



# The HUMAN Link +



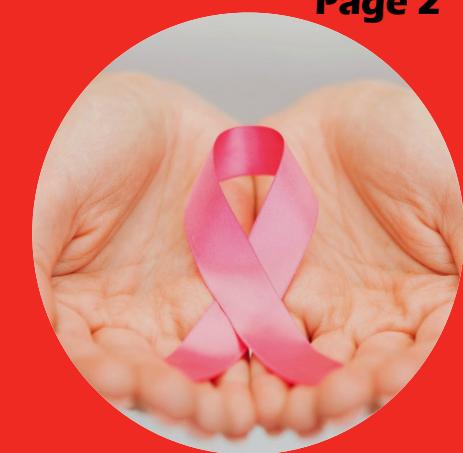
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# THE MODERN TIMES EVIL

A TESTIMONY FROM ANA MARIA DA SILVA

When I decided to interview Misses Ana Maria da Silva, the first thing that came to my mind was how emotional it was going to be. While she was talking, you could see her effort to keep the tears to herself. This was going to be a hell of a ride.

"I received the news on October 2001, even though I can't really remember the day" said Ana while cleaning the plates that have been just washed.

This led me to ask her how hard was it to live with such a heavy weight, to know that you had breast cancer.

"I had surgery in the 21st of November and, I must say, that month was the hardest one in my whole life. I only knew that cancer killed and killed, and my first doctor wasn't that much of a help either. I used to cry every time I saw my children and grandchildren. You know, it was terrible to think if I would ever see them all again"

During the procedure, the whole breast was removed, however, she thought that only a small part of it was going to be removed.

"Breasts are a distinctive characteristic of being a woman, a sort of female symbol. Seeing myself like that, mutilated, was devastating. I used to ask why did it happen to me...I just wanted to be healthy and feel like a woman again"

At this moment, her voice cracked a little. You could feel the pain she felt just by listening to her voice.

"Nevertheless, my second doctor was an angel, a real angel. He was a doctor, a friend, a psychologist, a shoulder to cry on. Nowadays, we're still friends and I still believe he was an angel placed in my life by God himself"

It is just amazing how doctors can be less or more than doctors.

"I didn't know until recently that cancer could be transmitted to the following generations...it has something to do with genes right? Something in our DNA..."

And misses Ana Maria is right. Cancer is caused by certain

changes in genes that control the way that our cells function, specially how they grow and divide. Cancer is basically the abnormal growth in cells that have the potential of invading and spreading to other parts of the body.

"Nowadays I'm a red cross volunteer, specialized on the oncological area."

"How is it? Is it too hard to see people suffering like that?" said I, perhaps a little bit to loudly

"Well...after all this time, I got a little bit used to it, but it's still hard and I can't forget certain situations. There was this time when a really young lady, on her thirties, was really bad and, I must say, on the verge of dying...but her son always came with her, a young teenager. I kept this image for days, I couldn't even sleep!"

"But does cancer affect all ages?"

"It does, yes, but, as you may know, breast cancer usually affects older women. But, just the other day, I talked with a 22 year old girl who had it. They are getting younger and younger."

It's so touching to hear to such a testimony. These women (and men, which represent 1% of the diagnostics) are so strong and we don't really notice it. Cancer is a physical disease, but it also affects people mentally and we forget it!

Cancer is the modern times evil, but I'm sure that we'll beat it pretty soon!

WRITTEN BY BÁRBARA SILVA

# Organ Transplantation

BY MARTA SOARES

Transplantation Medicine is one of the most challenging and complex areas of modern time's.

But, before moving on, we should clarify some concepts. Organ transplant is a medical procedure in which an organ is removed from one body and placed in recipient's body, to replace a damaged or missing organ. If the organs and/or tissues (tissues include bones, tendons, corneae, skin, heart valves, nerves and veins) that are transplanted are from within the same person's body, it is called *autografts*. On the other hand, those which are performed between two subjects of the same species are called *allografts*.

Until now, some organs that have been successfully transplanted include the heart, kidneys, liver, lungs, pancreas, intestine, and thymus. However there are still some organs, like the brain, that cannot be transplanted.

Some key areas for medical management are the problems of transplant rejection, during which the body has an immune response to the transplanted organ, possibly leading to transplant failure and the need to immediately remove the organ from the recipient. When possible, transplant rejection can be reduced through serotyping to determine the most appropriate donor-recipient match and through the use of immunosuppressant drugs.

## IMMUNE RESPONSES

In order to understand why rejection occurs and how it may be prevented, it is necessary to know somethings about the functioning of the immune system. The key cells of the immune system are the white blood cells, known as lymphocytes. These are of two basic types: T lymphocytes (T cells) and B lymphocytes (B cells). These cells have the ability to distinguish "self" substances from such "nonsel" substances as microorganisms and foreign tissue cells. Substances that provoke an immune reaction are recognized by the presence of certain molecules, called antigens, on their surface.

T lymphocytes are responsible for cell-mediated immunity, so named because the T cells themselves latch onto the antigens of the invader and then initiate reactions that lead to the destruction of the nonself matter. B lymphocytes, on the other hand, do not directly attack invaders. Rather, they produce antibodies, proteins that are capable of initiating reactions that weaken or destroy the foreign substance. The overall immune reaction is exceedingly complex, with T lymphocytes, B lymphocytes, macrophages (scavenger cells), and various circulating chemicals waging a coordinated assault on the invader.

Transplant rejection is generally caused by cell-mediated responses. The process usually occurs over days or months, as the T lymphocytes stimulate the infiltration and destruction of the graft. The transplant may be saved if the cell-mediated reactions can be suppressed. Antibody attack of transplanted tissues is most apparent when the recipient has preexisting antibodies

against the antigens of the donor. This situation can arise if the recipient has been previously exposed to foreign antigens as the result of pregnancy (during which the mother is exposed to fetal antigens contributed by the father), blood transfusions, or prior transplants. Unlike a cell-mediated reaction, antibody-mediated rejection is rapid, occurring within minutes or hours, and cannot be reversed.

## ABO-INCOMPATIBLE TRANSPLANT

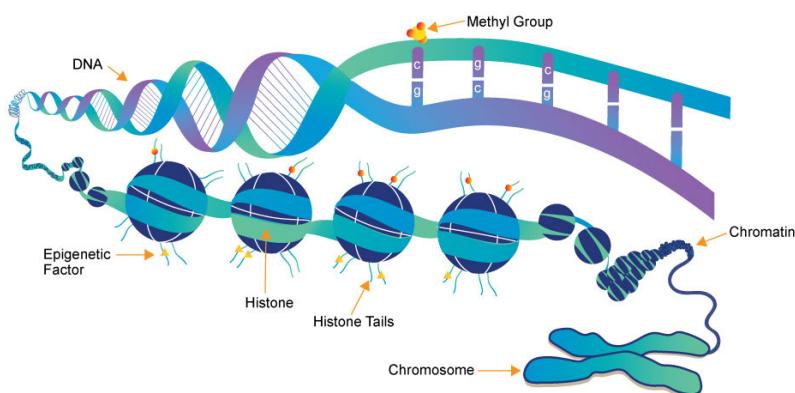
Because very young children (generally under 12 months, but often as old as 24 months,) do not have a well-developed immune system, it is possible for them to receive organs from otherwise incompatible donors. This is known as ABO-incompatible (ABO<sup>i</sup>) transplantation. Graft survival and people's mortality is approximately the same between ABO<sup>i</sup> and ABO-compatible (ABO<sup>c</sup>) recipients. While focus has been on infant heart transplants, the principles generally apply onto other forms of solid organ transplantation.

The most important factors are that the recipient not have produced isoagglutinins, and that they have low levels of T cell-independent antigens. United Network for Organ Sharing (UNOS) regulations allow for ABO<sup>i</sup> transplantation in children under two years of age if isoagglutinin titers are 1:4 or below, and if there is no matching ABO<sup>c</sup> recipient. Studies have shown that the period under which a recipient may undergo ABO<sup>i</sup> transplantation may be prolonged by exposure to nonself A and B antigens. Furthermore, should the recipient (for example, type B-positive with a type AB-positive graft) require eventual retransplantation, the recipient may receive a new organ of either blood type.

Limited success has been achieved in ABO-incompatible heart transplants in adults though this requires that the adult recipients have low levels of anti-A or anti-B antibodies. Kidney transplantation is more successful, with similar long-term graft survival rates to ABO<sup>c</sup> transplants.

**20% increase in transplants over 5 years\***





# What is EPIGENETICS?

BY MARTA SOARES

Epigenetics is the study of heritable changes in gene function that do not involve changes in the DNA sequence.

Epigenetics most often denotes changes in a chromosome that affect gene activity and expression, but can also be used to describe any heritable phenotypic change that does not derive from a modification of the genome, such as prions. Such effects on cellular and physiological phenotypic traits may result of external or environmental factors, or be part of normal developmental program. The standard definition of epigenetics requires these alterations to be heritable, either in the progeny of cells or organisms.

The term also refers to the changes themselves: functionally relevant changes to the genome that do not involve a change in the nucleotide sequence. Examples of mechanisms that produce such changes are DNA methylation and histone modification, each of which alters how genes are expressed without altering the underlying DNA sequence. Gene expression can be controlled through the action of repressor proteins that attach to silencer regions of the DNA. These epigenetic changes may last through cell divisions for the duration of the cell's life, and may also last for multiple generations even though they do not involve changes in the underlying DNA sequence of the organism; instead, non-genetic factors cause the organism's genes to behave (or "express themselves") differently.

## TWINS

Direct comparisons of identical twins constitute an optimal model for interrogating environmental epigenetics. In the case of humans with different environmental exposures, monozygotic (identical) twins were epigenetically indistinguishable during their early years, while older twins had remarkable differences in the overall content and genomic distribution of 5-methylcytosine DNA and histone acetylation. The twin pairs who had spent less of their lifetime together and/or had greater differences in their medical histories were those who showed the largest differences in their levels of 5-methylcytosine DNA and acetylation of

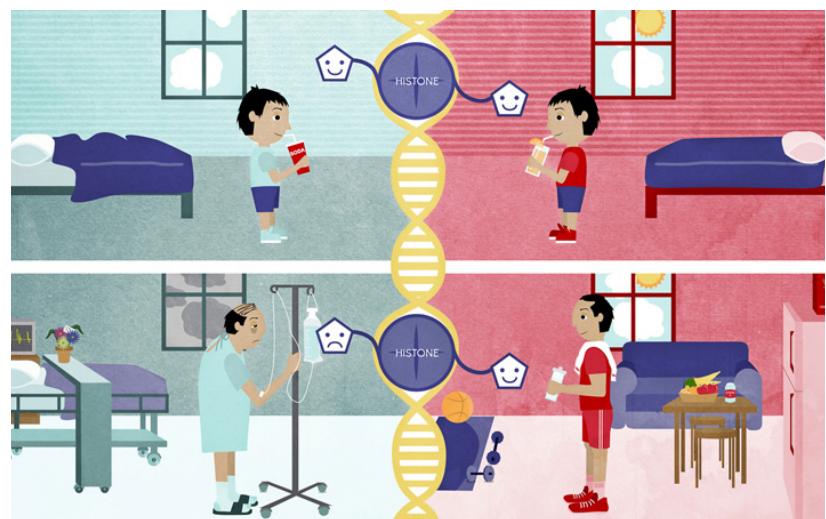
histones H3 and H4.

Dizygotic (fraternal) and monozygotic (identical) twins show evidence of epigenetic influence in humans. DNA sequence differences that would be abundant in a singleton-based study do not interfere with the analysis. Environmental differences can produce long-term epigenetic effects, and different developmental monozygotic twin subtypes may be different with respect to their susceptibility to be discordant from an epigenetic point of view.

A high-throughput study, which denotes technology that looks at extensive genetic markers, focused on epigenetic differences between monozygotic twins to compare global and locus-specific changes in DNA methylation and histone modifications in a sample of 40 monozygotic twin pairs. In this case, only healthy twin pairs were studied, but a wide range of ages was represented, between 3 and 74 years. One of the major conclusions from this study was that there is an age-dependent accumulation of epigenetic differences between the two siblings of twin pairs. This accumulation suggests the existence of epigenetic "drift". Epigenetic drift is the term given to epigenetic modifications as they occur as a direct function with age. While age is a known risk factor for many diseases, age-related methylation has been found to occur differentially at specific sites along the genome. Over time, this can result in measurable differences between biological and chronological age. Epigenetic changes have been found to be reflective of lifestyle and may act as functional biomarkers of disease before clinical threshold is reached.

A more recent study, where 114 monozygotic twins and 80 dizygotic twins were analyzed for the DNA methylation status of around 6000 unique genomic regions, concluded that epigenetic similarity at the time of blastocyst splitting may also contribute to phenotypic similarities in monozygotic co-twins. This supports the notion that microenvironment at early stages of embryonic development can be quite important for the establishment of epigenetic marks.

Congenital genetic disease is well understood and it is clear that epigenetics can play a role, for example, in the case of Angelman syndrome and Prader-Willi syndrome. These are normal genetic diseases caused by gene deletion or inactivation of the genes, but are unusually common because individuals are essentially hemizygous because of genomic imprinting, and therefore a single gene knock out is sufficient to cause the disease, where most cases would require both copies to be knocked out.





# A WORLD WITHOUT COLORS

BY BÁRBARA SILVA

Our daily lives depend on futile things that we tend to ignore. These things are imprinted in us, from a small age, and we don't even take time think about them. Let's have traffic lights as an example. We all know that green is "go" and red "stop", well, we even know that yellow is for "take caution", however, these notions can be extremely hard for people with colour blindness.

Colour blindness, commonly known as "daltonism" is the decreased ability to see colours or differences in them.

John Dalton, a well-known physicist and chemist, was one of the first persons to be diagnosed with this problem, and this all happened in a odd and funny way. When he was 26, he gave his elderly mother a pair of stockings for her birthday. All was well, but he didn't realize that they were scarlet!

Dalton's theory was that the aqueous humour in his own eye was discoloured with a blue tint and so he asked to have his eyes removed and studied after he died. His wish was fulfilled, but the results of the investigations proved him wrong.

Colour blindness is caused by the eye's light-sensitive cells, also known as cones, being faulty or missing. Certain genes present on the X chromosome are the ones behind all this fuzz (yes, it is not a curse, sorry to disappoint you). This explains why men are more likely to have this problem. Since men have only one X chromosome, this defect can't be compensated by the other one.

But is everything black and white for this people?

Contrary to popular belief, there are three major types of colour blindness:

Red-green colour blindness – people have problems in distinguishing red and green hues

Blue-yellow colour blindness – people have difficulty in discriminating between bluish and greenish hues as well as reddish and yellowish hues.

Total colour blindness – people view everything monochromatically, literally.

Now that we have everything crystal clear, I believe it is safe to presume that colour blindness isn't that much of a big deal! These people can do everything, they just see the world in a different way!

Let's take a look at this list of people:

Bill Clinton

Keanu Reeves

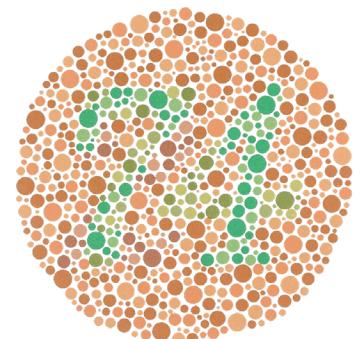
Paul Newman

Mark Zuckerberg

Christopher Nolan

Eddie Redmayne

Test to detect Color Blindness:



See? I just proved my point!  
These successful people are colour blinded!

So, if you're reading this and you happen to be colour blinded, fear not! You have the whole world ahead of you!

# A Melody For Eternity



BY JOANA CRUZ

The bond that unites the human being with music has always existed, which means that it is impossible to refer to one, without thinking about the other.

After all, it only makes sense talking about music if we consider that there is a receptor which gives meaning and information to what is, in its essence, only an amount of musical tones. Yes, because sounds aren't more than waves captured by the ears, that enter the ear canal and make the ear drum vibrate. This action moves the tiny chain of bones (ossicles – malleus, incus and stapes respectively) with the same frequency captured initially (they amplify the sound). Curiously, these bones are the smallest in the human being. The last bone in this chain 'knocks' on the membrane window of the cochlea and makes the fluid in the cochlea move, which makes the basilar membrane to vibrate and sensitive cells. These cells, when stimulated generate nervous impulses that are transmitted by a hearing nerve to the area reserved to hearing in the cerebral cortex, where they are interpreted. And this, fellow readers, are the sounds that we hear.

activities, it is scientifically proved that you should listen to more calm songs. This can be explained by the hormones ACTH and MSH's action, produced by hypophysis glandule, which affects concentration and visual retention, being capable of resynchronizing and harmonizing the human organism. Their assimilation comes from the system that synchronizes respiration, concentration and imagination. Therefore, ambient or motivational music decreases tiresome, increases the income of your work, balances the nervous system and reduces muscular tensions of those who listen to it, leading to a relaxing effect. However, if on the one hand, music can be used to boost the human being, it can also harm the human body, as demonstrated by Tartchanoff. Consequently, listening to music in a volume greater than 80 dB delays significantly transmission of the electrochemical messages to the brain, because it affects myelin, which is a substance in the neurons responsible for the transmission of that messages at a velocity of approximately 523 kilometers per hour. Moreover, when a person is submitted to an abnormal volume of music, the endocrinical system releases adrenaline to the blood current. When this happens, the heart rate accelerates, the blood vessels contract, the pupils dilate, the skin gets paler, and it even can occur spasm in the esophagus, the intestine and the stomach (epileptic attack). When this noise is kept for a long period of time, the heart rate gets irregular, which doesn't sound healthy at all...

## MUSIC AND EMOTION

Additionally music can also affect our mind and emotions. This way, a melodic song can suggest that your surroundings are peaceful, while noise suggests uncertainty, insecurity and danger.

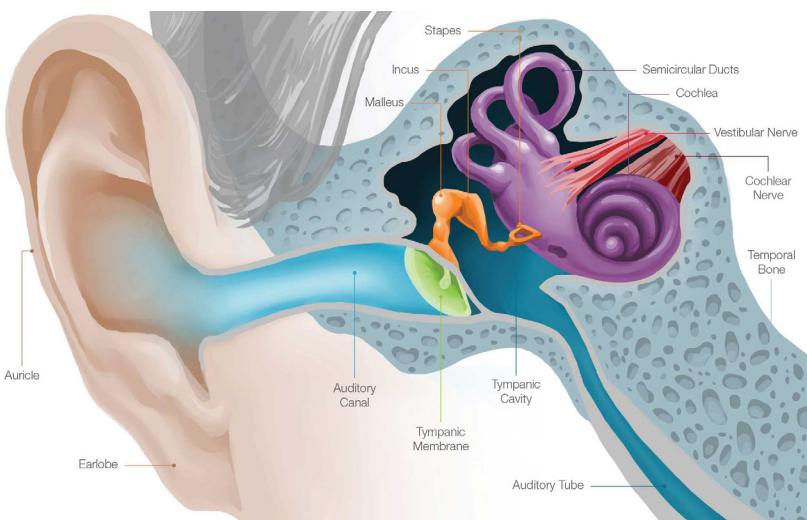
This correspondence between feelings and sounds is commonly used in the cinematic industry, leading the viewers to experiencing emotions predicted by the producers themselves, accordingly to the cacophony to which they are submitted.

And this is all thanks how eager music can move our heart.

Accordingly to the Italian musical notation, *giusto* refers to an uniforme compass between 66 and 76 in the metronome and it is the frequency to which the music is synchronized to the rhythm of a healthy heart.

But what truly get us all emotional are the ups and downs in time. A symphony of just one tone becomes boring to our brain and, short after, source of despair. As the Spanish philosopher Jorge Wagensberg says, the music needs to have that "pink noise".

"It is the enjoyment of music: solving self-affinity; a tense conflict between what can be predicted and surprise. If the correlation in time is too low, prediction requires infinite work,



## MUSIC AND PHYSICAL EFFECTS

Music has this power to induce changes in us that most of the times, we only notice through mood. But, these alterations depend on the music we are listening to, and, if they are used adequately, they are an efficient source of manipulation of our own organism. The most flagrant example to prove us this, that surely everyone has experienced it before, is precisely the effect music has on our sportive performance, since not only it motivates us, but also it increments our metabolism, accelerates our respiratory frequency, increases our muscular energy...

Contrastingly, if you need to focus on more less intensive

for which the brain considers itself insufficient and depressed. The white noise (totally random) first despairs and then bores. If the correlation is too high, prediction requires zero work, which makes the brain consider itself unnecessary and offended”.

## MUSIC AND MEDICINE



Once music revealed itself to have such a powerful effect on the human body and mind alike, it started to be thought in a way to use these same effects in medicine.

The conclusion reached was that music has so much power on us, that it can be capable of increasing important substances of the immune system. Soft music known as Musak or elevator music, for example, is more efficient to achieve that, than jazz and even silence, following a study from 1998 of northern American researchers. On the other side, random noise only reduces that same benefit substance.

Thereafter, it was developed a method called music therapy, which consists on using music as a tool to recover or improve language and motor skills, or simply to calm patients. The method is used because of the immediate impact of the melody on almost all regions of the brain, a phenomenon not yet fully understood and that has been studied for example by Oliver Sacks, a famous neurologist, who dedicated a large part from his life to study the amazing effects of music on the human brain. The following two studies were addressed by biologist Robert Trivers in his book “The Folly of Fools”:

“There are two recent experiences that stand out from the others. When 500 cancer cells are injected into rats that have been stressed by nighttime noises, the disease progress is much slower if they are allowed to listen to melodious music for five hours every morning. We can cite an equally remarkable experiment, this time with humans. A group of people who underwent physiotherapeutic treatment for the bronchi (inhaling a drug, breathing and coughing) listened to Bach compositions. This group recovered much faster than the group treated with the same method, but without music”.

## THE IMPORTANCE OF MUSIC IN OUR DAILY LIFE

In the same way that music can be used for positive purposes to our body, the activities related to it can bring relevance to our lives.

For example, the act of singing also modifies the brain, particularly the right temporal lobe, which stimulates the release of endorphins, especially oxytocin, which translates into deep feelings of happiness, unity and love. That is, they provide communication.

Even for those who play an instrument, they may see an increase in memory, the speed of math calculation, and the ability to multitasking, since playing an instrument involves a great deal of interaction with the brain that stimulates cognitive functions. Music is a sum of complex elements, such as proportion, rhythm, harmony, etc. So, a musician needs to have the left side of the brain (related to mathematics and reasoning) working in tune with the right side (related to creativity and arts). And every time it is touched again, the brain exercises the connection between the two sides of the brain.

After such a long dissertation on the psychophysical effects of music in our complex system, I can only conclude that unlike words, music communicates directly with the brain, playing a more effective role in our well-being. As Facundo Manes states, the melody, “instead of facilitating a largely semantic dialogue, as [happens with] language, seems to mediate a more emotional dialogue.”

And so, I end, like a sad melody, which we want to perpetuate, evoking what the Swedish psychologists Hella Oelman and Bruno Loeng have believed and studied: there is a kind of universal tonal grammar: people of different times and cultures experience a shared range of emotional moments at concrete musical intervals, that is, beyond being something ...

**Music is something that, above all, unites us, humans, as a species!**



# Dopamine The molecule of the Achievers

BY JOANA CRUZ

Dopamine is a molecule, which, despite its small size, plays a crucial role in uncountable brain functions involving mood, sleep, learning, the ability to focus and concentrate, motor control, and working memory.

Before developing further, this molecule is a type of neurotransmitter, which are substances responsible for transmitting nervous impulses between cellules, in this case, located in the brain. Thus, the concentrations of this neurotransmitter ends explaining a great part of our behaviors, emotions and the origins of some well known diseases.

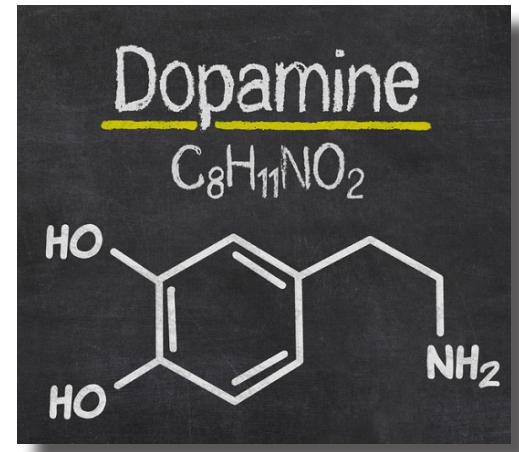
First of all, this molecule is in charge of our pleasure reward system which basically means it stimulates us to crave for what we want and makes us feel well in return. One thing that should be made clear is that Dopamine is released when your needs are about to be met. That's why it's also called the motivation molecule, since it provides drive and focus you need to be productive and achieve your targets. This being, dopamine is behind most of our positive feeling, for example, when we are in love, this is the one molecule responsible for making us go after our partner.

Going deeper in the functions of this so important molecule, Dopamine also controls the flux of informations from other parts of the brain. That's why deficiencies in its levels can cause a decrease of their cognitive functions, especially memory, attention and problem resolution.

As we proved before, dopamine is indeed really important to our organism, so as expectable, deficiencies in its concentration can be the cause of grave deseases to our body:

- Parkinson is a progressive neurodegenerative disease that occurs when the brain gradually stops producing dopamine. Parkinson's usually starts with a slight tremor in one hand, but, as time passes Patients gradually lose their ability to regulate their movements and emotions. There is no cure, but so far the most effective treatment is levodopa, a natural compound that converts into dopamine.

- ADHD and Dopamine: The underlying cause of ADHD is still unknown. But it is widely accepted that the root cause of ADHD is probably an abnormality in dopamine function. This seems logical since dopamine is critical for maintaining focus. Most ADHD medications are based on the "dopamine deficiency" theory. Prescription medications used to treat ADHD are believed to work by increasing the release of dopamine and



norepinephrine while slowing down their rate of reabsorption.

- Dopamine Deficiency Symptoms in Fibromyalgia and Chronic Fatigue Syndrome: Both fibromyalgia (FMS) and chronic fatigue syndrome (CFS) are associated with low dopamine levels. Low dopamine symptoms experienced by FMS and CFS patients include brain fog, achy muscles, poor concentration, tremors, poor balance and coordination, and walking abnormalities.
- Depression: The idea that depression is caused by low dopamine is not new. One study published over 20 years ago states that dopamine has wrongly been ignored as a cause of depression and that there's a large body of evidence that antidepressants that target dopamine can be effective for treating depression. Ten years ago, Harvard Medical School researchers pointed out that dopamine dysregulation is implicated in depression as well as ADHD, schizophrenia, bipolar, and substance use. Clinical trials have found that people with depression have lower levels of a major metabolite of dopamine (homovanillic acid) in their central nervous system. There's some evidence that SSRI antidepressants work by indirectly affecting dopamine levels. And lastly, there are some antidepressants, like Wellbutrin, that are known to work by increasing dopamine. Wellbutrin belongs to a class of antidepressants, the norepinephrine-dopamine reuptake inhibitors, which are sometimes prescribed when SSRIs don't help. Dopamine-based depression expresses itself as lethargy and lack of enjoyment of life, while serotonin-based depression tends to be accompanied by anxiety. With dopamine depression, you may use sugar, caffeine, or nicotine as a quick fix to temporarily feel more alive. This is no coincidence — they all increase dopamine.

## MEASURES TO BE TAKEN

Dopamine deficiency can sap the joy from life. It is also a factor in many mental health conditions, including depression and addictive behaviors. Make appropriate lifestyle changes to raise your dopamine levels. Eat a diet high in dopamine promoting foods.

Take appropriate dopamine-boosting supplements.

Engage in known dopamine enhancing activities — physical exercise, meditation, hobbies, music, and goal planning.

# The Benefits of Sports in our Health

BY MAFALDA COSTA

Although research interest on physical activity and health dates back to the 1950s, the breakthrough in the scientific evidence on health benefits of physical activity largely took place during the 1980s and 1990s. There is an overwhelming amount of scientific evidence on the positive effects of sport and physical activity as part of a healthy lifestyle. The positive, direct effects of engaging in regular physical activity are particularly apparent in the prevention of several diseases, such as diabetes, hypertension and cardiovascular disease.

The Report from the United Nations Inter-Agency Task Force on Sport for Development and Peace states that young people can benefit from physical activity as it contributes to developing healthy bones, efficient heart and lung function as well as improved motor skills and cognitive function. Physical activity can help to prevent hip fractures among women and reduce the effects of osteoporosis. Remaining physically active can enhance functional abilities among older people, and can help to maintain quality of life and independence.

## PHYSICAL ACTIVITY AND PSYCHOLOGICAL HEALTH

The WHO (World Health Organisation) has estimated that “one in four patients visiting a health service has at least one mental, neurological or behavioural disorder, but most of these disorders are neither diagnosed nor treated”. In fact, a number of studies have shown that exercise may play a therapeutic role in addressing a number of psychological disorders, such as depression. The evidence relating to health benefits of physical activity predominantly focuses on intra-personal factors such as physiological, cognitive and affective benefits, however, that does not exclude the social and inter-personal benefits of sport and physical activity, which can also produce positive health effects in individuals and communities.

In fact, it is proven that the practice of sports:

- Boosts self-esteem: Physical self-worth and physical self-perception, including body image, has been linked to improved self-esteem. Watching your hard work pay off and achieving your goals develops self-confidence, as well as it encourages you to achieve other goals you set. It is seen as a rewarding and exciting learning process.
- Reduces pressure and stress: Exercising is a natural way to loosen up and let go of stress, as well as it is a means of meeting new people.

In addition to these benefits, it is important to stand out that:

- Many athletes do better academically - Playing a sport requires a lot of time and energy, which some people may think would distract student-athletes from schoolwork. However, the opposite is true. Sports require memorization, repetition and learning — skillsets that are directly relevant to class work. Therefore, the determination and goal-setting skills a sport requires can be transferred into the classroom.
- Sports teach teamwork and problem-solving skills: Fighting for a common goal with a group of people teaches you how to build teamwork and effectively communicate to solve problems – a helpful skill, when encountering real-life problems.

## SPORT AND PHYSICAL ACTIVITY AS PART OF A HEALTHY LIFESTYLE

Sport and physical activity as part of a healthy lifestyle

Clearly, the practice of sports can help you reach your fitness goals and maintain a healthy weight. Furthermore, it also encourage healthy decision-making, such as not smoking and not drinking, in addition to having other health benefits. However, Sport and physical activity in itself may not directly lead to profits but, in combination with other factors, it can promote healthy lifestyles. Some elements that may be determinant on health include nutrition, intensity and type of physical activity, injury, stress levels and sleep patterns.



# GENETIC BREAKTHROUGHS

BY MARTA SOARES

## IT SOUNDS LIKE MAGIC: THE FDA APPROVED THE FIRST “LIVING” THERAPY... AND THEN ANOTHER... AND ANOTHER

In a landmark decision made this past August, the Food and Drug Administration approved a treatment for childhood leukaemia that works by genetically modifying a patient’s own blood cells to turn them into cancer killers. The FDA called it the first approved “gene therapy” though experts quibbled over whether that term technically applies. Either way, it was a pretty big deal, and a decision that will pave the way for an era of FDA – sanctioned human gene modification. Just two months later, it approved another cutting-edge immunotherapy for cancer, this time a CAR T-cell therapy designed to treat aggressive non-Hodgkin lymphoma in adults.

And in December, it approved the first treatment to directly target mutations in one specific gene – a true gene therapy. That one, Luxturna, treats a rare form of inherited blindness called Leber congenital amaurosis through surgical injections in each eye.

## PIG ORGAN TRANSPLANTS FOR PEOPLE

Scientists created designer piglets this year, genetically modifying them so their organs could be more safely transplanted into humans. The development raises hopes that xenotransplantation, the process of transferring organs from one species to another, could finally become a reality. The piglets were created by eGenesis, a company that used the new high-tech gene editing tool CRISPR to eliminate more than 2 dozen copies of pig genes that could produce dangerous viruses in humans.

## 3-D PRINTED SPINAL IMPLANTS

Patients suffering from spinal deformities began getting more high-tech help this year, thanks to new 3-D printed implants made from titanium. Several of these implants are made from titanium powder and designed with rough surfaces and porous structures, which allows them to integrate more quickly and completely into the body.

## LIQUID BIOPSIES

Scientists announced major steps forward this year in the development of “liquid biopsies”, methods for analysing blood samples to find evidence of cancer. Currently being used to detect changes in people with metastatic cancer, liquid biopsies could eventually help diagnose new cancers early, when they’re most treatable.

## GENE THERAPY RESTORED A SEVEN-YEAR-OLD BOY’S SKIN

In November, Italian researchers announced that they used a combination of gene and stem cell therapy to almost entirely reconstruct the skin of a seven-year-old boy afflicted with a rare disease called Junctional Epidermolysis Bullosa (JEB). JEB is an often lethal genetic condition that plagues its victims from infancy with painful blisters that cause the skin to become extremely fragile. Researchers took healthy skin cells from the patient, genetically modified them, and then grafted them back onto the boy. Over 21 months, about 80 percent of his skin regenerated. It was a major biomedical breakthrough that signalled the power of new technologies to treat genetic conditions previously written off as untreatable.

## SCIENTISTS EDITED DNA WITHIN THE HUMAN BODY

Yes, this one is as crazy as it sounds! In November, and for the first time ever, scientists edit a patient’s DNA while it was still inside his body. It was an effort to cure a genetic disorder and the scientists attempted to do by permanently changing the patient’s genome. Typically, therapies that alter a patient’s genetics have relied on tweaks made outside of the human body. But in this case, scientists used an IV to deliver billions of copies of a corrective gene into the patient’s body, along with a genetic tool called “zinc finger proteins” that cuts DNA in the right spot in order to create a spot for the new genes. The patient suffered from a metabolic disease called Hunter Syndrome and was missing an enzyme to break down certain carbohydrates. Theoretically, with the corrected gene, his body should be able to produce that crucial enzyme.

## REGENERATING BODY PARTS

Regenerative medicine – a branch of science working to find ways to regrow or replace damaged tissue and organs – took a huge leap forward in 2017, when Ohio State University researchers announced the development of a new technology called tissue Nano transfection. TNT technology can reprogram skin cells to repair organs and blood vessels. The non-invasive procedure involves placing a postage stamp size chip on the skin and sending a small electric current through it. The process delivers DNA vectors into the body in less than a second. So far, the research has focused only on animals, growing blood vessels in an injured mouse leg in a week and regenerating nerve cells that helped mice forever recover from strokes. Clinical trials in humans are scheduled to begin 2018.

# ON INTEGRATED CURRICULUM EDUCATIONAL RENAISSANCE / ERASMUS+

BY JOANA CRUZ

When my physics teacher, João Paulo, told me about this project I couldn't hide my excitement. After all, I would be required to develop extra-school projects (approximately one per month) with other people, concerning themes that were given to us. But, we had one condition. We needed to build bridges of knowledge between the theme and the maximum of school subjects we could think of. And so, we did it, January was about the Global Warming, March was about Water, and this month, April, was about the Human Body. And, after all this time, I can only conclude that, in the ending, this project was much more than what I was expecting. First of all, through our team work, the bonds between me and my colleagues were strengthened. But, more important, I was able to learn a lot of new and interesting things. For example, what is the water's triple point or how the music can be used in the field of Medicine.



Now I can't be more in agreement with what the famous Benjamin Franklin said:

"Tell me and I forget it, teach me and I may remember, include me and I learn"

Nowadays, school focus too much in preparing students to final exams. However, talking by myself, I don't go to school because I want to be prepared for the exams. I go there because not only it's a place where I can prepare to live in a society, but also, because I'm really keen on learning new things. It's a place where I can understand more about the world around me, and that brings me happiness. And that is why I really need to thank the existence a project like this and for all the teachers behind it, for caring about the students that have that bug of curiosity stuck in them, but that need someone to awaken it.

## It's Time to keep your brain fit...

Complete the sudoku

5	3			7				
6			1	9	5			
	9	8				6		
8			6					3
4		8	3					1
7			2			6		
	6			2	8			
		4	1	9			5	
			8		7	9		

Find the following words in the word puzzle

L	N	C	E	N	X	H	H	R	A	M	E	P	A	S
U	I	O	I	N	C	I	I	E	U	U	A	L	E	E
N	P	E	S	A	I	B	D	S	A	N	R	E	H	V
G	V	D	M	E	S	P	C	N	C	R	S	S	C	R
S	T	O	N	S	I	L	S	R	E	M	T	O	A	E
D	T	B	E	Y	E	S	E	R	O	P	I	P	R	N
S	Y	R	E	T	R	A	S	U	I	F	P	H	T	U
S	E	N	I	T	S	E	T	N	I	L	L	A	M	S
S	E	N	O	B	F	H	G	S	K	H	L	G	E	N
G	L	A	N	D	S	L	W	P	J	I	Y	U	F	I
T	N	E	M	A	G	I	L	L	V	O	D	S	P	K
L	A	R	G	E	I	N	T	E	S	T	I	N	E	S
B	L	O	O	D	U	E	R	E	Q	B	H	N	E	J
N	I	A	R	B	F	G	H	N	U	V	Z	V	T	Y

- |            |                  |                  |
|------------|------------------|------------------|
| -Appendix  | -Joint           | -Pancreas        |
| -Artery    | -Kidney          | -Ribs            |
| -Blood     | -Large Intestine | -Skin            |
| -Bones     | -Ligament        | -Small Intestine |
| -Brain     | -Liver           | -Spine           |
| -Ears      | -Lungs           | -Spleen          |
| -Esophagus | -Mouth           | -Stomach         |
| -Eyes      | -Muscle          | -Tonsils         |
| -Glands    | -Nerves          | -Trachea         |
| -Heart     | -Nose            | -Vein            |

2  
0  
1  
8



## January

SUN	MON	TUE	WED	THU	FRI	SAT
1	2	3	4	5	6	
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

## February

SUN	MON	TUE	WED	THU	FRI	SAT
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28			

## March

SUN	MON	TUE	WED	THU	FRI	SAT
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

## April

SUN	MON	TUE	WED	THU	FRI	SAT
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

## May

SUN	MON	TUE	WED	THU	FRI	SAT
1	2	3	4	5		
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

## June

SUN	MON	TUE	WED	THU	FRI	SAT
			1	2		
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

## July

SUN	MON	TUE	WED	THU	FRI	SAT
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

## August

SUN	MON	TUE	WED	THU	FRI	SAT
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

## September

SUN	MON	TUE	WED	THU	FRI	SAT
			1			
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30						

## October

SUN	MON	TUE	WED	THU	FRI	SAT
		1	2	3	4	5
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

## November

SUN	MON	TUE	WED	THU	FRI	SAT
		1	2	3		
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

## December

SUN	MON	TUE	WED	THU	FRI	SAT
			1			
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					