so I decided I needed to do more research on assisted reproductive technology in general, specifically egg donation, in vitro fertilization, and surrogacy. I also realized that the decision doesn't only affect physical aspects of my health, but also would have psychological impacts on my life as well as on my family. To further complicate things, the physical and psychological well being of the potential child also has to be considered.

Assisted reproductive technologies

are relatively new phenomena in science and medicine. The various technologies began being utilized in the 1970's and are now used to aid in a range of infertility cases. In the early 1980's, egg donation became a viable solution for women whose ovaries failed to function, and who, for a variety of reasons, were unwilling or unable to achieve pregnancy through in vitro fertilization (Steinbock, 2004). Surrogacy can be used in two ways, either full or partial. Partial surrogacy utilizes the egg of the surrogate mother and the sperm of the father from the couple who will parent the child after its birth. Full surrogacy is when an egg from the parenting mother or the egg donor is fertilized through in vitro fertilization with the sperm of the parenting father and inserted into the uterus of the surrogate host (Golombok et al., 2004). Egg donation, in vitro fertilization, and surrogacy have been successful means of having children despite infertility for decades, but their benefits are accompanied by health risks to the parties directly involved.

Few extensive and long term studies have been done on the risks involved in assisted reproductive technologies because it is a new field in medicine. Although many of the risks are unknown, there are also many known health risks that range from minor to life threatening. Egg retrieval, whether for donation or for in vitro fertilization, can be a time consuming process with many risks. The process entails injections of daily hormones that stimulate the maturation of several eggs. Side effects of these hormone injections include mood swings, vaginal dryness, hot flashes, sleep problems,

fatigue, breast tenderness, body aches, headaches, and visual disturbances (Steinbock, 2004). In order to achieve maturation of as many eggs as possible, hormones may be prescribed in excess, which can cause hyperstimulation. Hyperstimulation occurs when a surplus of eggs reach maturation causing the body to swell with fluid (Spar, 2006). A mild case is mainly uncomfortable and will heal itself after a cycle of menstruation. A severe case, which is the result of 1-10% of in vitro fertilization cycles, can be accompanied by kidney failure, blood clots, fluid buildup in the lungs and shock. There is a possible, but uncommon, outcome of ovary removal or even death resulting from severe hyperstimulation (Steinbock, 2004).

The actual retrieval of the eggs is done using a needle guided by an ultrasound inserted into the vagina and is accompanied by minimal risks of sedation and infection. The procedure is reported to create minor pelvic discomforts but one donor referred to the pain as "feeling like somebody punched you in the stomach" (Steinbock, 2004). In fact, five women are known to have died as a result of the procedure in the United Kingdom, and roughly 0.5-5% have reportedly had side effects ranging from respiratory distress to renal failure (Spar, 2007). The known risks of egg donation and in vitro fertilization range from minor to severe, but what may be the most frightening are the unknown risks involved. The unknown health risks linger in the back of my mind. If I grow up to have a health consequence that may have been caused from donating I don't know if I would ever forgive myself for unnecessarily putting my health at jeopardy.

It is also important to consider the health risks to the potential child. Multifetal pregnancies are associated with more risk than a single fetus pregnancy. And multifetal pregnancy is a common

occurrence with in vitro fertilization when multiple embryos are injected into the uterus in hopes that one will be successful (Henig, 2003). Other than common risks involved with all multifetal pregnancies there are also risks involved to the child specifically from in vitro fertilization. Studies have shown that in vitro babies are more likely to miscarry or die soon after birth, and are at high risk of having low birth weights. In addition, infants have been found to have a range of serious birth abnormalities. Some of these birth defects are, but are not limited to, musculoskeletal and chromosomal defects (Henig, 2003). The physical risks to all parties involved are dangerous and deserve considerable thought. In addition, I can't help but think that I would feel some sort of responsibility if the child was born with abnormalities. In addition to physical risks there are psychological risks, as well as questions of ethics and family that need to be well thought-out.

There are many psychological consequences of egg donation with respect to the question of family. There is no accurate way to predict what the psychological outcome will be for me, the potential child, Pete and Jason, and all of our families. After discussing it with Pete and Jason I was better able to piece together what the scenario would look like. They would be honest with the child about how she or he were conceived. With a gay couple as parents, I don't think it would take long before the child began to wonder how she or he were conceived from daddy and daddy. I respect how open and honest the situation would be, and I can't imagine it would be a secret, because I think the child should grow up knowing exactly who she or he is and from where she or he came. Obviously, I am very close to Pete and Jason and I would be a part of the child's life whether my egg was used or not. I would be Auntie Heidi. And I think it sounds like

great fun until the part of having to separate myself from any mother-child feelings I may have. I don't know how I would react if the child looked like me and had the same goofy characteristics and mannerisms. I think a part of me would always wonder if I made the right decision or if I essentially gave away my child. It is a complicated situation because I don't necessarily want children, but I have been known to change my mind quite often. And if I did have children, how would I explain why they have a half brother or sister being raised completely separate from them?

I also have to consider my family in this decision too. I have an extremely tight knit family and culturally I was raised with a strong understanding that family relationships are a critical aspect of my life. I know my mother, and there is no way that I could have a "little me" running around somewhere without her wanting to be a huge part of the child's life. What about my sister's children- wouldn't they want to know their cousin?

There are so many complicated issues when it comes to my family's involvement that I don't know where to begin with the questions and if there is ever a correct answer to any of them. I feel as if the more I think about the potential situation, the more complicated it gets, and I am sure there will be a lot of complications that I will never be able to prepare for. I'm concerned with my ability to separate myself from my egg and I am not sure that I should donate my eggs unless I am 100% sure. I love Pete and Jason, but when it comes down to it this is a decision that can't be purely based on how much you love someone or want to help.

Another problem that I can't even begin to tackle are the ethical issues. I am

not sure that I ethically agree with these procedures being performed every day while the risks are ultimately unknown and could be significant. I don't know if I would want to even support the field by being a guinea pig. In wanting to be part of the medical community and having a strong appreciation for the pursuit of medical knowledge, I would feel obligated to be a part of ongoing research for the rest of my life if I donated my eggs. I would feel a moral obligation to be a lifelong lab rat, and I can honestly say it doesn't sound like fun. The question of family and ethics is one that I can't answer, and I can't imagine putting that burden on a child.



Being a kid is not easy and trying to figure out who you are and how you fit into the world can be an enormous challenge. Pete and Jason are so loving and nurturing that I think the child would grow up with a strong sense of belonging and personhood. Studies have shown that children who were born with the assistance of reproductive technology are extremely wanted children and for that reason their parents are more involved with their lives and the children have healthier relationships with their parents than other children (Golombok et al., 2004). But who can predict how the child will feel about the surrogate that carried him or her for nine months and then gave them away, or the donor who offered them up. While the studies show that the children born through assisted reproductive technologies do not show any severe psychological problems, they are mainly focused on young children whom I don't think are really old enough to understand where they came from. I think that once the child reaches their teenage years the situation will be a lot different and that you can't predict how someone will

react when he or she realizes he or she were conceived from what might be perceived as a science experiment, especially when the child becomes aware that as a result they may suffer from severe health consequences, which are not even known yet. I feel like the child doesn't have a choice on how he or she came into the world. Would such a child grow up to ethically disagree with how they were conceived and spend his or her whole life filled with resentment? There are so many possible outcomes, and in reality it could work out in a perfect way where everyone is happy. But if everything doesn't work out, the stability of someone's mental health is at risk.

The more and more I think about the subject, and making this decision, the more and more I can't even wrap my mind around it. Honestly, I can't even decide what to order for lunch, and after I do order I always wish I could change my mind. I just don't think I am capable of committing myself to something for the rest of my life when I am so unsure of how I feel. After researching the physical risks, I feel uneasy about putting my body through such a process. If I knew that the physical risks of donating were all known, I would feel more comfortable and I would have an easier time accepting what risks were involved. Knowing that I could die, and that even if I live through it I could experience health risks later on down the road, is scary. It feels like I am playing Russian roulette with my health, and I respect my body too much to do that. The psychological effects are equally as scary to me because I don't want to live my whole life haunted by whether or not I made the right decision. I feel like I would not only be potentially sacrificing my own psychological well being, but that of my whole family's as well. I have a very close family and I am not sure that anyone would know how to approach the child and what

would be appropriate. Ethically, I am not sure where I stand on the subject and I don't think I can make a half hearted decision to be a part of something that could potentially cause me to live in regret for the rest of my life. So now I know that I am not prepared to be a part of it by donating my eggs. I can't say that I am not disappointed, because I really wanted to be able to help Pete and Jason since I know they will be great as parents. However, I think I would be more disappointed in myself for making a decision purely based on feelings of my heart when my brain clearly thinks differently.

References

- Golombok, S., C. Murray, V. Jadva, et al. "Created Through Surrogacy Arrangements: Parent-Child Relationships in the 1st Year of Life". *J Dev Psychology*. 40: 400-441, 2004.
- Henig, R.M. "Pandora's Baby". *Scientific American*. 288: 62-67, 2003.
- Powledge, T.M. "Looking at ART". *Scientific American* 286: 20-23, 2003.
- Spar, D. *The Baby Business: How Money, Science, and Politics Drive the Commerce of Conception*. Harvard business School Publishing Corporation, 2006.
- Spar, Deborah. "The Egg Trade-Making Sense of the Market for Human Oocytes". *NEJM* 365: 1289-1291, 2007.
- Steinbock, B. "Payment For Egg Donation and Surrogacy". *The Mount Sinai Journal of Medicine*. 71: 255-265, 2004.

Ethical Issues at Play in Oocyte Donation

*By Laura Bothwell**

*Program Director at the Center for the Study of Science and Religion (CSSR) of the Earth Institute at Columbia University

Current statistics indicate that roughly 10-15% of all adults experience some form of infertility (Spar, 2006), a term that is applied when a couple has been unsuccessful achieving conception after twelve months of unprotected coitus (Zegers-Hochschild, et. al., 2006). According to recent studies, donor eggs are used in nearly 10% of all Assisted Reproductive Technologies cycles (American Society for Reproductive Medicine, 2003). Egg donation arose as a treatment for women who are infertile for a variety of syndromes. Some women cannot ovulate or their ovaries have been damaged. In some women, LH (luteinising hormonal) and/or FSH (follicle stimulating hormonal) signals have weakened, are too low, or are not coordinated in the appropriate temporal sequence.

The process of egg donation involves the administration of daily hormone injections for the donor, coordinating her menstrual cycle with that of the recipient, and priming her ovaries to release an abnormally large number of eggs. Meanwhile, the recipient takes progesterone pills in order to prime her womb for the implantation of an embryo. This treatment usually takes at least 3 weeks. Once the women's cycles are coordinated, the donor's oocytes and follicular fluid surrounding them are surgically removed from the ovaries by a needle attached to an ultrasound probe. Selected eggs are then combined with the father's sperm, and a chosen number of the resulting embryos are injected into the recipient's womb.

During standard In Vitro Fertilization

(IVF) procedures, parents and their health care professionals consider numerous ethical issues, including: which technologies they are ethically comfortable pursuing; whether to freeze for later use, to donate to research or to donate to another couple the embryos that are not implanted in the procedure; whether to pursue pre-implantation genetic screening for congenital diseases or other undesired traits; whether to continue a pregnancy if a congenital disease is detected; or whether to selectively reduce a multiple pregnancy.

When donor eggs are used, those involved face a host of additional complex and challenging decisions. Of course, if donor sperm is used, similar ethical quandaries apply; however, this article shall specifically address issues at play in oocyte donation.

Recipients of donor oocytes have often already undergone basic to extensive fertility treatments. The process can be both time-consuming and emotionally demanding. Certain ethical questions arise regarding self-care. How many cycles of treatment are infertile women willing to pursue using donor eggs in order to birth a child with either the genes of the father paired with those of an egg donor, or the genes of sperm and egg donors selected by the couple? What potentially considerable costs are they willing to bear in order to achieve a pregnancy, and at what age will they stop trying? Many recipients of donor eggs are women or couples seeking children at a later age in life. Oocyte donation allows embryos to even be implanted in the uterus of menopausal or postmenopausal women.

Then, the ethics of what is asked of egg donors must be seriously considered. To begin, “donation” is a euphemism in most cases—most egg donations are in fact egg sales, with an average compensation rate in the United States of \$4,216, varying according to region or donor profile (Covington & Gibbons, 2007). Some recipients are willing to pay up to tens of thousands of dollars for eggs from women of certain physical, academic, or religious profiles, and there is no legal limitation on the sum a couple may offer for eggs from a donor with specific physical and/or intellectual characteristics. Some ethicists are concerned that women’s eggs are becoming commodities, or that donors may be compelled by money to overlook health risks as they decide whether or not to donate their eggs.

Further, the health risks associated with egg donation are not fully known. Presently, there are no longitudinal studies on potential late-onset detrimental health effects. Shortly after the procedure, donor health is usually stable, sometimes involving mood swings or abdominal swelling. However, some egg donors experience Ovarian Hyper Stimulation Syndrome (OHSS), causing significant pain and bloating following hyper-ovulation. Among women undergoing ovarian stimulation for egg removal, the incidence of OHSS has been estimated at 20-33% for mild cases, 3-6% for moderate cases, and 0.1-2% for severe cases (Rizk, 2006). There is no remedy for OHSS, and symptoms generally dissipate a few days after egg harvesting. However, it has been reported that five women have died in the UK as a result of severe OHSS (BBC News, 2005). The pathophysiology of OHSS is poorly understood, and there is no reliable test to predict which patients will develop severe OHSS (Orvieto, 2005). So, ethically, one weighs whether retrieval of a woman’s eggs

for use by another woman is a procedure meriting these risks to the health of the donor.

The difficult ethical questions extend beyond the egg harvesting and implantation stages. If a surrogate gestational carrier is employed by the parents, adding yet another party involved in the pregnancy, then her rights and relationship to the child need to be addressed.

Relationships between donors, parents, and the child must be agreed upon. The donor may remain anonymous, but there are both benefits and risks involved in this approach. What are the psychological consequences when a child is told that she/he has an anonymous genetic parent? On the other hand, open relationships between the recipients of the donated oocyte, the donor, and/or the resulting child may be either congenial or precarious and undesirable. If the donor is not anonymous, it must be considered whether donors ought to be protected from any future legal or financial obligations to the child. Occasionally, parents may feel that it is most ethical to withhold the truth of the child’s genetic identity, never mentioning the child’s donor parentage. However, if the child never knows his or her true genetic parentage, he or she may be susceptible to harm resulting from ignorance of inherited health concerns or personality traits.

Clearly, there are a plethora of complicated ethical issues at play in egg donation. Individuals and couples who pursue this procedure, as donors or recipients, are often in somewhat vulnerable positions when they must weigh all of the ethical issues involved—the recipients are coming to terms with infertility and the donors are usually young women without significant financial stability. Numerous external factors confound the decision-making process. Yet, despite the situational challenges facing those involved in pursuing

egg donation, it seems that a great deal of the aforementioned ethical questions belong to those directly involved, rather than to society at large. Is it not a donor's personal choice whether or not she will accept the risks associated with donating her eggs? Is it not a couple or woman's choice whether or not to pursue all of the technologies available in creating a family?

While respecting the privacy and freedom of individuals, a number of actions and recommendations can be offered by outside parties. First, it seems that it is appropriate for clinics providing oocyte donation technologies to not only fully inform all parties involved of all associated procedural risks for the donor, recipient, and child, but also to provide comprehensive information and counseling on all of the many ethical issues involved in the completion of a procedure. Many clinics make an effort to do this, but information and counseling support could be provided to clinics by federal or state agencies. (Unfortunately, at this point, whereas many countries have established government centers that address fertility issues, such as the UK's Human Fertilisation and Embryology Authority, no such body exists in the U.S.) Second, measures protecting donor health and well-being could be implemented.

Perhaps health care professionals could recommend that caps be set on the amount of compensation that may be publicly advertised, or additional counseling may be required in cases involving unusually high sums of compensation. Perhaps there could be legal limits to the number of times a woman may donate her eggs. Third, and most controversially, new procedures that emerge and are deemed to pose unacceptable levels of risk to the health of those involved can continue to be outlawed. At present in the U.S., this is the case for human cloning and cytoplasmic

transfer, which is the injection of the cytoplasm of a younger donor's eggs into the eggs of an older woman.

At the core of bioethics is the question of how health can be sustained and promoted without harm to patients or to society. People have different opinions on the level of influence they wish society and law to have in donor and parental child-bearing choices. As egg donation continues to increase, the ethical challenges associated with this technology must be further discussed and debated.

References

American Society for Reproductive Medicine Assisted Reproductive Technologies: A Guide for Patients Patient Information Series January 14, 2007 <http://www.asrm.org/Patients/patientbooklets/ART.pdf>.

BBC News. Safety of egg donation 'unclear'. 30 June, 2005. [<http://news.bbc.co.uk/2/hi/health/4634625.stm>].

Covington, S.N. & Gibbons, W.E. What is happening to the price of eggs? *Fertility and Sterility* 87; 1001-1004, 2007.

Orvieto, R. Can we eliminate severe ovarian hyperstimulation syndrome? *Human Reproduction* 20; 320–322 , 2005.

Rizk, Botros R. M. B. Ovarian Hyperstimulation Syndrome, 10, (Cambridge University Press, Cambridge, 2006).

Spar, Debora, The Baby Business: How Money, Science, and Politics Drive the Commerce of Conception, (Boston. Harvard Business School Press, 2006).

Zegers-Hochschild , Fernando, et. al., The International Committee Monitoring Assisted Reproductive Technologies (ICMART) glossary on ART terminology: *Fertility and Sterility*, 86;16-19, 2006.

Fetal Reduction: Playing it Safe?

By Aina Fuller

A 37-year old woman used IVF and fertility medication, specifically GnRH-analogues and gonadotropins, in hopes that she would become pregnant. Her hopes were answered nine fold when doctors told her she was pregnant with nontuplets. Her joy soon turned to concern as doctors relayed the health risks posed not only to her potential children, but to herself. The family and doctors chose to take the route of multifetal reduction: an outpatient procedure that involves the use of ultrasound to fatally inject potassium chloride into one or more of the fetuses through the mother's abdomen (Women's Health Channel). Her pregnancy was successfully reduced to two fetuses after three attempts, and the woman gave birth to healthy twins (Athanasiadis, et al., 2005).

In this case, the health risks posed were fairly obvious to both doctor and patient, and fetal reduction was the logical next step. But what about in the case of lower multiple pregnancies? In a paper published recently, a study found that reduction even in smaller multiple pregnancies increases fetal viability, thereby posing a more difficult ethical question (Cheang, 2007). With proper care and management, pregnancies up to triplets are now more successful than ever. With the lack of resources, however, even these smaller multiple pregnancies pose a huge risk to the mothers and infants, calling into question the utilization of fetal reduction. Unfortunately, not all cases of fetal and multifetal reduction result in success. There are health risks posed to both mothers and fetuses, whether one decides to undergo fetal reduction or maintain multiple fetal pregnancy, compounding the ethical

implications for both sides.

Between 1980 and 1997, the number of births involving triplets or more soared by 400% (Chertok, 2001). This increase is directly correlated to the use of infertility drugs in conjunction with IVF. The most common fertility drugs are gonadotropins—naturally occurring hormones that the brain produces to stimulate the ovaries to produce other hormones and prepare eggs for release (Kirkey, 2000). The use of multifetal reduction becomes more highly recommended as the number of fetuses in pregnancy increases.

Although ultimately it is up to the mother and her doctor, multiple fetuses that are quadruplets or higher often pose risks that make fetal reduction practical and appealing for all parties. Once fetal reduction comes into play for pregnancies of triplets or lower as aforementioned, the issue becomes much more challenging. The severe prematurity rate for non-reduced triplets in a 2007 study was 25%. For reduced twins the rate is 4.9%. Similarly, low birth weight correlates to the number of fetuses in the pregnancy. Triplets had significantly lower birth weights than did their reduced twin counterparts (Cheang, 2007).

To successfully reduce fetuses, potassium chloride is usually injected into the heart of the targeted fetus between 10 and 12 weeks of pregnancy. The heart then stops beating and the dead fetus is reabsorbed by the mother's body. A second, less common and more invasive procedure involves a transvaginal approach and is performed earlier in the pregnancy. The procedure is performed at about 8 to 10 weeks via embryo aspiration or suction from

the uterus. Here, the patient must undergo anesthesia and there is a greater risk of infection. This second procedure is considered more dangerous because of a higher risk of spontaneous reduction and it is too early to screen for genetic defects (<http://bioethicsdiscussion.blogspot.com/200610/multiple-fetal-births-should-society.html>). A common theme in both these procedures is timing: timing must weigh into the decision process as it is important for the mother's body to have sufficient time to reabsorb the remains back into her body without posing risk to the other fetuses (Valko).

Children and mothers of multifetal pregnancies are at risk for a number of conditions. Firstly, children of multiple births often are more likely to suffer long-term disability when they do survive. Cerebral palsy and other neurological disorders have a higher occurrence among multiple birth babies. In about 4 to 5% of women who do undergo multifetal reduction, the pregnancy still results in miscarriage of all the fetuses. In addition, the mother of a multifetal pregnancy is at risk for pregnancy induced high blood pressure; increased incidence of preeclampsia – a condition with a slew of symptoms including a sudden increase in blood pressure, excessive weight gain, swelling, severe headaches, visual disturbances, and more; acute polyhydramnios or an excessive amount of amniotic fluid; vaginal and uterine hemorrhaging, heavy bleeding; preterm labor and delivery; and a prolonged hospitalization and surgical delivery (<http://bioethicsdiscussion.blogspot.com/200610/multiple-fetal-births -should-society.html>). Although multifetal reduction significantly reduces these risks, there are still other risks posed to pregnancies that do undergo multifetal reduction. Often, however, these risks are usually more associated with the quality of care including the prominence of mistakes during the procedure that causes

risk to the other fetuses as well as the careful management of reduced pregnancies until they reach term.

Because the average age of a women utilizing IVF and accompanying fertility drugs tends to be older than naturally pregnant mothers, genetic screening is often a routine procedure. The most common test is Chorionic Villus Sampling (CVS) (Chertok, 2001). Although this test can be an important factor in deciding which fetuses to reduce, it is not the only one. To consider them all evokes the ethical questions inherent in this type of procedure.

The Ethics of Fetal Reduction:

The American College of Obstetricians and Gynecologists recommends the prevention of multigestational pregnancies during the hormonal regulation, conception, and implantation stages of fertility treatments (Chertok, 2001). According to different doctors at the college, the patient's physician should not only take into consideration health risks, but also ethical concerns. Often, patients undergoing multifetal reduction also undergo counseling. According to one study, there is a measurable trajectory of acceptance for most patients who undergo multifetal reduction as: (a) pre-fetal reduction: feeling threatened by the confirmed diagnosis of multifetal pregnancy, facing guilt and conflict of undergoing fetal reduction; (b) undergoing fetal reduction: getting confused due to family's concern about fetal reduction, losing a sense of body boundary intactness, and worrying about the safety of the remaining fetuses; (c) post-fetal reduction: grieving for losing fetus, and returning to the course of normal pregnancy (Chiu, 2006).

The real problem at the ethical core of this controversial procedure is that neither the doctors nor the patients have any concrete control over how many eggs

become fertilized after insemination.

In the United States, unlike most other countries, in vitro clinics are not susceptible to any law that regulates the number of embryonic babies that can be implanted into a womb (Valko). This has a much larger political implication as IVF is a costly treatment. Clinics with the highest fertility rates often attract the most patients. To achieve high fertility rates, these clinics often err on the side of caution and implant upwards of 5 eggs as a sort of "insurance policy" in hopes that at least one will catch and the procedure will be statistically successful (Valko).

The ethically charged question that comes into play, then, is how to choose which fetuses to reduce. Already a difficult question, there are a number of obstacles posed through technology that make the decision even more trying. According to one study, in a case reviewing 4,000 cycles of fertility treatments, doctors found that blood tests and ultrasounds used to monitor egg follicles were not reliable at predicting the risk of multifetal pregnancy (Kirkey, 2000). Although genetic testing is common for women who are above the age of 35 and use their own eggs, doctors disagree on the timing of this genetic testing. According to one doctor, the safest way to undergo fetal reduction is to reduce the pregnancy first at ten weeks, lets say to twins, and then do genetic testing via CVS one week later (Johnson, 2000). In this safe mode, then, the selection of the reduced fetus is really left up to chance – a moral dilemma for a family.

Even if genetic testing identifies a certain abnormality, what does that imply about the status of disabled people in this country? By choosing not to have a disabled child, is one leaning toward eugenics and reducing the value of people with disabilities? In certain cases as is documented in any pregnancy with genetic

testing, such as is the case for Tay-Sachs disease, abortion and fetal reduction are more acceptable than in others (Johnson, 2000).

Often, the selection of the fetus to reduce is based, not on any sort of genetic testing, but on geography (Johnson, 2000). For example, if a mother is carrying triplets and she opts to reduce her pregnancy to twins, the doctor will recommend choosing the fetuses located on opposite sides of the



womb to prevent competition for nutrients and to reduce the risk of miscarriage.

Following this course of logic, then, in the case of multigestational pregnancies of three or higher, how does one choose how many fetuses to abort? Often, because of the risks posed by fetal reduction, doctors will recommend reducing to twins in order to leave a margin for error in hopes that at least one will make it to delivery. In cases of severe health concerns, however, a reduction to a singleton may prove wiser since statistically, singleton pregnancies are more successful than twins or higher (Kirkey, 2000). Most high quality care

facilities, however, will reduce the least amount of fetuses necessary in hopes of complying with an ethical standard. With proper management and care, the successful triplet pregnancies brought to term has increased exponentially (Chertok, 2001).

What if one does not have access to high quality healthcare? Accessibility to IVF and fertility drugs is based on a number of factors that are often economically based. Age does play a role in that younger women encountering fertility issues often are advised to undergo just IVF, with a success rate that is 2 to 3 times more than that of natural pregnancy. In the case of older women, fertility treatments become more invasive with the introduction of fertility medication, genetic testing, and so on (<http://bioethicsdiscussion.blogspot.com/2006/10/multiple-fetal-births-should-society.html>). Often, facilities with lesser quality standards are still able to provide the expensive treatment by foregoing counseling that is strongly recommended in conjunction with IVF and fertility treatments. As part of a more successful management plan, a psychologically healthier mother makes for a physically healthier mother and environment for the fetus or fetuses. In said counseling sessions, there is also a forum to review and discuss personal ethical concerns with the procedure that might leave mothers distraught (Kirkey, 2001).

Often with ethical discussions about multifetal reduction, a comparison to abortion is unavoidable. Because of the concerns for quality of healthcare, the number of fetuses implanted, and the presence of counseling, some people who are pro fetal reduction also advocate federal regulation of the procedure (<http://bioethicsdiscussion.blogspot.com>). Regulation can become invasive, forcing women to make a choice between babies. With abortion, however, the law states

nothing about forcing a choice on women, only that they have a choice. In the case of fetal reduction, I believe it's important to maintain this option for choice to undergo the procedure, but this choice must be coupled with education and counseling. If anything, the regulation should not be imposed on the procedure itself, but on the services provided in conjunction with it. Without education and emotional counseling, it will be difficult for mothers to make an informed decision that will not risk the lives of the rest of their children. As a society, this is a challenging bioethical issue.

From a religious perspective, however, multifetal reduction evokes a much more concrete response. In one paper, the author outlines the ethical concerns for multifetal reduction in Judaism. The procedure presents a challenge to Jewish law as "there is an apparent threat to the preservation of the fetuses' lives." (Chertok, 2001) In Judaism, childbearing is of utmost importance, thereby justifying the utilization of certain fertility treatments such as IVF and fertility drugs. Many rabbinical authorities allow fetal reduction where there are three fetuses or more, since it presents a real health risk to the mother. According to Jewish law, a religious benchmark for the definition of life is forty days post implantation. Because multifetal reduction often occurs at about ten weeks, this might be viewed as contrary to Jewish law and its guidelines to preserve life. However, there are some religious exceptions to this rule.

In the case of abortion, Jewish Law states that if the woman's life is endangered, termination of the pregnancy is acceptable. Applying that to fetal reduction, then, if the fetuses pose a serious health risk for the mother, fetal reduction is ethically acceptable. The mother here has authority of life because of her status as a full human being. In multifetal gestation, where all the fetuses threaten each other resulting in

reduced chance at survival, Jewish Law would consider the fetuses as each other's pursuers. Yet, the fetuses have equal status since none of them are yet a full human being, unlike the fetus' status in comparison to its mother. Thus, it may be understood that multifetal reduction is only permissible in the event that the chance for the survival of the remaining fetus(es) is increased (Chertok, 2001). However, reduction or abortion based on gender or non-life threatening anomalies are not acceptable.

The Catholic Church employs a much stricter stance, prohibiting the use of any sort of fetal reduction technology. According to the church the procedure is unacceptable because it is a "willful elimination of human life [that] cannot be justified, neither on the basis of the principle of the so-called "lesser evil," nor on the basis of that of the double effect," referring to the projected increase in health for both mother and remaining fetuses (www.all.org). The church also warns of the potential of fetal reduction to lean towards a eugenic mentality, "where through the techniques of prenatal diagnosis, people come to measure the value of a human life solely according to parameters of normality and physical well-being" (www.all.org).

Even on a religious basis, then, there are disagreements about the utility of fetal reduction.

A Resolution?

Perhaps a method of resolution is to discuss fetal reduction in consultation with the physician and a member of the clergy (Chertok, 2001). Some studies have shown that patients undergoing counseling had a much higher success rate of babies carried to term (Women's Health Channel). Often, hospitals that deal with high-risk pregnancies will provide such counseling, but it is not standard. Thus, individualizing

counseling of patients to take into account their religious or other unique lifestyle perspectives, could help the decision making process. Because the procedure of fetal reduction is so inherently ethically charged, the necessity for counseling is integral.

In addition, one study found that embryos incubated in the lab for five days as opposed to three before implantation could dramatically "lower the multiple birth rate while actually increasing a woman's shot at getting pregnant" (Kirkey, 2000). This technique allows embryos to grow to blastocysts, allowing physicians to more carefully screen for healthier embryos that are more likely to implant. This could significantly reduce the number of embryos implanted to two or even one, guaranteeing a precedence in which fetal reduction would not be required at all.

In terms of policy, as aforementioned, I am a firm believer in pro-choice, allowing a women to decide for herself what to do with her body. Again, however, I believe this choice is not really a choice unless the decision maker is fully informed about the consequences, both positive and negative, of her decision. Of course, the entire point of IVF and fertility treatments is to provide people with the potential for life and offspring where it is no longer naturally available. Bearing children is a gift that comes with both good and bad baggage. It does not seem to make much sense to attempt to vie for the potential for life by putting at risk both the lives of the potential children and the mother who carries those children. Mothers must be informed about these potential life risks so they can be responsible for both their own lives and those of their offspring.

Fetal reduction is a useful technology but it should be practiced as it was intended: as a solution to a serious health risk and not a routine procedure. The

commodification of the reduction of life poses much more charged ethical implications than the reduction of life for beneficial purposes, as fetal reduction is intended to be. Through education and support, it should be standard that mothers are always able to make their best, informed decisions.

References:

Athanasiadis A.P., Karavida A., Tzitzimikas S., et al. J. Fetal reduction in a nontuplet pregnancy: technical and ethical considerations. *Eur J Obstet Gynecol Reprod Biol*, 120:227-9, 2005.

Brambati, E. Genetics: Genetic analysis prior to selective fetal reduction in multiple pregnancy: technical aspects and clinical outcome. *Human Reproduction*, 10:818-825, 1995.

Cheang C.U., Huang L.S., et al. A comparison of the outcomes between twin and reduced twin pregnancies produced through assisted reproduction. *Fertil Steril*. 88:47-52, 2007.

Chertok, I. Multifetal Pregnancy Reduction and Halakha. *Early Pregnancy: Biology and Medicine*. V: 201-210, 2001.

Chiu P.Y., Su T.J., Chen Y.C., Ko C.M., Hu Li Za Zhi. Lived experience of multifetal pregnant women with fetal reduction. 53:25-33, 2006.

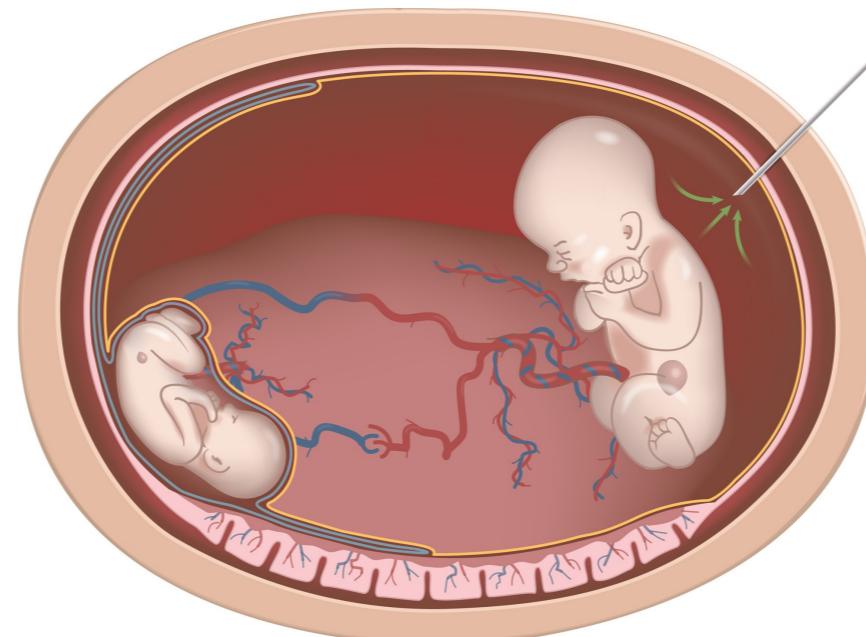
Johnson, K. Tough Choices on Fetal Reduction, Genetic Testing. *OB/GYN News*, May 15, 2000.

Kirkey, S.'Outdated' fertility drugs not worth the risk. *The Ottawa Citizen SAN DIEGO*. Friday 27 October 2000.

Valko, N.G.. Fetal Reduction: Good Medicine or Atrocity? http://www.lifeissues.net/writers/val/val_02fetalreduction.html.

Women's Health Channel. Bioethics Discussion Blog. <http://bioethicsdiscussion.blogspot.com/200610/multiple-fetal-births -should-society.html>.

"Multiple Pregnancies: Fetal Complications." http://www.womenshealthchannel.com/multipregnancies/risks_babies.shtml.



A New Drug Boosts up Cognitive Capabilities and the Ethical Debate on Performance Enhancers

By Amanda Harris and Elizabeth Cedars

A new drug that falls under the category of AMPA receptor potentiators, or "ampakines," was recently discovered that has the potential to heighten cognitive capabilities (Fernandez, et al., 2006). The drug works by modifying the action of AMPA receptors in the brain, which respond to the neurotransmitter glutamate. Although these compounds may have ameliorative effects for a variety of diseases and seem to work in animal models with neuropsychiatric diseases, their therapeutic value has yet to be fully established. Already acknowledged, though, is the effect of these types of drugs on healthy individuals, who can abuse the medication in order to enhance their cognitive capabilities. The discovery of a drug similar to, but potentially more potent than, other ampakines raises an ethical question: Does the potential benefit outweigh the already negative consequences or should researchers begin investigations into new treatments in order to prevent the escalation of an already dangerous practice?

A recent article, published by Fernandez, et al. (2006), details the discovery of a class of drugs that modulates a receptor of the neurotransmitter glutamate. The binding of neurotransmitters like glutamate to receptors on the dendrites of neurons affects the opening and closing of ion channels. AMPA receptors are one of three different kinds of glutamate receptors. When the AMPA receptor binds glutamate, a conformational change occurs that leads to an open channel. That channel is permeable to positive ions that will flow along their concentration gradient, leading to

depolarization and causing the propagation of the signal, in the form of an action potential, down the neuron's axon to the axon terminal (Fernandez, et al., 2006). There the signal is converted from an electrical one to a chemical one through neurotransmitters, which are released into the synapse to bind to receptors on the next neuron. Signaling in networks of neurons leads to all brain functions, from memory, emotion, and decision-making to regulation of autonomic processes. When these processes do not occur in the way they should, various diseases may result.

AMPA receptors are able to bind and release glutamate very quickly, and are therefore primarily responsible for fast excitatory synaptic transmission (Black, 2005). They play an important role in Long Term Potentiation (LTP), a phenomenon contributing to the plasticity of neural connections and therefore thought to be important for learning and memory. Modulators of AMPA receptors have been found to affect the rate at which the receptors become desensitized to glutamate (Lynch et al., 2006). These receptors can be activated for longer periods of time after a single release of neurotransmitters, increasing their ability to propagate a signal. Drugs that modulate the transmission of AMPA's excitatory signals may therefore be beneficial in treating diseases such as Alzheimer's and schizophrenia in which there is impairment of cognitive functions (Marenco and Weinberger, 2006). Additionally, several studies have shown that modulation of AMPA receptors increases the expression of neurotrophins,

or growth factors in the brain, such as Brain-Derived Neurotrophic Factor (BDNF), which has been implicated in depression (O'Neil et al., 2004). This increase in BDNF may be responsible for the anti-depressive effects seen in rodents treated with AMPA receptor modulators (O'Neil et al., 2004). Through their role in the expression of neurotrophins, AMPA receptor modulators also have the potential to be beneficial in treating Parkinson's Disease (O'Neil et al., 2004).

The new class of drugs appears to be more potent than the previously identified AMPA receptor modulators (Fernandez, et al., 2006). The claim is that these new interactions will be more effective in generating the beneficial effects of previously discovered AMPA receptor modulators. However, no studies have yet confirmed the effect in actual neurons or in live animal models. Therefore, their actual potential as treatments for these diseases remains to be seen.

While any drug that may improve treatments of debilitating diseases deserves attention and consideration, there are ethical issues associated with this particular category of drugs and a precedent of tolerance to contend with. Ampakines that modulate the activity of AMPA receptors, have been shown to enhance cognitive functioning not only in targeted diseased patients, but also in healthy individuals (Lynch et al., 2006). Is it ethical for individuals to benefit from increased capabilities because of a drug-induced chemical surge? Should the moral understanding of an "equal athletic playing field" be applied to academics as well? It is illegal for professional athletes to enhance their performance through the use of drugs like steroids because it is not "fair" to the other players.

Students in America can easily acquire prescription amphetamines, like Adderall, to help them focus more concretely

on one particular thing for an extended period of time. From preparatory private high schools to competitive universities, the desire to have an edge over other students is compelling. There is an increasingly popular black market on campuses for these drugs. Students frequently take medications to study longer, more efficiently, or to improve their cognitive functioning while taking exams. Currently, this abuse of Adderall and other amphetamines is not at a scale large enough to attract political attention. However, if it continues to escalate at the present rate, it will be an issue that university policies and even national legislation will have to address. If this new, more potent drug follows in its



brothers' footsteps, it can greatly exacerbate the problem.

The ethical issue is deeply rooted in American values. In America especially, there is a culture of competition that permeates all aspects of one's leisure and work experiences. Since competition is an important vehicle for evaluating a person's skill, it is essential to Americans that there is an equal playing field in every area. Affirmative action, although now mostly disapproved of, can be understood as the country's way of leveling the playing field

between races for educational and employment opportunities. Need-based scholarships are also an example of American customs that attempt to correct discrepancies in equality. That is why Americans condemn "performance enhancers" so vehemently; they interfere with what is perceived to be the natural selection process wherein the fittest survives. In addition, certain groups of people are able to obtain these drugs more readily, specifically wealthier people who can afford them and who can afford the psychiatrists who prescribe them. The availability of cognitive enhancers therefore also raises the possibility of creating further stratification within society, a phenomenon that is already being seen to occur with the use of expensive preparatory programs for standardized tests (Roscigno, et al., 2006).

Yet, these drugs were developed for a purpose and with good intentions. Ampakines do seem to be able to treat certain diseases. However, some of these diseases are also the subject of some controversy. Diseases such as ADHD and depression are certainly real, but some experts believe they are over-diagnosed (Brower, 2004) and once a person is prescribed medication, it is easy for them to get refills, even in excess. That is why these prescription pills readily find their way to healthy hands. The problem with fixing an overly-diagnosed disease and its subsequent prescription is qualifying who is ill enough. If doctors apply stricter guidelines to their diagnoses, they might inadvertently turn away patients who actually do need the medication to treat their depression or ADHD. It is a dangerous road that could lead to unfortunate, preventable tragedies. Is it worth continuing to develop these specific kinds of drugs if this will be the fallout from them, or should time and money be invested in a totally different approach to these illnesses? Should there be stricter

legislation that regulates these cognitive enhancers? How can these consequences be prevented and still preserve the therapeutic benefits of these drugs?

A bioethicist might approach these questions with two suggestions. One is to devote resources to developing the drug so that it limits the delivery to specific areas of the brain. Alzheimer disease seems to be characterized by abnormalities in specific regions of the brain, including the neocortex, hippocampus, and amygdale (Kandel, Schwartz, and Jessell, 2000). The affected



brain regions of Schizophrenic patients are less well understood, but may include the prefrontal cortex, hippocampus, and globus pallidus (Kandel, Schwartz, and Jessell, 2000). Targeting drugs to these regions might be helpful in limiting the effects of the drugs on healthy individuals and thus rendering them useless as performance enhancers.

The other suggestion is to approach treatment of these diseases from alternative pathways. The effects on AMPA receptors ameliorate the symptoms of the diseases,

but AMPA receptor deficits are not the cause of these disorders—in many cases the causes are still unknown. While AMPA receptor potentiators may be a good treatment for the symptoms, funds should be used instead to support research into identifying the causes and developing cures rather than generating ethically ambiguous drugs.

Both of these options are scientifically feasible today and therefore scientists have an obligation to spend their money and resources on the development of alternative drugs. The potential benefit of more potent ampakines is outweighed by the ethically dubious use of these drugs. More specific localization of the drug or more appropriate mechanisms of treatment should be sought. At this time, the government or universities should take steps to regulate and restrict the availability of these drugs to healthy individuals.

References

Black, MD. *Therapeutic potential of positive AMPA modulators and their relationship to AMPA receptor subunits. A review of preclinical data*. *Psychopharmacology (Berl)*, 179:154-63, 2005.

Brower, V. *Analyze This*. EMBO Rep 4:1022–1024, 2003.

Fernandez, et al., *A novel class of AMPA receptor allosteric modulators. Part 1: design, synthesis, and SAR of 3-aryl-4-cyano-5-substituted-heteroaryl-2-carboxylic acid derivatives*. Bioorg Med Chem Lett, 16:5057-61, 2006.

Kandel E.R., Schwartz J.H., Jessell T.M. *Principles of Neural Science*, 4th ed. p.1153 (McGraw-Hill, New York, 2000).

Lynch, et. al., *Ampakines and the threefold path to cognitive enhancement*. Trends Neurosci, 29:554-62, 2006.

Marenco, S. and Weinberger, D.R., *Therapeutic potential of positive AMPA receptor modulators in the treatment of neuropsychiatric disorders*. CNS Drugs, 20:173-85, 2006.

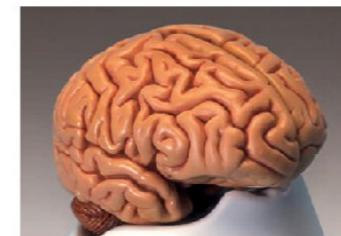
O'Neill, et al., *AMPA receptor potentiators for the treatment of CNS disorders*. Curr Drug Targets CNS Neurol Disord, 3:181-94, 2004.

Roscigno, et al. *The Myth of Meritocracy? SAT Preparation, College Enrollment, Class and Race in the United States* Paper presented at the annual meeting of the American Sociological Association, Montreal Convention Center, Montreal, Quebec, Canada, 2006. <http://www.allacademic.com/meta/p104558_Index.html>.

This is your brain.



This is your brain
on drugs



Load up Children!

Taking an (Incomplete) Trip Down Memory Lane

By Sophia Lin and Matt Nguyen

If you were presented with the opportunity to erase a particular frightful memory without affecting other memories, would you take it? Joseph LeDoux of the Center for Neural Science at New York University studied the phenomenon of deleting one precise memory in the brain, and its potential effects on the future of psychiatry. This paper examines the specifics of his experiments, their ethical implications, and possible resolutions.

When memories are newly formed, they are vulnerable to disruption for a period of time before being stored in the long-term state of mind. During reconsolidation, a process is evoked when the memory is retrieved, providing the opportunity to mold the memory before storage once more. This process may potentially be utilized to treat psychiatric disorders and pathological conditions including drug addiction, phobias, paranoia, or post-traumatic stress disorder (Doyere et al., 2007). However, the knowledge regarding the selective process of reconsolidation is still very limited. Research on reconsolidation has centered upon Pavlovian fear conditioning based on a method for manipulating associative learning. Fear arousal from conditioning induces synaptic potentiation at lateral amygdala synapses (Doyere et al., 2007). The amygdala, a small, almond-shaped part of the brain, is a part of the limbic system and attached to the anterior of the hippocampus. It is involved in encoding and consolidating memories relating to fearful experiences and receives its core contributions from the visual, auditory, and somatosensory cortices while distributing responses to the hypothalamus (see <http://neurophilosophy.wordpress.com/2006/1>

0/31/the-neurobiology-of-fear).

What remains unknown are whether recollection of a fear memory also causes synaptic potentiation in the lateral amygdala, and whether interference of reconsolidation is reconciled through a reduction in potentiation at reactivated synapses (Doyere et al., 2007). The experiment involved two different conditioned stimuli: a pure 1-kHz tone and a complex frequency-modulated sound. These two stimuli were paired with the same aversive unconditioned stimulus, and then the rats were subjected to an intra-lateral amygdala infusion of either vehicle or U0126, a pharmacological agent which causes amnesia. The rats were then placed in a reactivation trial with one of the conditioned stimuli while the other conditioned stimulus was not reactivated. Shortly after retrieval, the rats were tested for memory retention of both stimuli as well as one day later to test for long-term memory.

Both the vehicle and U0126 group displayed similar levels of freezing to the reactivated conditioned stimulus during reactivation and to both reactivated and non-reactivated conditioned stimulus during the short-term memory test. However, there was impairment during the long term memory test for the reactivated conditioned stimulus in the drug-treated (U0126) group. This signifies that the effect of U0126 on memory is selective to the reactivated conditioned stimulus. Consequently, despite sharing the same aversive outcome, two associated memories can be independently consolidated. The fearful memory is erased, rather than only breaking the connection between memory and its fear-induced response (Smith, 2007).

For the reactivated conditioned stimulus, the level of potentiation in the lateral amygdala during the short-term memory test differed between the pure tone and frequency modulated stimuli. Retrieval itself can produce plastic changes in the lateral amygdala independent of alterations in afferent processing in the thalamus (Doyere et al., 2007). This experiment illustrates the selective effects of retrieval and reconsolidation, where the retrieval activates two different actions. One creates potentiation, which may reflect mechanisms of updating new memories, while the other process renders the modifications connected with initial learning labile. Therefore, there is a de-consolidation of the fear memory trace in the lateral amygdala, possibly erasing the initial encoded plasticity. During the renewal of fear memories, these discoveries form the neurophysiologic groundings for content-limited modifications.

While these findings are experimentally sound, the scientists do not specify to what extent the particular fears can be erased. Additionally, these tests are only conclusive in rats, and have not yet shown promise on humans. The study fails to focus on inhibiting the molecule responsible for the synaptic strengthening, a part of the memory process.

There is still much research to be done. If this technology is ever able to work in humans, there are important ethical issues to consider. The ability to erase memories, even if they are fearful ones, is a powerful tool in altering minds. Is there ever a time when it is appropriate to do this to a human being? Easing the suffering of someone with post-traumatic stress disorder (PTSD) is an appealing goal and perhaps the most notable way this technology could be applied in a positive manner. The world is being torn by war and every day man-made and natural disasters affect people. If

someone is crippled by a terrible memory, it could be a blessing for them to forget. It seems that this technology would be a worthwhile pursuit if a large group of people could benefit from it. Those with drug addictions or phobias are also a large group who would possibly be given relief by this technology. Yet even in these possible instances of use there are ethical questions.

Is it ever ethical to erase memories?

Memory is a key to self-identity. Someone who has undergone experiences in his or her life is indelibly affected by them, for better or worse. Deciding to destroy a memory is not a light decision to undertake. The psychological problems that could be helped from this technology already have existing treatments which do not have to resort to pharmaceutically altering the brain. There is a possibility that such a technology would be over prescribed, used in a way that would lessen regard for human experience. If experiences were always treated as though they could be erased later, how would that affect people's perception of the world and how they act in it? If it is possible, the ability to edit one's mind in this powerful way would be unprecedented. It is important to note, however, that there is precedent in this kind of desire. People have used many substances and methods to try to forget things for time immemorial, from the lotus plants of *The Odyssey* to alcohol. If individuals have the right to control what is in their mind, shouldn't they have the right to delete things as they wish? This is a question that has been at the heart of many debates of the individual against the proclamations of society and government, such as with the war on drugs and prohibition. This technology would simply be a new arena for this longstanding conflict.

There are also ethical questions about how this technology could be used by organizations such as the government. Soldiers could be medicated and be made to

forget atrocities committed or seen - and then they could be sent out again to the next conflict zone. Intelligence agencies could use the technology to erase the memories of those who witness clandestine activities or carry out secret missions. Criminals could erase the memory of a witness, or erase their own memory of committing a crime. These possibilities reveal how much potential for malevolence could come from such a technology. It also exposes the societal and cultural influences that play into the use of technology. Ruminations on memory erasure have been in culture and society for a long time. There are even films in popular culture like *Total Recall*, *Memento* and *The Eternal Sunshine of a Spotless Mind*, which have explored ideas about memory loss and deletion.

The benefits of this technology seems at first, to be outweighed by the risks. But in reality this technology could lead in a dangerous direction. When technology could have the potential for so much abuse, it must be pursued very carefully. Regardless, this type of research could be very useful in learning more about memory and the brain. Many still unenvisioned benefits could arise from this study. Many technologies we have now could be used for supposedly terrible ends but have been tightly regulated. That is why a possible solution would probably stem from observing the use of technologies in other areas such as reproduction. Cloning technology, for example, is restricted by laws that prevent the creation of humans. It is too early to say what kind of treatments could come out of this research, and it remains to be seen whether treatments could be so dramatically effective as to allow the sort of uses mentioned above. Regardless, it would be best if these treatments were carefully used and regulated. Screening processes and psychological profiles would have to be very

thorough. It would also be worthwhile to think of how governments would use this technology if it were highly developed; we should be informed and alert citizens who would elect trustworthy people. Technology per se is morally neutral, it is how people use technology that creates moral dilemmas.

References

Doyère, V, J. Dbiec, M.H. Monfils, G.E. Schafe, J.E. LeDoux. Synapse-specific reconsolidation of distinct fear memories in the lateral amygdala. *Nature Neuroscience* - 10: 414 - 416, 2007.

Smith, K. Wipe out a single memory: Drug can clear away one fearful memory while leaving another intact. www.nature.com/news/2007/070305/full/070305-17.html.



Images of Immorality: Brain Structure Studies Implicate Specific Regions in Immoral Behavior

By Michael Peluso and Gabriella Rothberger

Imagine sitting on a jury and hearing the following case:

A waiter in a local restaurant is charged with poisoning and killing a customer. He claims that the customer revealed to him that he was infected with HIV and desired to spread the virus to as many people as possible before he died. Evidence in the case suggests that the waiter, knowing that the customer had a severe allergy to poppy seeds, placed these seeds in his customer's soup in response to what he heard. The customer ate the soup, began to convulse, and died at his table. The waiter was accused of murder.

Although you believe that the waiter should be found guilty, the defense calls a key expert who presents some interesting neurobiological data. The accused has a lesion in a particular brain region that regulates emotional behavior and morality. Now, you need to make a decision: does the damage to this region preclude you from rendering a guilty verdict? Or should the accused face the same consequences despite the fact that he may have been neurobiologically predisposed to commit his crime?

The work of Koenigs et al., (2007) illustrates that damage to the ventromedial prefrontal cortex (VMPC), an area of the brain implicated in social emotions, results in the generation of overly utilitarian judgments with regard to moral dilemmas. This unusual behavior is indicated by a decreased aversion to emotionally salient,

negative decisions and increased likelihood of engaging in these actions if they are thought to fulfill a utilitarian goal. For example, patients with VMPC lesions are more likely to take the life of a loved one if they think that it will save a group of people with whom they are unacquainted. The VMPC is crucial in emotional responsiveness; damage often results in significantly diminished social emotions including guilt and compassion. Individuals with damage to this area are predisposed to make decisions that would be viewed as morally "wrong" by our legal system and society, and that this predisposition directly results from damage to this particular area of the brain (Koenigs et al., 2007).

Initially used as a means of identifying damaged brain regions and in linking specific brain areas to particular objective behaviors, fMRI may now be employed to determine the moral perceptive ability of an individual. Dr. Joy Hirsch, the director of Columbia University's fMRI research program, includes this types of studies as the new "Neuros" of modern society – including NeuroViolence, NeuroDecision-Making, and NeuroLaw. Increasingly, our society looks for explanations of more and more behaviors in the structure and the function of the brain. By taking a brain image of this particular area, researchers may conclude that there exists a predisposition to a lack of moral behavior and, more disturbingly, attribute it to the structure of a particular region of the brain.

In their study, Koenigs et al., (2007) patients with and without lesions in VMPC

were presented with hypothetical situations that were non-moral, moral but emotionally impersonal, or moral and emotionally personal. Emotionally personal moral dilemmas were either low-conflict or high-conflict. The researchers collected the responses of participants and analyzed them based upon whether the patients had a VMPC lesion. They found that in high-conflict personal scenarios (which included raping, poisoning, and killing others,) a significantly greater proportion of the VMPC group endorsed the action than either comparison group.

These results suggest that individuals with damage to the VMPC make emotionally-charged moral judgments according to a different code than healthy individuals. With the ease of brain imaging in the twenty-first century, it would be very simple to adopt this technology to perform brain scans of suspects in crimes of an emotionally personal and salient nature. The technology could be used in the argument for the acquittal of these suspects because they possess a physiological limitation that prevents them from making proper moral judgments. Conversely, this technology could be used to argue for the immediate incarceration or, at the very least, monitoring of people found to have damage to this particular brain region. The results of this study could also be applied to testing qualifications for law enforcement officers, civil servants, and members of the armed forces, as these individuals must not be morally incapacitated when it comes to making sound judgments upon which millions of lives rest.

This study cleverly demonstrates the influence of the VMPC in mediating moral decisions using MRI technology and self-report of subjects' reactions to different scenarios. Still, the significant findings hinge on the distinction between those decisions that constituted having personal significance

and those that did not. The measurement used to distinguish between the situations centered on the emotional reaction to the scenarios of an independent group of ten neurologically normal subjects. This is not a large group of people and can hardly be viewed as representative. Perhaps if the categorization of the situations had been different, the results would not have had statistical significance.

Furthermore, it is difficult to speak of statistical significance when the sample size of patients with lesions is confined to six subjects. A much larger sample is required to draw any conclusions. In addition, the researchers conducted neuroanatomical analysis through fMRI for the VMPC patients but used CT data for other subjects, raising some issues of consistency. And the categories of stimuli used are actually quite subjective – are low-conflict and high-conflict situations really the same for different people? Their statistical analysis of logistic regression and estimating equations was strong, but although differences in VMPC activity were statistically significant, only six subjects were used in this study and twenty-one personal moral scenarios, many of which were highly-specific and unlikely to ever occur in an individual's life. More appropriate and relevant scenarios would have enhanced the study significantly. If these data were ever to be applied on the larger scale discussed in this paper, mapping would need to be done on scenarios judged to be germane to the specific case.

Ethical Issues

The main ethical issue that results from this study is the propriety of using imaging technology in a way in which an individual can be implicated or exonerated. The fact that certain brain activities correlate with certain types of behavior is well known.

This research indicates that a specific area is involved in a particular type of morality and, presumably, damage to or poor development of this region will compromise the ability to engage in that type of moral decision making. While previous studies have indicated that the prefrontal cortex and limbic system are implicated in utilitarian thinking, this work specifically predicts that utilitarian ideals will be pursued even if that pursuit requires a high-conflict, emotionally salient act. Thus, murder, rape, and violence may be viewed as reasonable means to a perceived noble end; as long as the goal benefits more people than its pursuit hurts, damage to the VMPC makes any action morally justifiable.

It is difficult to really align activation of brain areas with coherent or specific thoughts or behaviors. Different people think differently and behave differently in given situations despite the fact that they may exhibit activity in identical brain regions. Our thoughts and behaviors are complex responses to the totality of inclinations and experiences our lives afford us. Therefore, although the study links brain activity in the VMPC with moral reasoning, we cannot be certain what the differences in actual thought processes are between individuals with or without these lesions, nor can we conclude what behaviors will result.

This technology brings to light the shortcomings of the idea of free will in our actions. Can a pathological condition in which the VMPC is damaged absolve a person from accusations of violent behavior, as there would be a discrete neurological basis to that behavior? Could innate criminal behavior as a result of VMPC damage prevent charges from being brought against a rapist or murderer? It is possible to imagine a system in which individuals do not have to serve prison time because it would be biological or neurological discrimination to sentence them for an

action to which they are predisposed. This has both positive and negative consequences – our justice system would be more objective in only punishing those individuals who engage in violent actions to which they are not predisposed, and this increases fairness by not punishing individuals who are not in control of their actions. But if they don't have control over violent actions, what is to be done with individuals with damage to the VMPC? If acquitted, they are likely to engage in such activities again. But if institutionalized, it is unlikely that they will ever be able to live normal lives. They will have to live with the stigma of being VMPC-damaged, and the knowledge of this stigma may exacerbate their condition. And because these individuals are otherwise unaffected by the damage to the VMPC, is it fair to prevent them from living everyday lives just because of a predisposition to a very limited range of violent activities that would arise out of situations which they may never face?

These ethical concerns describe circumstances in which an individual has already engaged in some sort of violent behavior. However, there are two slippery slopes created by the application of this new understanding of the VMPC. First, at what point do we limit the study of brain areas and their implication in our actions? What if we continue to pursue the identification of regions that may explain all different types of immoral behavior, not just ones limited to specific utilitarian situations? The implications of identifying brain regions attributed to the range of immoral behavior are many, as is the risk of individuals claiming damage to these regions to exonerate them from the guilt of their actions. A person might claim that a difference in the shape of his prefrontal cortex, attributable to natural variation within populations, predisposes him to a behavior even if it is not so. And if studies do not

e-BABY: Your Source for Designer babies

*By Class of 2007– Frontiers in Bioethics
Dr. John D. Loike, Course Director*

For around \$45, high-end toymaker F.A.O. Schwarz will make a life-like doll to your specifications. As advertised on their website, “You can choose from skin, eye, and hair color... to recreate someone you know.” While customized dolls are an expensive luxury in the toy world, there is burgeoning potential for an even pricier medical technology that would allow wealthy clients to design the features of their own real children.

Modern society supports technology such as in-vitro fertilization, pre-implantation genetic diagnosis, and prenatal genetic testing as a positive way for families to avoid the transmission of debilitating genetic diseases such as Tay-Sachs disease, Down’s syndrome, and hemophilia. In such cases, parental selection of children’s genetic traits is not only moral, but should be encouraged to ensure that these diseases are not passed on.

The issue of selecting babies with genes that regulate physical characteristics, such as height, raises bioethical concerns. While only 14.5% of people in the United States are over six feet tall, 58% of Fortune 500 CEO men are over six feet. Research has shown that for every inch of height, a person makes an additional \$800 more a year in salary. Furthermore, statistics show that society correlates height with intelligence, power, ability to provide, and leadership skills – characteristics that undoubtedly would make many people’s lives better. If we were able to isolate a gene for height, wouldn’t we want to select for it? Yet we believe the choice to apply

technologies to artificially select for non-disease based traits is unethical.

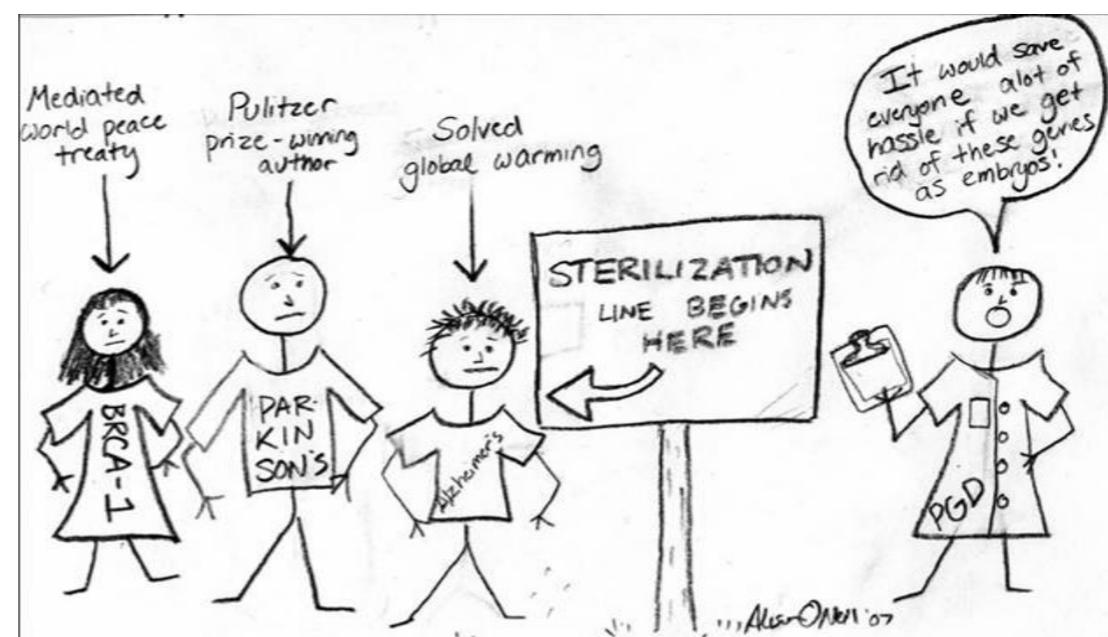
Parents could use genetic technology to select their children’s physical characteristics by generating a variety of embryos and choosing one with the desired characteristics. Applying these technologies to select or to genetically alter physical characteristics interferes in the natural evolution of the species and the beauty of human diversity. Secondly, it reduces children to the level of toys: custom-made playthings to be had for a price. If we are to have any respect for human life, we must appreciate the wide variety of physical appearances that are prevalent across our species. Thirdly, it makes the dangerous assumption that the superficial preferences of the parents will be the best for the child. There is no way to predict how parents will then treat their “product” and how that relationship will affect the child. Finally, the manipulation of the human genome also has the potential to create a further stratification between classes. Far from unifying mankind and directing our genetic predispositions away from disease and disability, these technologies could create an unprecedented divide between social and cultural groups.

New technologies in the area of genetic engineering are progressing rapidly and could be applied to designing babies by altering the genetic makeup of the embryo. For example, germ-line gene therapy goes beyond pre-implantation genetic diagnosis and involves the addition of new genes to cells so that any trait could be theoretically expressed in a genetically-tailored child. In

reality, there are limitations to this technology. The addition of new genes to an embryo does not necessarily mean that any trait can be expressed since both genetics and the environment influence the physical characteristics of an individual. Parents must understand that genetic engineering only provides a child with certain genetic propensities and not necessarily the expression of the desired trait. Our genes interact in specific ways and exhibit multiple effects on an organism. Genes also must be added at specific sites, and the random addition of genes may be dangerous. As a result, using this technology to eliminate the natural interaction of genes might elicit terrible diseases or disorders that were not anticipated. Therefore, germ-line therapy should be used exclusively for treating disease.

Assisted human reproduction has been highly successful, in part, because new technologies focus on aiding the disabled and treating disease. In vitro

fertilization has facilitated the birth of millions of healthy children from couples with infertility problems. Yet, we are witnessing the commercialization of this technology through centers that allow "customers" to choose sperm or egg from potential donors, based on the donor's intelligence, physical characteristics, appearance, and personality. Applying all these technologies to select for "superficial" physical characteristics is dangerous and immoral. In the future, when our children ask "Where do babies come from?" we sincerely hope the answer will not be that they are "the top of the line designer babies," ordered with every option from the e-BABY website.



exist to confirm or deny this, can the person be held responsible?

Secondly, this research forces us to consider the possibility of the use of brain scanning for pre-diagnosing an inclination toward immorality. Could our legal system devise a method that screens individuals for damage to brain regions like the VMPC and then institutionalizes them because they pose a risk to those around them? It is easy to imagine organizations whose employees are often in emotionally salient, high-conflict situations initiating screening tests to determine the compatibility of potential workers through an analysis of neural activity in certain brain regions. All of these are possibilities that result from the application of the technology in this paper; it represents a slippery slope, at the bottom of which are societies like those in *1984* and *Minority Report*. All semblances of privacy and individual property would be sacrificed in the name of society as medical records are exploited for these purposes.

Resolution

A possible resolution of these issues would be based on doctor-patient confidentiality and the guarantee that medical records like those indicating damage to brain areas associated with moral activity will not be made available to potential employers or in any situation in which they are not subpoenaed in court.

However, a more important question is whether evidence from studies of brain regions that are associated with morality should be admissible in court at all. At present, individuals can be exonerated if they demonstrate that they were not competent to make an appropriate decision at the time that they committed a crime. But this situation is fundamentally different – individuals are predisposed to engaging in a certain type of moral decision making, but

that does not mean they are not competent enough to be aware of societal norms and modify their decisions as such.

These studies do not analyze the relationship between the VMPC and other brain regions that may modify its thought processes, and as such, we may not be able to reduce moral actions to just one area of the brain – they may be the result of interactions of global brain circuitry. Thus, the evidence provided in this paper is not conclusive enough to justify the idea that an individual's actions are unqualifiedly determined by just one region, and it therefore cannot be argued that these individuals are unable to modify the decisions made by the VMPC with a working knowledge of acceptable societal norms. Additionally one can argue that regardless of being able to personally feel moral emotion, as long as the individual has functioning brain regions involved in rational thought, he should be held responsible for his actions. Murder is a crime, and the law still maintains this fact, despite its possible social utility.

The most straightforward resolution of the ethical dilemmas posed by this paper is the rejection of the technology in situations in which it would be used for any legal purposes. In the past, technologies that initially appeared to be detrimental to the survival or integrity of humanity have provided us with inestimably valuable knowledge of the functions and processes of the human mind, brain and body. Still, legal strongholds around such technologies are required to ensure that we do not veer from the path of knowledge.

In all clinical studies, subjects are required to give their consent that they are aware of the aims of the study and the procedures they will undergo. But in cases like this, does the subject really know (can they really know?) what the implications of their participation will be? It is hard to predict how the public would react to

findings which demonstrate that these individuals are lacking in moral cognition. Will brain lesions in this region or altered capacity for moral and empathetic feelings be considered a clinical condition or a disease? Can or should such a condition be cured? What will life be like for an individual with this particular brain lesion? We have to consider the effects that participating in these studies will have on the subjects. If we cannot assure participants that they will benefit from participation, we should at least be able to ensure that they will not have to face any adverse responses or circumstances as a result. Any participants engaged in such research must be informed of the implications the results could have in social arenas and in what ways their lives may be impacted.

Ultimately, John Stuart Mill, the father of utilitarianism, can provide guidance on the application of technology indicating a neurological predisposition toward utilitarian crime. Mill stated that "Everyone who receives the protection of society owes a return for the benefit." These individuals believe that they are paying this debt by committing acts that they consider utilitarian, but are still objectively viewed as immoral. It is our obligation as bioethicists to ensure that we protect the rights of those individuals who may lack the neurological capacity to discriminate right from wrong.

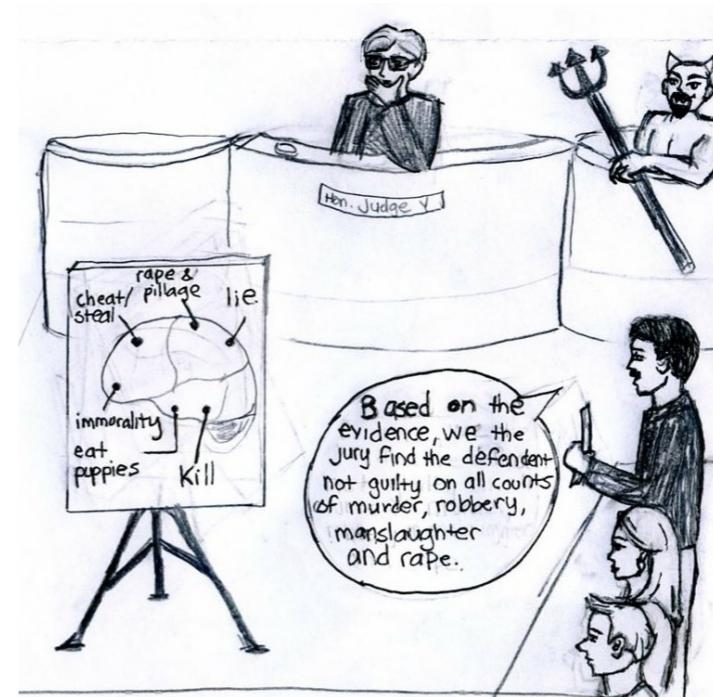
References

Hirsch J. Your conscious and unconscious brain: from brain to mind and beyond. Lecture, Kavli Institute of Brain Science, Columbia University, 2007. W3005, Neurobiology II: Neural Circuits.

Koenigs M, Young L, Adolphs R, Tranel D, Cushman F, Hauser M, and Damasio A. Damage to the prefrontal cortex increases utilitarian moral judgements. *Nature* 446: 908-911, 2007.

Loike JD. 2007. Chapter 10: Neuroethics. Bioethics Digital Textbook, Columbia University.

Mill JS. On Liberty. 1869. On Liberty. <www.bartleby.com/130>.



Silent Continent, Silent Spring: DDT as a Bioethical Obligation

By Matthew Nguyen and Michael Peluso

Southwestern Uganda is inhabited by some of the most unfortunate people in the world. Living on less than \$1 a day, they struggle to survive in the face of infertile land, starvation, and the threat of violence from the Democratic Republic of Congo. But the biggest killer is not malnutrition, Congolese rebels, or even the ubiquitous HIV – it is a microscopic protozoan that causes malaria. News reports claimed that Idi Amin was responsible for 500,000 deaths in his eight-year reign as President of Uganda. During that same period it can be estimated that mosquito-borne malaria caused sixteen times—over 7 million—as many casualties worldwide. A far cry from the summertime pests in the United States, these infected mosquitoes in sub-Saharan Africa are harbingers of death.

Malaria is the most common diagnosis made at the Bwindi Community Health Centre (BCHC), the only clinic that serves the Bakiga and Batwa populations in southwestern Uganda. Malaria is the biggest killer of patients, incurs the largest drug and blood costs, occupies the most laboratory time, and causes the staff to lose days of work and family members. Yet, foreigners, mostly wealthy tourists on gorilla-tracking expeditions, know little of the problem. While on a hike through the Impenetrable Forest, visitors, like myself (Michael Peluso) are generally informed that using a bed net is unnecessary because there is no risk for contracting malaria at such a high altitude. That night, one of us (MP) got bitten, and three days later, diagnosed with malaria. For about \$3 proper treatment was obtained-In Uganda, a

mere \$3 which that is usually unaffordable by most Ugandans, can save your life from malaria!

On a continent where 90% of the one million malaria-related deaths in the world occur each year, remarkably little has gone into combating the disease. New technologies are not necessary to reduce the risk of malaria in Africa. Dichloro-Diphenyl-Trichloroethane (DDT), over a century old, has the potential to help in alleviating this critical health issue as a cost-effective and potent way to fight mosquitoes. Nevertheless, DDT's many negative associations in the West, stemming mostly from research and observation in the 1950s and 1960s of the effects of high concentrations of the chemical, have prevented its use in places like Uganda, as donor governments and international agencies have refused to fund programs in which it plays a fundamental role.

Last fall, the World Health Organization announced support for a new policy of indoor DDT spraying in both epidemic and non-epidemic areas. Under the guidelines, the WHO calls for spraying in areas of high malaria transmission, including in Africa. While scientists, health workers, and policymakers heralded this decision as a breakthrough, it does not represent a significant change from the last 40 years of restrictions, as the utilization of DDT in a public health capacity was never limited legally. Instead, it faced financial and ideological obstacles. Now, the funding that wealthy nations and organizations have been resistant to provide since the 1970s, may start to trickle in for use in areas where

governments cannot afford comprehensive DDT programs. We can only hope so, as the provision of DDT to the regions that need it the most is not just a political, economic, or social issue: it is a bioethical one.

Bioethical debates over DDT focus on the balance between saving human lives and the polluting the environment. While Rachel Carlson's work (1962) provided valuable insight into the dangers of chemical agents and their effects on wildlife, the use of DDT for public health requires far lower concentrations how much lower than for agricultural use. And with 500 million infections and 1 million deaths each year from malaria, it is hard to deny that a lack of effective DDT programs contributes to a tremendous amount of avoidable human suffering. The WHO decision signals a realization that DDT has not been used to its full potential in the developing world, even though it was largely responsible for the eradication of malarial mosquitoes in much of the western hemisphere and Europe during the 1900s.

Unlike stem cell research or cloning, DDT is not a new technology. Consequently, insufficient attention has been devoted to it. When so many lives are at stake, it is imperative to look not only to newly developed technologies, but also to older ones that may have not reached their full potential.

While the WHO initiative represents a step in the right direction, simply stating support for a program is not enough to solve a problem. Countries around the world can help ensure that adequate DDT programs are instituted internationally. This obligation is held by both

the scientific and political communities of the West: researchers have the responsibility of continuing to study DDT and its applications, and the political community is obligated to assist financially and administratively with the implementation of these programs. According to doctors at BCHC, "prevention is so much better than cure." The logic is irrefutable: malaria is a terrible disease; DDT could prevent the death of millions cheaply, safely, and effectively. It is time to move beyond the perceptions of a "Silent Spring" when the cries of so many dying are left unheeded. It seems incongruous to screen embryos to eliminate genetic disorders as done in many Western countries when millions of people in developing countries are falling victim to a disease caused by simply improvable environmental conditions.

References

Carson, Rachel. *Silent Spring*. Boston: Houghton Mifflin Co., 1962.



Organs for Sale

By Raymond Raad

Nearly 100,000 people in the US are waiting for organs to save their lives, but most will never get them. About 12,000 of these will die in the next year alone, while only 6,000 will get another chance at life. What is especially tragic is that a solution *does* exist - but it is banned by the federal government.

The solution is to create a market on human organs. However, the National Organ Transplant Act, passed in 1984 and sponsored by Sen. Al Gore, makes it illegal for individuals to sell organs whether they come from live donors or cadavers. Thus, all organ donations must be self-sacrificial. Naturally, as a result of this ban, a huge shortage of organs has developed.

People who needed transplants should be able to pay for them as part of the transplantation costs, and receive them at the moment that they are needed. Many of today's most morbid diseases, from end stage kidney disease to liver cancer would be like high blood pressure -- diseases to live with rather than die from.

Many influential people speaking on this issue, including doctors and ethicists, consider such a market doable but consider it to be immoral. In the face of such a moral belief, no number of logical arguments can be effective, and for good reason. No one can accept a practical solution when it requires selling one's soul.

But is an organ market truly *immoral*? Suppose that there are two people: Joan and Claire. Joan needs a kidney to live and has agreed to buy one from Claire for \$15,000. Claire is in full agreement, but would not be willing to donate her kidney for free. Both stand to

gain from the exchange. Joan would get a chance at life, which she obviously considers more valuable than \$15,000. Claire would gain both an opportunity to save a life, and whatever she chooses to do with her money. This act is not immoral for two reasons. First it is pro-life for both Joan and Claire. Joan gets an opportunity to live longer, and Claire can use her new money on any number of commodities to improve her life. Second, if these two individuals have made their choices to participate in the exchange, then a respect for privacy requires that no one gets in their ways.

So why do so many people consider this *immoral*? Primarily due to two subtle errors in moral thinking. The first is exemplified by questions like these: Why doesn't Claire just donate her kidney for free? After all, doesn't money taint the donation process?

These questions may seem reasonable, but only on a superficial level. The decision to donate a kidney is a remarkable display of virtue because it shows that a person values human life. Kidney donation also involves undergoing the risks of surgery such as bleeding and infection, and a 6-week recovery time. If the doctors and nurses involved get paid, why should the donor undergo all this trouble for free? Not only does Claire deserve compensation, but it is profoundly disrespectful to remove an organ from her body and not offer her anything in return. Compensating the donor doesn't compromise her virtues; it reinforces them. A donor who is paid is likely to leave the surgery satisfied both with herself and

her contribution. In fact, the effect of *not* compensating the donor may be viewed as *punishing* her for her virtues -- and it may cause even the most caring of donors to regret her decision.

Further, it is important here that we distinguish between two questions that are easily confused:

- (1) Is it right for Claire to sell her organs for money?
- (2) Is the government justified in punishing her if she does?

The trouble with many anti-market positions is that they do not separate these two questions -- and, in fact, they assume that the second is a corollary of the first. Nothing could be further from the truth. Whether Claire should sell her kidney or not, is a private autonomous decision for her to make. No one has the right to impose his view on her. She may elicit the opinions of family members, doctors, and ethicists, but only if she so chooses. When the government bans her from selling her kidney, it is imposing itself on her life and violating her right of privacy in a matter of utmost importance.

The second type of moral error is believing that an organ market will somehow exploit the poor by forcing them to give up their organs. To think about this clearly, let's go back to our above example. This time, assume that Joan is rich while Claire is a poor woman who needs the money to attend college. It very well may be an injustice that Claire is poor, but given that she is, there is nothing about this exchange that is forceful or unjust. If Claire has decided that she would rather have the college education than her kidney, then she will likely be better off after the exchange. Poor people when properly educated can make their own decisions just like everyone else.

The only effect of the ban is to limit

Claire's choices. Instead of going to college to become more successful, Claire would have to continue to live in poverty. In contrast, an organ market would provide her with more opportunities to climb the socioeconomic ladder and achieve happiness, while also allowing her to make a contribution to another human life. Those who want to help the poor should stop opposing organ markets; the real problem is poverty, not the organ market.

It is important that we challenge and dispel this popular notion of an organ market being immoral, both because it is wrong and because this belief has many negative effects. Its widespread acceptance is leading to tens of thousands of deaths each year due to organ shortages in the United States alone. When our code of morality leads to death of patients, it is time that we question this code.

Thankfully there has been some limited progress in this area recently: several ethicists and doctors have become less anti-market. Yet at best they are willing to concede that the buying and selling of organs is "not necessarily immoral" -- hardly a whole-hearted or whole-minded endorsement. If patients are going to have any chance to live, then we must make it clear that an organ market is not just morally permissible but highly moral because it is the only system that is compatible with human life and human choice.



Does your Food Wear Designer Genes?

By Alison O'Neill and Nikki Learned

The use of biotechnology to improve the color, taste, nutrition and production of food began in ancient times, when farmers first cross-bred different plant strains and realized that they could produce varieties with the optimal characteristics of both of the original plants. Today, our knowledge about biology and genetics is indubitably more advanced, and our tools to harness that knowledge are increasingly more sophisticated, yet the two central goals of bioengineering food remain the same: nutrition and economics. Researchers hope that by designing foods that have superior nutritional value, increased resistance to pesticides, and a variety of other positive characteristics, many health and food shortage problems can be alleviated. Current techniques in food bioengineering vary from basic hybridization of different crop strains to the insertion of new genes into a plant's genome. Although the creation of improved food products has resulted in many positive benefits over the years and still has great potential, there are drawbacks to the use of technology in crop manipulation, which have possibly unethical implications.

Recently, a group of researchers at the University of Florida bioengineered a tomato strain with up to 25 times as much folate as the control tomatoes. Folate, the anion form of folic acid, is a water-soluble B vitamin that helps to produce and maintain new cells, as it is essential in the production of DNA and RNA. As a result of its role in cell division, folate is especially important during periods of rapid cell generation, such as pregnancy. Additionally, it is essential in

the production of new red blood cells. Folate is commonly found in leafy green vegetables as well as in citrus fruits. A typical adult should consume approximately 400 µg of folate per day, while pregnant and nursing women need up to 600 µg daily. Folate deficiency has been implicated in a variety of birth defects, as well as in anemia and even cancer. The United States currently requires that grain products be fortified with folate in order to increase intake by the population, but there are no such requirements in most underdeveloped countries where many of these health conditions are prevalent. Moreover, the addition of synthetic folic acid (the current method of grain product fortification) has raised concerns regarding its safety. Therefore, the introduction of folate into a common food product such as tomatoes could provide benefits both here and abroad.

In order to increase the amount of folate in tomatoes, researchers crossed two strains of tomatoes that had greatly increased quantities of the precursors in the plant's production of folate. The vitamin is composed of one molecule each of pteridine, p-aminobenzoate (PABA), and glutamate. A previous team of scientists engineered a tomato strain that overexpressed GTP cyclohydrolase I, the enzyme that catalyzes the first step in the pteridine synthesis reaction. Although levels of pteridine greatly increased, folate levels only increased 2- to 4-fold. It was determined that this was a result of decreased levels of PABA and thus, a new strain was engineered to have

overexpression of aminodeoxychorismate synthase, which catalyzes the first step of PABA synthesis. When the two strains were crossed, the resulting offspring tomatoes contained over 25 times as much folate as the control tomatoes. The levels of folate in the tomatoes are high enough to provide daily folate intake for an average adult in less than one serving.

While there are many advantages to the folate biofortification introduced by de la Garza and his research team, there are also potential downfalls relating to this specific technology and that of genetically engineering foods, in general, which need to be examined. The possibility of having the daily requirement of a vitamin or nutrient available in a single tomato, for example, can be dangerous especially if the biofortified food product is a staple of one's diet. The consumption of three tomatoes would lead to three times the daily intake of folate. For the general public the consumption of excess folate proves harmless, but there are two population groups that could potentially suffer, the elderly and those on anti-malaria treatments. High levels of folate can mask the symptoms of Vitamin B12 deficiency. Considering that 20-25% of the elderly have low or borderline B12 stores and B12 malabsorption, the elderly have an increased risk of living with undiagnosed Vitamin B12 deficiency, which ultimately leads to demyelination and nerve cell death. (www.fda.gov/oc/history/makinghistory/folicacid.html). Should the elderly be confronted with that increased risk? Excess folate has also been shown to interfere with anti-malaria drugs, and in one study, doubled the drugs' failure rate (<http://news.bbc.co.uk/2/hi/health/6067450.stm>). If the consumption of these tomatoes was unregulated in areas such as Sub-Saharan Africa where malaria is a serious threat, the anti-malaria treatment would be less effective and would lead to more deaths.

However, these areas are also those that would benefit from having increased folate in their diet. This raises the question of which is worse: folate insufficiency or malaria? Excess folate could interfere with other drugs as well, but these would not be identified until something goes wrong.

The biofortification of foods has the potential to exacerbate the obesity epidemic



present in the United States. By condensing the daily requirement of vitamins and nutrients into one tomato, the motivation to eat fruits and vegetables could decrease. We eat fruits and vegetables because of the nutrition they provide, but if their health benefits were condensed into one fruit or vegetable, would we choose to eat them? The future applications of this technology could lead to fruits and vegetables that contain the daily requirement of many vitamins and minerals. This could detrimentally affect people's eating habits. It is reasonable to hypothesize that a section of the population would use these super nutritious genetically engineered foods as an excuse to eat less nutritious and higher

calorie foods.

Genetically engineered foods also affect the environment they are grown in as well as the surrounding animal population. While the potential for this genetically engineered tomato to harm the soil and surrounding animals may seem low, a look at a past example of genetically engineered corn illustrates the potential dangers. In the case of the StarLink bioengineered corn, there were studies that showed that the consumption of the corn's pollen by monarch butterfly caterpillars led to their death (www.news.cornell.edu/releases/May99/Butterflies.bpf.html). In addition, it was intended only to be used for cattle consumption but was somehow leaked into the human food supply. StarLink corn, which was only approved for animal consumption, was genetically engineered to contain a gene whose protein product is toxic to moths that destroy crops and decrease corn yield. However, that same protein product caused many people who consumed traces of the corn to have anaphylactic allergic reactions upon ingestion. Additionally, while StarLink corn has negative consequences for butterflies, it also has positive effects on the environment because it reduces the need for the pesticides that will kill the corn-devouring moths.

The ethical issues associated with the use of bioengineered foods can be partitioned into two main concerns. One has been touched upon already in this paper: how do we weigh the environmental effects of the use of biotechnology in food production? As has been demonstrated, GMOs can have both positive and negative effects on the environment, and thus it is essential to analyze the potential ramifications of the introduction of a new crop strain. The issues require us to define our responsibility to other species in a variety of ways. For example, if a new food strain is harmful to an animal population, but

could drastically improve health and nutrition in humans, does our commitment to improving conditions for people supersede our obligation to protect other species? Alternatively, if the use of genetically modified foods reduces the need for pesticides and other products harmful to the environment, should we actively pursue those strains even if they have negligible nutritional benefits for humans?

The second overarching ethical issue is whether or not people have the right to know the exact content of food purchases. It can be argued that food bioengineered for nutritional purposes is a form of treatment addressing a medical condition. As an example, the new tomato strain could be considered a medical treatment for folate deficiency, and a patient, in this case the food consumer, always has a right to know exactly what treatment he or she is receiving. Also, it is worth acknowledging that many people simply have an aversion to food that is not considered "natural." Whether or not their concerns are scientifically valid, it is reasonable that they should have the choice to avoid eating something that they find distasteful. Additionally, there are several religious concerns associated with bioengineered food. A common critique is that manipulating the genome of plants either by transferring genes from one species to another or simply introducing new characteristics, interferes with the uniqueness of species and violates God's handiwork. Another issue is that dietary restrictions prescribed by many religions require that the practitioner be vigilant about the content of food consumed. Although decisions such as whether or not a practicing Catholic can eat a vegetable that contains part of an animal genome on a Friday during Lent should obviously be left to the observer and the Church to decide, it is important for them to have the information

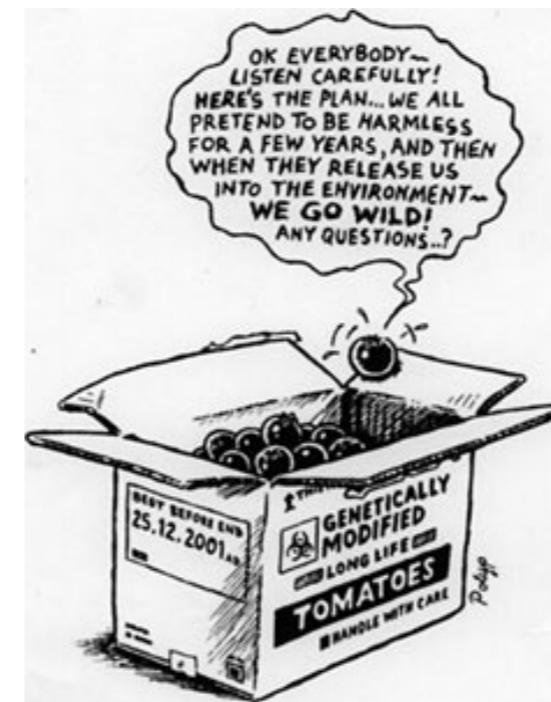
necessary to make an informed decision.

As a solution to these complex issues, we propose an educational campaign to demystify bioengineered food as well as the creation of a committee to create guidelines for the labeling of food items. The education/labeling program will be modeled after the recent campaign to help the public understand the nutrition facts of their food. By combining mandatory labeling of food with an understanding of the meaning underlying the labels, people will be able to make informed decisions about what they consume based on health, personal preference, and religious persuasion. Additionally, regulations regarding the manufacture of GMOs must be put into place. Any farm producing food for human consumption, whether it engages in the production of bioengineered crops or not, must regularly test the composition of their products in order to ensure that they can accurately label their products. Essentially, the goal is to eliminate the public perception of GMOs as "bad" or "unhealthy" and truly help people understand the composition of substances that they ingest. Once this level of understanding is achieved, any choices that they make are wholly dependent upon their own personal preferences and free will to decide what and what not to eat. Furthermore, the creation of a database of the genetically engineered foods being produced and where they are sold is essential. This will allow healthcare practitioners to recognize possible negative effects, such as an undesirable reaction between a compound and a vaccine. If the doctor is aware that folate-enhanced tomatoes are being consumed in a particular area, for example, she can advise his patients receiving the malaria vaccine to reduce their tomato consumption. Through both education as well as careful regulation of GMOs, we can begin to reap the benefits

of this burgeoning technology without overstepping ethical boundaries.

References

- Diaz de la Garza, Rocio I, et al. Folate biofortification of tomato fruit. *PNAS*, 104;4218-4222, 2007.



Teen Obesity Operations: “Big Concerns for Big Kids”

By Rob Deiches and Nikki Learned

The Associated Press recently published an article addressing the rise in the frequency of teen obesity operations in the United States. The article cited findings published in a recent study prepared by researchers at the Robert Wood Johnson Medical School in New Brunswick, N.J., and the Cincinnati Children's Hospital. The research indicated that between 1996 and 2003, an estimated 2,744 children between the ages of 12 and 19 underwent some form of obesity-related, or “bariatric” surgery. The rate almost tripled between 2000 and 2003, reaching a shocking 771 surgeries in the final year of analysis. If adolescent surgery rates continue to climb at these speeds, experts predict that more than 1000 adolescents may undergo surgery this year. It is important to note that the study does not address the causes of obesity, the types of surgery performed, or the severity of the obesity of patients who underwent surgery. Nonetheless, those are startling numbers - too many young people are going under the knife during what are supposed to be their healthiest years. Perhaps these statistics are not great cause for concern; perhaps these are all routine, minimally invasive procedures that do not carry great risk.

Sadly, this is not the case. As it turns out, bariatric surgeries are anything but routine, fundamentally altering the way the body processes and metabolizes ingested food. There are two main types of bariatric surgeries: banding, or stapling procedures, and gastric bypass. In banding procedures, the stomach is partitioned into two smaller sections via the installation of

restrictive bands or staples. This creates a small pouch at the top of the stomach, which receives all of the food deposited from the esophagus. Because the pouch is much smaller than the entire stomach, the functional volume of the stomach is greatly reduced. The pouch fills with food more quickly and encourages feeling “full” more quickly. In addition, a very narrow opening is created at the base of the pouch, which delays the emptying of the stomach, and thus reduces the sensations of hunger between meals. In other words, you eat less at mealtime and spend more time not eating between meals. The net effect: you are eating less overall and therefore lose weight.

In gastric bypass, an even more extreme procedure, the small intestine is



surgically cut within the duodenum, the intestinal segment which normally is the first to receive digested food from the stomach and is responsible for the majority of nutrient absorption into the body. Surgeons then create another volume-restricting pouch from the stomach tissue, and create a

functional pathway from the pouch to the shortened small intestine, thus bypassing a portion of the duodenum, and reducing overall nutrient absorption by an amount proportional to the amount of bypassed duodenum tissue. Here, physicians literally impair the body's ability to absorb fuel, so it becomes substantially easier to encourage your body to break down its fat stores for energy.

As might be expected, both of these procedures involve significant risks and side effects including infection, hemorrhaging and other common risks associated with abdominal surgery, like leakage of corrosive digestive fluids into the abdominal cavity and nutritional deficiencies.

It's not all bad news though: almost all of the aforementioned surgeries go well, with mortality rates of zero for children, and 0.2% for adults. Rates of complication in children are also lower than that of adults. And it works. Bariatric surgery has been shown to be the most successful way to treat obesity and promote fat loss.

But can we truly justify making the decision to have our next generation undergo major surgery so early in life? These procedures are serious, life-long commitments, and are irreversible without additional surgery. As we continue to embrace the quickest, easiest solutions to modern medical problems for our children and ourselves, we really must make significant strides in developing safe standards and practices, specifically for bariatric procedures. At what point does surgery become a viable treatment option to overweight patients, and what roles should doctors and parents play in making or helping to make the decision to undergo this type of surgery? Yes, the technology is there, but should we use it?

These questions are particularly relevant for children and adolescents, whom



the government has largely overlooked in medical decision-making process legislation. Children and adolescents thus face a risk of exploitation by impatient parents or overzealous physicians. And who is going to pay for these expensive ordeals, which include significant operating room time, an average 3.2 day hospital stay for adolescents, and extensive post-operative check-ups and diet and lifestyle planning sessions with doctors and nurses?

These are tough issues to face. It is important to take a step back for a moment and consider the larger picture. Bariatric surgery is certainly reserved only for the most extreme, morbid obesity cases when alternative means of treatment have been exhausted; it is used only as a last resort measure. Also, in 2002, over 16% of American adolescents were considered overweight or obese. That means there are hundreds of thousands of overweight kids (another issue we won't directly address here) who aren't getting their stomachs stapled. So really, the most important question we need to answer is, why and how are these few children getting the

surgery reaching the point that an invasive operation is the best option to treat their condition?

The general sentiment in the medical community about the causes of morbid obesity is ambiguous; in the minds of some, the condition is the result of physical or mental disease, while to others, a lack of self-control and responsibility is the underlying cause of this gratuitous body fat. While our genetic predispositions are the primary determinants of our metabolisms, and while it is tempting to use our grandparents as genetic scapegoats for all of our tendencies toward disease, it is clear from the ubiquitous weight loss and exercise product advertisements we face today that our behaviors and actions can also have significant impacts on our bodies. And it doesn't cost a dime for a child to get up and go for a walk around the block.

The first step in the path towards a satisfactory solution is to more effectively target and educate children who are at risk of becoming morbidly obese about the damage their physical condition is doing to their bodies. As with many diseases, early lifestyle changes may be the cheapest, safest, and healthiest way to prevent the

development of the condition and it's never too early to start cultivating healthy habits. Beyond that, we must take greater responsibility for our youths' awareness of and access to alternatives to fast food and video games, and make a more sincere effort to be aware of the day-to-day food and activity choices they make. We will need to develop objective medical legislation that tells us in what cases surgery should even be considered as a potential treatment. Eventually, we will have to encourage an effort on the part of restaurants and food suppliers to limit the fat and caloric content of their food (no trans fats is a good start), and campaign for healthier foods in schools.

In the end, the most important thing is the health, individuality, and well being of the children. As long as we supply sufficient opportunity and education to ensure that adolescents have the capability and know-how to lead healthy lives, the most important thing we can do is be supportive, emphasize positive choices, and encourage our young people to think ahead when they choose what to eat, or what activities to pursue.



Animal Use In Medical Research: A Look at Various Religious Attitudes Toward Animal Testing

By Dana Balitzer and Laura Rusky

The ethical dilemma of using animals for research continues to reemerge, brought to attention by various organizations which question the legitimacy as well as necessity of using animals for research. In a world where many base morality on religion, these beliefs and science must meet a common ground. Many religions do not advocate the abolishment of animal research, yet still demand that society carefully consider, on a case by case basis, when there is a need to sacrifice animal lives.

Jewish, Christian and Islamic arguments regarding animal research overlap considerably. All share the belief that animals were created and are loved by God. Various groups interpret this belief as a reason in itself to abolish animal experimentation. Some Christians argue that the teachings of Jesus mandate care for those "weak" or "lesser" than oneself and therefore humans have a God given responsibility to protect animals (www.all-creatures.org/clct/art-antest.html). A Muslim scholar, Al-Hafiz BA Masri, states, "According to the spirit and the overall teachings of Islam, causing avoidable pain and suffering to the defenseless and innocent creatures of God is not justifiable under any circumstances. No advantages and no urgency in human needs would justify the kind of calculated violence which is being done these days to animals" (www.islamicconcern.com/vivisection.asp). Many followers of Judaism and Christianity agree.

Other abolitionists believe that innate differences between humans and

animals render animal experimentation useless. Christian anti-evolutionist/creationists propose that all animals belong to one category and humans to another, with little relation between them. These Christians cite biblical scriptures such as, "all flesh is not the same; men have one kind of flesh, animals have another" (www.all-creatures.org/clct/art-antest.html). They conclude that using animal research to further medical understanding is flawed because the knowledge obtained is irrelevant to helping us better understand humans. Similar views are expressed by animal research oppositionists from the Jewish and Islamic faiths (www.islamicconcern.com/vivisection.asp and <http://www.jewishveg.com/schwartz/position-paper.html>).

Yet similar arguments about the fundamental differences between humans



and animals are used in support of animal research. A verse from the New Testament supporting this reads, "A man is worth many sparrows, but not one sparrow can die unnoticed in God's world." (www.fbresearch.org/education/religions.htm). Many Christians contend that Christianity values the lives of humans over the lives of animals and thus if sacrificing animal lives can potentially save human lives, it is acceptable. Some Muslims also condone medical experimentation to support medical advances (www.islamonline.net/iol-english/dowalia/techng-2000-August-22/techng7.asp). Of key importance to these Muslims is the intent behind research. Qur'anic scholar Al Hafiz B A Masri states that "any kind of medical treatment of animals and experiments on them becomes ethical and legal or unethical and illegal according to the intention of the person who does it." (www.fbresearch.org/education/religions.htm).

Jewish belief also considers human life to be of higher worth than animal life, thereby justifying the use of animals in medical research (www.jewishveg.com/schwartz/position-paper.html). Jewish law dictates that "It is forbidden, according to the Law of the Holy Torah, to inflict pain upon any living creatures. On the contrary, it is our duty to relieve the pain of any creatures." (www.jewishveg.com/schwartz/faq_animals.html).

Proponents of animal research from all three western religions state provisions under which the research must be conducted. A leading Judaic scholar, Rabbi Rayner, states "... would regard any experimentation on animals as ethically permissible provided (a) that it is done in such a way as to cause the least possible suffering to the animals and (b) that there is real basis for the hope that such experimentation may lead to the saving of human life or the relief of human

suffering." (www.fbresearch.org/education/religions.htm). Animal experimentation is not expressly outlawed, but must be justified by a real human need.

Eastern religions are known for their reverence of animals. Hindus and Buddhists both believe that animals have souls and emotions, and consider the lives of all animals sacred. This is exemplified in the fact that both religions consist largely of vegetarian followers. A key concept of Buddhism is the elevation of suffering in all living beings. Buddhism emphasizes that killing must only occur out of necessity, however different interpretations what qualifies as "necessity" can lead to different ethical conclusions. Buddhist bioethicist, Damien Keown, states, "in general I see little justification for experimentation on animals from a Buddhist perspective. If we think animals have a right to life then it's difficult to justify fatality-causing experiments, regardless of the benefits which may (or may not) follow, or the fact that those conducting the experiments do so from the highest motives." (www.ahimsa.net/jbe/jbe043.html).

The Dalai Lama, leader of the Tibetan Buddhist Sect and considered by followers to be an incarnation of embodiment of Buddha's compassion, however, disagrees with these scholar's interpretations. In a talk given at the Society for Neuroscience's annual international convention in 2005, he said, "I encourage the minimum use of experiments on animals, the absolute minimum amount of pain. Only perform highly necessary experiments, and as little pain as possible." It is his belief that animal research is a necessity "to bring greater benefit to a great number of sentinel beings" (www-pharyngula.org/index/weblog/comments/dalai_lama_at_the_society_for_neuroscience/).

According to the Hindu faith, the

atman or soul can be reincarnated into animals. One scholar explains how "Hindus see animals as beings like humans but with souls in different karmic form." Due to the belief that souls that reside within humans and animals are of equal value, many Hindus oppose animal experimentation. Others recognize the potential benefit animal experimentation can provide to mankind. As with Buddhism, individual Hindu sects and followers often have diverging views on the balance between these karmic consequences and the value animal experimentation could provide to human life (http://www.ethnicityonline.net/hindu_staff_issues.htm).

Analysis of how animal experimentation is viewed in five major world religions, Judaism, Christianity, Islam, Buddhism, and Hinduism, reveals immense similarities in each. Great respect for animal life as well enormous value of human life is expressed in each. Animal experimentation is either expressly outlawed or tightly regulated from the perspectives of various religions. It is arguable that modern technologies have not advanced enough to entirely replace animal experimentation. However, it is important to balance the value of each study to improving the quality of human life, and to never frivolously disregard the moral implications of animal sacrifice.



Redefining Disease

By Rob Deiches and Adil Ahmed

High-throughput chip-based matrix-assisted laser desorption/ionization time-of-flight mass spectrometry (MALDI-TOF MS) is a technique that allows researchers to analyze and compare biological macromolecules, such as large pieces of chromosomal DNA and whole protein subunits. The technology works by shattering a sample of molecules with a laser and determining the sizes of the resulting fragments by ionizing them and measuring how fast they fly toward an electric source. The bigger pieces move more slowly, the slower pieces more quickly, and a computer reads how many pieces of each size show up for a given sample. Because bonds between different atoms have different strengths, each molecule shatters in a specific way based on its chemical structure, and thus produces a characteristic pattern of fragment sizes. This fragmentation data can be collected, and the resulting mass spectra can be catalogued, allowing researchers to make a database of signature patterns which can be used to identify unknown proteins or genes. This is a fast and accurate spectral analysis technique for high-throughput processes, yet sensitive and gentle enough to be used effectively to look at whole proteins.

Recently, scientists at the Steno Diabetes Center in Copenhagen used MALDI-TOF MS to compare similarities and differences in genetic information from 5,857 middle-aged white subjects. They looked at the GAD2 gene which codes for a protein enzyme involved in the production of gamma-aminobutyric acid, a chemical messenger which has been shown to be

part of the regulatory mechanism for blood sugar by controlling pancreatic hormone release. Subjects who carried a specific polymorphism in the GAD2 gene exhibited lower blood-sugar levels during fasting, "in-between-meal" times and had lower Body Mass Index values, while subjects with higher BMI values exhibited the gene less frequently (Boesgaard, TW, et al, 2007). In other words, the Danish researchers found a "skinny" gene, or at the very least, a gene which seems to promote healthier body weight in its carriers.

Findings like these represent the tip of the proverbial iceberg in proteomics research because they help bridge gaps between genetic information, protein production, and phenotype expression. In years to come, scientists hope information obtained from assays like the MALDI-TOF MS process will allow us to build a genetic lexicon, a roadmap which will allow physical and emotional characteristics and predispositions to be accurately predicted from genetic information, and vice-versa. Armed with this kind of knowledge, we could screen people for disease risks to help them take precautionary measures early on in life, and even go so far as to screen developing embryos for genetic predispositions to diseases. The incidence of obesity, diabetes, cardiovascular disease, cancer, drug addiction, and possibly even criminal behavior could be drastically reduced by filtering out "bad seeds," and making sure that only the more disease-free genes are allowed to be passed to future generations.

But why stop at that? What if we were to isolate a gene for intelligence and

greater learning aptitude, or perhaps a gene for sexual preference, or athletic ability? Why could we not screen embryos for the presence of these genes as well, ensuring that all members of the next generation will have the "strongest" possible genetic predisposition? This potential future is not pure science fiction; it is likely that one day we will be able to screen embryos for predispositions to all sorts of phenotypes, and perhaps even add or subtract desired genes. Humanity has already witnessed analogous scenarios in our domestication of plants and animals, through which we have unknowingly selected specific genes to design the most successful profile. We have also already made significant strides in human genetic screening processes. Researchers can now perform genetic screening to measure susceptibility to approximately 1400 different diseases, many of which can be detected during the prenatal or even pre-pregnancy periods (www.genetests.org). It is important to think about what a society capable of such science will look like - we may be able to literally build a genetically superior human being, taking the best genes we as a species have to offer and combining them to create the most successful child, with the greatest possible potential. In other words, we might be able to perform "rational" selection, and shorten the Darwinian time frame from hundreds of years to only a few generations.

Certainly, this technology would raise many religious and moral questions, like what would it mean to be human if we were able to change ourselves at will, or, given that many people believe humans were made in the image of God, is it right to tamper with God's design? Let us assume, however, for the sake of discussion, that public opinion permitted the use of human genetic engineering. What would society look like? Would people feel less obligated

to work to make themselves attractive to potential mates, given that they would be able to choose the characteristics of their offspring anyway? What effects might that have for certain industries, like those for perfume or designer clothing, and for social institutions like dating and marriage? Would parents feel the same connection with their children, knowing that they did not share all of the same genetic information? What would this do to the institutions of family and lineage?

These questions are interesting, but the answers are unclear. We can be sure, however, that society would face significant practical issues upon the introduction of human genetic engineering. For instance, how would the non-engineered's relative physical "shortcomings" affect daily life? Consider this example: there are currently about 1 million public school students in New York City, each of whom falls somewhere in a wide spectrum of intellectual ability (<http://schools.nyc.gov/offices/stats/default.htm>). The standard public school curriculum is a compromise between limited resources and a need to be appropriate for the majority of students. What might happen if, over the course of a few years, genetically engineered students, with much stronger intellectual abilities, suddenly became a majority in classrooms? The old curriculum would not allow these students to achieve their potential, and it would likely be made more advanced to accommodate the new "average student." This new curriculum, however, would now be too advanced for many non-engineered students, and thus more students would struggle. New classes might have to be developed just for these struggling students, providing a greater strain on resources, and these students might find themselves labeled as "learning impaired" in relation to their more capable, engineered peers.

Another case: in New Jersey, the

current minimum vision score one can have to still be legally permitted to operate a car is 20/50 vision in at least one eye with or without corrective lenses (www.state.nj.us/mvc/Licenses/VisionTest.htm). This standard was developed as a safe compromise between statistical factors such as the average drivers' reaction times, speed limits, and vehicle braking distances. What would happen if, over a few decades, the majority of drivers suddenly became genetically engineered individuals with nearly instantaneous reaction times, and 20/10 or 20/5 vision capabilities? Speed limits would likely increase, and the minimum vision score would change accordingly, perhaps dropping to 20/30 or maybe even 20/20. Suddenly, many people who used to be considered healthy might be considered handicapped, as society makes accommodations for new needs and characteristics of the average driver.

In each of these scenarios, how should those unable to meet the new social benchmarks be accommodated? Should they be encouraged to seek pharmaceutical or prosthetic enhancements? Who would pay for those procedures? Should the social benchmarks remain at their original levels and should efficiency be reduced, just to accommodate the less capable? In other, more extreme circumstances, would the non-engineered be entitled to disability benefits? Cases like this raise a significant question: how would the condition of the genetic "underclass" differ from many of the disabled and diseased states we have defined in today's society, like ADD, myopia, or mental retardation? These diseases are often characterized through a relative comparison, in that the afflicted individuals have a lower average potential for productivity in society than the average healthy citizen. Thus, if the average citizen becomes more productive and more capable, the benchmarks for these diseases must

change accordingly. Eventually, today's definition of normal might become tomorrow's description of disease.

It is interesting to consider the emotions individuals would experience in the wake of these altered definitions of disease. Would the non-engineered feel proud of their "natural" origins, or would they feel inferior to their engineered peers, and feel compelled to adopt pharmaceutical or technological enhancements, just to keep up? What might be the psychological effects of such a practice? A paper sheds some light on this question in its analysis of the psychological and stigmatizing effects of antipsychotic medication for people with mental illness. Citing extensive survey data, the report found that patients who took antipsychotic drugs as treatment for schizophrenia felt significantly more stigmatized than patients who suffered from diabetes and took corrective medication (Sajatovic et al., 2007). Nearly half of the subject pool reported aversion specifically to the medication because it invited more frequent criticism from family and friends, and also often correlated with a devaluation of the patient and the patient's family. It is clear from studies like these that having to rely on treatments just to maintain normal social competencies can be extraordinarily challenging. In an analysis of the social value of genetic enhancement technology, it will be important to consider the less obvious personal and emotional costs such a technology would introduce.

If our understanding of human biology ever does reach the point where human beings can be literally designed, can the technology be introduced in a way that will prevent genetic class stratification, and thus will not require a thorough revision of certain social institutions? We believe it can, but the process will require significant collaboration between policymakers and scientists. We will need to develop

extremely strict regulatory guidelines explaining what kinds of genetic screens and manipulations can be performed. The use of genetic replacement or engineering technology should be limited such that only a small proportion of a gamete's DNA can be changed. This would likely decrease the risk of problems associated with large-scale restructuring of the genome, but more importantly, it would also prevent ability enhancement from occurring too rapidly, thus preventing significant distinction in ability between the genetically engineered and the non-enhanced individuals in society, and therefore allowing many social practices to continue unchanged. In addition, in order to prevent potential genetic profiling or prejudice, individuals should only be given access to their own genetic information, and genetic screening of gametes should only be performed at the request of the donor. Finally, we must educate the public about genetic engineering technology's strong basis in natural biological processes like recombination, to ensure that humans born from engineered gametes will not need to suffer from stigma, and will be treated much the same as the non-engineered.

If strong, decisive measures like these are not taken, there is a high probability that the introduction of this technology would result in too rapid development of human abilities, increased strain on public infrastructure resources, increased class stratification, and significant tensions between newly defined social groups. If we start discussing these potential problems now, we can minimize their damaging effects in the future, which will allow us to take greater advantage of the disease-fighting potential of genetic engineering technology.

References

Boesgaard, TW, et al. "A -243A-->G polymorphism upstream of the gene encoding GAD65 associates with lower levels of body mass index and glycaemia in a population-based sample of 5857 middle-aged White subjects." *Diabetic Medicine* 24: 702-706, 2007.

"GeneTests." University of Washington. 1 May 2007 www.genetests.org.

"Licensing Tests." State of New Jersey Motor Vehicle Commission. New Jersey Motor Vehicle Commission. 1 May 2007 <http://www.state.nj.us/mvc/Licenses/VisionTest.htm>.

"NYC Department of Education Statistical Summaries." Official School Register. 31 October 2006. NYC Department of Education. <<http://schools.nyc.gov/offices/stats/default.htm>>.

Sajatovic, Martha, et al. "Is antipsychotic medication stigmatizing for people with mental illness?" *International Review of Psychiatry*, 19:107-112, 2007.



Navigating the Maize Maze: How to Avoid Toxic Corn

By Ashley Pandolfi and Alex Port

Every day, almost 16,000 people die from hunger-related causes (Black, et al., 2003). Biotechnology offers a solution. Genetically modified organisms (GMOs), such as corn, increase productivity and eliminate plant pests and diseases. Corn, one of the GMO industry's principal targets, is vital to the global food supply and is grown commercially in over 100 countries with a combined harvest of 705 million metric tons. It is grown primarily for its kernel, which is refined into human and animal feed, medical products and industrial goods. Refined maize products are abundant internationally in processed foods such as breakfast cereals, dairy goods, and chewing gum although around 80% of maize in the United States and Canada is used as animal feed.

GMOs are a promising step in the elimination of hunger, but campaigners against GMOs have said for years that genetic modification technology is unproven and potentially dangerous. Their arguments have mostly gone unsubstantiated—until now. A recent study, showed that rats fed on a globally available version of genetically modified maize developed liver and kidney toxicity, and concluded that the particular strain of GM corn, MON863, is not safe for consumption (Seralini, et al., 2007).

MON863, the corn in question, is a form of maize genetically modified to make it resistant to corn rootworm, *Diabrotica virgifera*, a major pest of maize in the US maize-growing belt. The larvae feed on maize roots, causing nutrient and water depletion and making harvesting difficult. In

the year 2000, over 14 million acres of United States maize were treated with chemical insecticides for this major pest. The corn root worm is estimated to cost the maize industry in the United States one billion dollars per year due to pesticide costs and crop damage.

GM foods, like MON863, have been around since the 1990s, with the principal ones being derived from plants; soybean, maize, canola and cottonseed oil. Such alterations improve the health of the plant and potentially benefit farmers; farmers use fewer inputs to grow their crops, eliminating the need for pesticides, herbicides, or chemicals to prevent disease. Genetic modifications can also increase yields, increase nutritional content or raise levels or quality of starch, proteins, or oils.

This is not the first time MON863 has been tested. Before it was put on the market, field trials in the United States indicated that MON863 was not different from other maize varieties in terms of agronomic characteristics, aside from resistance to corn root worm. Additionally, reproductive characteristics such as pollen production, viability and dispersal were unchanged in MON863. Gene exchange between MON863 and maize relatives was determined to be negligible in managed ecosystems, with no potential for transfer to wild species in Canada and the United States.

The MON863 transgenic maize faced even tougher scrutiny before it could be approved by the European Union. As a result, Monsanto conducted a 90-day rat-

feeding study that, according to the Monsanto Company's claims, demonstrates that MON863 is safe for consumption. Following the Monsanto study, MON863 has been authorized by the European Union for use in animal feed since 2005 and for human consumption since January 2006. Nevertheless, the results of the initial studies remain contentious, and a German appeals court forced Monsanto to allow public access to the data. This led the Committee for Independent Information and Research on Genetic Engineering in Paris to independently reassess Monsanto's findings. According to the abstract of this study:

Appropriate statistics were added, such as a multivariate analysis of the growth curves, and for biochemical parameters comparisons between GMO-treated rats and the controls fed with an equivalent normal diet, and separately with six reference diets with different compositions.

The findings of this reassessment are startling: of the rats that were fed the altered maize, the males saw a 3.3% weight decrease, and females saw a 3.7% weight increase marked by hepatorenal toxicity in both. The males were affected primarily in the kidney, leading to changes in urine concentrations and weight loss indicative of renal toxicity. Females were primarily affected in the liver, and showed decreased plasma protein levels in comparison with control females.

Unsurprisingly, the liver and the kidney, the main organs of detoxification, were disrupted by consumption of the GMO-maize. The transgenic modification causes the cells of the maize to produce an insecticidal toxin. Ordinarily, agricultural pesticides are subjected to extensive toxicity tests in mammals before they are deemed

safe for consumption. However, genetically-modified plants that have been engineered to produce pesticides are not subject to the same rigorous toxin testing. It is generally assumed that the toxins produced by the GMOs will not affect mammal consumers. On the contrary, the high incidence of hepatorenal toxicity found in rats fed on MON863 indicates that the insecticidal toxins being produced by the altered maize do, in fact, affect mammals. Long term exposure to altered maize can cause toxification of the liver and kidney, which may lead to either organ failure or tumors. As such, MON863 cannot be considered safe for mammalian consumption until more extensive studies have been conducted.

This provides an ethical dilemma, as MON863, which may cause liver and kidney toxification, is a widely propagated strain of maize throughout North America, New Zealand, Australia and Europe. If this particular strain was prohibited while further tests were conducted, the global supply of corn would be greatly reduced, sending the price of maize skyrocketing. In addition to being consumed directly, corn comprises a substantial percentage of animal feed, and any shortage in maize would have a cascade effect on the prices and availability of meat and dairy products as well. On one hand, it is unethical to knowingly feed consumers a product that may be carcinogenic, yet on the other hand, it is unethical to create a global food shortage simply because a strain *may* be dangerous. Additionally, the dilemma is double edged: GM corn allows for increased production that directly benefits the poorest consumers, conversely any action taken regarding the saleability of such maize will directly affect those lower socioeconomic strata. Wealthier consumers can afford to purchase more expensive organic foods, and will be largely unaffected by either the risk of cancer from GM products or an increase in global corn

prices, but poorer consumers would be hit hard by both prospects. Therefore, it is necessary to act both quickly and cautiously in order to reach a positive solution.

We therefore propose a solution that will preserve the current global corn supply while preventing the entrance of unhealthy corn to the market in the future. MON863 GM corn currently in production cannot be immediately taken off the market because of the detrimental effect such action would have on the global corn supply. However, it is unethical to allow a potentially toxic strain of corn to be used for human consumption. As such, we recommend that MON863 corn currently in production be reallocated to industrial uses such as the production of ethanol, cardboard, textiles, and adhesives. Major crops of corn grown throughout the world are currently under contracts for use in particular industries such as human consumption, industrial products, or animal feed. Reorganization of these contracts would undoubtedly take time and careful examination; however, reallocation of MON863 corn to industrial uses would also save human lives by preventing human consumption of toxic corn and by saving the global food supply.

Furthermore, it is also necessary to establish globally applicable mandatory testing regulations for GM foods. These regulations must be specific for different GM modifications so that GM foods such as the MON863 strain of corn are tested as pesticide-related modifications rather than under less strict general GM regulations. As the GMO industry progresses, GMO testing regulations must remain current with different avenues of genetic modification to prevent strains such as MON863 from heading to market without adequate analysis. GM foods, such as corn, are a promising step toward the elimination of hunger. Development of GMO products should be allowed to continue, under

sufficient testing regulations. Until MON863 can be deemed safe for consumption, no new MON863 corn should be planted or produced. After current harvests, MON863 corn should be replaced with either a benign variation of MON863 that has been adequately tested or with a non-genetically-modified strain of corn.

References

Black, R., S. S. Morris, J. Bryce. "Where and Why Are 10 Million Children Dying Every Year?" *The Lancet*, 361:2226-2234, 2003.

Seralini, G.E., D. Cellier, et. al. "New Analysis of a Rat Feeding Study with a Genetically Modified Maize Reveals Signs of Hepatorenal Toxicity." *Archives of Environmental Contamination and Toxicology* 52:596-602, 2007.



Supplemental Section: BIOCEP

Cross Cultural Education in Bioethics

By Dr. John D. Loike

Under the leadership of President Lee Bollinger, Columbia University has developed its global perspective, presence, and identity. BIOCEP is a prototype for interscholastic cooperation designed to align students with modern international issues in the area of bioethics. In this educational enrichment summer workshop, Columbia University students spend two weeks at Mahidol University with Mahidol University students engaged in lectures, discussions, and on-site professional visits



related to the challenges of bioethics.

This comprehensive workshop is based on the extensive experience of Columbia University's faculty in the areas of bioethics and public health education. The workshop focuses on how different cultures, religions, and governments respond to and resolve bioethical challenges including: emerging

infections (SARS, avian flu, malaria), the integration of Western and Eastern medicine, medical tourism, stem cell research, abortion, public health, HIV, genetic testing, and reproductive medicine. BIOCEP's interdisciplinary workshop aims to enrich students' cross-cultural awareness and analytical skills concerning the ways different religions and cultures work to resolve complex issues in medical ethics.

The first BIOCEP program in 2007 had 17 Columbia University students and 10 students from Mahidol University. In addition to participating in an educational program, the Columbia students served as global goodwill ambassadors for Columbia University.

BIOCEP represents an ideal opportunity for students to experience bioethics and public health issues in other countries and to view, on site, the impact of diverse cultures on global public health education and delivery. The outcome of this innovative program goes beyond classical classroom-based education. It fosters experience in real-life situations, creative thinking and conflict resolution, all of which are essential components to cultivate the next generation of leaders emerging from Columbia University.

The following BIOCEP special supplement contains articles written in partnership between Thai and Columbia students comparing and contrasting how differences in Thai and American culture and religion influence bioethical challenges.

Buy One Get One Free: Luxurious Resort & Your Perfect Baby

By Ashley Pandolfi and Shanshan Tang

Sitting on a beautiful beach, sipping a coconut smoothie, you flip through a magazine snipping out the most mesmerizing eyes, delicate nose and luscious lips. The next day, you will head off to the finest medical facility in the country, and for less than you would pay for a new washing machine, you will walk out pregnant with your perfect baby.

Combining medical tourism with honeymoon quality vacations, Thailand is climbing the market on medical technologies, including pre-implantation genetic diagnosis, or PGD. Offering affordability and highly personal service, Thailand is enticing foreign clientele and keeping up as PGD technology progresses.

Though the technique sounds fascinating at first, and medical tourism plays an important role in Thailand's growing economy, the lack of limitations on PGD in Thailand, and in America, could be dangerous. Without restrictions, technologies such as PGD and prenatal genetic testing enable parents to make decisions that could affect gender balance, disease burdens, and genetic diversity. Thailand and America should regulate these processes, within their unique conceptions of human life and disease, while maintaining certain reproductive freedoms. Using PGD, parents can try to avoid having a child with a debilitating genetic disease such as cystic fibrosis, Duchenne muscular dystrophy, and even late-onset diseases such as Alzheimer's Disease and breast cancer. One might also use PGD to screen potential embryos in order to create "savior siblings"

who have the genetic makeup necessary to be compatible donors for a sick child. At the same time, however, future parents could use the technology to select embryos for their perfect baby – whether it be a blue-eyed blonde or a stunning brunette.

To perform PGD, one cell is removed from an 8 cell embryo around three days after it is fertilized by the parents' egg and sperm in the laboratory. The removal does not damage the further development of the embryo, and the chosen embryo(s) can then be implanted into the woman for development into a fetus. An important factor that differentiates America from Thailand is the metaphysical origin of diseases. Buddhism, the predominant religion in Thailand, has firm stances toward genetic testing. Revolving around a principle of karma, that each individual is born as a being that has accumulated experiences over previous lifetimes, genetically modifying a fetus would be condemned. Eliminating embryos with serious conditions may be frowned upon as alteration of beings with poor karma, and an action against nature and the being that holds that karma. Through suffering, and perhaps benevolent deeds in this lifetime, the person could have been able to raise his or her karma, working towards a better lifetime in the future – a chance forever denied to tossed-out embryos.

American views on PGD are based in a wide array of religious influences and political divisions and vary widely across America's diverse population. For those who regard human life as acquiring full

moral status at conception, the use of PGD to deliberately create more embryos than will ever become children is ethically problematic. This view is common amongst many followers of Christian religions and politically conservative Americans. More liberal Americans often argue that reproductive choices are private decisions a woman makes with her partner, their physicians, and their faith.

Currently, there is significant support in both the United States and Thailand for using the procedure to prevent implanting embryos with early onset, life-threatening diseases. But when it comes to choosing children with a less debilitating condition, or a late-onset disease such as Alzheimer's, a lack of legal regulations leaves clinics in both countries making case-by-case decisions on just how far they will go with PGD.

The Thai Medical Council merely "advises" against techniques such as PGD, leaving physicians to set their own moral boundaries on case decisions. Similarly, in the United States, while a number of medical boards recommend limiting the technique to early-onset serious diseases, many clinics will test for late-onset diseases and allow sex selection. Because of U.S. bans on federal support for embryo research and heated political division over abortion, PGD has developed mostly in the private sector where it has been free of government regulation and oversight. Decisions about the ethical uses of PGD remain at the discretion of private physicians.

When it comes to abortion, PGD technology might actually alleviate some ethical concerns. Pre-implantation genetic testing, in contrast to prenatal genetic testing, skips the need for an abortion by testing the embryos before they are even implanted. In prenatal genetic testing, already developing fetuses are tested for diseases leaving parents with the difficult

decision of whether or not to abort their child. United States law allows abortion into the second trimester without designating reasons for performing the abortion. In contrast, abortion is illegal in Thailand with exceptions on rape cases and serious health risks for the mother. In the last few decades, however, Thailand has embarked on a campaign to eliminate thalassemia, a serious genetic disease characterized by anemia and physical abnormalities. In order to reduce the rates of thalassemia, Thai physicians use prenatal genetic testing to test fetuses and recommend the abortion of affected fetuses. Pre-implantation genetic testing might offer families a better option – preventing having an affected child while relieving the need to undergo an abortion in order to do so.

One of the most dividing factors between the two countries and what might ultimately impact a family's decision to undergo PGD is cost. In the United States, a round of PGD, including IVF, can cost over 15,000 dollars. This barrier to affordability, some critics fear, could make pre-implantation diagnosis the first significant step toward a genetic class divide in which the wealthy will become more genetically pure than the poor. Whereas only the wealthy Americans can afford PGD procedures in the United States, many Americans and Thais are more willing to pay 4,000 to 6,000 dollars in Thailand for the exact same procedures. By appealing to foreign wallets, Thailand has increased medical tourism, offering foreigners not only PGD but also inviting beaches and the mouthwatering Thai cuisine during their stay— quite a package!

Clearly, Thailand and America must approach the ethics and regulation of PGD from their unique perspectives, incorporating cultural and religious perspectives as well as economics. Although economics ideally should not play a factor in decisions about

reproductive choices and the regulation of reproductive technologies, in reality it is likely to have a significant impact. As a developing nation, PGD technology is new to Thailand and public awareness is low. Medical tourism has become a key factor for the growing economy, and might encourage Thailand to be more lenient on restricting PGD. PGD might be controversial or illegal in the west, but Thailand is a perfect option –irresistible temptation lies in those infertility treatment/vacation packages. At the same time, however, Buddhist ideas of karma lie in stark opposition, necessitating Thailand to lay down the law carefully.

If Thai prices continue to appeal, customers will keep rolling in. But Thailand, and America as well, must surmount the economic draw of PGD and put restrictions to keep the technology in check. The two nations must draw the line between the moral obligation to prevent painful diseases and the human desire to create the perfect child.

A Thai island filled with delicious coconuts, beautiful bodies, and erotic massages by the sea is a perfect romantic setting. Let's leave these tropical islands for baby-making and not baby-shopping.

References

"Designer Babies." BEEP BioEthics Education Project. <<http://www.beep.ac.uk/content/110.0.html>>.

Ratanakul, P. "A survey of Thai Buddhist attitudes towards science and genetics." Intractable Neurological Disorders, Human Genome Research and Society. Proceedings of the Third International Bioethics Seminar in Fukui, 19-21 November, 199-202, 1993 <<http://eubios.info/IND/INDPR.htm>>.

"Thailand Offers Less Expensive Fertility Treatment, Preimplantation Genetic Diagnosis, Attracting "Fertility Tourists"." Medical News Today <<http://www.medicalnewstoday.com/articles/49176.php>>. 2006.



Thailand's government support for Family Planning

By Patcharapol (Pat) Jitramontree

In contrast to America's casualness in addressing overpopulation through government control, Thailand has met the problem head on with tremendous success. The turning point was 1971, when the Thai government willingly worked with the Population and Community Development Association (PDA), the largest non-governmental organization of Thailand, in carrying out a national population policy. Within 15 years, Thailand lowered the total fertility rate (TFR) of 3.2, (which is considerably high in comparison to the replacement rate of 2.1) to a significantly lower rate of 1.6 (Frazer, 1996). Furthermore, subsequent outcomes were doubling per capita income and achieving economic security amongst individual families, therefore improving Thai's quality of life (*ibid*).

The Thai government achieved success in family planning by doing two things: promoting use of contraception and incorporating economic development with family planning.

If one could describe Thailand's contraceptive campaign with three words, they would most likely be hilarious, provocative, and effective. The campaign was led by the famous former economist and public relations mastermind Meechai Viravaidya. Meechai took public education of contraception to the limits, with programs such as the condom balloon blowing contest, whereby local authorities competed in popping condom balloons by blowing them up. Once the people were more aware of condoms and their benefits, Meechai made sure condoms were available to

everyone. Indeed, condoms were everywhere: bus stations, schools, parks, malls, clubs, pubs, movie theaters, and even in the ever-so-prevalent traffic jams. Anywhere there was a crowd, there were going to be condoms. Obviously, the primetime of condom distribution was on holidays. For example, cops were given boxes of condoms to hand out on New Year's Eve during the world famous campaign called the *Cops and Rubbers Campaign* (*ibid*).

Apart from the promotion for condom use, the government wisely introduced other forms of contraception, and, more importantly, made them accessible to the public, including the poor, who make up the majority of the Thai population. For example, Thailand was the first to allow the injectable contraception Depo-Provera (DMPA) and remains the world's largest user. Operating room nurses were trained to do simplified methods of female sterilization (Africa, 2000). Non-scalpel vasectomies were available free of charge at various festivals as well as on the King's birthday, in an effort to instill the perception of contraception as a celebratory trend. In other words, contraception was promoted as something everyone was getting into for the good of it, like the introduction of the iPod.

In fact, sterilization, even more than condoms, has become the main contraception used by Thais. Also, use of contraception amongst married couples incredibly increased from 15 to 70 percent by 1996 (Frazer, 1996). Given the success of family planning in Thailand, the same

result could not be achieved if America were to adopt the same family planning program. This is because Thailand's strategy is unique to its own problems, which are completely different from America in many aspects. For example, the underlying story behind the success in Thailand was the integration of family planning with social economics. By doing so, the government made it clear that they were not coercing Thais to have fewer children. They were encouraging families to prepare adequately for desired family size. The Thai government launched several programs along with the promotion for use of contraception, which



were aimed to improve families' economic development as a part of the family planning program.

There is a famous preaching for Thais which is "Thailand's backbone is rice farmers." This teaches Thais to value food and, more relevantly, to respect poor farmers regardless of their wealth. Indeed, Thailand's main support seems to be rice farmers as they make up 80% of the Thai population (Overpopulation, 2007). Amongst farming families, it was understood that the more farmer hands they had, the more the families could produce crops and therefore make, and possibly even increase, profit. Thus, farmers felt the need to

'produce workers' by having more children without consideration of the feasibility of supporting the family size. One of the challenges was changing this perspective by providing alternative income sources. The Thai government came up with a creative animal loaning program reducing debt and poverty amongst farmers. Instead of leaving farmers with no choice other than borrowing money from high interest local money lenders who were relentless in tiding them through, the government and the PDA provided them with this alternative whereby they borrowed 'workers' (animals) and returned them, while keeping their profits. In another program, priority of giving out large amounts of loans was given to families who practiced family planning. "Members of the loan fund received shares and dividends on the basis of the contraceptive method used; more effective methods had higher values. As the level of contraceptive prevalence within a village increased, so did the total amount of the loan fund" (Frazer, 1996). These two loan systems helped relieve the burden of debt, and thus reduced the feeling of need to have many children to help them work to increase profits.

One ethical concern of population control arises within its general concept of restricting individual rights versus protecting the community. From a Thai's perspective, the government's national population policy was very appropriate considering the socio-economical impact overpopulation would have on a developing country such as Thailand. Thais dutifully sacrificed individual rights for the good of the community, perhaps due to an increased understanding of the economical impacts of having too many children. The government's strategy to influence motives for family planning with economic incentives is distinctively milder than China's One Child Policy (International, 2002). Thai people were 'highly recommended' to consider family planning,

but not coerced by any means. Buddhists, who make up over 90% of the population (Overpopulation, 2007), had no problems with the new idea. Besides, a Buddhist scripture says, having "many children makes you poor." Contraception is viewed as religiously acceptable as long as it does not kill an "embodied soul," which generally refers to embryos. Sterilization has interestingly received little criticism. Furthermore, the government made it clear that the national population control is aimed at tackling Thailand's most prevalent problem: poverty. By doing so, the government made the impression that they were less focused on forcing families to have fewer kids, but were more concerned about making sure a family can afford and accommodate the family size. Many Thais see the government's plan of incorporating social economics with family planning killing two birds with one stone. Therefore, there are really no considerable ethical violations by the population control of Thailand.

I think that the fact that family planning in Thailand has worked considerably well without resistance is in itself telling of the ethical concern amongst the population on the topic. While in the United States the public may respond otherwise, Thais, 94.4% of which are Buddhists, support the policy (Overpopulation, 2007). The general explanation for this is perhaps the fact that Thailand is more of a community-oriented society than the United States, which values individual rights more. Accordingly, a national population policy is naturally perceived as acceptable to most Thais while Americans may feel

differently. Furthermore, the implications of an overpopulation problem are much more amplified in the perception of a developing nation like Thailand as opposed to a developed country such as the United States.

References

Africa, F. Thailand in *Laws and Policies Affecting Their Reproductive Lives. Women of the World.* Pg 169-204, 2000. <http://www.reproductiverights.org/pdf/Thailand.pdf>.

Frazer, E. Thailand: A Family planning Success Story. 1996. <http://www.context.org/ICLIB/IC31/Frazer.htm>.

International Family Planning Programs: Criticisms and Responses Population Matters. 2002. http://www.rand.org/pubs/research_briefs/RB5063/index1.html.

Overpopulation. From Wikipedia, the Free Encyclopedia. 2007. <http://en.wikipedia.org/wiki/Overpopulation>.



Ethical Stances in Post-Menopausal Pregnancy

By Chatchanit (Farah) Arif

The controversial issue of post-menopausal pregnancy is at the fore-front of bioethical debate. Ethicists in favor of post-menopausal pregnancy, as well as critics of the idea, base their perspectives on religious beliefs, social sciences, and medical science. This paper specifically focuses on the Islamic perspective on post-menopausal pregnancy and evaluates the positions of both proponents and critics basing their arguments on the social and medical sciences.

It is essential to review the basic tenants of Islam before discussing the viewpoints of Muslims on post-menopausal pregnancy. Islam is a monotheistic religion originating with the teachings of the Prophet Muhammad (Pbuh), believed to be the final prophet sent by God. Believers of Islam read and follow the word of God which is compiled in a holy book called the Qur'an. The words and deeds of the Prophet Muhammad (Pbuh) are incorporated into an Islamic scripture called Sunnah. Together, the Qur'an and the Sunnah are the fundamental textual sources for the Islamic faith. In this fast growing world, new technologies are being invented and implemented on a daily basis. In order to combat issues related to the advancing methods, Ijtihad, the Islamic process of making legal decisions by interpretation of the Qur'an and the Sunnah, is used (Gatrad, 2001). The Qur'an, Sunnah, and Ijtihad are the three main sources for Islam's divine code of conduct called Shari'ah, which is used widely in many Muslim countries (Gatrad, 2001). Shari'ah is a sacred law for Muslims and deals with all aspects of human

life.

In assessing the Islamic point of view on post-menopausal pregnancies, it is important to discuss the Muslim concept of purity of the child. Artificial insemination and in vitro fertilization are allowed, only if the sperm and the egg are of the husband and wife (Gatrad A., 2001). Hence, post-menopausal pregnancy can be practiced if the couple uses their own cryopreserved embryo or, if possible, their own sperm and eggs (Gamal, 2005). It is absolutely forbidden for any couples to use donated eggs, sperm or embryos. Since at present it is possible to cryopreserve embryos,



parents can decide to have another child later in life even if a wife is beyond menopausal period. Nevertheless, Islamic ethics demand caring for the health of the woman. The health of the woman must be protected not only for her own life, but for the benefit of her children who need a full set of parents to guide them through their mid-adolescence (Gamal, 2005). Furthermore, the decision to initiate post-menopausal pregnancy must be based on

many factors including: the maintenance of a child's genetic parentage, the pressing nature of the circumstances, the safety to both mother and child and, finally, insuring that the parents will not abandon their responsibilities to their children (Gamal, 2005).

Aside from religious perspectives, there are many ethical and biological concerns regarding whether it is appropriate for old age women to use technology for the purpose of reproducing beyond natural childbearing age. Although today the technologies are advanced enough to practice such unnatural processes, there are also many ethical points of view as to how far they should be allowed.

Ethicists in favor of post-menopausal pregnancy often state that one should respect the rights of women to decide to be a mother at any age, even past menopause. There should be no age discrimination to who can be a parent as long as she is physically and emotionally ready to do so. There are no concrete rules to what age a mother should be or to who is too old to be a mother. In Islam, proper parents should be the ones who can bring up their child in a safe environment providing enough love and care. They should be economically stable in order to raise a child in a safe and nurturing manner.

How would Islam view a post-menopausal woman who requests pregnancy because she lost her only child or she never had a child before? Islam will support such a woman only if it is confirmed by a doctor that she is healthy enough to practice post-menopausal pregnancy, but a mother can only do so with her own eggs and her husband's sperm or their own cryopreserved embryo. If they have not met the requirements, Islam would not permit post-menopausal pregnancy.

There are also those who oppose the idea of post-menopausal pregnancy.

One of the critics against post-menopausal pregnancy is Dr. Eike-Henner Kluge who denies the practice of assisted reproduction in older age women. He asserts that it is inherent in female biological development that pre-pubescent girls and post-menopausal women are not able to reproduce (Jennifer, 1996). Kluge realizes that many post-menopausal women merely want to have a child to make up for their opportunity loss earlier, and that there is no evidence showing that children of old age parents are being harmed based on the age of parents alone. Nevertheless, Kluge points out that post-menopausal pregnancy is not only unsuitable biologically but it also gives rise to social and moral incapacity for motherhood (Jennifer, 1996).

Another argument against post-menopausal pregnancy is that nature has limited human beings and their capability to reproduce (The Ethics Committee, 2004).



Practices that try to extend the limits of reproduction are said to be unnatural (The Ethics Committee, 2004). The Ethics Committee of the American Society for Reproductive Medicine stated that parenting needs both physical and emotional involvement which can be stressful, and old age parents might not meet the need of a growing child and might not maintain a long parental relationship. Given this point, it is true to say that there are many tasks for parents involved in raising a child; from

getting up several times in the middle of the night to running around and playing with them when they are young. It may be difficult for older parents to do these tasks effectively. Although some families might have baby sitters who are ready to help take care of a child, it is not going to be a real parent-child relationship if all the major works are being done by someone else.

In conclusion, post-menopausal pregnancy is a sensitive issue which has no definite conclusion to say whether it is right or wrong within Islamic law. Although this controversial issue might be considered wrong by various points of view, with valid arguments and reasons this procedure might be adaptable to a certain extent. For instance, in Islam, if the couple's cryopreserved embryo (or egg or sperm) is used and if the mother is physically fit to undergo the procedure, it is acceptable. Also in ethical points, if a post-menopausal mother has weighed her options and has decided to use the technology, she has a right to do so. Therefore, Islam would support the principle of autonomy allowing one's own personal decision in deciding what is best for oneself.

References

Anne, Z. S., & Richard J. P. Motherhood after age 50: an evaluation of parenting stress and physical functioning. *Fertility and Sterility*, 87;1327- 1332, 2007.

Gatrad, A. R., & Sheikh A. Medical ethics and Islam: principle and practice. *BMJ* , 84;72-75, 2001.

Gamal, I. S., & F.R.C.O.G., & F.R.C.S. Religious perspectives of ethical issues in ART. *Middle East Fertility Society Journal*, 10; 185-190, 2005.

Jennifer, A. P. A closer look at reproductive technology and postmenopausal motherhood. *Canadial Medical Association*, 154;1189-1191, 1996.

The Ethics Committee of the American Society for Reproductive Medicine. Oocyte donation to postmenopausal women. *Fertility and Sterility*, 82; S254-S255,2004,



Bone marrow Transfer and Stem Cells

By Krysten Chin and Lulan Wang

As nature has dictated for centuries, the conception of human beings occurs when the sperm from the male and the egg from the female unite within the fallopian tube after the act of sexual intercourse. Religion and culture have played very important roles in providing guidelines as to with whom and when people should have children, usually with a spouse and when they are able to take on the responsibility of raising a child. The increased demands for assisted reproductive procedures such as *in vitro* fertilization (IVF), gamete intrafallopian transfer (GIFT), and surrogacy have pushed scientists even harder to uncover more options in order to give hope to couples who are infertile. It has now become feasible that in the near future, sperm may be created from bone marrow stem cells. This information gives rise to many ethical issues around the world concerning the possibility of children being born into many different family situations that could be considered as far from 'ideal family life' as possible. Given that sperm could be created from the bone marrow stem cells of either a woman or a man, it is conceivable that there might not even be a need for the male to take part in the wonderful process of creating a child. The fact that two women in a homosexual relationship may have their own biological child without the use of a donor sperm has sparked a very controversial issue. Is it ethical to allow two people of the same sex to have a child using gametes formed from their own bone marrow stem cells?

The spread of medical knowledge around the world has been immensely beneficial to the smaller developing

countries that lack the resources to conduct their own research; however, many countries face their own ethical issues as it relates specifically to their culture. The religious and cultural perspectives in Thailand greatly differ from those of the United States of America. About 90% of the people living in Thailand are Buddhist and therefore religion plays a large role in how the country is run and how the rules and regulations are made. Although Buddhism is an exceptionally compassionate religion, the people of Thailand are very traditional and resistant to certain changes. With the large number of people in the United States, it is always difficult to reach one conclusion on ethical matters but there are many people who have a liberal approach to life. Through activist organizations and numerous people willing to speak and act out for certain causes, the government is constantly being challenged and laws are slowly but surely changing. Even if the U.S.A and Thailand have similar laws, they may have them because of different reasons.

Discoveries in bone marrow stem cell research have opened another doorway in reproductive medicine. Bone marrow is the soft tissue found in the hollow interior of bones and it contains two types of stem cells. There are hematopoietic stem cells which produce leukocytes, erythrocytes and blood platelets, and mesenchymal stem cells which have the capability to differentiate into many other types of cells when given sufficient and necessary stimulation for a specific cell type. Mesenchymal stem cells are the cells that are being used in medical research. It was

recently discovered that the germ cell progenitors found in bone marrow stem cells contain some genetic markers which could be coaxed into differentiating into full fledged gametes. What is interesting is that the research so far shows that spermatozoa may be produced outside of the testis, but so far the stem cells only help to replenish the ovaries, not create new oocytes independently of the ovaries. What also needs to be acknowledged is that the stem cells taken from a female's bone marrow can only produce X-chromosome sperm, therefore only creating female (XX) babies. It would be impossible for a lesbian couple to have a biological son (XY) from both mothers. Although the creation of functioning gametes cannot be achieved just yet, because it may be a reality within the next decade or so, a plethora of ethical issues arise from the possible uses and abuses of such a technology.

The ethical concerns arising from the creation of spermatozoa to be used by homosexual couples in the United States of America differ from Thailand. Of course there are many advantages of 'making' sperm such as helping infertile men to provide sperm for the conception of their own biological child, but there will be even more ethical dilemmas that scientists, doctors, the government and the general public must face when dealing with all the other possible uses of this ground breaking procedure. One must take into consideration the current perspectives on the homosexual family lifestyle as it pertains to gay marriage and adoption, as well as the questions and possible issues that the child will have to deal with throughout her life. Going even further is the issue that only female babies could be produced from a lesbian couple so how fair would it be only make girl babies? Because a woman is unquestionably needed for the conception and birth of a child, wouldn't it create an argument by male

couples that it would not be possible for them to have a biological child between them without the use of a female? Lastly, even if this procedure is legalized only for the use by infertile men, like every other law that is in place, wouldn't there be those who disobey the law and provide this procedure for those who want it for illegal reasons? How could the government efficiently control the utilization of creating gametes from bone marrow stem cells?

In the United States of America, since the social movements of the gay community in the 1970's, there has been a very slow acceptance of the rights and equality of homosexuals. Presently there are only ten states that allow civil unions or domestic partnerships between two people of the same sex and only one state, being Massachusetts, which allows for marriage between same-sex couples. It is even harder for same-sex couples to adopt children. It is allowed only in a handful of states and only few more allow for the adoption by one person and then the other applying for joint rights over the child after the adoption process is completed. This method however is extremely complicated and expensive and only the most vigilant of couples fight for that opportunity. *In vitro* fertilization is another route that same-sex couples take but it is still very complicated for both people to obtain parental rights.

So in light of the many troubles that homosexuals still have with equal rights for marriage and adoption, we reach the question of if it is even ethical for same-sex couples, whether in the future they can be legally married or not, to be given the option of using bone marrow stem cells to produce a child. In the U.S.A. there are widely varying opinions about every topic under the sun because of the great number of people, religions and region specific cultures so it would not be fair to generalize what a 'typical American' would say. The union of

the egg and sperm outside of the uterus like in IVF does not occur naturally but it does not change the fact that a man and a woman need to be involved for the creation of that child. Creating sperm from a female is definitely out of the norm. It seems as absurd as a male human being becoming pregnant and giving birth! That for sure will never happen, even if for some bizarre reason it becomes scientifically possible. Which man in their right mind would chose to become pregnant? Anyway, as it is already argued that homosexuality is 'unnatural,' just the introduction of such a procedure is raising moral concerns among doctors.

Since the research so far shows that only female babies may be produced by female couples and an oocyte cannot mature without an ovary, these stem cell procedures may not be easily accepted. The



obvious inequality of opportunities for gay couples may either lessen the interest or heighten the anticipation of further discoveries. For example, using synthetic biology it may be physically possible to insert a Y-chromosome in a sperm or develop techniques to allow an oocyte to develop without an actual ovary.

Despite strong protests by the Catholic Church in the European Union, Spain has turned into the third country in the EU that recognizes the rights of homosexual couples. In a Buddhist culture like Thailand, where over 95% of the population are Buddhist, many Thai people are pondering whether the law could be applied in the country as Theravada Buddhism. The

question is whether or not is any objection of the Buddhism against same-sex marriage? The answer is "no."

In fact there is neither support nor denial of marriage between the same genders. This is because Buddhism is most concerned with whether an action is helpful, based on good intentions, and free of harm. This differs from the positions taken by Christian faith groups. They often evaluate a specific action itself, based on whether it is good or evil according to a system of morality derived from that group's interpretation of the Bible. Homosexuality, whether it is between men or between women, is not improper in itself. What is improper is the use of organs already defined as inappropriate for sexual contact. The Buddha posted himself simply as the one who shows the way. He did not insist that he had any right to enforce on others what they should do. However the third Precept of Buddhism deals with sexual misconduct, under the law of karma which is being followed by greater majority in Thailand. The law of karma basically says that all living creatures are responsible for their actions and the effects of their actions, so if an individual committed a sin, then he or she will have to repay for it in the future. Even the Dalai Lama, who is the leader of the Tibetan people and is revered by millions of Buddhists worldwide, commented "From a Buddhist point of view lesbian and gay sex is generally considered sexual misconduct." For all these reasons it is unlikely that Buddhists will easily approve a law to allow gay marriage.

In Thailand, the ideas of homosexual behaviors and acts are more commonly accepted as a form of entertainment for the general public; homosexuality has nowadays become a fashion eventuating in youngsters forming circles at various schools and universities fighting over their lovers of the same gender.

In addition, many other homosexual groups often include university graduates, office workers, and students, promote behaviours that may contradict conservative Buddhist culture and Thai traditions. This trend though has been rather exaggerated in the media. Although the Constitution has provided same-sex groups with rights as personal rights, the Cultural Department cannot accept it and has been standing on the opposite side and would most probably disregard any homosexual pregnancy.

Thai family is about thankfulness and respect. Thus family values are especially essential in Thai ethnicity ever since Thailand was named. Precisely, even the Thai language contains multiple vocabularies to show their politeness. On the other hand, homosexual marriage creates an unusual family structure which is unfamiliar to the Thai society. Additionally, it's hard to imagine a child having parents of the same gender. Therefore allowing bone marrow stem cell transfer will neither create a general acceptance by the public nor support from the family relatives.

Studies have shown that children growing up with same-sex parents do not necessarily have differences in self-esteem, gender identity, or emotional problems from children growing up with heterosexual parents. Yet, a child raised by same-sex parents may create a different cultural burden.

Conclusively, Thailand and America are culturally and ethnically very different, but when it comes to certain issues with regards to a new way of living or to a new perception of life and family, the social acceptance is slow and gradual.

References

Heidi Hardman (28 Jul 2005) *Stem cells in bone marrow replenish mouse ovaries*, <http://www.medicalnewstoday.com/articles/28210.php>.

Jean-Pierre Predagne (n.d.) *THAI FAMILY* <http://www.thaiworldview.com/family.htm>.

Jessica Ruvinsky (June 28, 2007) *Babies from Bone Marrow and Another potential use for stem cells: procreation*. <http://discovermagazine.com/2007/jul/babies-from-bone-marrow>.

METTANANDO BHIKKHU, (July 13, 2005), *Religion and same-sex marriage*, <http://www.buddhistchannel.tv/index.php?id=0000000008,00000001429,0,0,1,0>.

Somtrakul (Jun 4, 2004) *Cultural Ministry Irate Over Gay Civil Servants, Blaming TV Media as a Distributing Source*. http://www.utopia-asia.com/unews/article_2004_06_4_034037.htm.

WebMD Medical News, (Oct.12, 2005), http://www.religioustolerance.org/hom_budd.htm.



The Balancing Act: Cultural Attitudes Towards Human Embryonic Stem Cell Research

By Kathryn Vreeland and Tina Lo

Many fundamental ethical tenets span religious and cultural divides. A society must uphold the right to life for its survival, for example, especially since life can be taken away as easily as it was created. This becomes particularly clear in current debates over the morality of embryonic stem cell research. Unlike techniques for harvesting adult and umbilical cord blood stem cells, the current process for obtaining embryonic stem cells requires what some consider the violation of our most basic moral precept. This article examines the response to an ethically ambiguous medical advancement from two strong, yet distinct cultures. In Thailand, Buddhism greatly influences public opinion and the government's reserved response, while in the United States, diversity fuels action both for and against the use and research of human embryonic stem cells.

Globally, the stem cell debate has not been confined to the scientific community. Future therapies in regenerative medicine and tissue replacement proposed by researchers, coupled with current treatments for cancers, diabetes, Parkinson's, and genetic diseases by non-embryonic stem cells, have made the average person aware of the vast potential applications for human embryonic stem cells (hES cells). However, despite having ethically motivated stances on abortion, the general population lacks a nuanced scientific understanding and is often unclear on the various points disputed. Ethical concerns are not limited to the

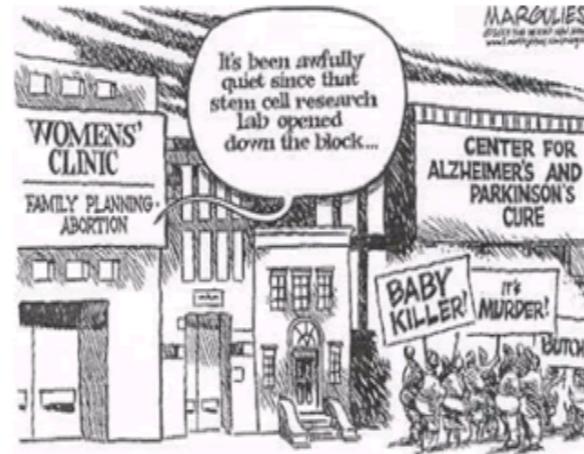
embryo's right to life versus the needs of the mother, as with abortion. There are many other ethical concerns related to questions over the true research potential, availability of alternative therapeutic options, and the potential costs and benefits to wider society. One strong argument in favor of embryonic stem cell research is that it is efficient. Current techniques utilize embryos that have been fertilized through in-vitro fertilization (IVF), but were not used and will therefore be frozen or destroyed. On one hand, it is practical to use these leftovers for harvesting hES cells, making use of a resource that would otherwise be wasted or accumulate storage costs. On the other hand, if society accepts this sacrifice of embryos, to what degree should the creation of embryos specifically for research purposes be allowed, if at all? Furthermore, as scientists discover in greater detail the conditions required to utilize ES cells' pluripotency, novel techniques could develop for harvesting hES cells without destroying the embryo.

Thai Perspective

Buddhism strongly influences Thai culture and exists as a foundation for medical ethics, as the majority of Thai people practice the religion. Buddhism places great importance on the principle of ahimsa, or non-harming. As in most religions, do not kill or cause others to suffer is an essential tenet, but it is important to note that monks do not teach that Buddhism

is an absolutist religion with steadfast rules. Guidelines exist for negotiating the gray areas of life, and a person's karma is generally influenced by his or her intention. Thus, it may be acceptable for a scientist to kill an embryo for the purpose of treating illness, but unacceptable for the same person to kill the same embryo for selfish reasons, such as termination of an unwanted pregnancy. In Thailand, aborting an unborn child is staunchly illegal, but not the killing of a fertilized egg. Abortion is permitted when the mother's health is at risk, or in the case of rape, but society generally feels that the baby has the right to a traditional family upbringing. Buddhism emphasizes the needs of society over personal desires, and another life enhances the community, while abortion drains resources and mandates the doctor and family act unethically. In this regard, one may argue that Buddhist teachings embrace science for the greater good, and the Thai people should uphold embryonic stem cell research because the controversial embryo termination is intended to be an altruistic sacrifice, not murder.

Although researchers in Thailand have slowly become involved in human embryonic stem cell research, and currently work with animal embryonic stem cells, no government policy exists to prevent or regulate the medical community. Public officials recognize the potential for this research, but feel it has been unveiled too rapidly for the ethics that mold regulations to have a chance to catch up. The Medical



Council of Thailand imposes controls to maintain medical ethics. This is especially true in regards to advertising for clinical use of adult and umbilical cord blood stem cells to treat disease despite sufficient supporting data. Yet, the

government sector has lacked in-house expertise for making an informed decision on embryonic stem cell research. Consequently, the Food and Drug Administration (FDA) does not recognize it and provides no standard to compare the stem cell quality and the safety of potential treatments. Dr. Suradej Hongeng, a scientist and professor at Ramathibodi Hospital in Bangkok, feels that some federal stance is better than none, even if it opposes research. Without guidelines, individual scientists are hesitant to break into the field and impose personal beliefs on the larger community.

American Perspective

On June 30, 2007, in a press release defending his veto of a bill already passed by the United States Congress and House of Representatives, President Bush stated: "My Administration has sought to understand the dilemmas of stem cell research not as a choice between science and ethics, but as a challenge to advance medicine while meeting our solemn obligation to defend human life." Though abortion may be legal in the United States, both pro-life and pro-choice Americans

strongly vocalize their beliefs, often centered around the precise point when a person should be recognized. Democracy encourages diversity of opinion, as do multiple religions and a plethora of cultures influencing citizens, so it is to be expected that this melting pot disagree on medical ethics.

Two concurrent events necessitated regulation of federal funding for research involving human embryos. In 1969, scientists created life by performing the first human in vitro fertilization, and in 1973, *Roe versus Wade* terminated life by legalizing abortion. Americans value personal freedom, thus a woman's right to make ethical decisions governing her own body. But with in vitro human embryos, as the entire voting population does not agree on when life begins, the government cannot force all taxpayers to support a possibly unethical practice. In 1999, the Clinton Administration attempted to modify regulations after the National Bioethics Advisory Commission deemed it ethical to derive stem cells from leftover embryos for research benefiting society, as spares were consciously made during IVF, but Congress would not agree to fund any research that resulted in the destruction of a human embryo. And so today, as scientists extol the wondrous potential of hES cell research to change the field of medicine, Americans remain divided on the line between life and death, and federal funding is provided only for research on hES cells derived from the cell lines of previously destroyed embryos, where the crucial decision has already been made.

Capitalism, a tenet of American ideology, upholds the efficiency argument that embryos leftover from IVF procedures should be used for a better purpose. Some Americans believe this to be "ethically permissible if not a moral imperative," while others stand firm that no potential life should

be sacrificed, even for the greater good.

Many citizens are slowly coming to understand and accept the importance of stem cell research, and applaud the state of California for its significant financial backing. IVF was at first controversial, but when the technology became commercially applicable and helpful for many families, ethical uneasiness diminished. Scientists argue that embryonic stem cell research will follow a similar path and strive to increase the number of experts in the field. Federal support is essential not only for financial reasons, but also to decrease the paperwork created by legal issues and to generate large-scale quality control. In addition, the efficacy of the few cell lines currently available for distribution is minimal, as they lack broad genetic diversity and may deteriorate with age.

Conclusion

An ethical contradiction exists in the fact that abortion in Thailand is not legal, yet embryonic stem cell research has been carried out unregulated, and comparably, that the United States government does not fund embryonic stem cell research, but legalized abortion over thirty years ago. American policy makers will continue to strive for a balance in legislation until enough citizens favor crossing the line, most likely influenced by a prominent discovery, and dissenters will protest until a loved one can benefit from the research. Recently, the Thai government created a committee of medical professionals to draw up regulations on human stem cell research and its clinical applications. They understand the demand for direction, and hope to formulate an official ethical standard in accordance with cultural beliefs to govern current and future stem cell discoveries. Buddhism has helped many Thai people decide when, if ever, life may be sacrificed, and American ethics

support opinions as varied as the population. Fundamentally, both societies agree that the value of life cannot be compromised by technology, but pervading culture influences the way in which the two governments regulate and interpret ethical conduct in medicine. Globalization has recently spawned the phenomenon of medical tourism, where people travel to a country specifically for more advantageous medical treatment. As Thai culture places importance on the community, perhaps future stem cell researchers will gravitate towards Bangkok. In contrast, individuals seeking safe and legal abortion could find refuge in the United States, a country that embraces the philosophical bioethical principle of autonomy.

References

Editorial, "Stem cells: hope or hype?" The Nation 7 August 2007 <www.nationmultimedia.com/2007/08/07/opinion/opinion_30043975.php>.

"Embryonic stem cell." Wikipedia. 2007. 10 Oct 2007 <http://en.wikipedia.org/wiki/Embryonic_stem_cell>.

Kiatpongsan, Sorapop, Pruksananonda. "International Trends in Bioethics for ES cell Research." J Med Assoc Thai Vol. 89 No. 9 (2006): 1542-1544.

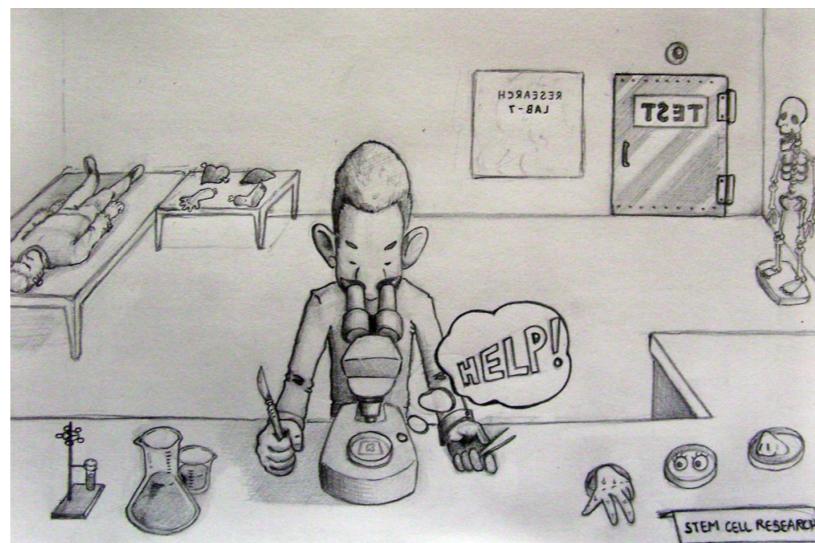
Mehlman, Maxwell J. "The Ethics of Embryonic Stem Cell Research." The Doctor Will See You Now November 2005 2 Oct 2007 <http://www.thedoctorwillseeyounow.com/articles/bioethics/stemcell_12>.

MSNBC News Report, "California gives go-ahead to Stem-Cell Research." MSNBC Health. 10 Sept 2007 <<http://www.msnbc.msn.com/id/6384390/>>.

Lecture given by Dr. Suradej Hongeng at Ramathibodi Hospital in Bangkok, Thailand, and subsequent conversation, August 2007.

Office of the Press Secretary, "President Bush Disappointed in House Vote on Embryonic Stem Cell Bill." The White House June 7, 2007 12 Sept, 2007 <<http://www.whitehouse.gov/news/releases/2007/06/20070607-10.html>>.

Thomson , JA, Itskovitz-Eldor. "Embryonic stem cell lines derived from human blastocysts." Science Vol. 282 No. 5391 (1998): 1145-1147.



“Alternative” East Meets “Conventional” West: The Medical Dichotomy

By Rajiv Agarwal, Sanhajutha Amnajhankij, and Zahrah Taufique

“Medicine” is traditionally considered to be the art of restoring the human body to a “healthy” state, in which its practice brings each patient’s condition a step closer to the ideal, arguably Platonic, human form. Based on the Hippocratic definition of medicine as “to do away with the sufferings of the sick [and] to lessen the violence of their diseases,” medicine should maintain a dual emphasis on curing patients of their sickness and easing their corporal and mental pain (Jones, 1981). However, upon analyzing this conception from a global perspective, differences in culture and religion tend to introduce alternative approaches to medicine which - though they may preserve Hippocratic standardized concepts - can reprioritize and shift the art’s *primary* concern from providing a cure to offering palliative comfort. That is to say, non-Western medical practice that is grounded on religious and spiritual underpinnings affects not only *how* medicine is practiced but also questions the fundamental objective of the art itself.

As regional and cultural differences revolutionize our understanding of medicine, the problem that seems to quickly surface is whether we can trust these alternative methods that lack scientific proof to be efficacious and beneficial for the patient. Some may argue that any modicum of recovery is not due to the usage of such non-conventional medicine but is rather the result of the body’s natural healing process. If this is the case, one may question whether it is even appropriate to call these non-conventional methods a subcategory of “medicine” since it merely provides a source of psychological comfort and cannot

scientifically provide a cure. Moreover, a second issue that arises when discussing the multiplicity of medicine is whether we should have one universal approach in order to further galvanize international discussion and collaboration on advancements within the healthcare domain. It is commonly thought that having one standard practice of medical care will most likely enable us to achieve universal access to medicines and will also facilitate in providing an equitable standard of healthcare. Yet, is this really possible? Should we disregard cultural and religious influences on the practice of healthcare in order to establish one global art of medicine?

First, it is important to highlight what we mean by medicine driven by culture and religion, as “health is a product of social, economic, political, and religious social structures that are themselves shaped and constituted culturally” (Adams, 2004). Specifically, medical practice in Southeast Asia is largely influenced by societal norms and Buddhist cultural foundations. In fact, “the Buddhist Order was very solicitous for the bodily health of its members and the Buddha is reported to have said, on one occasion: ‘He who would care for me should care for the sick’ (de Bary, 1972). According to one of the precepts of Theravada Buddhism, one must always act with mindfulness and use one’s thoughts as a gateway to higher truths - “a monk... [must be] always strenuous, self-possessed, and collected in mind” in order to achieve clarity and utter freedom to make cognitive decisions (de Bary, 1972). As Buddhist monk Phra Chainarong stated: “The goal is not to control your mind, but rather to not be

controlled by your mind." Therefore, the notion of mindfulness enables one to have a better awareness of both one's inner self and surroundings, and is essential for the path to enlightenment or nirvana. In conjunction with the fundamental principle to not harm others or oneself, the Buddhist emphasis on mindfulness and regard for the human being thereby contributes to alternative non-Western medical practice in Southeast Asian countries.

One of the most important applications of Buddhist principles to the medical realm is the practice of meditation. Meditation allows an individual to cleanse his or her mind of all emotional attachment, compulsions, and inhibitions to consequently arrive at a lucid state. Although meditation cannot rectify chemical imbalances or molecular infections, it still enables one to control pain levels and heightened emotions that inevitably affect one's mental health. The art of meditation can therefore assist in overcoming periods of depression or anxiety to better an individual's psychological state. Moreover, at the Golden Jubilee Medical Center in Thailand, Buddhist monks are invited to educate patients and staff members monthly, serving as spiritual instructors to improve patients' mental condition. However, one may argue that while this "eastern" method of healing proves to be valuable for the mind, it also threatens to mislead patients into believing that they are cured of their sickness due to the power of psychological comfort. Again, this reemphasizes the main skepticism behind the use of alternative medicine for treatment, since it seems to only improve the psychological wellbeing of an individual without actually restoring the body to a healthier state.

Along with the importance of achieving a collected mind as a source of medical comfort, herbs have been used as medicine for nearly 60,000 years, as each

herb can be particularly useful for treating specific diseases. In Thailand, the government encourages people to learn about the value of herbs in order to utilize their therapeutic benefits and to preserve the tradition of herb usage for future generations. Clearly, government advocacy for medicinal herbs further adds to the legitimacy of using such non-conventional methods of treatment. Furthermore, in contrast to the difficulty in obtaining certain drugs or medications, herbs such as ginger, garlic or lemon are easy to find. It is commonly thought that ginger helps in curing constipation, garlic helps in removal of parasitic worms, and lemon helps to reduce bruises and swollenness (Health Department, 2001). In China, Japan and India, herbal remedies are composed of dried and powdered whole herbs or herb extracts in liquid or tablet forms; China even considers herbs as a backbone for its medical knowledge. While the funding for research on herbal medicine may not be equivalent to that for conventional medications, there is still ongoing research on a number of herbs like *Silybum maritillus* (milk thistle), *Ginkgo biloba* (ginkgo), and *Echinacea* (purple cornflower). For example, European researchers have shown that *Echinacea* helps to stimulate the immune system by increasing the number of the immune system cells and developing cells in bone marrow and lymphatic tissue. *Echinacea* also speeds up the release of immuno-competent cells into the circulatory system and inhibits the enzyme hyaluronidase. This inhibition helps in healing wounds by accelerating the formation of new tissue (NIH Report, 1995).

Acupuncture is another fascinating case study when it comes to alternative medical care, as more Americans are adopting acupuncture as a valid treatment for many of their health problems. It is unusual that people who are culturally

accustomed to depending on conventional methods of medical treatment should so readily embrace this form of alternative medicine; there has not been much research done on acupuncture, and many of the results procured from studies on this subject still remain inconclusive, warranting further study (Carpenter, 2006). Despite the lack of scientific research about the effectiveness of the procedure, many people in the United States view acupuncture as "a therapeutic technique which can be applied legitimately without regard for its theoretical justification," (Yoshida, 1998). In fact, most of the States in America have acupuncture boards which serve to standardize the acupuncture practice and ensure that patients receive treatment from practitioners who have received a certain level of training. This clearly demonstrates the acceptance of this originally Chinese treatment into the American medical system.

Thus, in spite of its lack of scientific evidence, alternative medicine – such as that which originates from Buddhist concepts – has recently gained much attention and popularity in the western world; people have started turning to forms of treatment such as yoga, massage therapy, homeopathic remedies and meditation to alleviate medical problems, be it physical or psychological. Not only have people started using alternative medicines to treat already existing problems, but our society has become cognizant of the merit in prevention of illness as a more effective way to lead a healthy life, as Hippocrates remarked that "it is necessary to inquire into the cause why such symptoms come to men" in sickness (Jones, 1972). This philosophy stems directly from ancient medicine and is further supported by Buddhist values, which focuses on supporting the body's immune system by keeping one's mind and body healthy throughout a person's life. As mentioned at the Golden Jubilee Medical

Center by Dr. Visal Kantaratanakul, the basic principles of alternative medicine include a primary focus on the person as a whole being, prevention of illness, individualized treatments, treatments that are aimed at the causes of illness rather than the downstream symptoms, and most importantly, treatments that are designed to support the natural healing processes of the human body.

The exercise of a holistic approach for treatment, emphasis on preventative medicine, and reliance on natural curative efforts of the body itself therefore collectively add to the attraction of using alternative procedures in medicine. For this reason, it is not difficult to find signs of the popularity of alternative medicine in our society today. For example, the number of Yoga studios has drastically increased, fashion and health magazines frequently advertise the benefits of alternative medicine for stress relief, fitness and weight control, and treatments such as acupuncture are commonly used to alleviate muscle aches, joint problems and migraines among other ailments. Even the growing number of people turning to organic products and herbs to improve their general health indicates that the ideology behind most alternative medicines methods has trickled its way into our culture. In fact, alternative medicine has become so prominent in western civilization that the United States of America invests nearly two million dollars each year to the National Center for Complementary and Alternative Medicine, in order to stimulate research on the efficacy of using alternative medicines (Janeviriya, 2003).

But if there is no scientific evidence to support alternative medicine, then how do we explain the current phenomenon of the increasing interest in using non-conventional methods? Below are a few reasons that explain why people may prefer to use alternative medicine over conventional

procedures:

Some patients are simply unsatisfied with conventional treatment. Most people prefer to be responsible for their own health, so they feel that alternative medicine can give them freedom to make decisions on their own health.

Because some of the alternative methods have been practiced for thousands of years, people maintain a high level of trust for similar alternative treatments like acupuncture and herbal remedy. People from Southeast Asia are already accustomed to the idea of the non-conventional medicine since they grew up with the influence of cultural beliefs.

Some patients feel that with the alternative treatment, there will be no chemical accumulation in their bodies, thus they feel safer to use this method. The patients feel that alternative treatment is the simplest and most natural method of treatment.

Given that there is no credible support of alternative medicine, one may begin to question the kind of people who would use these alternative methods for treatment. Critics of alternative medicine may erroneously believe that only people who are not scientifically enlightened would use alternative medicine. But in fact, most of people who use alternative medicine are educated and take a greater interest in questioning the power of conventional medicine, especially when it does not provide beneficial results for the human body. Furthermore, according to BBC news, those in poor health, those who have physical symptoms, with no actual physical causes, and those who see themselves as spiritual or environmental friendly also use alternative medicine.

Therefore, though alternative medicine may not have enough scientific evidence to support its legitimacy, it has fulfilled the needs of many groups of people

throughout the world.

Perhaps then the original question should not be whether we should disregard cultural and religious influences on medical practice to create one universal brand of healthcare, but instead why proponents for conventional "westernized" medicine have so much distrust for alternative methods. According to medical anthropologist Vincanne Adams:

Another reason culture is often overlooked in analyses of health equity stems from the materialist biases of western medical science itself. That is, western medical models tend to prioritize the physical and material contours of health and health inequality and to treat cultural phenomena as extraneous. Typically, the cultural dimensions of health and healing are relegated to the realm of psychology or, more commonly, to the realm of 'placebo' or 'belief'. Most often these dimensions are seen as 'ineffable' and external to real medical effects of pathologies (284).

In other words, western physicians who oppose alternative medicine attribute all "success" of non-conventional practices to the psychological comfort that patients feel when they "think" they are cured of their illness. Advocates of western medicine believe that "even when they derive no objective benefits, devotees who have a strong psychological investment in alternative medicine can convince themselves that they have been helped" (Beyerstein, 1999). Accordingly, are we truly justified in valorizing "the secular over the religious" form of medicine or is this a paradigm of our bias for westernized medicine over the alternative methods of treatment that are grounded on religious and cultural principles? (Jones, 1972).

One way to resolve this problem is through the use of complimentary alternative medicine or CAM - that is, alternative medicine that is integrated with western

conventional treatment to increase the positive effect on patients. There are only very few people who actually ignore the conventional treatment and fully rely on the alternative treatment alone. Studies have shown that about 80% of people who use alternative medicine also use the conventional medicine, and are satisfied with the combined effect (<http://news.bbc.co.uk/2/hi/health/426005.stm>). Moreover, a majority of physicians find CAM acceptable as long as it is used in conjunction with traditional western medicine and does not act as a replacement for conventional methods (Snyderman, 2002). Thus, while alternative medicine may be derived from cultural and religious values, its combined usage with mainstream medicine garners some level of respect and legitimacy. And this integrated or "east meets west" form may serve as the only possible mechanism to "globalize" medicine without discriminating against influences caused by culture.

Even though the placebo effect and lack of scientific evidence contribute to the dubious nature of alternative medicine, we are not justified in mandating one universal medicine that favours conventional and westernized forms of treatment. Patients must still retain their ability to freely choose the method of healthcare that they are most comfortable with, regardless if different countries trust different medical practices; medicine should never jeopardize patient autonomy. Therefore, as religions like Buddhism have affected healthcare in Southeast Asia, it is not proper to completely discount these "non-scientific" and non-Western methods. Instead of focusing on the conflict between western and alternative medicine, we should remember that the main goal of any physician should be to improve the patients' condition both through cure *and by comfort*. And though alternative and cultural medicine has not been proven

to assist in the curing process, it nevertheless provides a considerable source of mental and bodily comfort in times where the very notion of "falling ill" exacerbates a patient's state of distress.

References

- Adams, V. "Equity of the Ineffable: Cultural and Political Constraints on Ethnomedicine as a Health Problem in Contemporary Tibet," *Public Health, Ethics, and Equity*. Edited by Sudhir Anand, Fabienne Peter, and Amartya Sen, (New York: Oxford University Press, 2004).
- Beyerstein, B.L. "Psychology and Alternative Medicine Social and Judgmental Biases That Make Inert Treatments Seem to Work," *The Scientific Rev of Alternative Med*, 3:16-29,1999.
- Carpenter, R. J. "The acute effect of acupuncture on autonomic modulation" Columbia University Lecture, Teachers College. 2006.
- De Bary, W.T. *The Buddhist Tradition in India, China, and Japan*. (New York: Vintage Books, Random House, Inc. 1972).
- Health Department. *สมุนไพรไทยพื้นเมือง[herb as medicine]*. 2001. Sri Muang Publish: Bangkok.
- Janeviriya, N. 2003. *การแพทย์ทางเลือกในประเทศไทย*. [http://www.elib-online.com/doctors46/general_alternative001.html].
- Jones, W.H.S. "Ancient Medicine," Hippocrates with an English Translation, 1; 12-63. (Cambridge: Harvard University Press, 1972).
- Jones, W.H.S. "The Art," Hippocrates with an English Translation, Vol.II. 190-217. (Cambridge: Harvard University Press, 1981).
- NIH Report, "Alternative Medicine: Expanding Medicals Horizons." (DIANE publishing company, 1995).
- Snyderman, Ralph and Andrew T. Weil. "Integrative medicine: bringing medicine back to its roots" *Archives of Internal Medicine*, Vol 162, No.4. 2002.
- Yoshida, Motoko. "The Conceptual Foundation of Physician's Use of Acupuncture: A study of New York State" Columbia University, 1998.

To Treat or Not to Treat? Cross-Cultural Perspectives on Denial of Treatment

By YoonJoo Kang and Michael Peluso

A 40-year-old Burmese man crosses the politically unstable border between Burma and Thailand, and makes his way into northern Thailand. He arrives at a Thai clinic in the mountains presenting symptoms such as fever, chills, night sweats, weight loss, chronic fatigue, and blood in his sputum. A chest X-ray indicates that he has tuberculosis, but due to the difficulty of culturing the bacterium that causes the disease, sensitivity results may not be available for two months. To make matters worse, the clinic is running low on drugs and has only a two-month supply of first-line drugs—isoniazid, rifampicin, and pyrazinamide. Therefore, he will need to return to the clinic to continue his treatment once they run out. With the instability at the border and his need to provide for a family back home, the physician is unsure whether the patient will ever return to the clinic again. Should the physician supply the drugs and risk creating a resistant strain in his community if he does not return, or should the physician deny treatment and send him home sick, with a 50% chance of succumbing to the disease?

While the standards of medical care in the United States and Thailand are comparable, the American and Thai medical systems may make different determinations regarding the obligation of the physician to the patient and to his community. In general, the focus on the individual and his privacy is prevalent in the American philosophy of medicine, whereas the Thai philosophy, grounded in the principles in Buddhism, stresses the importance of the individual's position in relation to the broader

community. According to doctors at Siriraj Hospital in Bangkok, the well-being of this community, which begins with the family and extends to all those who interact with the patient, is often taken into account by Thai doctors when weighing their options for treatment. An analysis of the two perspectives on the above scenario brings to light key ideological differences between the cultures, providing insight into cross-cultural inconsistencies in medical ethics.

The American Perspective

An American perspective on issues of treatment involving tuberculosis would likely be rooted in the individualism of the medical system and a strict interpretation of the Hippocratic Oath. While Thai medicine appears to focus on the effects on the community of treating or not treating a patient, American medicine would likely never turn a patient away. Of course, tuberculosis prevalence in the United States is incredibly low, and thus the risk of spreading any type of TB, drug resistant or not, is substantial. In Thailand, where the prevalence of TB is, according to several doctors at Ramathibodi Hospital, quite widespread, it is advantageous to endeavor to focus on maintaining sensitivity in the bacteria, as widespread TB is far better and easier to treat than widespread multi-drug resistant TB (MDRTB).

An ethical argument in favor of treating all cases of TB, regardless of the patient's apparent ability or inability to complete the course of treatment, is grounded within the very act of becoming a

doctor. The unstated prescription of the Hippocratic Oath, "first, do no harm" necessitates the prescription of drugs to all TB patients, as an attempt must be made to provide adequate medical care. It is not the responsibility of the doctor to assess whether a patient is capable of taking the drugs, nor is it within his authority to deny treatment on his own assumption that the patient is incapable. The onus falls instead on the patient, who is given by the doctor the resources necessary for complete treatment, to take responsibility for his own disease and health. Nowhere in the Oath are doctors given the responsibilities of judges – they are merely healers who must do their work with only the interest of the individual patient in mind. In American medicine, the patient is the primary concern, and his role in the community is secondary.

The reasons for being unable to complete treatment in the United States are also quite different from those in Thailand, and this may explain the discrepancies in the philosophy of treatment. Since access to medical care and drugs for treatment is consistently satisfactory throughout the US, the most likely reason behind treatment failure is human error on the part of the physician (who could misdiagnose or incorrectly prescribe drugs) or the patient (who may make a conscious decision to discontinue treatment even if the treatment is consistently available).

The Thai Perspective

The subject of drug resistant and MDRTB has been an area of growing concern among epidemiologists, clinicians and public health workers in countless nations. The primary aim in its control is to

prevent its development in the first place. This is because, as mentioned before, TB is much easier to treat than MDRTB. Second line drugs needed for treating MDRTB are expensive, and they are considered 'orphan drugs' since they are off patented and face exceedingly low demand from the manufacturer's perspective. If, by denying treatment, the risk of development and spread of MDRTB can be reduced, it will be favorable to do so.

Yes, doctors should not deny treatment based on the assumption that the patient will most probably not return. However, lack of finance

and distance from the patient's residence to the health facilities were the most common reasons reported by the patients for non-adherence to treatment. Under the Hippocratic Oath, doctors are not meant to bear the burden of being judges as to whether or not a patient should be treated; a doctor must simply issue the required treatment. Nevertheless, the rights and welfare of the community must be considered as well. Should the physician, aware of the repercussions of his actions, help a community to be free of malicious diseases? With respect to the aforementioned case: the illegal immigrant carries a TB that might lead to MDRTB if he does not complete his treatment. In this situation, a typical Thai doctor would deny the patient treatment due to his Buddhist teachings.

Traditionally, Buddhist teachings emphasize upon the concept of karma. Karma is the idea that one's actions, which can be good or bad, come back to one based on his or her merit. If one does something with good intentions, for the greater and common good, then one does not cause negative karma as one is thinking



for the good of his community. Under this given discipline, the doctor would believe that as he is saving more people from MDRTB by sacrificing the life of a single patient. It would be a justified course of action.

As medical practices within Thailand are evolving, Thai practitioners are faced with more and more ethical predicaments. Generally, Thais refer to Asian medical models, which are heavily influenced by Animist, as well as Chinese Taoist and Buddhist beliefs. Historically, these models were available to and performed by Shamans and healing specialists along with Buddhist monks. Then in the 19th century, Thailand was introduced to the western medical model as it came with the western world's colonization of the east. While Thailand was making efforts to modernize its nation and avoid western imperialism, acceptance of the western medical model became more recognized. This was influenced by the involvement of Christian missionaries and thus, by the mid-20th century, western medicine was the dominant medical model.

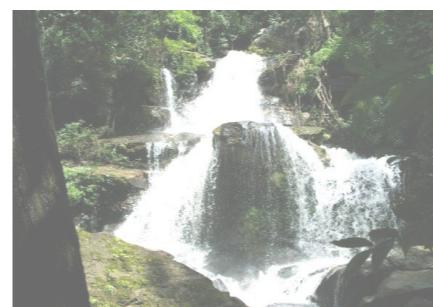
The western model, which is based on the cause and effect concept, was alien to traditional Thai beliefs. Buddhists believe that human beings consist of physical, mental, emotional and spiritual elements. These four aspects are then believed to be linked with a person's external environment. When one is said to be healthy, all the forces mentioned are in harmony, whereas disease suggests that disharmony prevails, averting one from living holistically. In addition, a person's physical body is treated as a vessel in which the spiritual elements are contained during the process of shifting from one life to another. Therefore, when a person dies, he or she does not really 'die' but rather move on to another life. In other words, death is not considered to be an issue. It is in these very Buddhist concepts

of karma, good intentions, and insignificance of physical death that denial of treatment is acceptable.

Conclusion

It is ironic that in spite of the introduction of effective chemotherapy fifty years ago, tuberculosis is still capable of causing as many as two million deaths a year. Despite the fact that we now have a more in depth understanding of the disease, the treatment of the disease can still be problematic. The right to refuse treatment and the risk posed by individuals, whose untreated disease poses a risk to others, is one of the many critical issues discussed by many.

The widespread problem of tuberculosis has not been addressed by the medical organizations adequately, albeit its magnitude. The fact that education in a society is strongly related to the health in the society must be addressed in order to come up with a solution. In order for the problem to be resolved, the government must develop information, education and communication for the people of their country. Along with this, the problems linked with access to medical treatment must be eradicated. It is, however, very important to realize that even with the finest treatment for MDRTB, the problems related to it may still persist and so the effective use of first like drugs is needed to remove the problem from the root.



Medical Tourism: The Unspoken Risk Benefit Ratio

By Jonathan Sury and Prakaikaew (Gail) Montriwat

If you could take a vacation to an exotic location and come home 30 pounds lighter, two bra sizes larger, and look ten years younger, wouldn't you jump at the chance? For a fraction of the price, thousands of foreigners travel to countries like Thailand each year to undergo popular cosmetic procedures such as nose jobs, tummy tucks and breast enhancements.

The industry of medical tourism is expanding at a rapid pace as its appeal is continuously glamorized. Advertisers promote the concept of going abroad for medical treatments, like travel agents promote spring break. They prioritize the affordability of the endeavour, while stressing the vacation as a bonus. While globalization has provided a forum for cultural exchange, it has also facilitated the production of medical tourism. In a world where consumerism is increasingly prevalent, medical care is now viewed like an à la carte menu.

Several ethical debates exist and many people question the legitimacy of the industry as a whole. Of concern are issues of health equity, economic implications, resource allocation, consumer protection and cultural maintenance. On the contrary, however, there are various consequential benefits and explanations for its validity. In the midst of such constructive cultural exchange, medical tourism has been applauded while the relevant ethical concerns are set aside. Thailand has become an exceptional destination for foreigners in need of essential medical treatments, as well as those seeking elective medical procedures. At Bumrungrad

Hospital, one of the leading hospitals in Bangkok, up to 60% of patients are foreigners (Medical Tourism, 2007). According to Cochrane (2006), Bumrungrad Hospital has treated more than 400,000 patients coming from over 150 countries during the past year. This unprecedented number of international patients surpasses any other hospital in the world (Vacation, 2005). In 2006, Yanhee Hospital, another institution that caters to foreigners, treated 457 patients from the United States, making the U.S. the top country of origin of international patients (Sumritvanitcha, 2007). After its appeal to international patients and subsequent expansion, the hospital was renamed Yanhee International Hospital (Yanhee, 2007). Breast augmentation, one of the most often sought out procedures performed at Yanhee Hospital, costs \$2600 U.S. dollars, whereas the same procedure performed in the United States would cost nearly five to ten times as much (Berger, 2007). Considering price alone, the calculations are compelling. After factoring in airfare and additional vacation expenses, the prospects of medical tourism remain favourable. It is still remarkably cheaper for Americans to travel to Thailand for cosmetic surgery than to have it done at home.

Although the lower cost is a persuasive incentive to choose medical treatment in Thailand, the attraction also lies in the additional services offered to foreign patients, such as transportation arrangements, private VIP rooms in hotel-like atmospheres, spa-like amenities and international cuisine (Bompey, 2006). Yanhee Hospital prides itself on excellent

service, demonstrated by their high nurse to patient ratio, and their Thai hospitality. Representing their institution are exceedingly attractive staff dressed in elaborate attire, emphasizing the highly valued concept of beauty. Lining almost every wall are mirrors that accentuate flaws, creating a sense of vanity and necessity for perfection. In bathrooms, posters of before and after pictures advertise what could be easily attainable.

Medical tourism is often driven by various failures in health care systems. Forty-five million Americans are currently uninsured in the U.S, yet some of these people have been able to seek out an alternative route of obtaining treatments, by engaging in cheap medical care in developing countries (Newsroom, 2007). Likewise, the impetus for the hospitals participating is most often determined by their economic state. Driven by the financial crisis in the late 1990's, when Thai hospitals were in need of revenue, medical tourism generated substantial amounts of money for the country (Bombardieri, 2002). Bumrungrad Hospital generates 50% of the hospital's revenue from foreign patients (Sloane, 2004). Money from international patients has provided several improvements for these hospitals, in both the quality of technology and quantity of resources. The economies of countries like Thailand have profited from such exchange; however, the health care systems in countries like the United States, where many of these patients come from, have remained stagnant.

While the industry of medical tourism has aided the economic system in Thailand, the provisions available to foreigners are often unattainable to the country's own citizens. Prioritizing the interests of foreigners over its own citizens raises issues of justice and health equity. Although there is a two-tiered system, where a price difference exists between services

offered to foreign patients and Thai patients, the latter are not always able to pay for the same procedures. The allocation and affordability of medical resources is increasingly inequitable. Despite the difference in the monetary value between the two countries, what international patients declare as cheap service is still considered quite unaffordable to many Thai clients.

Many rural areas in Thailand lack modern medical equipment and the fewer number of physicians available in these clinics are often lacking experience. As the best doctors and medical staff are serving medical tourists, their attention is diverted to these foreigners and the quality of care to locals often suffers as a result. Although the income generated from medical tourism is ultimately beneficial, only the wealthy Thai citizens and international patients who travel to Thailand for services are able to reap the benefits. This exchange further delineates the social classes in Thailand.

Despite the primary attraction of travelling to countries like Thailand for inexpensive medical treatments, many foreigners question the quality of the health facility and the physician. Oftentimes, appropriate certifications are difficult to locate. For international patients receiving treatment overseas there is also a lack of consumer protection in the sense that, for covered parties, insurance will not pay for these services. In the event of malpractice suits, initiating action is complicated. "When considering any overseas treatment it is important to understand that any legal disputes concerning your care will be decided in the country of treatment, not your country of citizenship" (International, 2007). In an effort to avoid such situations, Yanhee Hospital in Bangkok offers a satisfaction guaranteed policy whereby a second surgery is offered for free if the patient is not fulfilled and a full refund can be obtained if the patient is still not satisfied at that time.

Yanhee Hospital boasts that they have had "no malpractice suits from international patients" thus far (Sumritvanitcha, 2007). Bumrungrad Hospital also provides all



patients in Thailand a similar protection plan under the Patient Bill of Rights which has been enforced by the Kingdom's medical Council (International, 2007). Patients may

complain directly to the Medical Council, Ministry of Public Health and Thai Consumer Protection police, which have the power to revoke the licenses of offending practitioners. Now, not only Yanhee and Bumrungrad hospital are being accredited for its institution but many other private hospitals in Thailand are applying for accreditation from the Joint Commission International, the global arm of the institution that accredits most U.S. hospitals as well (Kher, 2006).

In Thailand, beauty has become a widespread obsession, which is attainable via plastic surgery. While cosmetic surgeries were once considered taboo, current Thai culture stipulates more covert measures, by seeking such procedures in moderation, to avoid scrutiny by the mainstream society. Yanhee Hospital is known as one of the best hospitals for cosmetic surgery in Thailand. They aim to live up to their motto of "Beauty can be yours at Yanhee Hospital!" and make this promise not only to international patients, but to Thais as well. Yanhee hospital has continued to attract various foreigners, from all around the world. As the number of foreigners has increased, Thai people have become more open to the idea of undergoing these medical procedures themselves. Yanhee Hospital also promotes their concept of beauty by holding an annual beauty pageant, in order to identify an appropriate person to help represent their

institution and promote their mission (Sumritvanitcha, 2007).

Religion has continuously intersected with medicine and often creates controversy. In Thailand, Buddhists believe in the importance of abstaining from beautification. While Buddhism is widespread, only a small portion of people in Thailand actually practice, therefore the presence of beauty pageants and advertisements on cosmetic surgeries are becoming more acceptable. Cultural exchange between countries has also facilitated and influenced their openness to obtaining such surgeries.

While many opponents of medical tourism fear its implementation will have adverse effects on the countries involved, the industry has been operational for many years now. Its performance has benefited all of the players involved, by providing services to the uninsured, and by providing income to the participating hospitals. As the healthcare exchange continues, cultural exchange is also amplified. More and more countries all over the world have become involved as the vision of the endeavour becomes universally advantageous. It is important to question whether this exchange has an expiration date and will there be a detrimental time when health care in countries such as the United States will be highly recognized as insufficient to its own people. Not only is it important to consider such consequences that are now fracturing health care systems accountability in the United States, but also punishments that could derive from the country providing medical tourism itself should as well be remarked upon. Thailand must further be conscious of its own unjust access to health care towards its own citizens before such inequity becomes too far established in the future. Therefore, at times tampering with both countries medical care makes it harder to maintain and preserve one's culture with

such prevalent exchange. For the time being, despite the numerous ethical issues that arise in such an endeavour, medical tourism is considered functional and seemingly beneficial.

References

- Becker, C., 2004. The Best Care Money Can Buy? *Modern Health Care Magazine, Global Care Solutions*. 9 August.http://www.hospital2000.com/english/news_modern_health_2.asp.
- Berger, G., 2007. Health Care Overseas – Is Medical Tourism Right For You?. *Ezine Articles*. <http://ezinearticles.com/?Health-Care-Overseas--Is-Medical-Tourism-Right-for-You?&id=711952>.
- Bombardieri, M., 2002. A Dose Of The Good Life In Bangkok: Thai Hospitals lure ‘medical tourists’ with low-cost care and hotel-like service. *San Francisco Chronical*. <http://sfgate.com/cgi-bin/article.cgi?f=/chronicle/archive/2002/12/15/TR51858.DTL>.
- Bompey, N., 2006. Thailand Attracts Patients For Sex Changes, Other Surgery, Global Journalism. <http://archive.wn.com/2006/11/22/1400/norwayglobe/>.
- Cochrane, J., 2006. Asian Hotspots of Medical Tourism: (India, Singapore, Malaysia and Thailand). “Medical Meccas,” *Newsweek International*. 30 October., http://www.healthmedicaltourism.org/Resources/October_2006_Articles/Asian_Hotspots_of_Medical_Tourism%3A_%28India%2C_Singapore%2C_Malaysia_and_Thailand%29/.
- Income Stable, Poverty Up, Numbers of Americans With and Without Health Insurance Rise, Census Bureau Reports. 2007. Newsroom. *U.S. Census Bureau*. http://www.census.gov/Press-Release/www/releases/archives/income_wealth/002484.html.
- International Visitors. 2007. Bumrunggrad International Hospital. <http://www.bumrunggrad.com/overseas-medical-care/Bumrunggrad-International.aspx>.
- Kher, U., 2006. Outsourcing Your Heart. *Time In Partnership with CNN*. 21 May., pp 1-5. <http://www.time.com/time/magazine/article/0,9171,1196429-1,00.html>.
- Medical Tourism In Thailand. 2007. Thai Websites. <http://www.thaiwebsites.com/medical-tourism-thailand.asp>.
- Pricing. 2007. Yanhee International Hospital. http://www.yanhee.net/eng/srv/srv_val_btc.asp.
- Sumritvanitcha, S., 2007. Medical Tourism Lecture. *Yanhee Hospital*. Bangkok, Thailand. Sept. 10.
- Vacation, Adventure And Surgery?, 2005. Elective Surgeries By World-Class Doctors At Third-World Prices. *MMV, CBS Worldwide Inc*. <http://www.cbsnews.com/stories/2005/04/21/60minutes/main689998.shtml>.



GMOs: an International Issue

By Alisha Sachchathep and Dana Balitzer

Starfire Red™, Electric Green™, and Sunburst Orange™ sound like very exciting colors, and one would generally perceive that they were used in coloring candies, or perhaps in certain toys, or even on t-shirts. However, children shopping for new pets will definitely be surprised to know that it gets better; they can actually buy fish in those colors. Glofish®, a genetically modified organism (GMO) is gaining popularity among customers who are captivated with the idea of having their aquarium filled with glowing fish. But is this ethical? Are all types of GMOs ethical? Where do we draw the line?

In this paper, the different ethical concerns of GMOs are going to be analyzed, and those of the Thai and American population will be compared and contrasted, in order to look at the variation of viewpoints among two very different cultures.

By definition, GMOs are organisms that have had their genetic material altered via recombinant DNA technology. The use of such organisms has endless possibilities in fields such as pharmaceuticals, agriculture, and medicine. Examples of GMOs include Golden rice, genetically modified papaya, pesticide resistant plants, insecticide sweet corn and long lasting tomatoes.

In many situations, GMOs have turned out to be helpful and carry with them many different advantages, especially in the agricultural field. However, GMOs also carry with them a lot of economical, social and environmental concerns. At the end of the day, it boils down to the bioethics of

manipulating life forms. Some of these ethical concerns include health issues, the lack of long-term studies, and even the possibility of new viral creation. Other concerns have to do with the environment, the unfeasibility of predicting the effects of introducing new species, whether to label foods as GMOs, and the high costs of GMOs because of their patents.

In Thailand, farmers do not currently grow GMOs, but the government has a generally optimistic impression of GMO technology. The Thai government is currently researching many GMO projects. In addition, local Thai stores and markets contain GMO products because the country does not prohibit the import of GMO products. GMO products in Thailand mainly come from China, the second largest producer of GMOs after the United States of America. Hence, politically, Thailand is not against the import of GMOs, and intensive research could mean that Thailand may one day grow GMO crops.

In South East Asia and Thailand in particular, there are a few major GMO agricultural projects currently in development, such as the development of a pest and disease resistant papaya. Perhaps one of the most well known examples of GMOs in South East Asia is that of Golden Rice, which is engineered to produce beta-carotene for vitamin A deficiency. In Thailand and throughout South East Asia, vitamin A deficiency is still a major cause for concern. Some have noted that GMO technology is in fact not necessary to resolve this issue, as other organic crops such as the sweet potato have naturally high

amounts of Vitamin A. In addition, others have criticized the use of Golden Rice in a country such as Thailand, where the amount of rice consumption is so high that rice containing large amounts of beta-carotene can in fact result in an excess amount of Vitamin A consumption.

The consequences of GMO usage in Thailand are complex. The use of GMO technology has the enormous potential to increase crop production and consequentially increase food availability throughout Asia. For example, one source estimated that transgenic rice can increase production to up to 25 percent from current numbers (James and Krattiger, 1999). As the world's largest rice exporter, Thailand could easily benefit from such increased crop yields. In addition, high-nutrition crops engineered similarly to Golden Rice could potentially solve many public health issues and malnutrition in Thailand.

However, many non-government officials and others disagree regarding how GMO technology may affect Thailand economically and politically. Thailand has a unique agricultural niche within the international markets as a producer of organic crops. It is possible that the introduction of GMO technology may in fact result in a loss of this economic niche. Thailand would be forced to compete with international agricultural superpowers and would no longer have the same unique crops to offer to the markets.

Even greater causes for concern in Thailand are the issues of global justice and patent rights. Due to the complex nature of international relations and trade agreements, it is very difficult to guarantee that Thailand would indeed benefit economically from the introduction of GMO technology. Many have argued that the introduction of GMO crops would not benefit poor Thai farmers, but rather the international companies who hold the patent

rights over these new species.

In addition to these concerns, it is very difficult to ascertain the view of the Thai public on the issue of genetically modified organisms. When speaking of social will, one must consider that in the case of Thailand, a large percentage of the Thai population is not educated enough to be concerned or aware of GMOs, including farmers. Although GMO crops are very prevalent in the markets and stores, these products are not currently labeled. So it is hard to predict the reaction of these farmers if the government ever starts encouraging the farming of GMO crops. Among those who are aware of the use of GMOs, many are apprehensive. However, the fact that imported GMO products, some of which are labeled, are still being sold in local stores indicate that there is room in the Thai market for GMOs. Thai society may currently accept GMOs, but this acceptance may stem from an overall lack of awareness.

Indeed, due to the high percentage of Buddhists in Thailand, it may be very possible that the Thai public would object more strongly to GMO technology if there were an increased awareness. In Buddhist belief, all acts must be performed out of compassion, never greed. With these principles in mind, it is reasonable to assume that the Thai population would be more accepting of GMO technology if they were convinced that its usage would have truly altruistic applications. However, the greed of large corporations and international competitions would not be viable motivations in the eyes of many Buddhists.

The political stance of America, on the other hand, is totally in support of the use of GMOs, domestically, and internationally. Around 65% of the products available in American supermarkets contain some amount of genetically modified ingredients. For a government to allow such a high percentage of a certain type of

product in its country definitely shows that it is totally in support of that product and probably does not believe in the harms that so many other people are worried about. The government has also had a number of disagreements with other countries with regards to labeling GMOs. These have been mainly clashes of opinions with the EU and its member countries.

Existing EU regulations require the labeling of certain GM food products containing more than 1% of GM material. This clearly shows that the EU is absolutely for the labeling of any GM product and wants its people completely informed of the presence of any GM material in their food. According to a recent MORI Poll conducted April 18 - 22, 2002 and commissioned by Greenpeace UK, public opposition to GM food is widespread in the EU. Of particular interest, 76% of respondents said the labeling of all food with GM ingredients should be made compulsory. The United States of America, on the other hand has indicated it has concerns with the growing move toward such restrictions on market entry. Many speculate that this is probably a result of concern of public fear, which would technically result in lower sales of GM products.

On the level of social will in America, it can be easily said that Americans have a far more relaxed approach towards GMOs, possibly because of the encouragement of their government. In 1994, the first genetically modified crop, a tomato, came on the market in USA. Americans have consumed GMOs for the longest period of time and because there have not been any incidents that show the scientific link between consuming GMOs and adverse health effects, most Americans are now convinced that GMOs are safe. However, what they are forgetting is the fact that long term effects cannot be predicted, and must be further examined. Reports

show that many Americans are actually unaware of the level of prevalence of GM food in their own markets. Funded by the United States Department of Agriculture (USDA) under its Initiative for Future Agriculture and Food Systems program, Rutgers University's Food Policy Institute conducted public opinion surveys (Hallman, Hebdon, Aquino, Cuite, & Lang, 2003; Hallman, Hebdon, Cuite, Aquino, & Lang, 2004) that found Americans are generally uninformed about GM food and largely unaware of its presence in the food system and their own diets. Fewer than half of the respondents in the latest Food Policy Institute (Hallman et al., 2004) study realized that foods containing GM ingredients are available in supermarkets and fewer than one in three believed they had personally consumed GM foods. Surprisingly, results indicate that Americans are generally not adequately informed about GM food and its availability within the American food industry. They are a population that might of heard of GMOs, might have seen some commercials here and there, but from a holistic point of view do not have a very sufficient knowledge of the use of GM crops in their own country. Perhaps this is another reason that allows such a relaxed approach towards GM products within the American society.

Another perspective that also has a strong effect on the way that people think and act, is the religious perspective. America is a diverse country consisting of people belonging to many different faiths. Judaism, Christianity, and Islam are the major religions of Americans of faith. In Christianity one can see, a lot of different views, so it is hard to draw a line that indicates exactly what the religion as a whole actually thinks of GMOs. With all that said, evidence does show that, to an extent, Christians believe that using GMOs for increased production was against God's will.

Those were the words of Pope John Paul II. Others have tried to show through scriptures that we should not interfere with the genes of life forms. For instance, in Genesis 1: "God saw that it was good...God saw everything that God had made, and indeed, it was very good." Scholars argue that every creature and species has an intrinsic value and hence we need to respect their uniqueness and the way that they naturally breed, by not tampering with their genes. Other Christian parties still argue that the use of GMOs is not beyond the limit of human action. Despite the Pope's (year 2000) denouncement, the Catholic Church officially confirmed they were not against the use of biotechnology, only advocating prudence and regulation.

Aside from the health risks and potential risks of GMO to the environment, Jewish law has to consider whether GMOs are Kosher. For thousands of years, Jews have adhered to strict food laws based on the instructions found in Bible. At the moment, many Kosher organizations are indeed certifying genetically modified food as being Kosher. However, this comes with many opposing viewpoints within the Jewish community as well. A lot of Jews are arguing that GMOs should be prohibited because of health or environmental risks. Once again it can be noticed that even within one religious belief, it is hard to place a certain bar that strictly decides the status of GMOs.

The next religion whose opinion needs to be addressed for analyzing opinions within America is Islam. So are GMOs halal? Yes, today's biotechnology products are approved as halal. According to the Islamic Jurisprudence Council (IJC), foods derived from biotechnology-improved (GMO) crops are halal - fit for consumption by Muslims. Some scholars have suggested that foods derived from biotechnology-improved crops could possibly become haram (non-halal) if they contain DNA from

forbidden foods. For example, swine DNA in soy could make the soy product haram. This issue is still the subject of some debate among scholars and certifying organizations. Basically, except for the use of pig's genetic material, other forms of GM food are accepted and consumed by Muslims without any religious concerns.

Looking at all three religions, and keeping in mind that a lot of American people are not strictly Christian, Jewish, or Islam, and many of them are also agnostic or atheistic, this basically explains why Americans have such a relaxed approach towards GMOs.

The use of genetically modified organisms as agricultural crops has created heated debate in almost every country which has been exposed to the technology. As exhibited in the relative attitudes of the United States and Thailand towards GMOs, the issues reflect the cultural attitudes as well the political-economical situations of each respective country. As the world continues to develop as an international marketplace, policymakers and citizens alike in every country must respect the cultures of other nations and must consider the ramifications that this technology may have on the future.

References

Factsheet. <http://pewagbiotech.org/resources/factsheets/display.php3?FactsheetID=2>.

Hallman, W.K., Hebdon, W.C., Aquino, H.L., Cuite, C.L., & Lang, J.T. (2003). *Public perceptions of genetically modified foods: A national study of American knowledge and opinion*. New Brunswick, NJ: Food Policy Institute, Cook College, Rutgers, The State University of New Jersey.

Hallman, W.K., Hebdon, W.C., Cuite, C.L., Aquino, H.L., and Lang, J.T. (2004) *Americans and GM Food: Knowledge, Opinion and Interest*

in 2004. www.foodpolicyinstitute.org/docs/reports/NationalStudy2004.pdf.

Globalpolicy. www.globalpolicy.org/socecon/trade/gmos/index.htm.

EU Labeling www.thunderlake.com/gmos.html.

Pope www.biotech-info.net/Pope_view.html.

Catholic church <http://www.agbioworld.org/biotech-info/religion/catholic.html>.

GMOs Halal <http://www.agbioworld.org/biotech-info/religion/index.html>.

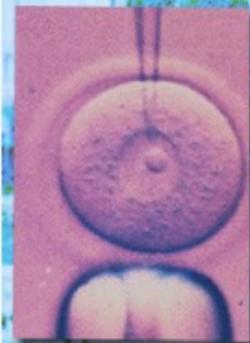
Crops percentage www.greenpeace.org/raw/content/international/press/reports/ge-crops-increasingly-isolat.pdf.

American unawareness www.choicesmagazine.org/2005-4/GMOs/2005-4-05.htm.



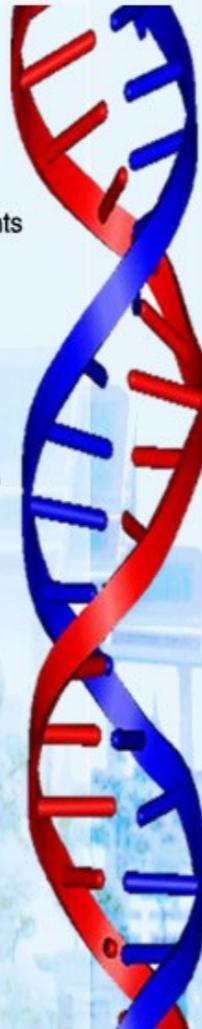
BIOCEP

(BIOethical Cross-cultural Educational Program)



Bioethics in Thailand (August 2008):

A two week intensive summer internship program designed to promote educational and cultural exchange in bioethics and Public Health (medical tourism, emerging infections, stem cell research, reproductive medicine, HIV, abortion, etc) with students from Mahidol University in Bangkok, Thailand.



Eligibility:

- * Undergraduate students from Columbia College, Barnard College, SEAS, and GS.
- * Graduate students from the Medical School, Mailman School of Public Health, School of Nursing, Dental School and Graduate School of Science.

Program outline:

- * Lectures, student discussions, professional visits to clinics and research labs, and cultural tours in Thailand.
- * Students will be partnered with corresponding students from Mahidol University.

Program fee: \$1500 (excluding travel to Thailand)

Applications due by 12/1/07

Application fee: \$35

Apply at www.columbia.edu/~jdl5

(Limited financial aid is available)