



# TEDDIES talks BIOLOGY

Keeping Soil Nice and  
Healthy

Cleaning Soil: Plant Edition

What's that smell?

The Science of Smelling

What is really inside of us?

Microbiomes and The Obesity Epidemic

# Editorial:

“Teddiess Talks Biology” is onto its 3<sup>rd</sup> issue. We are aiming for one a term. I am hoping the current Lower 6<sup>th</sup> team of Danielle Lim, Benjamin Wan, Huda Khalaf and Maddie Luke have one more issue in them for the first term of their Upper 6<sup>th</sup> before the next group of Lower 6<sup>th</sup> Biologists come through looking to bolster their UCAS forms, widen their biological interests and develop their scientific writing skills.

It should perhaps come as no surprise that the developments in the current CRIPSR technology has 2 articles dedicated to it in this issue. Read on for more information, but the implications of this technology really are enormous.

If you wish to get involved in future issues please email me and I'll add you to our mailing list ([storeyr@stedwardsoxford.org](mailto:storeyr@stedwardsoxford.org)).

I hope you enjoy the read,

Mr Rick Storey  
Head of Biology

Front Cover photo credits to Cicely Vane - L6th

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# The Science of Smelling

Huda Khalaf – L6th

The first sense activated when you are born; smell is a very powerful tool which influences people's emotions and has the ability to transport you to a memory or give you a feeling. Smell is the most sensitive of the senses. People can remember smells with 65% accuracy after a year, while visual recall is only about 50% after three months. But how is the body able to translate the detection of a chemical molecule into a specific scent?

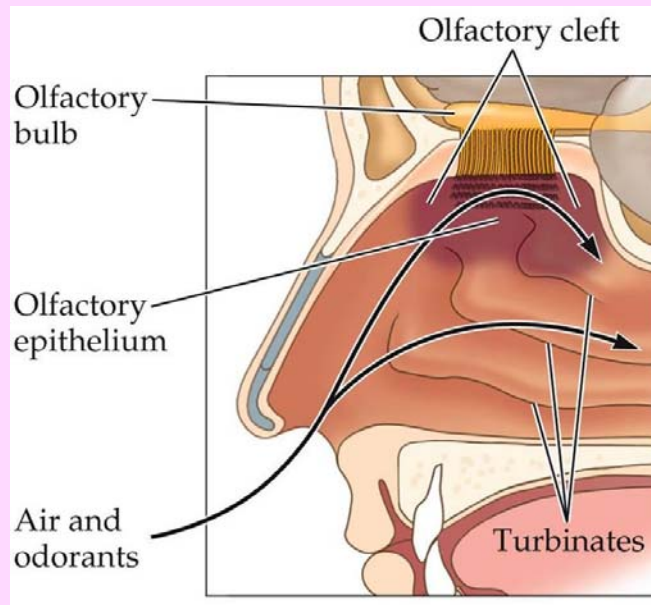
In order to be perceptible by our noses, chemicals need to be small and volatile. Fragrant molecules escape from their fluid or even solid state into the air and are detected by our sensory tissue, called the olfactory epithelium.

This is a mucous membrane which lies on the roof of the nasal cavity, in humans, it is approximately 9cm<sup>2</sup> in size and 7cm above and behind the nostrils. Odorants reach this area in the air we breathe; if something smells very faint, we sniff two or three more times, forcing more air and fragrance towards the olfactory epithelium.

Here, the cells have cilia which are covered by the mucus of the nasal cavity, facilitating the detection of and response to odour molecules by olfactory receptors. No one knows what actually causes olfactory receptors to react – there are many theories surrounding this, ranging from the chemical molecule's shape to molecular vibration. The electrical activity produced in these hair cells is then transmitted to the olfactory bulb followed by the olfactory tract.

The olfactory tract transmits the signals to the brain to areas such as the olfactory cortex, hippocampus, amygdala, and hypothalamus. Many of these areas of the brain are a part of the limbic system. This is the system of the body which is involved with emotional behaviour and memory. That is why when

you smell something, it often brings back memories associated with that specific object. This also helps us recognise substances which are hidden (such as when entering a house and knowing that a cake is in the oven) or helps us classify a scent as unknown (such as when you go to an exotic restaurant for the first time).

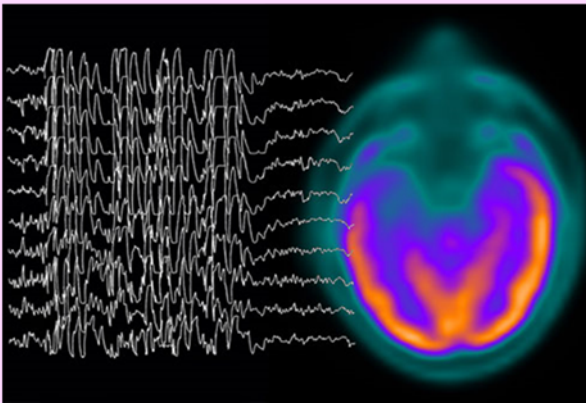


# Can We Cure Epilepsy?

Valeria Orlova – L6th

## What is Epilepsy?

Epilepsy is a name for the condition in which an individual has a tendency to have epileptic seizures, which are caused by abnormal electrical activity in the brain. During a seizure, a person might experience a loss of control over his body. The way in which one experiences an epileptic seizure is individual to each person and may vary significantly- some people may go into a "trance-like" state for a few seconds or minutes, while others lose consciousness and have convulsions (uncontrollable shaking of the body).



## What causes Epilepsy?

It is often impossible to identify why somebody develops epilepsy, then the epilepsy is said to be idiopathic. Currently scientists have not found a strong association between any particular genes and the development of epilepsy. However if the condition had only occurred in older age, then it is often associated with brain damage (such as strokes), tumours, infections (such as meningitis), and even drug and alcohol abuse. In this case the epilepsy is said to be symptomatic

## Is there any cure for it already?

Yes, a drug group called Anticonvulsant is already on the market. The first drug (potassium bromide) was discovered in 1850 and its mech-

anism involves inhibiting the excitability of neurons. However why do people still suffer from epileptic seizures? Unfortunately potassium bromide is only effective on a quarter of the victims of epilepsy. As a report in the scientific American tells us, "current medicines fail to relieve seizures in about a third of people with epilepsy'. It is estimated that 3 million people in the US live with epilepsy. In the UK, one in a hundred suffers from the condition. It is possible to surgically treat epilepsy if a distinct site of origin of the seizures is detected in the brain, as long as the region does not happen to be involved in essential functions (such as language), the part could be excised.

## New ideas for cure?

Another device that is being tested is NeuroPace's RNS system, which consists of a neurotransmitter that is implanted in the skull. This sends a charge through two electrodes when it detects unusual electrical activity in the brain.

Researchers are currently using nematodes (microscopic worms) as a means to understand epilepsy and find a different cure. Scientists have successfully managed to induce seizure in nematodes, which only have 302 neurons. Now it is up to us to find a way to prevent and cure epilepsy completely.



# Why Are You Always Tired?

Maddie Luke – L6th

This is a question asked frequently by all our parents. It is almost as if the day we turn thirteen years old we are hit by a wall of fatigue, and suddenly those early starts and early bed-times that we are used to become the most difficult parts of the day.

There are biological reasons for this; it is not that teenagers are especially lazy. Teenagers are at a critical stage in their growth and development. Therefore, we require at least 8-10 hours of sleep to be able to function at our best the next day.

When going through puberty, the circadian rhythm (body clock) alters so that it is harder to wake up early and it is harder to fall asleep at night. This throws the teenage body out of sync with the day and night cycle.

The circadian clock is the body's 24-hour control of processes. It is controlled by a section of the hypothalamus in the brain called the Suprachiasmatic Nucleus, which is signalled by light receptors and this controls the body's response to light- whether to wake up, whether to release hormones that affect drowsiness. In the morning when the sun has risen, the SCN sends signals to increase temperature and the secretion of cortisol which causes the person to wake up. At night melatonin is secreted and remains at a high level to induce sleep.

Jet lag is the disruption of the body's normal sleeping patterns as light and dark come at different times of day which can be quite debilitating and is similar to what occurs in teenagers. It is as if we are permanently jet lagged due to the desynchronization of our sleep patterns with societal norms.

However, demands in everyday life mean that a teenager, who cannot fall asleep until late at night, must wake up and start the day early de-

spite this not giving enough time for a full 8 hours of sleep. This sleep deprivation accumulates and can cause extreme fatigue which can lead to behavioural problems and mood swings, which is the point at which adults call us "moody teenagers" or worse, it starts to affect our own state of mental well-being. Unfortunately, society is not going to change enough as to allow adolescents to start school later in the day, however we can make changes to our lifestyle to give us the right amount of sleep:

By reducing the amount of technology we use in the hours before bed -as the blue light is similar to that of the start of the day, resulting in cortisol production- we can help ourselves to fall asleep earlier which will help to alter our body clocks.



In addition, try not to eat too much before. At our school, we tend to continue eating right up until we go to bed. The problem is that going to bed with a full stomach, and having consumed sugar and caffeine, can push back our body clocks even further.

Sleep is the most important factor affecting our wellbeing, therefore it is essential to give ourselves the recovery we need to achieve our best.

# Super Sleepers

Max Thompson – L6th

In our teenage years, we all love to sleep. The average time a teenager will spend asleep is usually 8-10 hours a day. In the holidays, for some of us, this may stretch well into 12-15 hours. Often, we will feel either fully energised for the day ahead or feel depleted before the day has begun. As a result, many of us often feel that the day has been wasted and little has been achieved. Yet imagine if we had 20 hours of day time and felt still completely fresh with only 4 hours of sleep. Thanks to a genetic mutation, a mother and daughter both, known as 'short sleepers', can operate at their maximum for the whole day on only 4 hours of sleep.

The mutation is on the gene DEC2 and has allowed the mother and daughter to remain healthy and be full of energy

without sleeping for longer than 4-6 hours. Although the average person could live with reduced sleep, it would affect their health and energy levels dramatically. To further investigate the gene and its impact on the body, researchers studied transgenic mice with the introduced mutation. These experimental animals experienced a daily activity period of about 1.2 hours longer than their nonmutant compatriots. Removing DEC2 in mice, however, did not generate the same wakefulness, but instead the genetic knockout mice slept a little bit more. The gene itself belongs to a basic helix-loop-helix protein (bHLH) family in which members can dimerize (combine to form a dimer) with each other and therefore affect gene transcription by binding to specific DNA sequences. In the

mutation, a C is changed to G in the DNA sequence which is predicted to cause a change from proline to arginine. This will as a result cause the change in phenotype.

In modern society, this mutation could prove to be very beneficial for many people who struggle to find the time in the day to complete everything they set out to do. In sport this gene could also prove very beneficial for ultra-distance endurance races where athletes often have few hours of sleep before continuing the race. In the world's toughest cycling race (Race Across America), the top athletes will usually sleep for 2 hours a day with 22 hours on the bike. Cyclists are reportedly sleep cycling due to sleep deprivation. If they had this gene mutation, they could potentially withstand the ex-



# Could We Become Immortal?

Leo Wilson - Shells

Deoxyribonucleic Acid (or DNA) is a molecule which lays the foundation for all life. It tells you what you have, what you do, and how you do it. DNA editing is a fascinating concept of changing the DNA in your cells. There has recently been a massive game changer in genetic research.

In early 2016 there were multiple experiments carried out using a new technology called CRISPR (Clustered regularly interspaced

short palindromic repeats). CRISPR consists of two main parts: Cas9 and RNA. Cas9 is an enzyme which acts as a pair of scissors and cuts DNA strands at different parts to add or remove DNA. The second part is called guide RNA. The RNA guides Cas9 to the part of the genome that needs to be cut to ensure it slices the right bit. The CRISPR system is used by bacteria that takes virus DNA and cuts into their own DNA to make space for it.

We can use CRISPR from bacteria on everything. The reason this makes genome editing so viable now is that anyone with a laboratory can do it. We can tell the RNA which DNA section we want cut out and the RNA will guide Cas9 there to take it out. You can effectively copy and paste DNA. It is much better than other methods because not only is it easily available, but it is much more precise and efficient. It can do quickly what would take our old methods over a year. CRISPR takes only a

couple of months. Whilst this system comes from bacteria it can work on any organism.

The real power of CRISPR is revealed however when you discover the medical feats it can accomplish. Scientists did an experiment with rats which had HIV in 99% of their body cells. By simply injecting CRISPR into the rats' tails,

they were able to reduce that percentage to 48%. Some say that in a couple decades we could eradicate HIV this way. Other diseases like Herpes which hide in the DNA of our cells could also be destroyed.



Then there are genetic diseases. They are caused by a mutation in DNA which then are inherited by children. With CRISPR you can use it change the mutation and cure the disease. People also believe that with CRISPR we could create 'designer babies' where we could modify the embryo's DNA to make them better looking, stronger or even more clever. This is of course very ethically controversial.

With CRISPR we could even become immortal. Today, of the 150,000 people that will die, 2/3 will be from age related causes. We know that aging is directly linked to our DNA. There are animals which age much slower, so we could potentially insert their DNA into us. This could slow down aging, or even reverse it. This research is still in its infancy and there are many refinements that have to be made to CRISPR but it is conceivable that the people living now could be the first to benefit from this.



# Gene Editing

Sadie Onosode - L6th

## What Is Gene Editing?

Gene editing is a method in which DNA can be inserted, deleted or replaced at a specific site in the genome of an organism or cell. Genome is defined as the whole genetic information an organism has or possesses. Gene editing is a laboratory technique in which 'molecular scissors' called TALENs are required for the process, also known as engineered nucleases. Additionally, the genome also includes regions of the DNA that promote or inhibit gene activity, and regions that do not seem to affect function and production. For gene editing to correct a faulty gene, the TALENs needs to target the right gene if not this could result in random genes being cut up that don't need cutting up. This is a rather difficult step – targeting the gene – because there are over 25,000 genes that make up our DNA. Once the TALEN makes the right cut and the

correct sequence is added, the cell is left to do the rest. Cells will fix the mistakes by a process called

homologous recombination.

## How does it work?

The DNA needs to be cut very precisely during gene editing. A tool known as CRISPR-Cas9 is a gene editing method which has two components. CRISPR stands for 'clustered regularly interspaced short palindromic repeats'. Cas9 stands for 'CRISPR associated protein 9', which is the protein that cuts the DNA at the target site. CRISPR refers to the basis of the guide system that finds the 'target', which is the spe-

cific sequence of the DNA that is to be modified.

## CRISPR Cas-9

Cas-9 is a protein which searches through the genetic material that matches the sequence of the programmable guide RNA. The guide RNA enables Cas-9 to open the DNA helix. It positions two molecular blades to cut each strand of the DNA helix. Repair enzymes seal the gaps of the broken DNA by inserting new genetic information supplied by the cell or inserter. Like this, disease causing-mutations can be corrected or altered by changing the underline genetic code.

## Uses of Gene Editing

- Gene editing is used to investigate and carry out research such as on models of human diseases or on:
- Crops and livestock-introducing resistance to diseases and increasing yield.



- Industrial biotechnology – producing pharmaceuticals and developing bio-fuels
- Reproduction and Inheritance – preventing inheritance of a disease trait.

## What you don't know about CRISPR

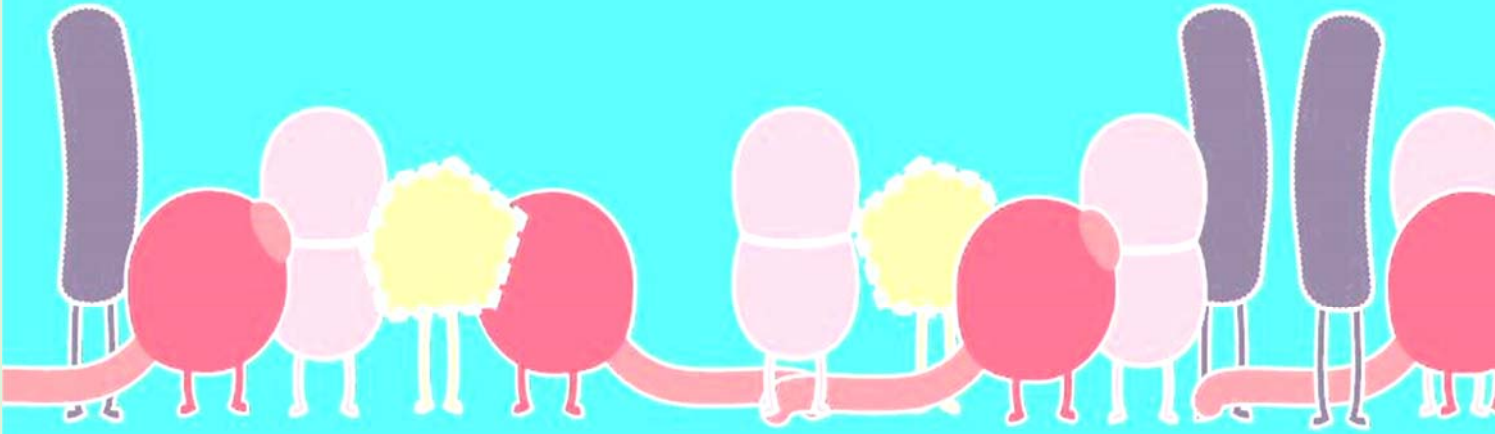
It can introduce mutations of various types to find out why they cause diseases and make people cancerous therefore able to treat patients with cancer or genetic diseases.

FUN FACT: It could also be used to create genes that will make police dogs stronger

Last but not least, it could bring about drugs that combat problems like obesity and diabetes.

# Microbiomes and The Obesity Epid

Cerelia Caesar – L6th



## Obesity and junk food diets

We all know that junk food is damaging to our health, but do we know what actually goes on inside our bodies when consuming it at the time and in the long-term?

Let's start by defining the Junk food diet: a high-fat and low-fibre (and high-sugar) diet with minimal nutritional value. This diet has the capacity to cause inflammation, a leaky gut, stimulate stress signals in the body and cause dangerous levels of visceral fat. The inflammatory states that are triggered are normal in short periods, but if sustained are unhealthy. These diets will start a vicious cycle of unnatural processes, which are harmful to our health.

With increasing fat content in the diet, there is an increase in a certain type of bacteria with a thick protective cell wall. Fragments of these cell walls are made up of lipopolysaccharide, which build up and form an endotoxin that humans are very sensitive to. This triggers a reaction in the lining of the gut, which starts the inflammatory process mediated by the fat cells. Fat cells are associated with Tregs or Regulatory T cells, which help them communicate with the rest of the body's immune system. These immune cells ensure maximum health in the body of their host and are therefore a vital part of us. Once obese, the Tregs associated with

the fat cells disappear, and release the damaging inflammatory signals.

Then the gut lining becomes leakier, allowing the toxic fragments to escape into the bloodstream where they reach the fatty tissue among other organs. This starts a chain reaction where the body goes into a state of high alert.

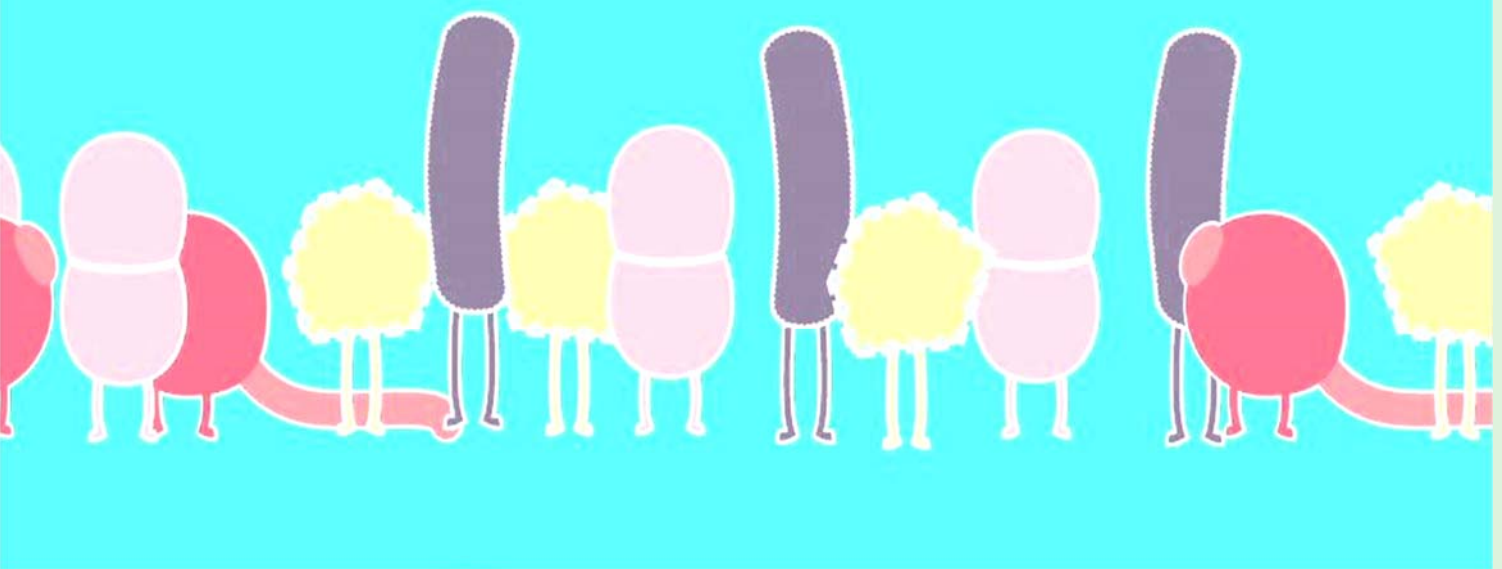
The stress signals generated as a result of the body being in high alert will make cells replicate faster, which could lead to higher chances of developing cancer. This in turn will affect the fat cells and cause them to produce more inflammatory chemicals and signals, which increases blood insulin, and after a while will prevent glucose from being metabolized efficiently. This signals for more unnecessary fat to be stored, particularly visceral fat around the stomach.

## Evolution and Digestion

One factor that makes us stand out among other species is the size of our brain. This organ makes up 2% of our total body weight and uses 20-25% of our daily energy resources. If apes had a brain with a relative size to ours, they would be eating over 20 hours a day to provide sufficient amounts of energy to it.

Around 2 million years ago our brains grew and our intestines shrank by a third.

# lemic



This reduction enabled us to invest more energy and calories in our brains and mental development. The cause of this evolutionary step was due to the introduction of cooking. Cooking involves the breakdown of complex starches of root vegetables and other foods, allowing us to extract energy and nutrients in a shorter amount of time. This accounts for the reduction in our large intestines as we no longer needed a lot of time to digest tough plants.

## What is the microbiome?

The microbiome is a community of microbes (microscopic organisms), found in the large intestine or colon, which lives in a symbiotic relationship (when both organisms benefit from the relationship) with us. They are essential to our digestion of food, they control the calories we absorb, provide vital enzymes and vitamins, and keep our immune systems healthy.

## Quick overlook of the health benefits of coffee

Caffeine found in coffee and tea, is likely the world's most common drug drunk by 80% of the global population. The cocoa plant that caffeine derives from, contains many other thousands of chemicals, which increase in number when the bean is roasted.

Coffee has many health benefits along with its caffeine content, which many people rely on to get

through the day. In terms of health benefits, studies show that moderate coffee drinking, three or four cups a day, reduces the risk of death by around 8% and heart disease by 20%. Coffee also has a high-fibre content and antioxidant polyphenols, which provide food for our gut bacteria known as microbes. These antioxidant polyphenols are chemicals that are released from food after digestion by microbes, which are healthy and useful for our bodies. The fibre that coffee offers is broken down by microbes to produce essential short-chain fatty acids such as butyrate, which allow healthy microbe populations to flourish.

This accounts for the necessity of fibre consumption as fibre ensures the growth of beneficial microbial populations in your gut, which in turn promotes a strong immune system.

## Where do your cravings come from?

Each microbe prefers a certain food, which allows them to feed and reproduce. To ensure their survival and maintain their ecological niche, they will send signals to the human host that they want more of that particular food. So, when you are having cravings for a certain type of food, you now know that these cravings originate from your gut microbes sending signals to your brain.

# Cleaning Soil: Plant Edition

Could plants be the key to remediating the soil back to its original composition?

Jenny Hu – L6th

## Dirty, Dirtier and Dirtiest Soils

Environmental degradation has become an alarming issue that is continuously growing in most countries. Deforestation, toxins seeping into waterways and improper disposal of contaminants seem to grow more frequent, and communities are urgently trying to keep up with the pace. However, the solutions we currently have may not be efficient enough to completely remediate the soil and return it to its original composition, and they are not that eco-friendly to begin with. But have no fear! Scientists have been exploring a new method in recovering soil and removing contaminants using plants as a sponge to absorb toxins and safely dispose them. This is called phytoremediation, and is seen to be favourable among industrial companies and environmental communities.

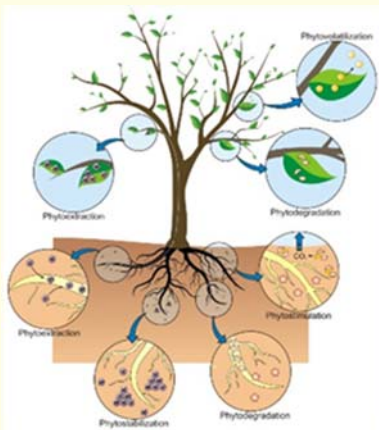


Figure 1 Diagram of phytoremediation and the numerous pathways contaminants undergo

## Spring Cleaning Using Plants

The entire process is quite simple. Certain plants can absorb specific contaminants (i.e. metals) faster than others. Hyperaccumulators are plants that can extract toxins in the soil at an abnormally quick pace, and are often a result of genetically modified/enhanced plants. Within the rhizosphere, the soil area within the plant's roots, toxins pass through the root's membrane, directly into the plant, and travels up via xylem stems to be stored within the plant above the surface. This entire process may take months or even years, as we must consider the plant's life cycle.

## Should we make the change?

Globally, other methods are being used to decontaminate soil such as soil washing—separating clean soil from contaminated soil that will be disposed of—or excavation, where the soil is removed from the site. Evidently, this is very damaging to the environment. These methods are usually cases of translocating the pollutants to another place, rather than removing them, thus not truly solving the environmental issue at stake. Phytoremediation sounds like the perfect substitution when compared to soil washing and excavation; it is 1000% cheaper than traditional methods, and has been continuously proven to work successfully. However, phytoremediation takes significantly more time than any conventional technique; a huge drawback for companies and governments that want to use this technique. Nonetheless, phytoremediation should be considered as a healthier, economically beneficial substitution to other conventional strategies in recovering soil to its primary state.



Figure 2: Phytoremediation at an Aircraft Repair Center in Elizabeth City, North Carolina, US.

# Size Matters

Sasha Orlova - 5th Form

## Current record holders

It is not difficult to name the biggest living creatures on our planet now. Almost anybody would be able to recall the Blue Whale. However its record size is not absolute. The biggest Blue Whale ever seen was almost 40 metres long and its weight was estimated to be around 200 tonnes. Those numbers sound horrifying, but there are at least two other creatures which can beat them. Another sea creature called the Portuguese-Man-Of-War can grow its tentacles up to 50 metres in length, while staying within the space of half a metre. However the length record belongs to the Bootlace worm, which can happily grow up to 65 metres in length.

However the size can be even greater if we look at other kingdoms, not just Animalia. The tallest tree in the modern day is *Sequoia sempervirens* which is 115.7m. The absolute largest living organism on our planet is a common honey fungus, which can grow to 3.8 kilometres in length. Furthermore, all the branches of its mycelium add together give a length of more than 8 kilometres.

## Further opportunities for improvement.

In the conditions provided by our planet, the most suitable size exists already – most animals or plants get smaller rather than bigger because of evolution. However under theoretical conditions, where growing even bigger will have an evolutionary advantage important enough to overcome difficulties to come with it, it is possible for the appearance of even greater species.

Water reduces the limitations of movement caused by a large mass significantly, but there is a medium which would be even more effective: air. An imaginary air-filled whale would be much bigger, while keeping almost the same mass and therefore almost the same nutrition requirement with all the advantages of being gigantic. Those advantages include greater nutrition intake (the whale feeds by consuming plankton in the water, which it swims through and its bigger jaw means larger quantities of fluid with food material being filtered per unit of time) and reduced surface area to volume ratio, which enables defensive mechanisms like shells on the outer parts of the body. Although those defensive mechanisms most likely would never be needed, while blue whales are being attacked by killer whales from time to time, there wouldn't be anybody willing to risk dealing with a creature of one hundred metres in size.

## Limitations and ways around them

There are multiple limitations to the growth of living organisms. The first and most important one is the required nutrition. By doubling the volume, the mass increases 8 times, therefore the requirement for nutrition increases by 6 to 7 times, but the ability to get this nutrition strongly depends on the circumstances. Moreover land animals have other size related limitations, such as carrying around the increased mass, ideally quickly enough to catch future food attempting to run away or eat the plant based nutrition before smaller competitors do. This requires legs and a skeleton strong enough to withstand the weight. These limitations are not so much of a problem in water, which is exactly the reason that the heaviest organism- the whale-lives in water. On land the way of reducing this limitation is to have a snake-like creature with no legs at all. A long and rounded body with large surface contact with the ground would also reduce the work performed by the skeleton.



# Diabetes – What is it?

Danielle Lim – L6th

## What is the difference between type 1 and type 2 Diabetes?

Common misconceptions between type 1 and type 2 Diabetes is that those with type 1 will be underweight and are dependent on insulin while those with type 2 Diabetes tend to be overweight and do not need insulin. However, this is not the case; around 20% of people diagnosed with type 2 Diabetes, at the time, are of healthy weight and many of them are dependent on insulin and similarly people diagnosed with type 1 diabetes in some cases will be overweight.

## How does type 1 diabetes develop?

Type 1 diabetes is an autoimmune disease. This means that it is a result of the immune system mistakenly attacking parts of the body. In this case the immune system mistakenly attacks insulin-producing beta

cells in the pancreas. It is unsure why this occurs but the immune system will continue to attack the pancreas until it is unable to produce insulin anymore. Therefore people with type 1 diabetes must inject themselves with insulin in order to compensate for the death of the beta cells and therefore everyone with type 1 diabetes is insulin dependent.

## How does type 2 diabetes develop?

Type 2 diabetes is different to type 1; the autoimmune system of people with type 2 diabetes do not attack beta cells but rather it is characterized as the body losing its ability to respond to insulin. This is also known as insulin resistance. Therefore the body tries to compensate for the ineffectiveness of the insulin by producing more. However, it cannot always produce enough and over time the strain placed on the

beta cells by producing an increased level of insulin eventually can destroy them, which events in the production of insulin decreasing.

## Why do some type 2 diabetics take insulin injections?

Low sensitivity to insulin: The more excess body weight we carry the less sensitive we become to insulin. This means that our blood glucose levels does not reduce as much as it should, therefore they must inject themselves to avoid hyperglycaemia.

Beta Cell Failure: This leads to a similar situation to that of someone with type 1 diabetes that essentially because the beta cells have been strained too much to the point that they have been killed that insufficient amounts of insulin is being produced and therefore insulin must be injected in order to keep blood glucose levels under control.



# Fact or Myth: Can you catch a cold from being cold?

Benjamin Wan L6th



I'm sure that, when we were children, we can all remember being told that we should put on more layers or 'you'll catch a cold'. Colds and the flu are more prevalent during winter, but, is there any truth to this? Or is it simply correlation and not causation?

People now know that the common cold or the flu are caused by viruses. There is often a misconception between the two. The common cold can be caused by a number of viruses (up to 200) including: rhinovirus, coronavirus, RSV and parainfluenza. However, the flu on the other hand is caused by influenza virus A, B and C. Vaccinations help for A and B but there is no current vaccine for C.

So does being cold actually affect whether you catch a cold

or not? Well, although weather is not a direct cause, the cold can affect the body's immune system, leaving it in a weaker state than normal. The weather has an effect on both the virus and the body. The cold weather means that the air is dry and the virus can survive and be transmitted easier. Research from the National Institutes of Health (NIH) suggest that the flu virus' protein coat becomes tougher and makes them harder to kill and easier to transmit. In the winter, people often stay indoors where the ventilation is poor and humidity is low. This also allows the virus to be more active and stay alive for longer.

When a person is outside the cold can have an effect on the amount of mucus you produce and the ability of nasal and cilia hairs to expel it from the system. The level of mucus produced is reduced and the nasal and cilia hairs find it more difficult to remove mucus out of the nasal passageway and

throat. Also, due to the cold weather people often stay inside more. This causes infections to spread more easily as people who are infected can spread it by droplet infection and lack of hygiene.

A recent study from the Nature Journal described a study with mice and subjected them to a rhinovirus, one at a warmer temperature and one at a colder temperature. The study showed that mice subjected to the virus at a warmer temperature produced more antiviral immune signals. These instruct the immune system to combat the viral attack. However, at colder temperatures the mice produce fewer antiviral signals. The study was then progressed to human airway cells and showed that cells at warmer temperatures were more likely than cells at colder temperatures to undergo apoptosis (programmed cell death).

In conclusion, to be cold does not directly give you a cold, however the effects that come with cold weather can contribute to a person being more likely to catch a cold or flu.

# HAVE A GREAT SUMMER!

The Biology Magazine Editorial Team

