Microchip Implantation

Most of the people know about the fabrication of nano or micro devices on a chip that supply the same biological, chemical, and electrical activities as those of a human organ. But the integration of several human functions on chip seems to be feasible. It is probably the greatest scientific and engineering challenge, but today found success and the technology named as "Microchip Implantation". The author explores here more about this technology.

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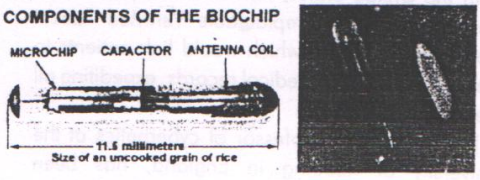
Microchip Implantation means a very small chip implanted in human body. The scientist also has named this technology as "HUMAN ON A CHIP". Human on a chip means not a human body is implanted on the chip but a chip in a human body. They are also known by RFID which means Radio-frequency identification. It is the combination of two branches: Bio-technology and Information Technology and it is founded by Scientists of Cornell University situated in America.

Human functions are the most complicated systems. It is probably the greatest scientific and engineering challenge to duplicate some or all the basic human functions on a chip. The success of this work can be of tremendous societal and economic rewards. While the basic functions of a human organ are generally understood, the feasibility of fabricating nano or micro devices on a chip that supply the same biological, chemical, and electrical activities as those of a human organ has only been explored recently. Some of these examples include artificial noses, tongues, ears, retina, skin, etc. There are many more human functions that can be duplicated on a chip. Furthermore, with advancement of the nanoscience and engineering, the integration of several human functions on a chip seems to be feasible. In principle, a human chip can be prepared based on the same or completely different scientific principles from the biological reactions in the actual human organ. The following are examples of the human on a chip concept.

Microchip Components

Basically this microchip is made up of glass tube inside which there is vacuum. The length of the chip is 11.5mm which is equal to that of size of an uncooked grain of rice. This microchip is divided into four parts:

- Computer Microchip: The microchip stores a unique identification number from 10 to 15 digits long. The storage capacity of the current microchips is limited, capable of storing only a single ID number. AVID (American Veterinary Identification Devices), claims their chips, using a nnn-nnn-nnn format, has the capability of over 70 trillion unique numbers. ".
- Antenna Coil: This is normally a simple, coil of copper wire around a ferrite or iron core. This tiny, primitive, radio antenna "receives and sends" signals from the reader or scanner.
- Tuning Capacitor: The capacitor stores the small electrical charge (less than 1/1000 of a watt) sent by the reader or scanner, which activates the transponder. This "activation" allows the transponder to send back the ID number encoded in the computer chip. Because "radio waves" are utilized to communicate between the transponder and reader, the capacitor is "tuned" to the same frequency as the reader.
- Glass Capsule: The glass capsule "houses" the microchip, antenna coil and capacitor. It is a small capsule, the smallest measuring 11 mm in length and 2 mm in diameter, about the size of an uncooked grain of rice. The capsule is made of biocompatible material such as soda lime glass. After assembly, the capsule is hermetically (air-tight)



sealed, so no bodily fluids can touch the electronics inside. Because the glass is very smooth and susceptible to movement, a material such as a polypropylene polymer sheath is attached to one end of the capsule. This sheath provides a compatible surface which the bodily tissue fibers bond or interconnect, resulting in a permanent placement of the biochip.

How it works

The reader generates a low-power, electromagnetic field, in this case via radio signals, which "activates" the implanted biochip. This "activation" enables the biochip to send the ID code back to the reader via radio signals. The reader amplifies the received code, converts it to digital format, decodes and displays the ID number on the reader's LCD display. The reader must normally be between 2 and 12 inches near the biochip to communicate. The reader and biochip can communicate through most materials, except metal.

Various Microchip Implantation Technology

There are various events were this technology has been used and it has been proved to be successful in many of the cases. Some of the techniques are below.

Patient's medical record

- VeriChip received preliminary approval from the U.S. Food and Drug Administration (FDA) to market its device in the United States within specific guidelines. Since its approval, about 80 hospitals and 232 doctors have elected to use the system.
- By implanting such a chip with a patient's medical record, hospitals and emergency workers can immediately gain access to an ill or injured person's medical history regardless of location. Implanted chips are impossible to lose, which could reduce the chances of information theft.

Implant location in animals

- In dogs and cats, chips are usually inserted below the skin at the back of the neck, between the shoulder blades on the dorsal midline. Continental European pets may be an exception; they get the implant in the left side of the neck. The chip can often be manually detected by the owner by gently feeling the skin in that area. It stays in place as thin layers of connective tissue form around the biocompatible glass which encases it.

If the pet is lost or stolen, and is found by local authorities or taken to a shelter, it is scanned during intake to see if a chip exists. If one is detected, authorities call the recovery service and provide them the ID number, the pet's description, and the location of the animal. If the pet is wearing the collar tag, anyone who finds the pet can call the toll-free number, making it unnecessary to involve the authorities. (The owner can also preemptively notify the recovery service directly if a pet disappears. This is useful if the pet is stolen, and is taken to a vet who scans it and checks with the recovery service.).The recovery service notifies the owner that the pet has been found, and where to go to recover the animal.

MicroChip in libraries

Among the many uses of RFID technologies is its deployment in libraries. This technology has slowly begun to replace the traditional barcodes on library items (books, CDs, DVDs, etc.). However, the RFID tag can contain identifying information, such as a book's title or material type, without having to be pointed to a separate database (but this is rare in North America). The information is read by an RFID reader, which replaces the standard barcode reader commonly found at a library's circulation desk. The RFID tag found on library materials typically measures 50 mm X 50 mm in North America and 50 mm x 75 mm in Europe, and can also act as a security device, taking the place of the more traditional electromagnetic security strip.

Passports

RFID tags are being used in passports issued by many countries. The first RFID passports ("e-passports") were issued by Malaysia in 1998. In addition to information also contained on the visual data page of the passport, Malaysian e-passports record the travel history (time, date, and place) of entries and exits from the country.

Advantages & Disadvantages of Microchip Implantation

Advantages

- Microchips have been particularly useful in the return of lost pets. They can also assist where the ownership of an animal is in dispute.

• Animal shelters and animal control centers benefit from microchipping by more quickly and efficiently returning pets to their owners. When a pet can be quickly matched to its owner, the shelter avoids the expense of housing, feeding, providing medical care, and outplacing or euthanizing the pet. Microchipping is becoming increasingly standard at shelters: many require all outplaced animals to receive a microchip, and provide the service as part of the adoption package.

• Hospitals can gain access to medical history regardless of location by scanning one's implant chip. The speed at which this information can be attained may be vital to one's survival.

• Implanted chips are impossible to lose which would significantly reduce the chances of information theft. (i.e., lost/stolen credit cards, passports, etc.)

• The microchip implants indicate a major leap forward in cyborg technology, creating a unique link to the inorganic entities that previously required physical interaction to function.

Disadvantages

• If the microchips are completely unencrypted, they would be extremely vulnerable to hacker attacks and interception by third-party scanners. By scanning secretly, someone could steal all of the information on a chip and could clone the signal, possibly leading to criminal misuse of medical files and insurance information. For example, a patient's list of known allergies could be altered maliciously, causing injury or death, or his/her insurance could be copied for another unrelated person to use.

• According to the FDA, implantation of the chip itself poses some health concerns. A patient could react adversely to the chip itself by infection or allergy, or it could be implanted improperly. It could dislodge itself and move to a different part of the body than where it was first implanted. The implant could also fail on its own at any time, and the information contained in it could be lost.

• More serious trauma could occur if the chip reacts to outside source, such as a strong electrical field or a magnetic resonance imager (MRI) machine. The strong magnets used in an MRI scanner could destroy the implant and cause serious burns, internally and externally.

App ications

• Mondex MasterCard is currently researching the possibility of integrating an implant chip into its suite of smart card products which currently allow consumers to digitally exchange currency.

• In the United States, numerous hospitals have elected to use the implantable VeriMed Patient Identification System which would link patients to their corresponding medical records, expediting all medical processes.

• Kevin Warwick, professor of cybernetics at the University of Reading in England, has been experimenting with home application of microchip implants allowing him to control lights, open doors, control temperature, etc.

• Contrary to popular belief, a GPS-enabled chip, for GPS tracking of individuals, does not yet exist mainly due to problems with power consumption and antenna performance. Many news sources and websites have confused implantable chips with wearable or portable tracking devices.

Conclusion

Three categories of rights are relevant to implanting microchips in humans: common law, constitutional and property. The common law concept of bodily integrity precludes nonconsensual implantation. When microchips constitute a legal search, the Fourth Amendment applies to preclude the government from using devices with read-write and tracking capabilities, but a warrant could legitimize scanning a read only or read-write device. Property rights might be applied to prevent intrusion without just compensation. This would seem to require expanding current law, but novel and unique situations may spawn novel applications of laws.

Although use of such a device at first appears farfetched, examination of the existing technology and the potential utility proves that microchip implantation is both possible and, for some purposes, desirable. Beginning with voluntary introduction, Americans may be lulled into accepting them. This article thus sounds a warning bell. The time to prevent grievous intrusion into personal privacy by enacting appropriate legislative safeguards is now, rather than when it is too late.

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