Trivia

Q.1) Making best from waste, he managed to save lives. Some might even call him the 'Luke Skywalker of artificial organs'. Who is he?

Q.2) This declaration was created in 2008 and helps in the prevention of organ trafficking. What is the name of this declaration?

Q.3) While this teaching considers living donors philanthropists, it also considers donation from the dead as a disturbance. What is it?

Q.4) This is the act that drives people to give and to gift. Sometimes, the closer the ties, higher the commitment. What is this act called?

Q.5) At this place, the first attempts were made to take an organ from an animal and to put it in a human. It may not have worked out well, but it certainly made an impact in history. What is the name of this country?

Q.6) After transplantating this organ some recipients have reported personality changes or the sensation of the donor's presence. While there's no scientific proof, this phenomenon has been the subject of much debate and study.

Q.7) This organ is the most frequently donated, followed by livers.

Q.8) This tissue is used in the surgical procedure to restore vision in certain ocular and corneal surface patients to help prevent rejection of the implant.

Q.9) This is considered the most complicated organ transplant, due to the how susceptible this organ is to infection

Answers

1) Dr. Wilhelm Johan Kolff
2) Declaration of Istanbul on Organ Trafficking and Transplant Tourism
3) Halakha/Jewish Law
4) Altruism
5) France
6) Heart Transplant
7) Kidney
8) Tooth and Jawbone tissue (osteo-odonto keratoprosthesis
9) Lungs

SYRINGES & SHENANIGANS



Some people say drugs only provide a momentary high, however, in some cases, they can give a career high by providing a record-setting seven Tour de France titles.

Doping, just to get an extra edge over the other competitors, is an age-old and unfortunate folklore that has become a part of sports dating back to as early as 1904 in the Summer Olympics held in St. Louis where Tom Hicks, winner of the 40-kilometre marathon, was found guilty of using illegal substances, a mix of cognac and strychnine to be more specific. Since then, there have been numerous cases of doping not just in athletics but in other sports as well. One example of this that pops into every person's mind is the infamous relationship between Diego Maradona and Cocaine, and mentioning Russia is a futile exercise at this point.

As advances were made in science to identify such wrongdoings, people indulging in not-so-legal ways to win also upped their game. They brought in the revolution in the world of doping in the form of Blood Transfusions.

During the 1970s, it was observed that blood transfusions can significantly enhance physical performance.

Through the transfusion, there is an increase in the mass of red blood cells (or RBCs) hence leading to an increased oxygen transportation capacity [1].

As the blood transfusion methods were banned by the International Olympic Committee for the Olympic games held in 1988 and any efforts for the same now went "in vein", another method came into the spotlight which was 'recombinant erythropoietin (rhEPO).'

This became a popular choice among athletes, in the 1990s, for increasing their RBCs artificially, and is used as therapy for the treatment of anemia that is caused by chronic kidney disease, and for cancer, or HIV infection, as this method proved to be much easier since it skipped the part of blood reinfusion as well as storage [2]. It was not until 2001 that a direct detection method was developed for rhEPO by taking urine samples.

However, recent developments and the most commonly used test presently use a non-specific extraction and concentration method, which is followed by gel electrophoresis utilizing a particular double blotting method to detect EPO in the network of other proteins present.

Even with such methods put in place, there are still limitations to such testing and sportspeople have found a few ways around this stringent testing regime.

The lengths people have gone to just to pass a rhEPO test makes you wonder if they put this much effort into actually practicing, maybe they wouldn't have to resort to illicit practices, from making holes in the walls of the testing labs for exchanging samples to washing down such performance-enhancing drugs with alcohol to reduce the detection window for such substances. The detection period can vary depending on various factors such as frequency of intake of such drugs, dosage, route of administration, and type of drug used.

Doping has had a long history in the world of sports and continues to rear its ugly head from time to time which can take the core values of sports and competition away from it all. Thankfully, with the recent developments in science, testing methods as well as strict laws against such practices, it is becoming more possible to keep up with the newer methods that are being developed to gain that unfair advantage. At this rate, we are not far from the day when sports will be again about fair competition for all and not humans fighting a losing war against robots.



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Usage of viral biocontrol methods for rabbits in Australia

INTRODUCTION: In 1859, Oryctolagus cuniculus, commonly referred to as European rabbits, were first introduced to the new wild lands with their sole purpose of being hunted as a sport. They were never a natural inhabitant or an indigenous species. A wealthy settler let loose around 13 European rabbits on his estate in Victoria, quite blind and oblivious to the future ramifications of this escapade, that led to the population metastasizing, in 50 years, to the entire island (1). These rabbits can begin reproducing from 3 months (2), give birth to around 5 kits, and have around 4 litters yearly! As soon as a female rabbit is 3 months old, they contribute to the population with 20 rabbits each year (2). The rate of spread of this mammal observed was the fastest of any in the world ever, primarily encouraged due to the vast and endless good ground cover, affluent food sources, and absence of predators.

WHY ARE EUROPEAN RABBITS SO SIGNIFICANT?: The European Rabbits are estimated to cause economic damage to the Australian economy by around $200 million annually. Rabbits overgraze every plant matter, thus incurring the collapse of all indigenous plant life, indirectly affecting the indigenous animal life that depends on it. Moreover, overgrazing at such a level causes the soil to erode, which hampers the pasture, fields, and water quality.

INITIAL METHODS: Through the decades, several methods for controlling rabbits were attempted including fumigation, rabbit warren ripping, and even bounty systems. Fences yielded no significant result. These were adopted as a staple defense by the settlers against the rabbits. The success of early small-scale private fences advocated the government in the construction of larger fences which, by the 19th Century, had become an integral part in the life of the settlers. These fences were later found unsuccessful because they were built well after a rabbit invasion and their maintenance proved difficult. An estimated 600 million rabbits were thriving around the 1940s due to good harvests and a lack of manpower to control the population due to the War.

ENTER VIRUSES!: The government shifted its gaze to biocontrol in the 1950s to put these rabbit populations in check. A rabbit-specific virus, Myxoma, was released into the wild through infected rabbits. This marked the first-ever use of a virus as a biocontrol method, i.e., the deliberate and purposeful release of a virus to completely eradicate an animal species. Myxomatosis, caused by the Myxoma virus, is a vector-borne disease, carried by flies and mosquitoes who have been in contact with infected rabbits. The clinical manifestations include puffy and fluid-filled swellings around the face, head, anus, genitals, and inside the ear. This progresses such that it becomes virtually impossible for the rabbits to see, eat, and drink, followed by death post 12 days of infection.

However, the rabbits, following a massive population reduction, eventually developed an immunity against the virus, thus rendering any further use of the virus ineffective.

In the 1980s, scientists came up with another rabbit-specific pathogen, the Rabbit Haemorrhagic Disease Virus (RHDV), an RNA virus, vectored by flies and carrying the ability to neutralize rabbits in 48 hours upon affliction. Post its official release in 1996, it was responsible for at least a 90% reduction in the rabbit population in dry areas, but it didn't fare well in the colder regions of Australia which receive higher amounts of rainfall. Nonetheless, it was an excellent feat. However, as it is with evolution, the rabbits developed immunity against RHDV, just as with the myxoma virus. This has highlighted the role played by selection pressure in evolution. Rabbits still exert their massive numbers and currently, chemicals such as Pindone and sodium monoflouroacetate, are used. The former serves as an anticoagulant poison. The latter, called 1080, is a derivative of plants native to Australia, hence only introduced species are highly susceptible.



Fig: Lorry loaded with rabbits.
(Source: How European Rabbits Took over Australia)

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Sensory deprivation

THE NEUROSCIENCE OF MANIPULATING PERCEPTION

INTRODUCTION

The human brain's plasticity is ours to exploit, and it can become highly susceptible to manipulation via psychological means in interrogation, especially during the absence of external stimuli. Sensory deprivation is the deliberate removal and limitation of sensory input. With interrogation as context, sensory deprivation is a mechanism that aims to disrupt the general cognitive process and heighten stress, eventually resulting in the extraction of information from the targets (1).

SENSORY DEPRIVATION TECHNIQUES FOR INTERROGATION

Sensory deprivation for interrogative purposes has varied applications, involving several techniques aiming to disorient the target and instill psychological distress. One technique is visual deprivation, wherein the target is blinded or surrounded by complete darkness. This inhibits the target's ability to perceive spatial information due to the absence of visual stimuli, leading to heightened anxiety and confusion (2). Moreover, inhibition of this sensory output also blocks the formation of a coherent perception of space and time, making the target susceptible to cognitive distortions (3)

Another tactic, achieved with the usage of white noise, earplugs, or confinement to a soundproof environment, is auditory deprivation. Loss of auditory cues results in distortion of regular communication and awareness of the environment.

Disorientation sets in as the target can neither gauge the presence of others nor orient themselves based on sound stimuli, further driving the target towards isolation and helplessness (4).

To cause further psychological stress, the target is relegated to a room without interaction or external stimuli. This technique aims to exploit a human's social interaction and communication needs. A person's resistance can be easily broken through the disjointed perception of reality caused by the unavailability of external cues along with the lack of social and temporal markers (5).

NEUROSCIENCE BEHIND SENSORY DEPRIVATION

A cascade of neurochemical responses is triggered, usually the hypothalamic-pituitary-adrenal (HPA) axis. Stress hormones, cortisol, and adrenaline, are released due to the disruption of homeostatic equilibrium caused by the absence of sensory input. The body undergoes a fight-or-flight response along with a state of heightened arousal. The continuous activation of this stress response causes cognitive overload and fatigue, greatly harming the decision-making processes, impulse control thought organization, and memory consolidation (3). The prefrontal cortex, tasked with higher cognitive functions, loses its efficiency in the absence of sensory input. Hence, the target is more susceptible to interrogation due to decreased resistance (2).

Persistent sensory deprivation can lead to hallucinations. The absence of sensory input causes the brain to generate its own, leading to perceiving phantom sights and sounds. This creation of false sensory information directly results from the brain's attempt to cope with the environment, making the target more susceptible to psychological manipulation. If this process is persistent and continuous, targets begin to accept their fate of a futile escape and resistance, thus making them compliant with the interrogator.

The malleated sense of time makes the target unable to ascertain when the process started and when it shall end (1).

ETHICAL CONSIDERATIONS

The art of sensory deprivation in interrogation is a tool of extreme power due to the ability to interfere with the neurobiology of stress, cognitive overload, and alteration of perception, making the target susceptible to manipulation. Prolonged use of such techniques is cited as torture with severe damage to mental health. It may further induce anxiety, depression, and PTSD.

However, it is to be noted that the fidelity of information extracted through this technique is questionable due to the high chances of false confession caused by stress and confusion. United Nations Convention Against Torture has condemned the use of sensory deprivation due to the inhuman nature associated with the technique. Instead, it can be used to acquire short-term compliance (7).

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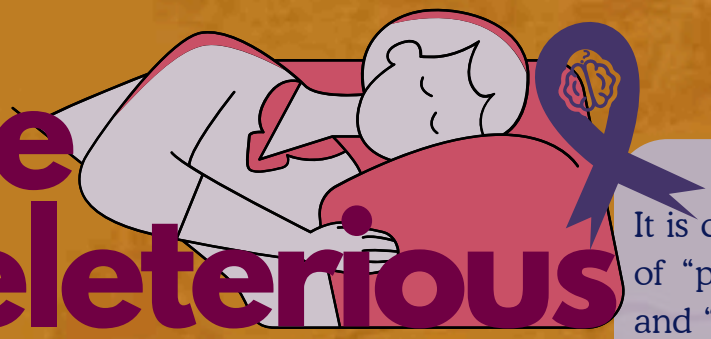
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the deleterious interplay between

ALZHEIMER'S DISEASE & THE SLEEP-WAKE CYCLE

The diurnal cycles of the human body are of paramount importance to the body's normal functioning and longevity, perhaps more than we let ourselves believe. Getting enough and timely sleep has innumerable benefits when it comes to our overall health, as well as for the long-term well-being of our brain.

When speaking about health conditions that manifest in the later stages of one's life, neurodegenerative diseases are likely the central point of conversation in the medical field, due to the way they progress and the onslaught of detrimental effects that mar the final years of a patient's life. Such a conversation is certainly incomplete without the mention of Alzheimer's disease.

At its core, a neurodegenerative disease that impairs cognition, memory and behaviour, Alzheimer's disease (AD) is a major cause of death in elderly people, while it also sets the stage for the onset of dementia in some cases (1).

It is caused primarily by the accumulation of "plaques" of the beta-amyloid protein and "tangles" of another protein known as tau. These plaques and tangles show a distinguishable pattern of accumulation in patients (2).

A hallmark among AD patients is a disturbed sleep-wake cycle. Evidence suggests that sleep deprivation can increase the levels of beta-amyloid in healthy adults by deterring its uptake by the microglia present in the central nervous system. Thus, a lifestyle with a poor sleeping pattern may contribute heavily to the risk of developing Alzheimer's disease later in life (3).

A statement such as the one above may be quite straightforward in its message: an unhealthy lifestyle will lead to consequences later in life. But it may help to consider that not only is disturbed sleep a cause or contributing factor to the onset of Alzheimer's, but it is also a pathophysiological sequala of the disease. Patients suffering from AD have trouble staying awake and going to sleep. This is accompanied by an arsenal of sleep disorders that become a contributing factor to a patient's distress. These include impaired rapid eye movement (REM) sleep, daytime drowsiness and insomnia, to name a few (3).

The focus of recent studies is not veering away from beta-amyloids to another important chemical that controls sleep: orexin.

This excitatory neuropeptide binds to G-protein coupled receptors which are present on cells distributed throughout the brain. Orexin is one of the main modifiers of sleep, as it promotes wakefulness and consolidation.

It is now coming to light that orexin may hold a pivotal place in the pathogenesis of Alzheimer's owing to the fact that it may deter beta-amyloid clearance from the brain by blocking microglial phagocytosis.

Moreover, it is also known that the orexinergic pathway is mainly the one responsible for hippocampal circadian oscillation, which impacts the transcription of genes associated with increased AD risk.

Additionally, orexin is also associated positively with the levels of tau protein in the brain. All these features point incriminatingly in the direction of orexin's involvement in AD. Regardless, more research is required in this area to begin any kind of treatment on the basis of this information.

It is a common practice to use medication that is prescribed to adults suffering from insomnia to AD patients, such as tricyclic antidepressants, benzodiazepines and some antipsychotics. While the reversal of Alzheimer's seems like a distant possibility, attempts to improve a patient's quality of life must continue through research.



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