MedSoc Newsletter

Y12 MedSoc



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HELLO!

Welcome to MedSoc's first newsletter of the year!

Our weekly newsletters will cover a wide range of topics related to medicine, medical ethics, and so much more...

Hope you enjoy reading!

Neuroscience

Brain

Blood vessels (arteries) in brain

Corebral anourysm

How aneurysms are removed from the brain



How does the method work?

This minimal technique, often referred to as endovascular coiling is an incision to the skull and is performed in emergency situations.

Usually a catheter is passed through the groin up into the artery containing the aneurysm. In the extreme scenario detailed above the neurosurgeon removes a section of your skull to access the aneurysm and locate the blood vessel that "feeds" the aneurysm. A tiny metal clip or a balloon is used to prevent the aneurysm from rupturing or any neighbouring blood vessels bleeding.



The death rate ranges from zero to 7% and the complication rate varies from 4% to 15%. In most cases however, the surgery is highly successful.

In most cases the aneurysm is very small and while the surgery may be tricky, it's not too hard to remove the aneurysm. However there are sometimes cases where huge aneurysms are found and depending where they are located on the brain, this can cause a lot of problems for the neurosurgeon. This is rare but in any case the surgery should be successful.

Asparagus

You can cook with it, barbecue it ... and implant it into people's spines?





Can plant cells be used to help regrow human tissues?

The World Health Organisation estimates that each year, between 250 000 -500 000 people suffer from spinal cord injuries (SCI). This can lead to partial or complete loss of motor and sensory function, and can affect various body systems. The symptoms vary depending on the location and severity of the damage. Up to 90% of cases are caused by trauma to the spine, but SCIs can also be caused by tumours, infection and loss of blood supply, for example, due to an aneurysm, prolonged drop in blood pressure or compression of a blood vessel.



Currently, the main treatments available are surgery, to alleviate pressure on the spinal cord and to stabilise the spine, and rehabilitation. Most recovery occurs in the first 6 - 12 months after surgery, and depends on how quickly surgery is administered, and the severity of the injury. Unfortunately, there is currently no cure for SCI, and, unlike peripheral nerves, nerves in the spinal cord rarely heal themselves, meaning some people are not able to completely recover. However, there is currently a lot of promising research being done, some of which involves stem cells, electrical stimulation and even editing genes in axons to help them regenerate, which has the potential to make treatment much more successful in the future.



Now, how does asparagus have anything to do with treating spinal cord injuries?

Andrew Pelling and his team of researchers have been looking into how plant tissues can be used to help regrow human tissue, and specifically how asparagus could be used to treat injuries to the spinal cord.

ASPARAGUS

Asparagus, like all plants, contains vascular bundles, which control water and nutrient transport.

In these experiments, they act as a scaffold around which tissue can regrow. The asparagus does not break down, as our bodies lack the enzymes to break down the cellulose. It is also inert, meaning it doesn't trigger an immune response. These properties make it a perfect implant.



EXPERIMENT

Their team did an experiment where they severed the spinal cord of a mouse and inserted a small section of asparagus into the gap. At first, the mouse was paralysed from the waist down, but after 12 weeks, it began to regain control and movement in its back legs.

After this experiment, they dissected the asparagus implants and noticed that blood vessels had begun to grow inside the vascular bundles, and that scar tissue had been minimised, promoting nerve cell regeneration, which helped the mouse recover.

FUTURE

Currently, human trials are still two years away, and it is likely that it will still take a while for this to become a widespread treatment. However, it certainly opens up many opportunities in the future, helping with recovery after a spinal cord injury, and potentially even helping develop other technology where we could use plants to help us treat other injuries.



Xenotransplantation

Is it ethical or safe to harvest organs and tissues from animals?

Xenotransplantation

What is Xenotransplantation?

As the title suggests, it refers to the transplantation of living cells, tissues or organs from one species to another such as from a pig to a human (what this page focuses on)

When did this idea come into practice?

Xenotransplantation dates back to 1682, when Dutch surgeon Job Janszoon van Meekeren reported that a Russian soldier's skull had been repaired with a fragment of bone from a dog. While at the time this was seen as a horrific act, the local Church decided that the bone had healed too well to be removed.

Years later following this the french surgeon Alexis Carrel's pioneering techniques for suturing blood vessels paved the way for the first xenotransplanted organs in 1902, but it took until the 1960s for any meaningful progress, when surgeons had limited success transplanting primate organs to humans. However most failed within couple of months, and the patients died. This remains the biggest obstacle today.



Why is it not a standard practice?

To date, no xenotransplantation trials have been entirely successful due to the many obstacles arising from the response of the recipient's immune system. The main issue is xenogeneic infections as they lead to the fatal infections and then rejection of the organs. This response, which is generally more extreme than in allotransplantation, ultimately results in rejection of the xenograft, and can in some cases result in the immediate death of the recipient.

There are several types of rejection organ xenografts are faced with, these include hyperacute rejection, acute vascular rejection, cellular rejection, and chronic rejection. Considering the vast array of risks associated with receiving organs from pigs it is no surprise that this is a prioritised practice. However in recent years measures have been taking place to reduce this: The breeding of transgenic pigs as well as new cloning techniques may be used to reduce the risk of organ rejection.

In August 1999, the results of a study were announced that found no evidence of infection among 160 people who had previously received medical treatment with living pig tissue. A number of patients in the study did show evidence of circulating pig cells, but no evidence of infection, potentially demonstrating that pig tissue can survive long-term in the human body with no ill effects. There is conflicting evidence in the medical field.









WHAT WOULD YOU DO?







Is this ethical?

The ethics of xenotransplantation is dependent on the person. Some argue that it is an exploitation of animals (particularly pigs) and say it is cruel and inhumane to harvest the organs from something intended for slaughter. Others would say that it is ethical in the sense that you use xenotransplantation to save a life, however there to date have not been any completely successful cases of it so you could argue both ways. Regardless of this, the idea of xenotransplantation has gained more medical attention and hopefully there will be more trials to assess the safety of this. What do you think? Would you want to accept a pig's heart?



The Brain of a Psychopath

Would you believe me if I told you both science and statistics suggest that at least 7 pupils in the school could possess the same brain pattern as a psychopath?

The Brain of a Psychopath





Prefrontal Cortex



Amygdala

The Brain of a Psychopath compared to the Average Brain

A study led by University of Wisconsin-Madison researchers compared the images of several prisoners' brains between those who were and were not diagnosed as psychopaths. The results showed two key differences between the brain pattern of the diagnosed and undiagnosed prisoners:

- The diagnosed prisoners had a noticeably smaller prefrontal cortex, responsible for emotional expression, problem-solving, memory, language, judgement and sexual behaviour
 - For psychopaths, whatever they would learn through emotions
 would not affect their future decisions and they may underestimate
 the consequences of their own actions
- The average brain could also be seen to have a larger amygdala: the amygdala controls emotions, survival instincts and learning
 The amygdala helps us learn societal norms and and without it, one may be more prone to anti- social behaviour similar to a psychopath

= Further studies showed that psychopathic brains showed less activation in the amygdala when viewing pictures depicting moral violations



The Brain of a Psychopath

Defying one's Genetics/Brain Pattern

Risk gene: a gene that makes people more susceptible to taking risks - this typically increases during adolescence

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So you may think from the information given that anyone with a similar let alone identical brain pattern as a psychopath would surely grow to be one themselves right? Well not necessarily...

Meet James Fallon. James Fallon is an American Neuroscientist who when studying the brain scans of serial killers and researching the patterns that correlated with psychopathic behaviour, found that his own brain fit the profile. But he was a successful scientist and family man. How is it possible, that he shares the same brain pattern to someone like Ted Bundy, a notorious serial killer, yet be able to live a rather normal life? Is there a flaw in the science?

This has all the more to do with environmental impact rather than genetic impact. Even though he had the genetic makeup of a born psychopath, when his risk genes were showered with love instead of abuse or abandonment through the critical first years of his life, psychopathic inducing effects of the other genes were reduced. This was unfortunately not the case for many infamous psychopaths I.e.. Jeffrey Dahmer, Donald Gaskins, Charles Manson

And just to clear the ominous question on the first slide :) A research paper by Cambridge University Press estimated that 1/100 people have a good chance of possessing a similar brain pattern to a psychopath. So could it be that among the 700 pupils at City, some could unknowingly possess a psychopathic brain pattern? Maybe, but think about it. Not only would it usually take both genetic and environmental impact to act on it, the given statistic would mean we would be meeting psychopaths on a weekly basis, too often for it to go unnoticed!



BLAST FROM THE PAST: History of Medicine



WOMEN IN ANCIENT EGYPT

A huge archeological site outside of Cairo, Egypt seems to suggest that women held high-statius medical roles in Ancient Egypt. A nearby tomb shows the image of Merit Ptah, the first female doctor known by name. She lived in around 2700 BC and the hieroglyphs on the tomb suggest that she was the "Chief Physician". Similarly, more than 200 years later, another doctor, Peseshet, held the title of "Overseer of female physicians" as suggested by her tomb. This is seems to show that female doctors were not one-offs in Ancient Egypt and

that they were, in fact, a well-respected part of Egyptian society (as they should be!)

HEROIN VS MORPHINE

Believe it or not, heroin used to be prescribed as a "cure" for alcoholism in the late 19th century! The drug was also introduced as a substitute for morphine, but it turned to be twice as potent and came along with a few nasty side-effects...

TREPIDATION OF TREPANATION?

If you think that biology homework gives you a headache, wait until you hear about the ancient practice of trepanation. This involved drilling holes into skulls by scraping away and drilling through layers of bone and was popular approximately 7000 years ago all across the world, from Ancient Greece to the Far East. This was meant to relieve headaches caused by skull trauma or a neurological disease. Further archeological evidence seems to show that people would practice trepanation in rituals; the holes in the skull would supposedly allow spirits to pass through the body





Thank you for reading!

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