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ISSUE

KEHS

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Journal



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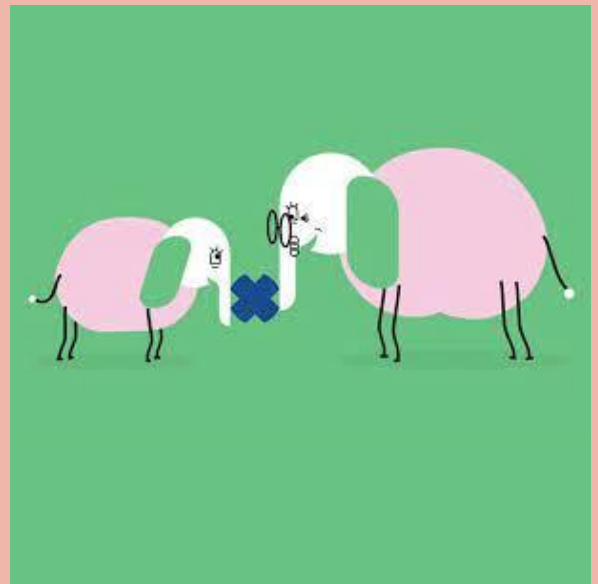
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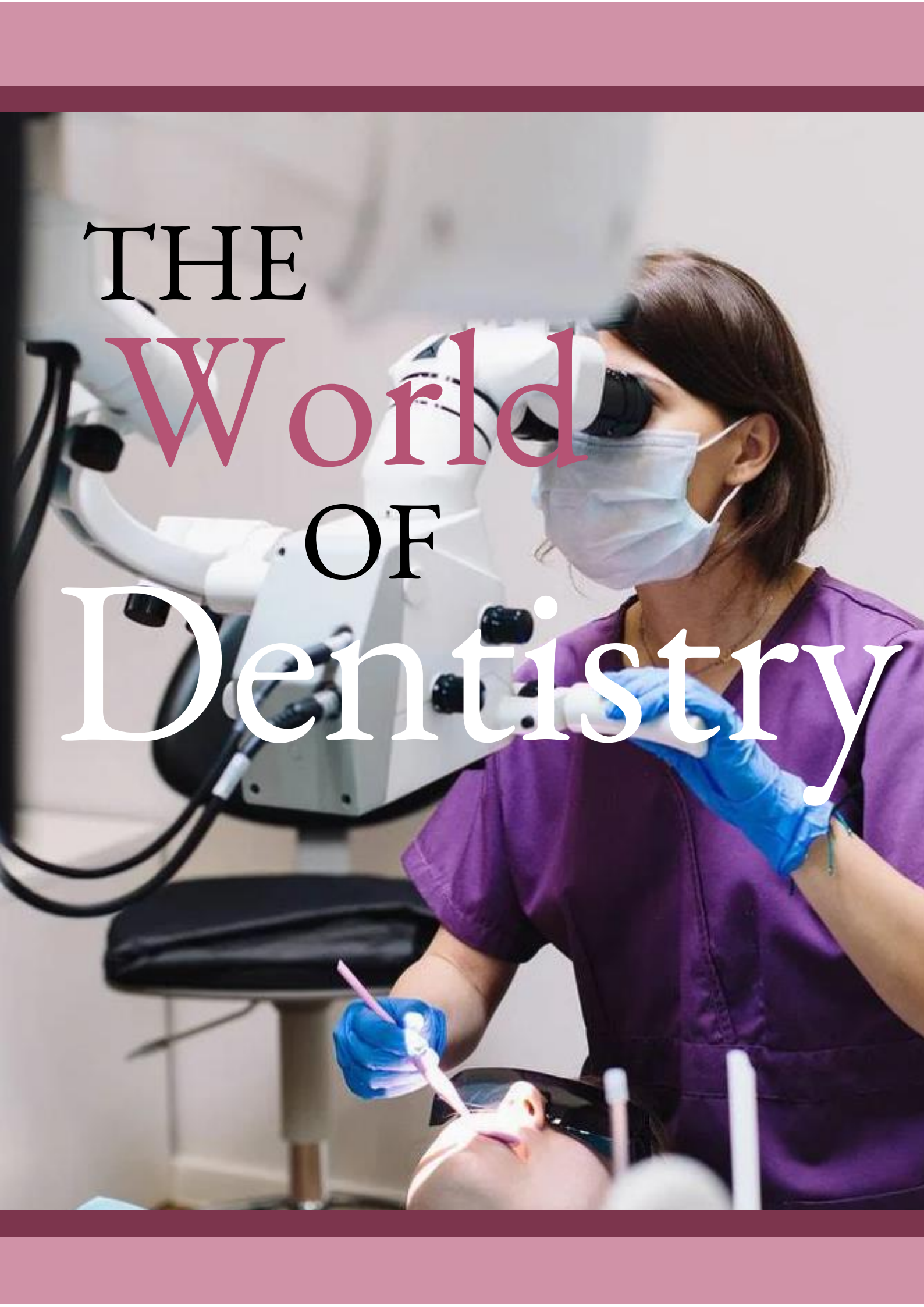
KISSING IT BETTER

Kissing it better is a healthcare charity and training provider that hopes to end elderly isolation 'by bringing generations together.' The charity started in 2009 and since then, the charity aims to make a positive impact to older, vulnerable people in hospitals, care homes and the wider community. The donations to this charity will go to fund their teaching programme, offer supported student volunteering placements, work as advocates for enhancing patient experience and research the impact of creative thoughtfulness on the recovery times of older people in healthcare. By donating to KiB, you can help to end the loneliness that elderly people experience and give young people the chance to show what they can do.



Get Involved

We are giving all donations from this magazine project to Kissing it Better, in the hope to help the charity in its projects and ideas. However, there are many other ways you can get involved, from becoming a volunteer, to signing up to one of their courses.



THE
World
OF
Dentistry

The Water Fluoridation Debate

Tooth decay remains a significant public health concern, with data from the Government's Office for Health Improvement and Disparities showing that 42,180 operations for tooth extractions took place in NHS hospitals in 2021/22 for those aged 19 and under; moreover, the estimated cost of tooth removal was 50.9 million pounds in 2021 to 2022. The key point is that tooth decay is a mostly preventable issue and adding small amounts of fluoride to drinking water helps reduce the prevalence of tooth decay, but also allows us to overcome socio-economic barriers and inequalities in dental health.

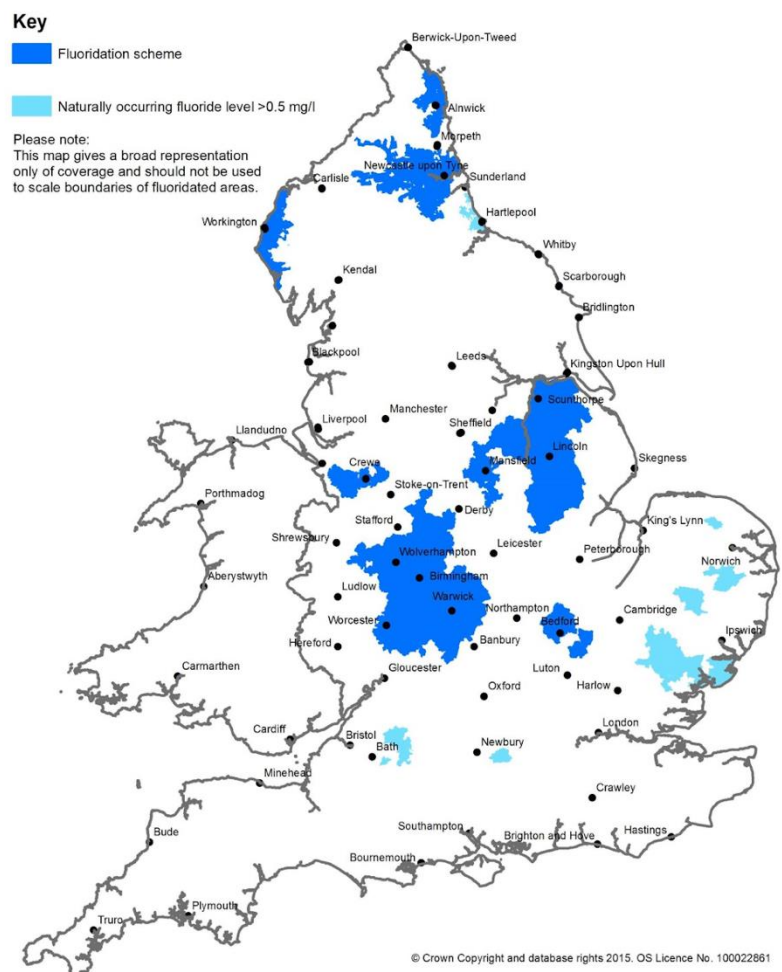


Currently in England, around 10% of the population receive fluoridated water, including parts of the West Midlands, East Midlands, North East, Eastern England, North West and Yorkshire and Humber. However, some people, although a minority, object to this public health intervention, as there have been some concerns of a link to other health conditions.

The main concern with water fluoridation is the occurrence of dental fluorosis (a condition that changes the appearance of the enamel); PHE's 2018 health monitoring report found that fluorosis was more common in the fluoridated cities compared to non-fluoridated cities (over 20% more prevalent in fluoridated cities).

There are also ethical concerns related with water fluoridation, referring to the idea of individual consent; this is because an entire population or large group of people is being 'medicated' without their approval as individuals have limited control over the water they use, unless they resort to buying expensive bottled water. For example, a study in 2021 in the Northeast of England published by the BDJ showed that after assessing public attitudes towards adding fluoride to the water supply, 16% opposed, suggesting there is a group of people that may not consent if they were given a choice. Thus, many argue that the limitations of water fluoridation are not just limited to health-related issues but also ethical concerns.

Areas of fluoridation schemes and of naturally occurring fluoride >0.5mg/l during 2014



However, a huge advantage of water fluoridation is that it is regarded as a simple measure to improve public health, through how it helps strengthen the enamel, preventing decay, cavity and tooth loss. Public Health England's (PHE) 2018 report included a comparison of results from dental surveys of 5-year-olds undertaken in fluoridated and non-fluoridated areas in England. According to the Department of Health and Social Care, the report found that there 'was a significant reduction in both the number of five year olds experiencing tooth decay and the number of teeth affected in areas with water fluoridation compared to non-fluoridated areas.' The results additionally showed that the impact was greater in more deprived areas, showing that water fluoridation is also successful in reducing oral health inequalities. Evidence has also been accumulated in other parts of the world. For example, the NHMRC 2016 review in Australia discovered that water fluoridation reduces the prevalence of dental caries in primary teeth by roughly 35% compared to non-fluoridated water and it increases the proportion of children who have no dental caries by approximately 15%. Thus, research carried out provides evidence of the benefit of adding fluoride to water in preventing tooth decay and overall, improving oral health.

Consequently, water fluoridation could help reduce the £1.7 billion a year the NHS spends on dental caries; water fluoridation could help relieve some of the pressure on the NHS, but also save money for working individuals by providing a cost-effective method of preventing dental caries and decay. Although the scheme can be expensive (the potential Hull scheme has an estimated operational cost of about £330 000 per year), PHE estimates that for every £1 spent on fluoridation, particularly in poorer areas, it can secure over £12 savings after five years (due to reduced treatment costs and less time off work for adults for dental treatment), highlighting the economic advantages of the scheme.

In conclusion, although a minority do disapprove of water fluoridation either due to ethical objections or safety concerns, it can be argued that the benefits do outweigh the costs in this debate; in their Commissioning Guidance document, PHE states that there is 'strong evidence' for the advantages of water fluoridation, mainly highlighted through the reduction of caries and decay in areas where water has been fluoridated. With the looming threat of the cost of living crisis, as well as rising NHS dentistry prices (estimated to rise by 8.5% in 2023-2024), preventative dentistry is of utmost importance, and many will argue that water fluoridation is a reasonable, efficient method of ensuring that oral health in the UK is cared for.



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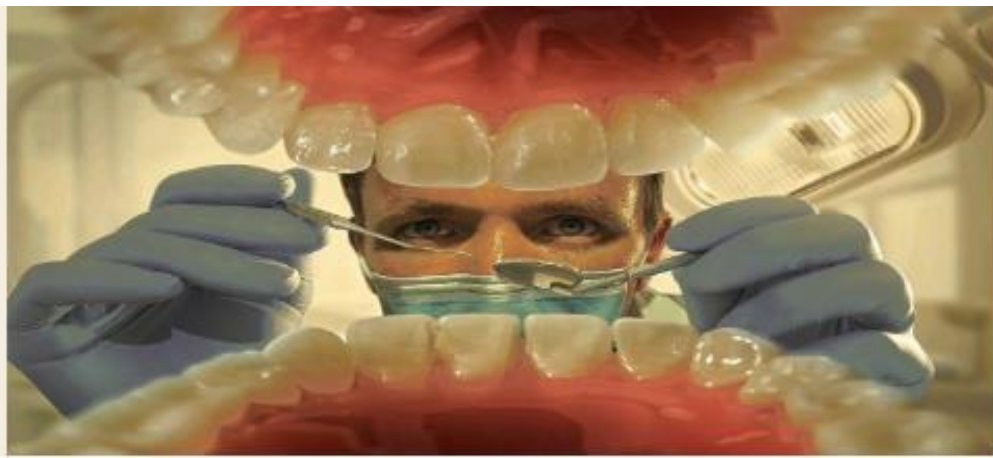
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in this issue >>>

A window to your overall health
Can dental health cause other health issues
Challenges in Oral hygiene
Oral health inequalities



Avneet Bajwa

What happens in the mouth doesn't stay in the mouth...

How do oral issues link to wider health issues?



current topics >>>

How can poor oral health affect the rest of the body?

It's simple to overlook that our mouths are a pathway for bacteria to enter the body. From there, the bacteria can enter the bloodstream, respiratory tract, or digestive tract, where they can then cause an infection, inflammation, or other issues in other bodily areas. It's a common fallacy that your general health and your oral health are disparate. They aren't. The mouth serves as the main entry point for the nutrition and oxygen that each living thing requires for survival. Your whole welfare depends on having good dental health, and the distinction between the two has more to do with how healthcare is delivered than with genuine medical science.

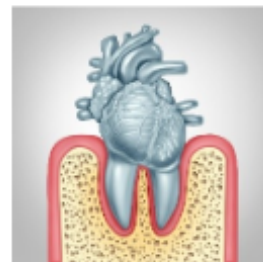
Consequences of poor oral health

Health issues connected to oral health

The mouth is a gateway to the rest of our body. With approximately 700 species, the oral cavity possesses the second largest and most varied microbiota after the gut. Your teeth are not the only parts of the body affected by dental health and oral hygiene habits.

As I have emphasized in the introduction, the mouth is the gateway to the rest of the body. The diseases present in poor oral health have adverse impacts on the mouth itself, but also cause problems in other areas of the body.

begin in the mouth do not stay there; rather, they spread and affect other body regions. Perilous dental infections can be fatal because, in a small percentage of cases, they can move to the brain, bloodstream, or airways. There is a significant link between oral health and specific systemic disorders like heart attack, stroke, diabetes, and Alzheimer's, as demonstrated by countless scientific studies.



Oral consequences

The consequences are numerous and extremely diverse when poor oral hygiene causes tooth loss. In addition to minimising your chewing forces, losing a tooth places additional strain on your remaining teeth. Patients who endure multiple tooth losses can encounter digestive issues as a result of big, inadequately chewed food particles entering the stomach because chewing is a crucial initial stage in digestion.

Systematic consequences

Infectious and inflammatory diseases that

Detrimental health problems include:

1. Dementia

Experts have demonstrated that periodontal disease and gingivitis, in which bacteria from the mouth can travel into nerve pathways or enter the blood stream, can result in brain cell death triggering memory loss, that may lead to dementia and Alzheimer's disease.

2. Pregnancy Complications

Due to several hormonal changes brought on by pregnancy, expectant mothers are more vulnerable to dental infections such as periodontitis and gingivitis, which are linked to premature births and low birth weight.

WHAT PROBLEMS COULD POOR DENTAL HEALTH CAUSE?



OTHER HEALTH PROBLEMS INCLUDE:

1. Diabetes

Gum disease can lead to higher blood sugar levels and this can put a person at risk for developing diabetes. It can also make diabetes difficult to control due to unregulated blood sugar levels.

2. Cancer

Poor oral health can put patients at risk of kidney cancer, pancreatic cancer, or blood cancer. In addition, if patients smoke or use tobacco products this can lead to oral or throat cancers.

3. Endocarditis

This infection of the inner lining of your heart chambers or valves (endocardium) typically occurs when bacteria or other germs from another part of your body such as your mouth, spread through your bloodstream and attach to certain areas in your heart.

Having poor oral health could even increase your risk for complications with COVID-19! Although there are many different coronavirus symptoms and degrees of severity, a recent British study correlates poor oral health with a higher risk for COVID-19 problems.



How dental disease causes systemic diseases

It had been speculated that oral bacteria, lipopolysaccharides, and proinflammatory chemicals may penetrate other parts of the body via the inflammatory pathway triggered by periodontal disease stimuli, generating chronic system problems and infectious diseases.

Dental social inequalities...

Dental health disparities are unjust and unfair differences in dental health. There are more differences between rich and poor people's oral health status. Just like with general health, there is a steady stepwise link across the entire socioeconomic spectrum, with dental health deteriorating at each level as people move down the social ladder. Children from underprivileged backgrounds are disproportionately more likely to be hospitalised for tooth extractions.

In England:

- 1/5th of admissions were for children from the most deprived tenth of the population
- Sheffield has one of the highest rates in England for the extraction of children's teeth under general anaesthesia

In 2017, 34% of five-year-old children in the northwest experienced dental caries compared to just 16% in the southwest of England – a clear example of the North/ South health divide. This serves as an effective warning sign for prospective health disparities as a whole. To reduce oral health inequalities recognise that prevention is better than cure, and continue oral health promotion to raise awareness or reports on the effect of oral health initiatives evaluate their influence on oral health inequalities.

BENEFITS OF GOOD ORAL HEALTH

ECONOMIC

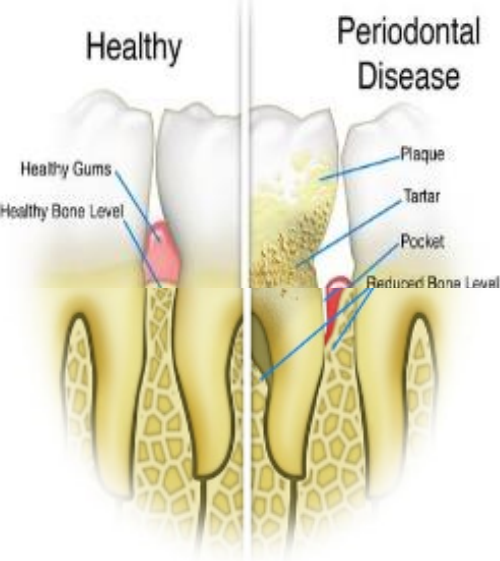
Maintaining excellent oral health at home will allow you to save an immense amount of money on dental care over the course of your lifetime.

PSYCHOLOGICAL

The psychological impact of poor oral health is complicated. Some people will suffer from low self-esteem, lacking the confidence needed to proudly display their smile due to the appearance of their teeth as people with dental problems prefer to hide their smiles or laughter and are often perceived by others as unfriendly or unkind. This perception creates a cycle of insecurity and embarrassment, leading to depression and social anxiety. Numerous studies have revealed that simply smiling releases endorphins in our brains that act as an antidepressant. When sad, forcing a smile has been proven to lower stress, decrease heart rate and boost your mood!

PHYSICAL

Because your mouth is healthy your immune system is not fighting inflammation and infection there therefore you can fight off other health problems like colds, sinus infections, the flu, and of course, COVID-19!



The cost of oral disease:

In England oral diseases place significant costs on society and the NHS for what are essentially preventable diseases. The NHS spent £3.6 billion on dental care in 2017 to 2018 in England. A similar amount is estimated to be spent on private sector dental care. In 2020, UK household expenditure on dental services was approximately £1.5 billion.

Q: Fast food – a convenience or a complication

After a busy day at work, or maybe after an exam the UK's favourite pastime is to order a takeaway. And it's easy to see why fast food has become such a staple to modern lives- its quick, easy and filling. As of 2022, it's thought that the UK has around 46,248 takeaway and fast food businesses. Understandably, the pandemic affected consumer behaviour around fast foods, with the average spend per person rising by almost half, from £452 to £641 in 2019 and 2021 respectively. As you well know, many fast food items are high in fats, sugars, salts and processed preservatives, which can wreak havoc on the tooth's enamel and on the sensitive gingival tissue. Oral health can also be negatively impacted by poor nutrition, which has been linked to illnesses of the oral mucosa, periodontal disease, and caries (tooth decay). While another study found that young women with a higher BMI had poorer oral health and a greater prevalence of caries.



Say Goodbye to Coca-Cola



Facts you never knew about Coca-Cola

- It used to contain cocaine

Are you shocked that a prohibited substance was used in the original formula? Back then, cocaine wasn't illegal (it was outlawed in 1914) and society believed it had some medicinal benefits, hence its inclusion in a variety of properties. The amount of cocaine in each glass of Coke was determined to be around 9 milligrams; in contrast, one line of cocaine contains roughly 50 milligrams.

- It made white coke to avoid losing communist sales

Due to the association that Coca-Cola had with being American because it was produced here, foreign countries found it difficult to purchase it during World War II, which led to a decline in sales. Coca-Cola created the colourless beverage White Coke to encourage neutrality during times of war. White Coke had a brief existence and is now infamously hard to find.

- It was originally alcoholic

Because caffeine and cocaine weren't enough, Pemberton's original Coca-Cola formula also included a third intoxicant: alcohol. Following the adoption of the Prohibition Act in Atlanta in 1886, wine was eliminated from the recipe.

- The recipe is locked in a vault

If you dream of one day getting your hands on the recipe, there is some bad news for you. The formula for modern Coca-Cola is locked away in a vault, which you can visit it at Atlanta's World of Coca-Cola. The specific recipe is allegedly only known by two employees, and they are forbidden from travelling together.

- Coke can be used as a bug repellent

Sugar attracts bugs, so you can take advantage of that. If you place a Coke (or any other sweet drink) a safe distance from where you are dining, the bugs may be attracted to the soda and not you.



How coca-cola affects your teeth

It's not a secret that Coca-Cola is perilous and harmful to your teeth or to your overall health.

There is a very strong link between soda consumption and tooth decay. It has also been linked to other health problems such as diabetes and obesity. The sugars in soft drinks interact with bacteria in your mouth to form acid, which attacks your teeth. Add that to the acids normally contained in regular and sugar-free sodas, and you're starting a damaging reaction that lasts for about 20 minutes. If you sip all day, your teeth are under constant attack.

Cavities from tooth decay are nearly inevitable in people who drink soft drinks regularly, especially when poor hygiene is practiced.

According to the American Dental Association, sugar should make up no more than 10% of your daily calories. For women, that is 10-15 teaspoons, per day. For men, it's 12.5-18.75 teaspoons.

Soft drink consumption leads to 2 major dental health issues: erosion and cavities.

Erosion: The acids that result from Coca-Cola consumption weaken tooth enamel. This thin, outermost layer of your teeth protects them from daily use such as chewing, biting, and grinding. The sensitive, dentine layer beneath the enamel is exposed when it erodes, making the tooth more vulnerable to damage, including decay. It may also result to tooth pain and sensitivity. Erosion is a serious dental issue because tooth enamel does not regenerate.

Cavities: One of the main causes of dental decay is the intake of fizzy drinks. Fizzy drinks are a triple threat to your teeth. Besides weakening tooth enamel, the carbonation, sugar, and acids encourage the growth of bacteria in your mouth and on your teeth, which contribute to cavities. Sugary beverages like sports drinks only damage the top layer of enamel however soft drinks also wears away at the dentin layer beneath the enamel, further increasing the chance of these unfortunate ailments.

Chase it with water

You can reduce the amount of time your teeth spend in an acidic environment by rinsing your mouth with water after drinking a coke. This allows your saliva to re-establish a healthy pH, and encourages remineralisation of your teeth.

Don't think diet will save you

You might think that because it doesn't have sugar, diet coke is better for your teeth. So what does coke do to your teeth. The sugar interacts with the bacteria in your mouth to produce acid in the first 20 minutes it comes into contact with your teeth. The next time the acid harms your teeth, it diminishes the tooth enamel and affects composite fillings as well as the dentin, the next layer of your teeth. The more coke you drink, the more trips to the dentist you will take.

Cut down on Cokes

Americans drink about 44 gallons a year, compared to other countries that drink:

- Japan: 9 gallons
- Russia: 8 gallons
- South Korea: 7 gallons
- Italy: 13 gallons

Effects on dental health

SUGAR

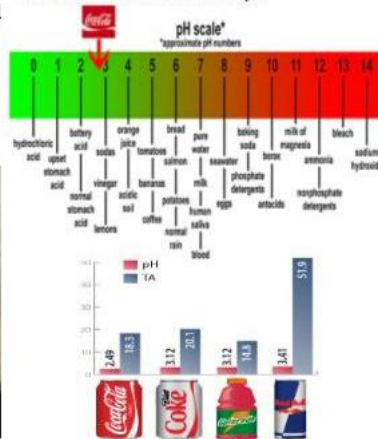


Bacteria that live inside your mouth eat sugar, producing acid as a result. The bacteria may penetrate into the damaged regions of your dental enamel as a result of the acid in soft beverages like Coca-Cola, which can erode your tooth enamel around the bacterial colony and ultimately lead to cavities and possible tooth rot. Bacteria may generate acid in a matter of as 20 seconds, but its implications can last up to 30 minutes.



ACID

Phosphoric acid is a component found in soft drinks like Coke and even Diet Coke and is utilised in industrial cleansers. Phosphoric acid erosion affects the entire tooth, as opposed to localised erosion that results in cavities. Temperature sensitivity, pain, transparency, cracking, and discoloration of the teeth are the hallmarks of dental erosion. The chemical in the dye used to make darker colas can interact with the enamel to diminish its ability to shield. Furthermore, the colour incorporates additional glucose, which has been proven to have has accelerated tooth decay..



CAFFEINE

Each person's reaction to caffeine is unique, but for many of us who drink Diet Coke to boost our energy, caffeine can be detrimental. For instance, a 12-ounce can of Diet Coke contains 47 milligrams of caffeine, which is considered a moderate dose for most people. Nevertheless, if you ingest more than one can per day or if you have a caffeine sensitivity, you may encounter side effects like trembling, headaches, anxiety, irregular heartbeats, and insomnia. Medications and dietary supplements like echinacea, ciprofloxacin, norfloxacin, and theophylline can all be impacted by caffeine.

Caffeine in Drinks



The Underestimated Role Orthodontic Treatment Plays on our Quality of Life

The process of orthodontic treatment is one that requires patience, time, and pain. The question of why such a vast number of people opt for braces, despite the struggles that the treatment can engender, can be answered with the alluring prospect of perfectly aligned teeth and the ubiquitous demand for an absence of aesthetic imperfections. Additionally, the discomfort and difficulty with maintaining malocclusion can result in further oral problems including gum disease. It is widely accepted that a major part of the aim of dentists is implementing preventative strategies, reducing the risk of developing virtually irreversible dental complications, and through orthodontic treatment with adolescents, this can be achieved.

At first glance, it would seem that braces are the perfect solution to a modern issue; the cure to the insecurities arisen from crooked teeth. Increasingly in the 21st century, we are more and more engrossed in the way in which we are perceived-- our physical appearance. So much so that hundreds of thousands of young people feel at unease in their own bodies, in their own unique faces; to the extent where a vast number of teenagers have braces to correct deemed imperfections in their teeth. The advancement in the technology of braces has given an increasingly accessible medium by which young people are able to alter their appearance.



However, this would be an unfair conclusion to make on the effect braces have on society. What dentistry cannot do, and what developments in oral care won't be able to change is the way in which society often allows appearance to dictate their wellbeing. The way in which braces adapt to this seemingly irrevocable issue, is by aiding people feeling more comfortable in their smile. "According to one source, 50.7% of those who consider getting braces do so for the purpose of improving their appearance.

Nonetheless 52.3% choose to receive orthodontic treatment in order to correct crooked teeth for oral care. "Following the Second World War, prevention became a primary objective for dentists, and under the National Health Service, the approach to dental care shifted to a model entrenched in maintenance and prevention as opposed to 'removal and replacement' It is indisputably more difficult for one to take care of their teeth that are overcrowded as certain areas are not cleaned during brushing and sequestered parts of the mouth remain unflossed, leading to a rise in the build-up of plaque. This can increase the likelihood of gum disease and tooth decay. "Furthermore, this would support the use of braces to enable better access to all areas of the mouth, allowing for healthier oral care and long lasting, strong teeth.

^[1] The British historian, Colin Jones, described the influx of orthodontics during post-war Britain, as 'the Second Smile Revolution'. This was accompanied by novel attitudes towards oral aesthetics, all of which was a consequence of a network of 'cultural, technical and political influence' originating at the heart of the common American evaluation that appearance reflects one's status and value. This view radically transcended across the western world, establishing the prevalence of orthodontic treatment in modern day dental care. Furthermore, the large normalisation of getting braces has reinforced people to feel as though they need to perfect their smile.

To conclude, it would not be a disproportionate assumption to say that the process of straightening teeth through orthodontic treatment is heavily influenced by societies manufactured image of what we should look like. Nevertheless, braces can impact your quality of life, both by yielding a confident smile in which young adults feel more comfortable in their appearance, but also alleviating the distress and risk of tooth decay and oral damage sourced from misaligned teeth.

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^[2] The Smile Stealers, Chapter 7 The Smile of Success pg 235

^[3] Crowded Teeth | Symptoms & treatment | Total Orthodontics. (n.d.). <https://www.totalorthodontics.co.uk/symptoms/crowded-teeth>

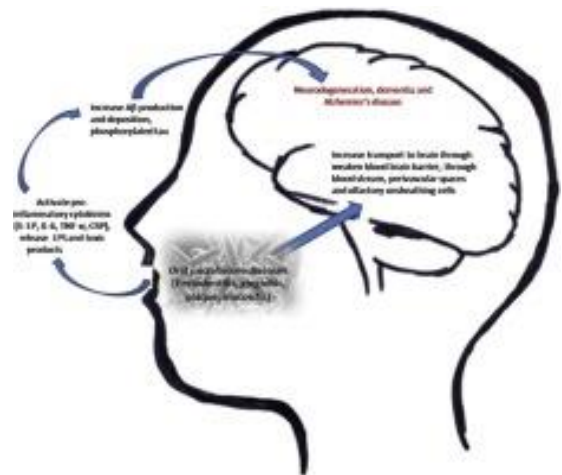
^[4] The Smile Stealers, Chapter 7 The Smile of Success pg 236

Is there a link between poor oral care and the development of Alzheimer's?

¹ According to the NHS, the degenerative condition that typically affects memory, manufacturing the deterioration of normal brain function, known as Alzheimer's, is believed to affect 1 in 14 over the age of 60. Whilst there is still no definite cause that has been identified in relation to the development of Alzheimer's, researchers have been able to establish various risk factors including age, family history and cardiovascular disease.

However, in recent years, there has been a rise in concerns of a link between poor oral care and Alzheimer's; establishing a seemingly unfamiliar relationship between what is understood to be two unrelated issues. ² Gingivitis, one of the hundreds of bacteria that live in the mouth, is widely recognised to cause gum disease and periodontitis. Gum disease develops following a build-up of plaque at the boundary of your teeth and gums, and if not removed, this plaque becomes tartar, engendering various, harmful bacteria to produce between teeth. If left untreated, bacteria continue to divide in the mouth, eroding your gums, catalysing gum recession and tooth loss, whilst providing a pathway for the bacteria to enter the bloodstream.

³ The mobile bacterial species, *Porphyromonas gingivalis*, linked to chronic gum disease, has been found to move from the mouth into the brain, where it secretes the gingipains protease that promotes neurone damage. This, in turn, is likely to result in a decline in the area of the brain responsible for memory. A study conducted by Science Advances, concluded that 49 out of the 54 tested deceased patients' brains, known to have suffered from Alzheimer's, had traces of *Porphyromonas gingivalis*.



Furthermore, whilst the notion that poor oral health will lead to Alzheimer's indefinitely is premature, as scientists are in their early stages of research, gum disease cannot be ruled out as a risk factor. ⁴ Moreover, the link between maintaining healthy teeth and Alzheimer's is reciprocal; the development in this type of dementia often leads to patients neglecting oral care. It is vital to recognise that for those diagnosed with Alzheimer's, visiting a dentist can be frustrating, confusing and uncomfortable. For dentists, it is imperative to maintain resilience in treating these patients to ensure their dementia is not having an adverse effect on their teeth.

As dentistry is heavily focused on preventative measures, to reduce the risk of developing dental complications, practicing positive oral care is a major focal point.



Suffering from Alzheimer's can often mean daily tasks are more challenging, as recalling how to perform these activities is onerous. To ensure diseases, such as periodontitis, does not progress, consistent reminders to brush teeth twice a day as well as frequent appointments with the dentist are required.

Whilst the nature of Alzheimer's is yet to be completely determined, there are various ways in which data can influence our behaviour in attempt to reduce developing this form of dementia. Through scientific research, figures suggest a likely connection between *P. gingivalis*, which arises from inadequate dental care, and the maturing of Alzheimer's.

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-Interview with a Dentist-

We were able to virtually interview a Dr Abir, a dentist who has had experience working both with the NHS and privately, in order to gain a real insight into what working as a dentist in the UK is like.

Q- What is the best thing about being a dentist?

A- The best thing about being a dentist is helping people to improve oral health by educating them, not just treating them and also directly relieving any dental pain they might have. It's very important to provide people with a smile they are happy and confident with and being able to provide them with this, is always such a great feeling.

Q- What are the main challenges of dentistry?

A- The main challenge dentists face is that patients may have fear and anxiety (dental phobia). Dentists must work to help patients feel comfortable during the appointment, put them at ease and explain the procedure and the plan with sufficient detail. Dental phobia is actually more common than some might think, and it's important to listen to those affected, empathise with them and build trust and confidence.

Q- What was dental school like?

A- Dental school was a great atmosphere to help and prepare us to achieve the knowledge and skills to be a good dentist. It was full of not only academic training, but also hands on training, which was especially very fun.

Q- What do you think are some important skills a good quality dentist must have?

A- In my opinion, the best quality a dentist should have is passion for helping their patients, which displays in their work. You must love what you are doing to be able to deliver it well. Alongside this, dentists must keep up to date with the latest techniques and treatment to be able to provide the best care for the patient. Also, effective communication skills are key, not just with patients, but also the other members of the dental team, like the dental nurse, in order to provide the best care- it is a skill that improves through experience and practise.



OUR

Healthcare

System

Nursing: A Glimpse into the Heart of Healthcare



Nurses are invaluable healthcare professionals, who play an irreplaceable role in the everyday functioning of the NHS. Nursing is the UK's largest healthcare profession with around 360,000 nurses in the NHS (almost 3 times the number of doctors).

Nurses have a multifaceted role as holistic caregivers, patient advocates, specialists, and researchers. As caregivers, they are responsible for managing the patient's physical needs (e.g., administering medication, ensuring the patient is comfortable, recording detailed medical histories, monitoring vitals). On top of this, nurses are often the first people to notice when there is a problem with a patient. Due to this, nurses must be well equipped with patient treatment plans and be able to think critically enough to respond quickly to emergency situations.

As patient advocates, nurses provide emotional support to patients and their families and explain treatment options to patients (patient education). Additionally, nurses support their medical, human, and legal rights since many sick patients are unable to comprehend their own medical situations to act accordingly. Nurses are typically most familiar with their patients since they monitor them on an ongoing basis. Thus, they are crucial when collaborating with physicians or other medical team members to create patient treatment plans.

Since 2010, NHS nurse salaries have dropped by 10% in relation to inflation. Low pay is driving "chronic understaffing" that puts patients at risk and leaves nursing staff overworked, underpaid, and undervalued. On top of this, the effects of the pandemic have caused nurses more stress and to feel less satisfied with their work-performance and well-being. Between 2018 and 2022, nearly 43,000 people left the Nursing and Midwifery Council (NMC) register. This is exacerbating the staffing crisis, creating a detrimental cycle to the welfare of both nurses and patients.

In December 2022, the first of the nurses' strikes against unfair pay and unsafe staffing took place. In March the government responded by offering a 5% pay raise for all NHS staff (except doctors). While 11 NHS Unions accepted this offer, the RCN (Royal College of Nursing), who originally sought a 15% pay rise, rejected this, warning that they would continue to pursue strike action. In Scotland, members of RCN and the Royal College of



Midwives voted to accept a pay offer of 6.5% for this year from the Scottish government. That is on top of a 7.5% pay rise planned for 2022-23, meaning staff will see pay increase by 13-14% over two years.

For the first time, the 24-hour walkout on 30 April 2023 involved NHS nurses across all departments. Every hospital was guaranteed a minimum level of cover for intensive care and trauma as the RCN must abide by trade union rules to ensure life-preserving care can be provided during a walkout. However, the strikes are increasing waiting times for patients, affecting staff burnout, morale and wards are seeing increasing aggression from patients. Amidst this, the head of the RCN, Pat Cullen reminds that 'Patients are not dying because nurses are striking, nurses are striking because patients are dying'.

After rejecting the government's deal, a postal ballot must be held between 1st and 21st June, for NMC members to vote on whether to continue to pursue strike action.

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Current Issues Facing the NHS

AN AGEING POPULATION

There are currently 3.2 million people over the age of 80 living in the UK, expected to rise to 8 million by 2050.

Although a larger average life expectancy may seem like a positive outcome for the NHS, this inadvertently creates a burden on the healthcare system, which must fund the treatment of more chronic diseases, disabilities, and injuries of the elderly population. Funding can be high due to demand for complex social needs and assistance with everyday activities, as well as treatment.

The average age of people admitted to hospital acutely is over 70 and people over 80 occupy a quarter of bed days in English hospitals. This is exacerbated by social care cuts, meaning older people are more likely to experience delay in transfer to other health or social care settings (known as 'bed blocking'). Cuts in social care also mean elderly (especially Alzheimer's patients) are less protected from falls, dehydration, and infections, leading to more pressure on A&E.

What must be done?

To combat this, the government must increase public health education and support around alcohol and smoking, better nutrition, and improved physical health and fitness. By reducing risk factors for cancer, dementia, heart disease, type 2 diabetes etc., the government aims to increase our Healthy Life Expectancy (years spent with good health- currently an average of around 63 years), thus decreasing the burden that these diseases place on the NHS.



Most importantly, there needs to be increased spending on adult social care and improved support for people living with disabilities and long-term conditions. This in turn will allow faster discharges, lightening the load on hospital beds, thus reducing the pressure on A&E.

STAFF SHORTAGES

Staff shortages have been a serious issue in the NHS for over a decade, with pay freezes and salaries not keeping up with inflation and have only recently come into the spotlight with the cost of living crisis and effects of the coronavirus pandemic. It is estimated that by 2030, there will be 250,000 unfilled posts across the NHS.

The impact of staff shortages is colossal, resulting in an increased workload and pressure on the remaining staff who are stretched further and further, which is not good for the staff or the patients. This staff burnout leads to more errors and thus higher mortality rates, higher failure to rescue rates and patient dissatisfaction.

The impact of job stress is great on staff too, with many nurses admitting to feeling like they have 'failed' their patients because staff shortages and workplace demands mean there is no time for basic care. Understaffing also becomes a security issue, with increased risk of violence and aggression on the wards.



What can be done?

To address chronic staff shortages, the NHS has called for the government to double the number of Medical School places by 2030. There are also plans to double the number of adult nurse training places by 2031, with around 24,000 more nurse and midwife training places a year. The government has proposed to train thousands of new doctors on-the-job as apprentices. This will require funding. However, their introduction into the NHS is controversial among some physicians, who point out the limited job progression and limited autonomy that these associates can have.

In addition to training more staff, increased funding could also be used to improve NHS staff retention rates, which are falling due to staff burnout, heavy workloads and an unsupportive work environment. As more staff decide to leave the NHS, this leaves even more pressure on existing staff. While funding can help through pay rises and improving working conditions, flexible working, career opportunities, wider benefits and improved terms to the NHS pension scheme will also play a role in retaining staff. What's more, the NHS needs emphasis on leaders who practise collective, compassionate, and inclusive leadership as well as supportive team working that values staff and meets their core work needs.

Other pathways can also be explored, such as finding more efficient ways to hire from abroad (still following an ethical code of practice), making more of the skills of existing staff (e.g., clinical skills in pharmacy profession are widely considered underused) and making better use of the volunteer sector.

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What Role should Technology have in a Healthy Society?

Technological advancements have fundamentally changed healthcare and have been a driving force for innovation and the core factor for breakthroughs. The contemporary yet pivotal role that innovation, digital healthcare and technology play in the quality and sustainability of health and social care. The global health landscape is rapidly evolving. This is due to shifts in the types of health conditions faced. While low-income countries still suffer greatly from infectious diseases, with increasing global wealth, sanitation standards, and scientific advances in healthcare and drug discovery, the global disease burden is shifting from communicable to non-communicable diseases. With this changing landscape, healthcare systems will inevitably need to adapt to this new set of challenges. Obstacles such as the global shortfall of doctors, nurses and other health workers are set to grow to 12.9 million by 2035, and huge inequities in the distribution of health workers still exist between and within countries. Dynamical contemporary challenges of climate change, disruption to supplies of food and water, mass migration, changes in diet and lifestyle, and numerous other trends, will create serious and novel challenges for health systems at every level. It is thus the case that digital technology fills the role of fundamentally assisting health providers to respond to such developments. Digital technology is being used to date in all forms, from; mobile health apps and electronic health records to remote consultations. Whilst many more are being researched, developed, tweaked and used at a smaller scale, in diverse areas including diagnostics, robot-assisted surgery, decision support for clinicians, and outbreak prediction.

The surge of wearable technologies and such wearables have seen a surge in popularity. The Covid-19 pandemic has accelerated this growth and, in turn, there has been a surge in fitness trends at home, as well as an emphasis on developing a more connected healthcare

system capable of with an emphasis placed on continuous monitoring. GlobalData projects

that the wearable technology market will increase from its value of \$59bn in 2020 to \$156bn by 2024 (Medical Device Network, 2023), with a compound annual growth rate (CAGR) of 24.6%. Atrial fibrillation causes a quarter of more than 100,000 strokes in Britain each year. Most of those would never happen if the heart arrhythmia were treated, but the first point of importance is detection. It is important to note that such tests are costly and largely inaccurate, but new technologies such as Apple Watches, and soon Fitbits, can detect it, are far cheaper and more importantly can save those whose lives are in danger. "Wearables" can record over 7,500 physiological and behavioural variables and whilst the industry and wearable technologies are still in their youth these product disruptors aim to provide three integral properties: "early diagnosis, personalised treatment and the management of chronic disease". Which all in turn have the potential to save lives through these low-cost technologies.

Early detection is made possible through sensors that can detect subtle changes. For instance, if an elderly person's balance is compromised and gait and arm swing change; it could reveal early-stage Parkinson's. Alternatively, a smart ring can help a woman conceive, by predicting her menstrual cycle and can also thus detect pregnancy. This can result in less critical stages of disease emerging when it becomes terminal or inoperable and provides a cheap solution.

Through algorithms, reams of data from wearables are into bespoke prescriptions and diet plans. We know that 80% of cardiovascular deaths are preventable with lifestyle changes, and physical activity is one of the most powerful ways that we can do that. Through the use of apps and motivating tactics, wearable technology could induce even small increases in exercise. For instance, adding 1,000 steps (0.7km) a day reduces mortality by 6-36% depending on how

sedentary you are. Further, the continuous monitoring that wearable provides can transfer care from doctors to self-monitoring, thus increasing efficiency.

Digital health & health tech can revolutionise and has great potential to strengthen healthcare provision for the most vulnerable, namely those in LICs. The proportion of the population that uses the internet is much greater in high-income countries (80.9% in Europe compared to 24.4% in Africa) (Chowdhury and Pick, 2019). However, access to LICs is rising rapidly. The ITU reports that, in ‘developing’ countries, the proportion of internet users increased from 7.7% in 2005 to 45.3% at the end of 2018. Of all ITU regions, the fastest growth was documented in Africa, where the proportion grew from 2.1% in 2005 to 24.4% in 2018. Skye Gilbert, Executive Director of Digital Square notes “ ‘Digital tools are ultimately accelerants... the biggest risk of digital health is that, rather than accelerating movement towards equity, it instead accelerates movement toward disparity’”. It was estimated by The World Health Organization (WHO) that there is a shortage of about 7.2 million healthcare workers. Forecasts show that this is expected to rise to about 12.9 million globally by 2035. LICs face a huge shortage of trained, accessible and equitably distributed health workers. From data reported by governments between 2007 and 2016, 76 countries have less than one physician per 1,000 population, and 87 countries have less than three nurses or midwives per 1,000 population. Extreme demand for doctors and nurses can be relieved through technology.

Temie Giwa-Tubosun, the health entrepreneur, set up Lifebank, a data and tech-driven platform that connected hospitals to blood in minutes, operating in Nigeria, Kenya and Ethiopia (The Economist, 2022) . She was inspired by the experiences of African women dying from postpartum haemorrhages. That is because women often lack access to safe blood delivered quickly to hospitals. Lifebank has undergone expansion of its mission and has built a safe supply system for oxygen, medical consumables such as gloves, syringes and catheters, and other equipment. Through a central marketplace platform, these products can be accessed so that women have access to

high-quality supplies that support pre- and post-delivery care.

By capitalising on the pre-existing infrastructures of the country and implementing realistic change health technology can be used everywhere. For instance, the increase in phone subscriptions in developing countries has been an element that medical call centres have capitalised on. Patients speak to an operator with basic clinical training, who is supported by an AI decision-making system (FT, 2020). The call is categorised depending on the urgency and severity and directed to a relevant facility or recommended basic treatments of medications that can be used. This approach was acquired by Babylon Health, a digital-first health service provider that combines an artificial intelligence-powered platform with virtual clinical operations for patients, in Rwanda, in partnership with the government. Babylon’s call centres in Kigali deal with 3,000 patients a day, and while its workers are based in the capital, 70 percent of its users are outside the city. Tracey McNeil, Babylon’s vice-president of clinical governance, says healthcare capacity has been increased by “shifting to triage being done by machine learning, by chatbots”. This modern solution to countries facing low doctor-to-patient ratios can be adopted not only in LICs but also modified for pressurised healthcare systems across the globe.

The digital revolution has the potential to vastly enhance healthcare systems, making them more efficient while delivering better quality and reducing response times for patients. The NHS Long Term plan (NHS,2019) aims to utilise the digital data captured to reduce staff’s administrative burden. The NHS Long Term Plan also describes how technology can be time efficient for patients through digital-first primary care. This will give every patient the right to choose remote care online or by telephone and through a streamlined service for specialist advice further supported by technology. The Local Government Associations describe how increased utilisation of data analytics can significantly decrease spending by predicting outcomes and taking early interventions. Technology reforms healthcare into an ecosystem, powered by optimised workflows,

data informatics, and intuitive technology. It gives healthcare providers a more holistic and impactful view of the patient's journey. By integrating operations and applying automation, artificial intelligence (AI), and clinical expertise at critical junctures in the workflow, healthcare leaders can enable their clinicians with a more streamlined path to a confident diagnosis and provide greater value to patients.

Optimised workflows can help provide a clear care pathway and predictable outcomes for patients. This helps healthcare leaders drive greater operational efficiency and clinical confidence. In the United States, for example, the length of the average hospital stay has decreased by 33% thanks to the introduction of clinical process management. Cloud computing is the delivery of on-demand availability computing services, including servers, storage, databases, networking, software, analytics, and intelligence. Its assets lie in data storage and computing power, without direct active management by the user. Cloud computing through companies like Microsoft is becoming common in healthcare (Kerv,2022) as it facilitates interoperability so well and thus reduces overheads and operational costs, provides demonstrably better services and improves general processes, making them faster and more efficient. This allows for patient records to be stored safely within the cloud, allowing all

departments to access the records and is one of the safest ways to store data, with extensive security that automatically backs up data to prevent any losses.

In the modern age, the absence of technology seems otherworldly and perhaps a dystopia. From automated IV pumps to portable monitors to MRIs technology fills a void in healthcare providing enhanced treatment and detection. Touch of button information reduces administration time provides the fundamentals of the efficient systems within the healthcare system. The old school mentality of technology "creating admin" is being completely eradicated and substituted with time save solutions. Large scale information sharing is resulting in ground breaking discoveries, showing patterns and trends and is the ammunition for the future and present to combat illness and disease.

On balance, technology is at the forefront of streamlining every procedure. It has the potential to provide unique realistic solutions to the problems faced by those in LICs and provides a catalyst for optimised workflows, and efficacy within the healthcare system and has the potential to strengthen the healthcare provision. Its uses in the future will far exceed our expectations as technology will and has revolutionised healthcare.

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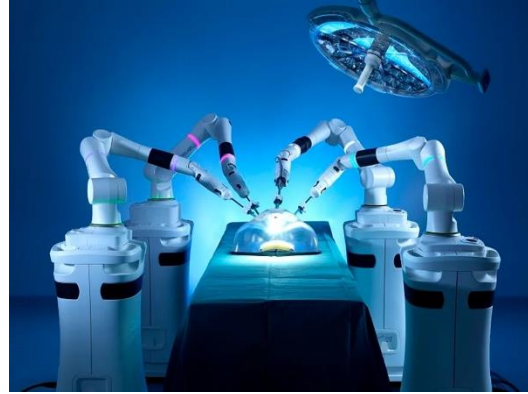
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The Vital Role of Artificial Intelligence in Healthcare

In recent years, artificial intelligence (AI) has paved the way for many revolutionary treatment techniques and processes, allowing for a more effective and equitable healthcare system in the UK. As further research and testing on it continues, there will be undoubtedly more discoveries and inventions in the future. From robot-assisted surgeries to diagnostic systems, artificial intelligence has become an increasingly prevalent element of healthcare but why is this the case?



Artificial intelligence is the simulation of human intelligence processes carried out by machines. In the instance of healthcare, specialised software can analyse human cognition to find the relation between different treatments and their consequent medical outcomes. This makes the diagnosis of patients more efficient, as it can take more data into account than humans, so the correct diagnosis can be provided before the symptoms arise.

For example, the NHS has utilised HeartFlow's AI technology, which analyses the computerised tomography (CT) scans of patients, who may potentially have coronary heart disease. A personalised 3D model displaying the blood flow around it is then subsequently created, enabling doctors to locate where the blood flow may be disrupted by blockages. This process is an alternative to the standard angiogram procedure, which locates restricted blood flow by inserting dye into the heart. However, HeartFlow's AI analysis is much less intensive and costly (up to 4 times cheaper,) further demonstrating the efficiency of AI in healthcare.

Another aspect in which AI has become incorporated into medicine is in improving customer satisfaction. A major issue patients often raise with hospitals is the low standard of client service. Staff shortages in the NHS and social care sectors often mean that the biggest challenge of healthcare is the deficit of time, which may lead to poor communication between the healthcare providers and the patients. AI helps to resolve this issue by improving patient experiences. For example, platforms for automotive appointment systems and real-time health status monitoring are widely accessible in many hospitals, which minimises waiting times for patients and improves convenience, therefore reducing frustration. Additionally, there are also chatbots and virtual assistants which can monitor medication adherence and guide them through personalised treatment programmes. However, there are concerns that come with the use of AI in this aspect, such as privacy and confidentiality, as the patient's data must be protected from breaches and leaks. Provided that the patient's data is securely stored, the utilisation of AI for improving customer experience provides many benefits, such as boosting patient engagement, and makes it worth investigating for many healthcare organisations.

In summary, AI is rapidly evolving and has continued to lead to more major advancements in healthcare. It has contributed to the increased efficacy of treatments, expedited waiting times for patients and improved their engagement with healthcare services. However, this powerful invention brings some challenges along with it, such as the ethical use of patients' data; health data is extremely personal and private to them, and they will naturally be skeptical about placing their trust in a machine. This means that hospitals must proceed carefully with how they will choose to implement AI into their medical practices. Given that healthcare organisations remain logical and ethical, the AI-enabled future of medicine is extremely hopeful.



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What is the Role of Médecins Sans Frontières?

A group of young French doctors went to work in a Red Cross hospital in Biafra (a Nigerian state) in 1968. Upon arrival they were absolutely appalled at what they were witnessing- thousands of children dying from malnutrition and believed that what they were watching was genocide. Whilst the Red Cross demands the utmost discretion from its volunteers, these French Doctors could not remain silent and so ripped the



Red Cross armbands from themselves and later organized a committee to raise awareness of the genocide. Simultaneously in France a Paris medical publisher was looking for a group of doctors to volunteer to help those affected by earthquakes and floods. The French Doctors and this medical publisher merged in 1971 to create Médecins Sans Frontières also known as Doctors without Borders. 52 years later the organization is the largest independent medical humanitarian organization with over 64,000 staff working across 72 countries. It must be noted that there is a difference between humanitarian and human rights organizations. Whilst both uphold international laws such as the Geneva Convention, human right organizations tend to be more activist and humanitarian agencies must remain neutral and detach themselves from the situation i.e., genocides.

In 2014, MSF launched one of the largest emergency operations in its history in response to the Ebola outbreak in West Africa which killed over 40,000 woman, children, and men. Ebola is the term for a group of deadly diseases in people caused by four ebolaviruses within the



genus Ebolavirus. The symptoms range from headaches, diarrhoea, and joint aches to bleeding from the eyes, ears, mouth, and nose. MSF emergency team set up Ebola treatment centres and set up contract- tracing systems whilst also providing psychological support for the community.

MSF carries its relief work usually in refugee camps because it provides the ideal conditions for all manner of pestilence such as

chorea. Some of the challenges MSF doctors and nurses face is seen within immunization programs where in places such as Afghanistan the workers must convince the population that these vaccines would help them and to overcome the superstitions they have. Another challenge that the organization faces is that it rejects funding from governments due to stance in remaining neutral and so the organization relies on private donations for its funding. One of the most frustrating moments for the workers is that sometimes patients are dying because MSF cannot afford the treatments – ‘the market is still failing to provide lifesaving affordable medicines for people in developing countries’ states one worker whilst another doctor stated ‘lives over profits.



The doctors, nurses and volunteers find physical risk accompanies them in whatever country they are working in. From Taliban ambushing and attacking an MSF Land Cruiser in 2004, killing five aid workers to Stephanie, a nurse who was shot five-time times in Somali whilst treating a severely malnourished 2-year-old girl. However, working for MSF is a rewarding yet challenging job but to be part of an organization that delivers medical care to people affected by armed conflicts, epidemics, natural disasters, and exclusion from healthcare- saving and changing lives for the better is a privilege.

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The image features a futuristic medical theme. A robotic hand, rendered in dark grey with glowing blue and green lights on its joints, holds a surgical instrument. The background is a vibrant blue, filled with glowing white lines that form a network or molecular structure. A prominent DNA double helix is visible on the right side. The overall aesthetic is high-tech and scientific.

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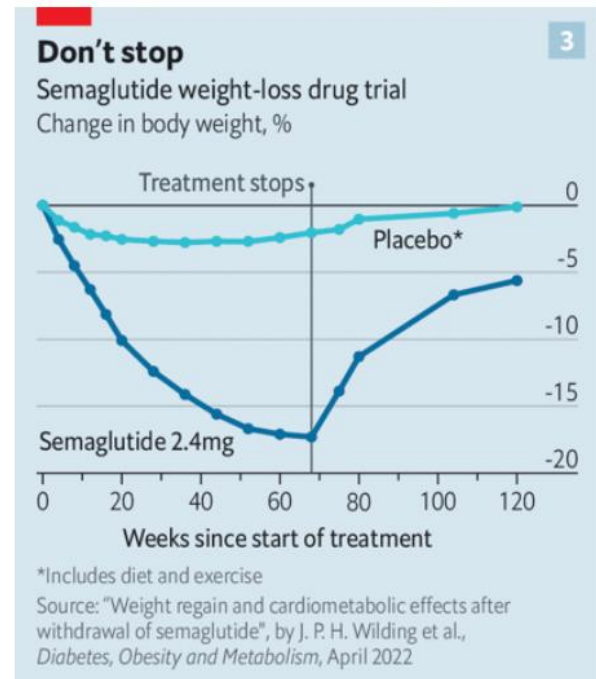
Medicine

The End of Obesity is Here

The pervasive demand and desire for an ideal body evident in today's society has led to the normalisation of beautification and enhancement treatments. Such is the case with a new generation of weight loss drugs, providing a simple solution to treat obesity which is widely being accepted as a chronic disease. Obesity is defined as the abnormal or excessive fat accumulation that may impair health and is fundamentally caused by an energy imbalance between calories consumed and calories expended. Excess weight is not simply a matter of appearance and is associated with grave health risks, making you more likely to have high blood pressure and abnormal cholesterol levels, which are risk factors for heart disease, strokes and 13 cancers. However, new weight loss drugs could help see the end for obesity, providing a new and powerful option to melt away the fat and reduce the likelihood of adopting these diseases.

In 2016, more than 1.9 billion adults, 18 years and older, were overweight. Of these over 650 million were obese. (WHO, 2019) In a report to be published on March 3rd, to mark World Obesity Day, the federation projects that 4bn people, half of everyone over five, are likely to be overweight or obese by 2035. (The Economist, 2023) The report predicts that the annual cost attributed to this pressing issue will reach \$4trn in 2035, of 2.9% of global GDP, both of spending on health care and of working time lost to illness and premature deaths. However, obesity is not just a first-world problem, it is a global health issue. More than 42 million children under the age of five are considered overweight, with 83% of those children living in developing countries. According to the World Health Organization, "the number of overweight children in Africa has almost doubled in the past 20 years." (Kline, 2013) Steep healthcare costs in these countries can thus wear on their economic growth.

Semaglutide, developed by Novo Nordisk, a Danish pharmaceutical firm, has been shown



The Economist

in clinical trials to lead to weight loss of about 15% and is being sold under the brand name Wegovy in America, Denmark and Norway and will soon be available in other countries. Britain's National Health Service has been reviewing the drug; it seems likely to make it available soon, but only to the most obese patients through specialised clinics. A lower-dose version; Ozempic, is a diabetes drug that is also being used "off label" for weight loss. Both medications are self-administered once a week with an autoinjector. Ozempic and Wegovy are glucagon-like peptide-1 or GLP-1 agonists. GLP-1 can cause you to feel full, so it increases early satiety by slowing gastric emptying. This slows the rate of food moving from your stomach into your small intestines. By doing this, the rate of absorption of nutrients into the bloodstream is slowed, including glucose, which may reduce your food intake. Incretins, the naturally occurring hormone that GLP 1 stimulates also impact the hypothalamus, a part of the brain that controls hunger signals, reducing hunger and cravings.

Due to the way semaglutide affects the stomach, gastrointestinal side effects such as

nausea and vomiting are possible. A more critical drawback is that users are likely to be dependent on them for life. Once a patient discontinues semaglutide use, weight that has been lost can return. In the first year after stopping a 2.4mg dose of semaglutide, people regain two-thirds of the weight they lost. (The Economist, 2023) Additionally, as a result of the widespread presence of GLP-1 receptors, several adverse effects have been observed, of which pancreatitis, pancreatic cancer and thyroid cancer were initially flagged as safety alerts, after the drugs were tested on animals.

Whilst Wegovy is currently the only weekly GLP-1 treatment approved for weight loss, there is competition within the pharmaceutical industry as rival drugs such as Eli Lilly are in the process of being approved and others are being developed that may result in more substantial differences in weight loss and fewer side effects.

These new weight loss drugs represent a turning point in the world's fight against flab and provides new hope for against the growing global epidemic of obesity. However, ultimately more action is required to address this issue if governments want to spend less on medication and surgery. It is pivotal that emphasis is placed on prevention rather than reversal through encouraging other anti-obesity measures, such as exercise, healthy eating and better food labelling, which may help tackle the problem from the root.

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Is there a Link Between Insomnia and Intelligence?

What is insomnia?

First, it is important to understand what Insomnia actually is, before delving in further. Insomnia is a sleep disorder which makes it difficult to fall asleep, sleep in a regular schedule or can disable one to sleep again after waking up (1). As sleep is vital for successful brain function and to ensure high energy levels are sustained, having insomnia has a significant impact on day-to-day life. Some individuals experience acute insomnia which tends to last a few days to a week's whereas the very serious condition of it is chronic insomnia: lasting for a month or more.

What are the symptoms of Insomnia?

Insomnia is caused by many symptoms including:

- **Travel:** When travelling to different time zones, sleep can heavily be affected. The body's signals, cycles and metabolism are regulated by the Circadian rhythm. Irregularity in these rhythms can lead to things like insomnia.
- **Mental disorders:** Depression and anxiety disorders such as post-traumatic stress disorder can cause individuals to not be able to fall asleep and can therefore act as a further trigger to more critical mental health conditions.
- **Stress:** Some very nerving events that occur in the individual's life such as losing a loved one and very important exams can cause a constantly active mind which does not allow the brain to shut down and sleep.



Intelligence and Insomnia:

There have been many occasions where researchers have found a connection between insomnia and increased brain activity or intelligence. John Hopkins researchers have cited through a research trial that those with sleep disorders have increased plasticity in the brain (2). Plasticity is the ability of the nervous system to change its activity in response to intrinsic or extrinsic stimuli by reorganising its structure (3). The study was undertaken by members of the Department of Psychiatry and Behavioural Sciences who used transcranial magnetic stimulation (TMS) to safely stimulate electromagnetic signals to the targeted area of the brain to disrupt function. The scientists sent 65 signals into the brain and spent time making participants move their thumbs in an opposite direction to the natural way. The idea of this study was to find out to what extent the brain could move the thumb in the involuntary direction after the signals. The more the thumb could move in the involuntary direction, the more the motor cortex of the brain can be identified as 'plastic'. Surprisingly, the individuals with chronic insomnia had increased plasticity.

There have also been many links between high IQ's (intelligence quotient) of a person. IQ tests are tools which help to measure intellectual abilities which reflect reasoning and logic. (4) When a person has to sleep, the neurotransmitters become 'excited' and therefore respond to all stimuli, not allowing them to sleep normally. Psychology Today reported that intelligent people are likely to be nocturnal (those who do not sleep through the night) beings, with those with a higher IQ going to bed later on both weeknights and weekends. Some evidence suggests that high IQ is associated with sleeping very late. However, it is unclear whether the relationship between IQ and later sleep is due to biological or social effects, such as the timing of working hours. (5) All data seems to conclude that there is no definitive causal link, but with more advanced research and a further focused look in the future, there will be definite data found.

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What is Alzheimer's and Why is it so Hard to Cure?

Alzheimer's is a rigorous brain disorder which starts to deteriorate the brain function including: memory, thinking skills and cognitive aspects.

(1) It is estimated that around 50 million people in the world are living with this disease. There are typically two types of Alzheimer's: (2)

- Common Ageing Alzheimer's- This is the more common form of the disorder and comes with age. Individuals usually are in their 60s.
- Genetic Alzheimer's- This is the more rare form of the disorder which is usually inherited through having the specific genes that contribute to the disease. Individuals usually start to show symptoms earlier on in their 30s. Around 5-10% of people diagnosed with Alzheimer's are under the age of 65. (3)

What Causes Alzheimer's?

There haven't been exact and definitive research to prove what exactly happens to cause Alzheimer's however there are vaguer explanations. (4) The main cause of the disease is due to excessive proteins being synthesised around the brain. Naturally with age, this tends to happen however it has been noted that excessive protein synthesis has been spotted in Alzheimer's patients. The most significant protein that is produced is called amyloid which deposits plaque around the brain cells, which can be detrimental for brain function. The other protein produced is called tau and this specific protein forms tangles within the brain cells. The more cells that begin to deplete in functionality, there is a registered decrease in neurotransmitters which send chemical messages and signals. Specifically, there is one neurotransmitter, acetylcholine, is detected to be very low in the brains of those affected with the disease. Generally over time, the brain starts to shrink and therefore loses its ability to store memories.

What is the Treatment and Cure for Alzheimer's?

There is no official cure for Alzheimer's yet, due to a number of varied reasons. First of all, the research for the treatment of the disease is severely underfunded and falls behind the more prominent diseases, cancer, cardiovascular disease and more recently COVID-19. (3) Thus, this means it does not receive the money and resources to divulge into finding a cure and running more research trials. Furthermore, the disorder is one that affects the brain which is one of the most complex, intricate and delicate organs in the body and has proven to be difficult to understand in scientific history. Additional theories suggest that Alzheimer's is rather a collection of different diseases, not just one, which means the medicines needed to be made require lots of time and money due to the long and extensive trials needed to be undertaken.

However, there are some drugs that can be given to those with mild symptoms such as cholinesterase inhibitors. (6) This is to help with the increase of acetylcholine (the neurotransmitter chemical in the brain) which in turn helps to increase the rate that signals are sent around. The main three inhibitors are: donepezil, rivastigmine, galantamine. This is definitely not a cure because it does not prevent the progression of the disease, it merely helps the patient go about their daily activities with a little more relief.

Overall, Alzheimer's is an impactful disease, most affecting those who are economically challenged. The mental and physiological stresses for the individual and the family are immense, especially when dealing with a disease that does not have a clear cure in the near future. Looking further, it is evident that more funding and support for the research of this disease could be extremely advantageous for the development of possible cures.

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The Future of mRNA Vaccinology

Involved in the core biological process of protein synthesis, mRNA is a necessary component of the human body, which has been researched by scientists for decades to investigate its delivery into cells. The investment into this research, combined with evolving technology has allowed mRNA to become a promising tool in vaccine development. mRNA vaccines protect the body against a virus by instructing the body to encode the viral protein, which subsequently triggers an immune response. They have major benefits compared to the traditional attenuated-virus vaccine, such as the quicker manufacturing process and safer administration. Moreover, these vaccines experienced their first breakthrough during the covid pandemic, where mRNA vaccines such as PfizerBioNTech and Moderna were administered to the population to achieve herd immunity against the coronavirus. Published safety and efficacy trials reported efficacy rates of approximately 94-95% after two doses, with few side effects and a low occurrence of adverse reactions. This incredible breakthrough has led scientists and the UK government to attempt to discover new, innovative methods to utilise mRNA technology for the treatment and prevention of diseases but what are some of the courses of action they have planned to take?

In 2022, the UK government and the pharmaceutical company Moderna entered a 10-year partnership, where Moderna committed to investing in research and development (R&D) activities based in the UK, as well as providing grants for universities, PhD places and research programmes. A new Innovation and Technology Centre in the UK is also in the works, which will create over 150 specialised jobs and have the



capacity to create up to 250 million vaccines annually in the instance of an unprecedented pandemic. This new manufacturing centre will ensure access to covid-19 vaccines, in addition to the development of effective mRNA vaccines for a variety of respiratory illnesses such as the respiratory syncytial virus (RSV). Once the technology centre is fully operational, it is expected to provide access to a domestically-produced portfolio of future mRNA vaccines that have been developed. By establishing this deal, Moderna aims to set up a global clinical trials base, which will endorse the UK as a science superpower and significantly boost the country's economy. Furthermore, a benefit of this collaboration is that NHS patients will be eligible to receive the manufactured mRNA vaccines, which is a crucial advancement of the UK's healthcare system. Therefore, the partnership between the UK government and Moderna is a significant step for the future of mRNA vaccinology as there is now substantial funding and more specialised resources to carry out research and clinical trials for its development.

Additionally, the UK government made another collaboration with the German biotechnology company BioNTech in early 2023 to test mRNA vaccines against cancer

and other illnesses. They intend to expedite the development of immunotherapies and vaccines by utilising technologies that have been researched for decades. Cancer patients in England will have early access to trials, which will be centred around personalised mRNA therapies and BioNTech is aiming to deliver approximately 10,000 therapies to these patients from September 2023 to 2030. Furthermore, University Hospitals Birmingham NHS Foundation Trust (UHB) is going to be the first site in the UK to carry out the BioNTech trials for specifically colorectal cancer, which is the 4th most common cancer in the UK. They intend to recruit patients who are at stage II and stage III, and therefore, cannot be offered standard-of-care treatment following surgery. Participants are chosen randomly to be administered the study treatment and will receive 15 treatments over a year and be followed up for at least 3 years. This trial also involves an informed consenting process and regular checkups where biomarkers and all reported outcomes are compiled and analysed, which ensures the safety of the patients during trial participation. These BioNTech cancer trials are vital in the future of mRNA vaccinology as there is the potential of developing effective mRNA cancer vaccines, which would not only be a massive breakthrough in medicine but also would provide hope for patients with this diagnosis.

In summary, mRNA technology is very promising in the field of vaccinology due to its rapid production and safe administration. They could play a significant role in the treatment of a wide array of illnesses such as cancers and respiratory diseases. Through increased long-term collaborations between the UK and worldwide biotechnological companies, more funding and resources can be directed towards the development of new transformative mRNA vaccines, thus potentially changing lives and evolving the healthcare of the UK.

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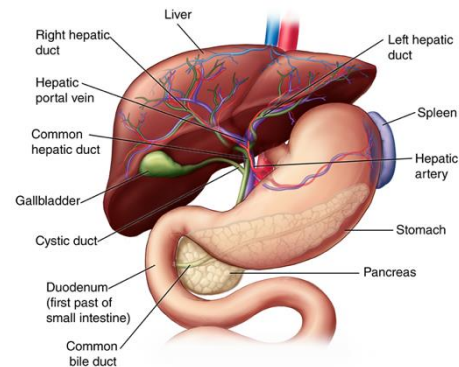
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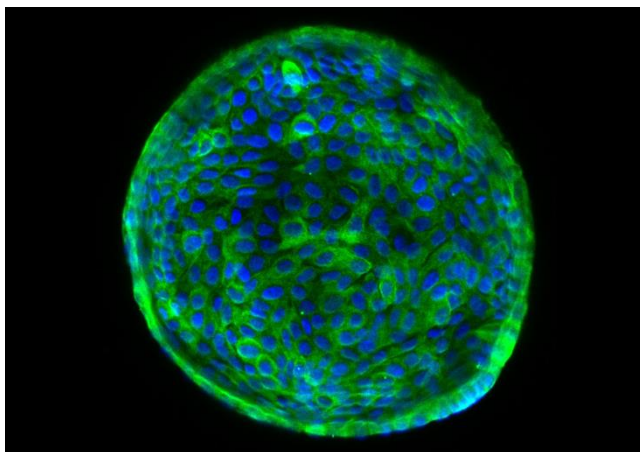
Repairing Damaged Donor Livers Using Lab Grown Tissues

There is currently a shortage of liver donors in the UK. According to the NHS, the average waiting time for a liver transplant is 135 days for adults and 73 days for children. Even if a liver is found it may be unsuitable for transplant because of the organ sustaining damage, meaning only a limited number of patients end up benefiting from a transplant. One cause of liver damage is a disease known as primary sclerosing cholangitis, where the bile ducts become inflamed and then scar tissue forms, narrowing and hardening the ducts. The resulting bile build up damages the liver tissue and there currently is no cure. This disorder and other bile duct diseases are responsible for 70% of liver transplants in children and about $\frac{1}{3}$ of liver transplants in adults.



Scientists have used a technique to grow bile duct organoids, (small organ-like structures grown in cultures of stem cells), in the lab and have shown that these can be used to repair damaged human livers. This research paves the way for cell therapies to treat liver diseases and restore or repair damaged organ donor livers, so that they can still be used for transplantation. These organoids have already been shown to integrate into many organs such as lungs, liver and guts in mice and can repair defects.

The research team used a technique known as single-cell RNA sequencing to learn more about the cells lining the biliary tree. They found that although duct cells differ, biliary cells from the gallbladder, which is usually spared by the disease, could be converted into the cells of bile ducts that were destroyed using a component of bile called bile acid.



Scientists grew cholangiocytes, (epithelial cells lining the bile ducts), from the gallbladder using organoids in the lab. By bathing the organoids in fluid the researchers injected these organoids into a damaged donor liver.

[Left, A human derived organoid - FOTIOS SAMPAZIOTIS, TERESA BREVINI]

When the research team exposed cholangiocyte organoids to bile acids there were higher expressions of genes, encoding proteins which would protect them from degradation. This happened no matter where the cells originally came from in the liver, indicating that their gene expression is flexible. To confirm this flexibility

the research team then transplanted these organoids into mice with damaged bile ducts. The donor cells were able to regenerate damaged tissue within the mice regardless of where they were located and mice that had the transplanted organoids survived, while the control mice of those that didn't died quickly which showed that the organoids were successfully integrated functionally.

The team demonstrated that the transplanted organoids engrafted and repaired the damaged bile ducts which allowed the liver to function properly. This new technique has shown that cell-based therapy could help restore damaged donor livers and may have the potential to fix a patient's own liver. Before surgery,

physicians have to assess a donated liver to determine whether it is suitable for transplant. About 20% of the time, a liver's bile ducts are badly damaged and the liver cannot be used for transplantation. If they could improve that damage with organoid engraftment, perhaps more organs would be available for patients who need them.

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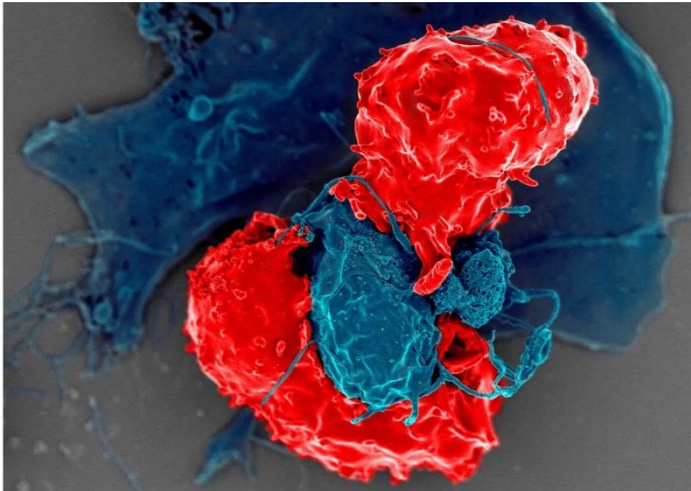
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How Gut Bacteria Influence T-Cells to Help Heal Injured Muscles



[Left : Regulatory T cell (red) interacting with an antigen-presenting cell (blue) [NIAID](#)]

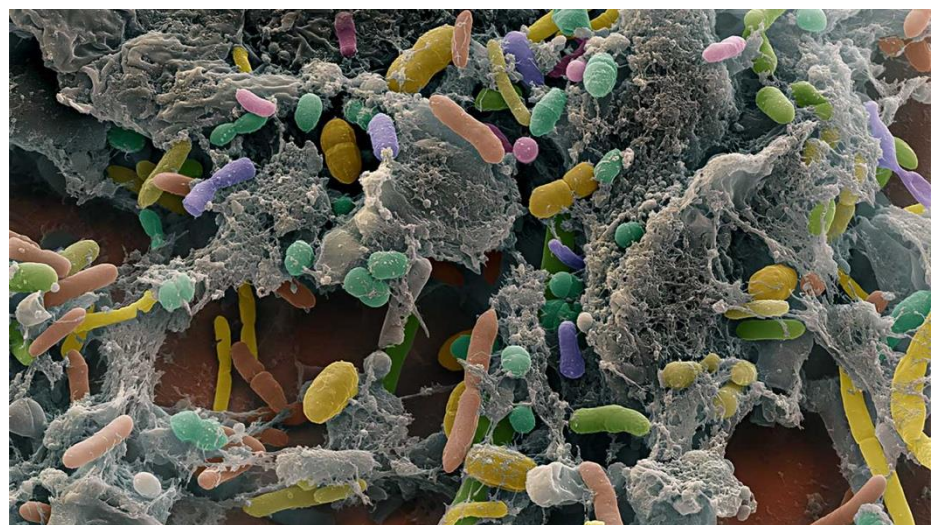
The human immune system is incredibly versatile with numerous functions, from fighting off pathogens to neutralising harmful substances. Recently, Harvard Medical Researchers have found that a type of immune cell, (regulatory T-Cells), that are produced in the gut play a role in repairing injured muscles.

Regulatory T-Cells already play an important role in maintaining gut health, such as

protecting the body from food allergens, autoimmune conditions like colitis, (inflammation of the bowels), and even colon cancer through actively controlling immune responses towards harmless dietary antigens and harmless microorganisms as well as towards invading pathogens.

However, during a routine cataloguing of various immune cells in different organs of mice, regulatory T-cells were found intermingled with muscle cells. Researchers were baffled as these colonic cells had rarely been found outside of the small and large intestines. By observing these cells through tagging them with light, they found that the cells left the guts of the mice and moved to other parts of the animals' bodies. Researchers then investigated why these cells were present in the muscles, and through genetically modifying mice to lack these specific colonic regulatory T-cells they found that these modified mice had noticeably slower muscle regeneration rates due to a higher level of inflammation in injured muscle tissue. And when the mice eventually did heal, they developed muscle scarring, or fibrosis, (a sign of poor muscle repair).

However, although this study showed that regulatory T-cells improved muscle regeneration, researchers still needed to determine if gut bacteria were responsible for fueling the production of colonic regulatory T-cells to heal muscle tissue. What they found was that when mice were fed antibiotics to deplete their beneficial gut bacteria, they had a harder time recovering from muscle injury. When their gut microbiota were restored, so was the



animals' ability to heal their muscles. These regulatory T-cells helped the muscle healing process by suppressing an inflammatory signal IL-17. Lowering this signal moderated the inflammatory response and helped stop inflammation when it was no longer needed for the healing process.

The study highlights the relationship between the gut microbes and the immune system, showing that T-cells can affect immune functions outside the gut. But beyond that, the results emphasise the importance of maintaining a healthy gut microbiota. One interesting question the study raises is the timing of antibiotic treatment in people with musculoskeletal injuries and if the drugs have potential to impede the healing response by disrupting the gut microbiota. If research continues, the results could also inform the design of new treatments using beneficial microbes to promote healing of injured skeletal muscles.

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How is Personalised Medicine Transforming Healthcare?

Personalised medicine is an emerging practice of medicine that uses an individual's genetic profile to guide decisions made in regard to the prevention, diagnosis and treatment of disease.

Traditionally medicine has been built around clinical teams specialising in a particular organ system working back from a patient's symptoms to arrive at a diagnosis. Personalised medicine takes an entirely different approach, recognising that complex diseases should no longer be considered as a single entity and one disease may have many different forms resulting from the complex interaction of our biological make-up and the diverse pathological and physiological processes in our bodies. These will not only vary between patients with the same disease but also within an individual patient as they get older and their body changes.

The human genome project was one of the most important steps in personalised medicine. Published in 2003 the sequence of the human genome allowed scientists to identify the genetic variations of thousands of diseases - an approach known as genomics. It also paved the way for fast, cheap and accurate DNA sequencing, placing genomics at the core of research and treatment efforts for various diseases.

As genomic data is analysed, clinicians can find common factors and causes of variation, resulting in the discovery of new pathways of disease, changing how diseases are thought of and treated. This allows us to recognise that the same underlying change in our DNA or genome can lead to problems in very different parts of the body, which would not have been previously identified with a more traditional care approach.



The current approach to drug development assumes all patients with a particular condition respond similarly to a given drug. All patients with the same condition receive the same first line treatment even though it may only be 30-60% effective.

Personalised medicine provides opportunities to improve how disease is treated. Based on comprehensive genomic and diagnostic characterisation, different subtypes of patients within a given condition can be identified and the treatment can be tailored to the underlying cause. The tailored treatment that matches an individual's makeup and response is more effective with fewer side effects.

Cancer is an area where this approach is already more common:

No two patient's cancers are identical and how a cancer develops is due to a complex relationship between genes and the environment. DNA sequencing offers a way to find out the inherited genes that are known to increase an individual's susceptibility to certain cancers

After cancer diagnosis, DNA sequencing of tumour biopsies can identify genetic markers for cancer, allowing doctors to direct certain anticancer treatments towards that specific abnormality. For example approximately 7% of non-small cell lung cancers (NSCLCs) are caused by a heritable mutation the the ALK gene encoding anaplastic lymphoma kinase (ALK). This discovery led to the development of ALK blockers which can be selectively prescribed to patients with ALK mutations suffering from NSCLC.

Benefits of personalised medicine:

- Prediction and prevention of disease
- More precise diagnosis
- Targeted and personalised interventions
- A more participatory role for patients

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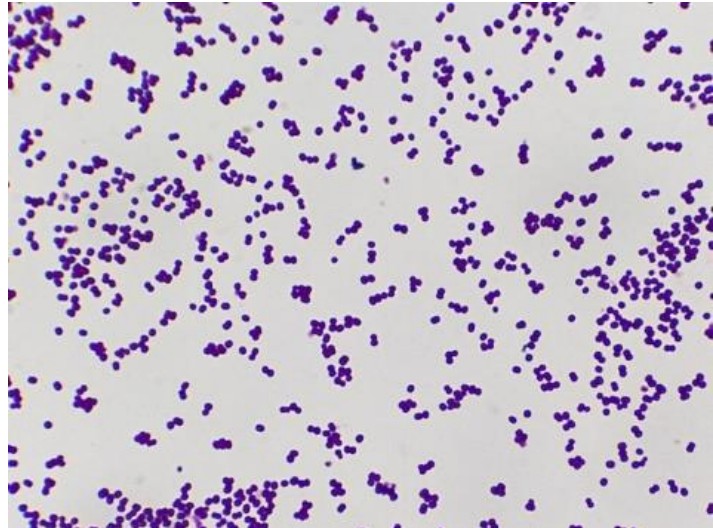
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Common Skin Bacteria Trialled as a Topical Cancer Therapy

Recently Stanford Medical researchers were able to fight cancer in mice by altering bacteria and microbes found on their skin.

After genetically engineering bacteria, commonly found on the skin, called *Staphylococcus epidermidis* to produce a tumour antigen - a protein unique to the tumour that is capable of stimulating the immune system, they applied the live bacteria onto the fur of mice with cancer. The resulting immune response was strong enough to kill an aggressive type of metastatic skin cancer, without causing inflammation.



Our skin is home to millions of bacteria, fungi and viruses that compose the skin microbiota. Skin microorganisms have essential roles in the protection against invading pathogens; however there are many unknowns about how the skin microbiota interacts with the host immune system. For example, unique among colonising bacteria, staph epidermidis triggers the production of potent immune cells called CD8 T cells - 'killer' T cells responsible for battling severe infections or cancer.

The researchers showed that by inserting a tumour antigen into staph epidermidis they could trick the mouse's immune system into producing CD8 T cells targeting the chosen antigen. These cells travelled throughout the mice and rapidly multiplied when they encountered a matching tumour, drastically slowing tumour growth or extinguishing the tumours all together.

The scientists genetically grafted a small fragment of DNA encoding part of a protein called ovalbumin onto the surface of staph epidermidis. They chose ovalbumin because it has been engineered into many commonly studied mouse tumour lines and therefore can act as a tumour antigen in multiple types of cancer.

The scientists applied the genetically engineered bacteria to healthy mice. As controls other mice were treated with either no bacteria, wild-type staph epidermidis (not expressing the ovalbumin peptide) or heat-killed ovalbumin-expressing staph epidermidis, which couldn't colonise the skin because it was dead.

Six days later the mice were injected with melanoma tumour cells expressing ovalbumin. Whilst all 3 types of control mice rapidly developed skin tumours, those that were treated with live, genetically engineered staph epidermidis grew tumours much more slowly and in many cases did not grow tumours at all.

While looking for an explanation, researchers found ovalbumin specific CD8 T cells in the draining lymph nodes of the skin, in the spleen and in the slowly growing tumours meaning

that the T cells generated by the colonising bacteria must have the same immune potential as regular killer T cells.

To find out whether this method could treat established melanoma the researchers tried injecting cancer cells up to 2 weeks before colonisation with the genetically engineered staph epidermidis. Even when the melanoma had metastasized to the lungs, treatment with the bacteria drastically reduced the size of the tumours or eliminated them, significantly improving survival times for the mice. The method also worked when the researchers used naturally occurring melanoma antigens rather than ovalbumin.

When the researchers combined the new treatment with a second type of immune therapy designed to increase T cell activity called checkpoint inhibitors that work by blocking proteins that stop the immune system from attacking cancer cells, the benefit was even more pronounced: 15 out of 16 established tumours disappeared. When the mice were re-injected with more cancer cells 30 days later, tumours didn't grow. This response is similar to the secondary immune response, similar to what happens after a vaccine.

The researchers now believe that the host organism produces these T cells to essentially vaccinate itself against the colonists, protecting against cuts and scrapes that could allow bacteria to breach the skin barrier.

Cancer therapies developed in mice don't always work in humans. However there are reasons to believe otherwise for this treatment. A previous study showed that staph epidermidis induces the same type of CD8 T cell response in primates as it does in mice. Also, while staph epidermidis usually disappears from mouse skin within a few weeks, most humans are permanently colonised with some strain of the bacteria, therefore in humans the bacteria will colonise more efficiently potentially leading to a constantly renewing supply of tumour specific T cells. If this research continues it could lead to a very effective, low cost therapy that can be applied to the skin.

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CRISPR-Cas 9

‘Genes are like the story, and DNA is the language that the story is written in’ - Sam Kean. One of the most beautiful and powerful things that all eight billion people share, is the code to life, the DNA. Its existence is what makes us different yet alike. Through centuries there have been major scientific breakthroughs however one could argue that the ultimate breakthrough was achieved in 2012, the discovery of Crispr-Cas9. This powerful technology could now allow us humans to genetically alter our genes to our liking. Could this be the cure for cancer or sickle cell anaemia? Or could this mark the dawn of a utopian (fatal trait removal, ethical enhancement) era?



In 2012 two female scientists, Emmanuelle Charpentier and Jennifer Doudna, (as seen above) discovered the Crispr Cas 9 (clustered regularly interspaced palindromic repeats) which was originally discovered in *E. Coli* (bacteria) in 1987 where the CRISPR-Cas 9 functions acted a defence mechanism in prokaryotes to prevent repeated infection by the same virus. This is achieved via splitting the nucleic acids of the invading viruses which thus protects the given prokaryotes from viral infection. ¹²The CRISPR Cas 9 is essentially comprised of 3 things, gRNA: which acts as a gps for finding a given DNA sequence (that could code for your eye colour or an inherited disease such as sickle cell anaemia), Cas 9 nuclease: an enzyme which acts a molecular scissors to cut out the DNA sequence and finally the endonuclease which breaks the phosphodiester bond between the nucleotides of the DNA.

Now whilst the CRISPR-Cas 9 is being utilized by scientists all around the world to help eliminate inherited diseases such as sickle cell anaemia (an inherited disease whereby the red blood cells have an abnormal crescent shape which as a result means that less oxygen can bind onto the haemoglobin and affects over 400,000 children (about half the population of Delaware) around the world) there is concerns that in the future, CRISPR Cas 9 could open door for eugenics and the creation of designer babies. The term ‘designer babies’ means that if we can read the genome of an embryo coupled with the machinery (CRISPR Cas 9) to remove and insert genes, then theoretically parents could choose the characteristics they want their child to have i.e., green eyes etc. ¹³This discussion of whether modifying the genome of embryos is ethical stemmed on Sunday, November 25th, 2018, after the birth of twins, Lulu, and Nana. Lulu and Nana were conceived via IVF but with one difference, scientist He Jiankui used CRISPR Cas 9 to remove the CCR5 receptor on the T- cells. HIV uses this receptor like

a key and binds onto the T-cell and eventually enters the cell. By removing this receptor, this meant that the girls could no longer contract HIV ever. As a result, He Jiankui was sentenced to prison for three years for illegal medical practice. This event sparked a debate not only within the science community but also between the rest of the world, whether eliminating diseases was ethical. Should we be playing God? Do parents have the right to prenatal autonomy? What if genetic engineering was used to create a deadly pathogen to kill humans or plants? ^[1] Could genetically engineering plants to become drought resistant save thousands of lives in countries like Somalia? Will the west advance in genetic modification leaving the poor countries behind where the deadliest inherited diseases are most prevalent due to the lack of medical accessibility? Genetic engineering could be the cure for cancer but also could be the downfall of humankind. There has been and will continue to be an extensive dialogue among scientists, politicians, ethicists, and industrialists on the impact of society.

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Role of Outdoor Physical Activities on Mental and Physical Health

Simple outdoor activities can have a tremendous impact on our physical and mental health. Although an indoor gym workout has its own benefits, outdoor sports like tennis, football and cycling allow us to gain fresh air and natural light, which can lower a person's blood pressure and invigorate the mind and body.

Improved mental health:

Sunshine increases serotonin, a hormone that uplifts your mood and helps you feel calm. Ultraviolet-B radiation prompts vitamin D production in the skin, which has been associated with improved emotional regulation and prevention of mental health conditions such as depression and schizophrenia. Exercise also produces endorphins, another hormone that boosts your mood and reduces pain whilst improving self-esteem and cognitive function.

Reduced risk of developing cardiovascular diseases:

Regular physical activity increases high-density lipoprotein (or “good”) cholesterol levels and lowers blood pressure, both of which reduce strain on the heart. It also reduces the need for the heart to pump more blood to the muscles by improving the muscles ability to pull oxygen out of the blood. These factors, along with the reduction of stress hormones which also put strain on the heart, reduces the risk of developing heart disease. In fact, researchers found that heart attack patients who participated in a regulated exercise programme experienced a reduced death rate of 20-25% than the usual expectation.

Other benefits:

Other benefits include the management of chronic health conditions. Exercising keeps joints moving so that they can work well. It can also ease pain, build muscle strength around joints and lessen joint stiffness. For people with arthritis, this means an improved quality of life. Another benefit is that bone strength increases. This is because as the muscles grow stronger during training, they tug harder on bones. Your body strengthens those bones in order to compensate for the harder pull.

Why outdoor is more beneficial than indoor:

As well as increased serotonin levels, sunlight also enhances energy generation in the muscles and oxidation of the tissues. Not only this, but exposure to nature has been proven to reduce blood pressure, heart rate, muscle tension and the production of stress hormones.

These are just some of the ways in which outdoor physical activity can improve both physical and mental health. The stress-reducing hormones produced have instantaneous positive effects on wellbeing and just 150 minutes of exercise a week can prevent the development of cardiovascular or other types of diseases in the future.



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THE
Pharmaceutical
Industry

Medical Cannabis and its Future in the UK

Cannabis is arguably the world's oldest medicine and has now been reinstated as a medicine in an ever-increasing number of nations, following a period in which it was prohibited due to political reasons in the second half of the 20th century. "Medical cannabis" is a broad term for any sort of cannabis-based medicine used to relieve symptoms. In the UK, medical cannabis was approved in November 2018 due to patient pressure and high-profile media campaigns for children whose epilepsy had been remarkably improved (such as Alfie Dingley). This led to many patients believing and understanding that the medicine would be available on the NHS. However, to date only 12 NHS prescriptions and less than 60 prescriptions in total have been made. Despite this, its interest in therapeutical benefits has been studied by the Centre for Medical Cannabis, and in 2020 they found that approximately 1.4 million people are using forbidden cannabis for varied medical problems:

- Chronic and cancer pain
- Depression
- Anxiety disorders
- Neurological disorders
- Sleep disturbances

In the UK, despite the legislation there is still ongoing controversy surrounding prescriptions. Medical cannabis is atypical, meaning it does not belong to a class of a group since its medical use preceded the demonstration of its efficacy in clinical trials. On the one hand, there is strong patient pressure for access to medical cannabis to treat chronic illnesses as there are limited medicines already that can help with such. On the other hand, there is only limited placebo controlled evidence on whether to and how to use cannabis for many of these conditions. This means that prescribers nowadays face challenges in the UK and so medical cannabis is unlicensed.



Furthermore, in the UK medical cannabis still has no further progress as doctors also lack the knowledge of cannabis based medicines that they need to have confidence prescribing them, especially off licence. This means that they have no training in prescribing them nor the dosage amount in different treatments. So many people argue that a priority should be to provide a range of good quality teaching programmes set up by the Health Education England. In addition to the NICE guidelines, doctors are also influenced by the guidelines of the Royal College of Physicians and the British Paediatric Neurology Association which recommend that cannabis is only given as a last resort when all other treatments have failed. Yet, the Medical Cannabis Clinicians' Society offers balanced guidelines proposing that for chronic pain cannabis should be considered instead of opioids, so there is controversy regarding what to do. Currently in the UK, the cost of medical cannabis is high and NHS

clinicians do not prescribe it, meaning some families are forced to pay for private prescriptions up to £40K a year.

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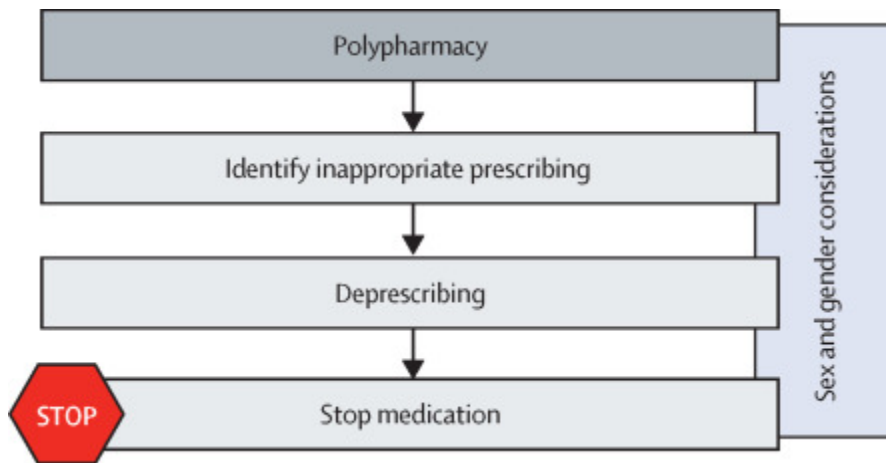
How is Polypharmacy Considered for use in the Elderly?

Polypharmacy is defined as the use of five or more prescribed or over-the-counter drug therapies. Polypharmacy is seen in the older generation as they have multiple chronic conditions requiring treatment with various medications. The older population at risk of multi-morbidity (the coexistence of two or more chronic health conditions) due to physiological and pathological changes, and it increases the likelihood of being prescribed multiple medications.



In addition, terms such as excessive polypharmacy refers to people who take 10 or more over-the-counter drug therapy. Appropriate polypharmacy acknowledges that elderly patients may need more than one drug therapies to treat their complicated illnesses. Problematic polypharmacy refers the inappropriate use of multiple drug therapies meaning certain drug interactions cause the drugs to not work as a whole. Therefore, if there are certain hazard drug combinations then there becomes a difficulty to how much the patient will follow medication plans and thus can lead to misinterpreted drug side effects which can cause misdiagnosis and thus leading to more medications required.

Consequently, it is crucial to optimise medication prescription for the elderly population. Medication safety optimisation is contingent upon the identification of potentially unsuitable medicines and chances for judicious deprescribing operations. These two processes are inherently related, complementary, and are essential for optimising medication safety. To optimise the prescription process for older people these are done through the discontinuation of medications and lowering dosages these both apply to unnecessary and hazardous medications. Some tools such as STOPP (screening tool of older persons prescriptions) are used to help identify inappropriate prescribing and these ways also show how to prioritise the correct medications



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Therefore, polypharmacy should be addressed in the elderly via healthcare providers conducting comprehensive medication reviews and prioritising the use of the most beneficial medications. Patients and caregivers should communicate with their trusted healthcare professionals about the medications being taken, address any concerns or queries they have, and regular check-ups on the patient and the medications. This all ensures positive patient care and that they receive the most effective and safe treatment.

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A photograph of a white dog, possibly a Golden Retriever, lying on a dark metal table in a veterinary clinic. The dog is looking towards the camera with its mouth open, appearing happy. A person with brown hair in a ponytail, wearing glasses and blue scrubs, is standing behind the dog, with their hands resting on its back. The background is slightly blurred, showing a typical veterinary office setting with framed pictures on the wall and a white table with a bottle on it.

Veterinary Medicine

Different Branches in Veterinary Medicine

When you think of a vet's role, you may picture someone working in a small practice administering routine vaccinations or flea and worming treatment to your cat or dog. But this is not always the case. There are so many animals out there, and with that comes many specialities, or 'branches' for vets to work in.

These can be split into:

1. Small Animal
2. Exotics
3. Large Animal: Farm & Equine

01 Small Animal

Small animal vets are usually responsible for treating small pets such as: cats, dogs, rabbits, guinea pigs and hamsters. These are usually our common house pets that many people have.



02 Exotics

Exotic vets treat animals, such as: amphibians, birds, fish, reptiles, zoo and safari animals. And without these, the animals we see in aquariums, zoos and safari parks wouldn't be there! They also treat common pet birds, such as parrots and budgies, and people's pet snakes and lizards.

03 Large Animal

Large animal vets are split into two main groups: farm and equine.

○ Farm

Farm vets are really important as they ensure the animals that make the food we eat are healthy. They involve treating generic farm animals such as: sheep, pigs, cows and poultry, which are all part of the food chain. These procedures can span from emergency caesarean sections to artificially inseminating an alpaca.



○ Equine

Equine vets specialise in treating horses, ponies and donkeys, and this is an unusually large sector. With so many popular equestrian sports such as racing and show jumping, vets are constantly needed to treat injuries and maintain the health of these athletes. But many people also keep horses as pets or for low levels of riding, and vets are needed to treat these too.



Surprisingly, many of the vets that work in these different sectors have gone to the same university and studied the exact same course, which shows how vast the subject of veterinary medicine is, and that it can appeal to every animal.

Specialities:

In the more popular branches, there are also specialities in veterinary hospitals, just like in human medicine. Many animals are referred to these departments for further investigations, or for diagnostics. These can include, but aren't limited to:

Orthopaedics: specialises in deformities of the musculoskeletal system which can include: muscles, joints, ligaments, bones and tendons.

Radiology: responsible for most scans which use radiation, such as: Ultrasounds, X-rays, MRI, CT, Bone scans and PET scans.

Cardiology: investigates any malformation or illness in the heart and its structures.

Oncology: specialises in cancers, along with possible treatments; surgery and radiotherapy.

Ophthalmology: treats and diagnoses any disorders in the eye.

Parasitology: studies parasites found in animals and the relationship between parasites and animal hosts.

Neurology: a branch that investigates and treats disorders associated with nerves and the nervous system.

These are just a few examples of the many departments seen in a small animal or equine hospital. But, they aren't usually found in farm veterinary practices. This is because most farmers will not treat animals that need further investigations as this is costly and possibly seen as pointless, since these animals will eventually be sent to slaughter for meat. Specialised veterinary departments in exotic animals are less common, but there are still a few for unusual and complex cases.

So, hopefully after reading this, you've understood that there are so many routes and pathways for a vet student to go down. Whether it's completing a routine dental on a dog, or performing emergency surgery on a lion from the zoo, there really is something for everyone! The only requirement is that you have a passion for animals, and the necessary scientific expertise.

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How do Veterinarians Contribute to Society

Many people think that a veterinarian's only job is to treat and help animals, and why this is primarily the case, vets can also help society in ways you wouldn't initially think of. There are a varied number of roles in industry, such as: food safety management, disease management and research.

Disease Management

Veterinarians play a direct role in disease management by diagnosing, managing, and treating common diseases within a veterinary practice, in the form of preventative measures like vaccines, but also medication and treatment methods. They also have an obligation to report any recent diagnosed diseases to the public health agency, so they can be monitored in case of epidemics.

The recent COVID-19 pandemic provided a prime example of how animal diseases can spread to humans and have devastating consequences, which is why disease management is so crucial.

Vets also work in agriculture and food production, to ensure spread of disease is limited and controlled, by advising local health boards on possible steps forward to

reduce the impact of a disease, for example: vaccination.

Due to the cramped conditions that come with farming, especially in the winter, it is becoming increasingly difficult to stop the spread of diseases, and so public health officials are constantly working to find solutions to limit this.

An example is the recent bovine tuberculosis (TB) outbreak in dairy farms across the UK, which resulted in closure and the slaughter of all infected cows. In 2022, 32,103 animals had to be slaughtered, including 9,507 cows, to maintain the spread of TB.

Other common diseases in animals include: salmonella and listeria, which are both bacteria

Food Safety

As mentioned above, veterinarians work with the food standards agency and members of the public health organisations to ensure the animals involved in food production are healthy and do not carry any infectious diseases.

They do this by looking at a variety of factors such as: handling, nutrition, living conditions, herd health as a whole and then

give advice and a plan going forward to improve these.

As well as maintaining this standard at farms, vets also carry out preslaughter inspections at abattoirs and will witness the slaughter to ensure it is done correctly by looking at correct handling and stress reduction.

Public Health

As well as working with committees, vets can also work on a board and are responsible for generating rules and regulations to ensure animal welfare, reduced spread of disease and an economical way of animal production. There are state veterinarians assigned to manage early detection, prevention, containment, and treatment of such diseases. This is not only important in

managing animal diseases, but indirectly preventing the spread to humans.

The current chief veterinarian, Christine Middlemiss has a primary role in DEFRA (department for environment, food, and rural affairs) and implemented the recent laws on monitoring the bird influenza outbreak, which involved rules such as: minimising contact between captive and wild birds and making sure there is no shared water sources either.

Biomedical Research

Research is constantly ongoing to find treatments for chronic and acute diseases. The prioritised diseases include diabetes, osteoarthritis, and cancers. However, most scientific breakthroughs also provide solutions in human medicine and treatment methods can be adopted in clinical medical trials.

Vets also work on looking at pathogens; parasites, vectors, and bacteria to understand factors such as their: optimum

conditions and ideal host, as well as how they interact with a host and how this can be prevented.



Manufacture

When manufacturing animal feed, vets work in animal health companies and advise them on ideal nutritional content needed in feed, and how this differs for a variety of species, breeds and ages. A common example is 'Hills pet nutrition,' which formulate a selection on food for cats and dogs specially designed for factors like: age, mobility, oral health and

weight loss. They work closely with vets to ensure the nutritional content is optimum.

Vets can also work with the manufacturers of pesticides such as: herbicides, fungicides and insecticides in agrochemical companies to ensure they are safe for animals grazing on the land and so they don't endanger human health.

Testing and Diagnostic Laboratories

Animals used in clinical trials or cosmetic and medical testing all require regular health checks as well as veterinary

intervention if they react during the trials. Vets are needed to ensure that the animals are treated humanely and are provided

with sufficient living conditions. These labs also use animals to investigate the outbreak of diseases and in comparative

medicine, so it is essential they are treated as best as possible.

Control of Pharmaceuticals and Medication

Several corporations work closely with vets to ensure that animal drugs are safe and effective. Vets have the role of developing new drugs as well as improving the composition of commonly used ones. They also manage the condition

and care of the medication, for example if the drugs need to be refrigerated and at what temperature. This is usually done to prevent any bacterial growth which may pose a threat to the patient.

Teaching and Education

It is not possible to train any new vets without advanced veterinary academics! Most of the professors that teach the curriculum of veterinary medicine will have done a postgraduate course, as well as worked in practice or research for a large number of years. Once veterinarians have worked for some time, they can go into teaching at a university level or beyond. Most of these roles require additional degrees, such as PhDs or teaching qualifications, and of course; the experience!



Animal Sports

Any sport that involves the use of animals will require veterinary input, due to injuries or just routine care. Examples can include most equestrian sports; polo, show jumping and racing, as well as greyhound racing.

At large sporting events, such as Royal Ascot, there are specialised teams of vets located across the site. They are designated with different roles; one team to check horses are healthy before racing, and another for after racing. There is also a team on the track while horses are racing in case of accidents, falls and injuries. This is the safest way to ensure the horses

receive immediate treatment from trained professional.

This is just a short summary of all the roles a vet can have, and there are many, many more! Veterinary medicine is a massively varied career, and every single one of the jobs mentioned above helps contribute to society. Whether it be in research, food safety, production, public health or environmental monitoring; we can definitely say a vet's role isn't only limited to looking after our furry friends!

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