Diseases of Aging?

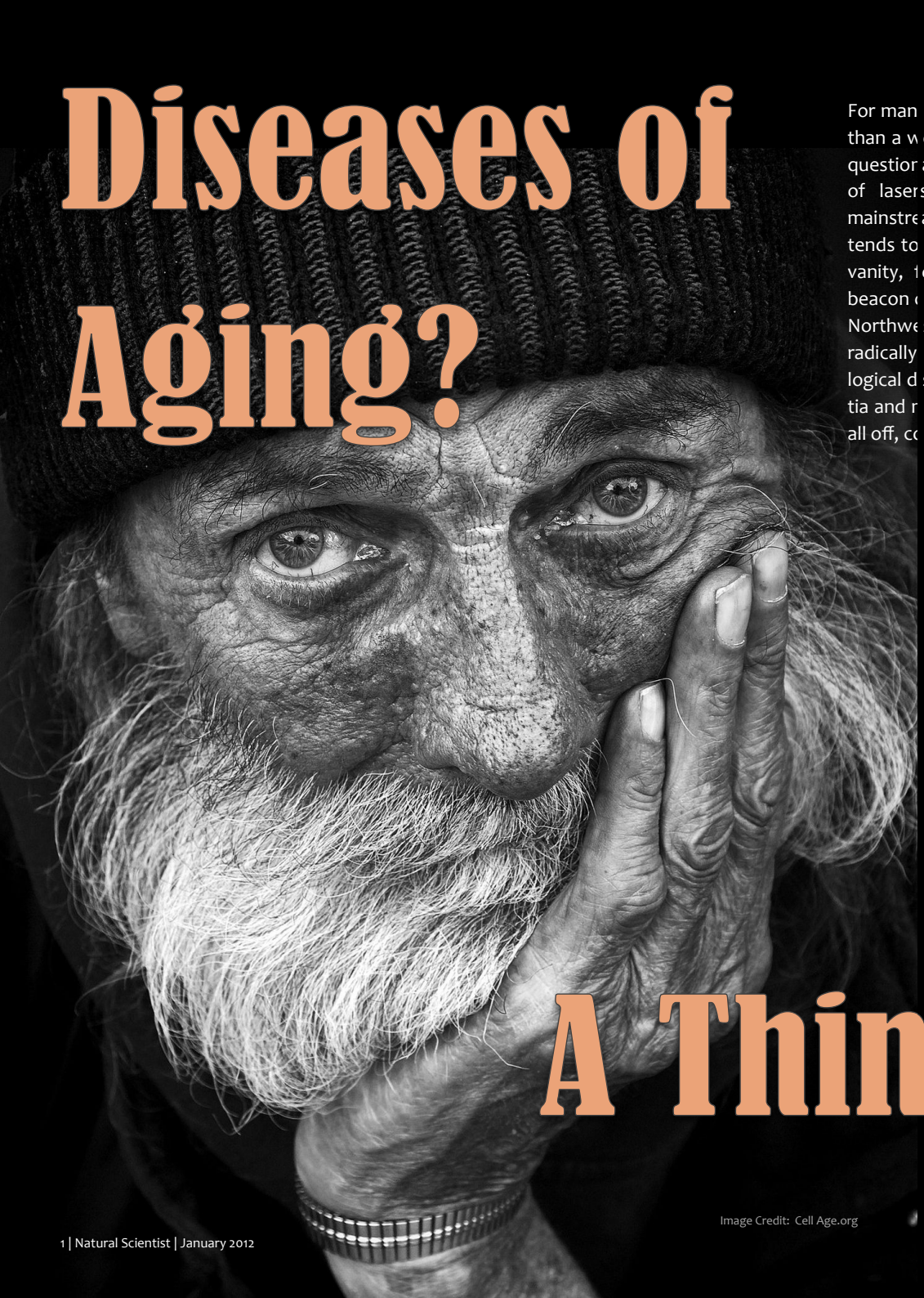


Image Credit: Cell Age.org

A Thing of the Past?

For man of us, ageing is more of a concept than a word. Though inescapable, it can unquestionably be delayed through a cocktail of lasers, creams and injections. Whilst mainstream interest in this field of research tends to have an underlying connotation of vanity, for others it represents a shining beacon of hope. Recent discoveries made at Northwestern University in the US could radically advance the way we treat neurological diseases such as Alzheimer's, dementia and motor neurone disease and to top it all off, could also increase longevity of life.

Diseases of the nervous system affect people of all ages and circumstance. A sixth of the population in the UK are affected, with one million of these left severely disabled. A large proportion of such diseases are related to ageing, which occurs because our biological functions gradually deteriorate over time. As we get older, cells stop responding to signals that control their growth, repair and eventual division within the cell cycle (such maintenance processes are key to the overall health of the body). This stage is known as *senescence*, and it occurs in all cells in all tissues of the body. This is, in part, key to understanding the loss of basic motor, sensory and visual skills evident in diseases such as Parkinson's as the brain decays.

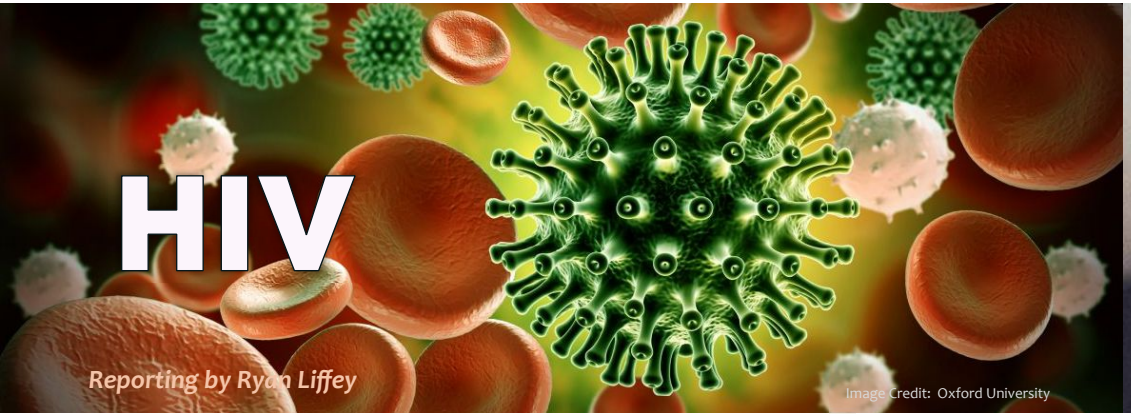
It has been found that moderate amounts of stress placed on cells, known as *hormesis*, actually encourages a cell to live longer. When inflicted with a combination of physical stress such as a low calorie diet or chemical stress such as prolonged exposure to UV, cells exhibit a far better adaptive response to cope. In comparison to sex cells, all other cells in the body (including neurons in the brain) are more prone to the effects of mutations and stress because they have double the amount of genetic information stored in double the amount of chromosomes. In harmony with evolutionary theory, the breakthrough research done by Eric Mimoto and his team at Northwestern University hence proposes that the secret to living longer and stronger is in fact better cellular resistance to stress.

Along with senescence, mitochondria play a large role in ageing. These are the powerhouses of the cell which, depending on the condition of the body, ceaselessly convert glucose, protein or fat into fuel. However as these organelles debilitate, highly reactive free radicals are released, which bind readily to other molecules and greatly interfere with cellular metabolism. Damage gradually accrues until a critical point is reached, which is why mitochondria are strongly linked to the sudden onset of disease.

The studies undertaken have hence targeted making drugs from proteins such as sirtuin-1 (SIRT-1), which regulate the ageing process of mitochondria by promoting more efficient DNA repair. As a direct implication, slowing down the ageing process of mitochondria in all cells could result in a body and mind less ravaged by time. With regards to neurological diseases, delaying the onset of dementia for example by just five years in the UK would result in thirty thousand fewer deaths directly attributable to the disease. Compounds that could enhance the activity of SIRT-1 have subsequently been investigated, and one of these is the powerful antioxidant resveratrol, found in red wine. It has already been found to prolong the lifespan of model organisms such as mice, fish and worms in laboratory studies.

Although most people would jump at the chance to live longer, many would equally rethink the decision if it meant prolonged frailty and dereliction. A spotlight thus shines on modern medicine; these findings represent the opportunity to develop a far more audacious way of treating, and possibly even preventing, neurological diseases. So if living longer and stronger is but a mere side effect, then bring on the stress. Δ

Reporting by Raisa Ramjan



HIV

Reporting by Ryan Liffey

Image Credit: Oxford University

Most people now know what HIV is, unlike when the virus first appeared, but many don't know how it affects the body or what is going into the current research in combatting this epidemic.

Human Immunodeficiency Virus (HIV) attacks white blood cells in the body. Viruses are microscopic infectious agent that replicates by injecting its genetic material into a living cell; for HIV the living cells it infects are CD4 or T cells, which are a form of white blood cell. Once infected with the virus the cell begins to replicate the virus's DNA thus creating more viruses. Once the replication is complete, the viruses 'break free' killing the cell and spreading the infection. As the virus spreads, more white blood cell die drastically lowering the immunity of the sufferer. The virus itself is not fatal but it destroys the immune system, and once this is sufficiently destroyed the patient is said to have Acquired Immune Deficiency Syndrome (AIDs) and even simple infections can become fatal.

HIV is difficult to cure due to the type of cell it affects, as the CD4 or T cells can lie inactive for years. When drug treatments are used it can appear as if a patient has been cured but in fact the virus is undetectable by a standard test. The inactive CD4 cells are not affected by current drug therapies therefore not all the virus is removed and it can start replicating again once treatment stops. For a permanent cure for HIV to work it must either remove all of infected cells within the body or control the virus such that it lays dormant even after the discontinuation of treatments. The third possibility is the development of a therapy which makes it impossible for the virus to be transmitted from person to person so that eventually the virus will die out.

Current treatments for HIV cannot stop or prevent the virus but are used to hinder its progression. Antiretroviral drugs have to be taken daily by a person infected with HIV. The current treatments usually combine more than one drug due to the complexity and intelligence of the virus. If only one drug were used the virus would evolve and become immune, with the use of several antiretroviral drugs that affect the virus differently, it is much more difficult. The drugs used usually affect the way the virus inserts its genetic material into a cell making it no longer able to do so. However even with the combination therapy the virus still eventually develops immunity meaning the drugs become redundant. There are only a few drugs that can be used as therapy so the virus will eventually become fatal although thankfully this evolutionary process takes decades.

Currently billions of dollars are being spent on research into the prevention and cure of HIV and AIDs. In 2009, $15.6 billion was spent around the world on treatments and research. However, only a small amount is spent on research into new cures. The majority of research is attempting to prevent the spread of the virus so that it is eventually eradicated, saving millions of lives. Some of the ongoing research currently includes the use of genetically modified plants to produce an antiviral drug that is currently being tested on humans. If the tests go well it could drastically lower the cost for the production of antiviral medication meaning more money can go into the research in finding a cure. Other research using GM tobacco includes the synthesis of antibodies which are used as therapy to lower the amount of virus within a sufferer.

Another research group is looking at vaccines; the vaccine called MVA-B could be used as a therapy to those already living with HIV meaning they may only need one injection annually to keep the virus dormant. It may also reduce or prevent onward transmission of the HIV virus. There is also a lot of research going into gene therapies as studies have shown patients being cured of the disease using bone marrow transplants, however, this therapy is highly dangerous and not currently cost effective. Δ

The end of chemo?

Reporting by Priyanga Perera

Image Credit: Sam Ogden SPL

Breast cancer is the most common manifestation of cancer, accounting for 1 in 3 of all cancer diagnoses in the UK. It will affect 1 in 8 women during their lifetime and claims the lives of 1000 women every month. Olaparib, a new drug currently undergoing clinical trials, has the potential to change this.

Cancer is caused by damaging gene mutations that lead to rapidly dividing cells. This cell division becomes uncontrollable and leads to tumours that can be fatal. The most prominent treatment of cancer is currently chemotherapy, a treatment that usually involves the intravenous administration of toxic drugs which directly attack and kill cancerous cells.

However, chemotherapy destroys not only cancerous cells but any cells that are rapidly dividing, such as those in the stomach lining, hair and bone marrow. Damaging these healthy cells causes many side effects, which include nausea, fatigue, balding, and a severely weakened immune-system. In addition, prevailing generations of cancer cells can often become unresponsive to chemotherapy, making the patient require repeat doses and thus experience these side effects on a regular basis.

This method of treatment can often hinder the patient's well-being, arguably as much as the cancer itself. Often chemotherapy is used palliatively to minimise the spread of cancer rather than remove it, in order to prolong the patient's life. But when facing such a difficult decision, likely anticipating such an unpleasant experience from chemotherapy, some sufferers choose to bypass the treatment and accept their fate in the hope of being able to spend the remainder of their lives with a higher quality of life.

Olaparib, on the other hand, is a targeted biological therapy that specifies its effects to destroy only the cancerous cells. In a significant proportion of breast cancer, the harmful cell division is facilitated by an enzyme called PARP (Poly ADP Ribose Polymerase), responsible for repairing the DNA of cancerous cells. Olaparib is a PARP inhibitor: it prevents the PARP enzyme from working, ensuring cancer cells do not repair themselves and die, thus halting tumour growth without damaging healthy cells.

If successful, Olaparib would have a tremendous impact to the well being of patients. It would allow them to avoid the detrimental side effects of chemotherapy, making them both physically and mentally more fit to fight cancer. Furthermore, as Olaparib can be taken orally in the form of a pill, patients would require fewer trips to hospital, which can surely only aid their recovery.

Nevertheless, Olaparib is not in use in the UK at present and only available in clinical trials. It has been trialled and found effective on people suffering from various forms of advanced cancer on whom chemotherapy had previously not worked, but not all. It was effective on cancers caused by the mutation of BRCA genes, which account for only 5% of breast cancers and 10% of ovarian cancers. Only a few cancers, predominantly those caused by the BRCA1/2 mutations rely on PARP to allow replication continue therefore this type of treatment will not be suitable for all cancers.

However, with further research and trials required, Olaparib's full potential, along with that of other PARP inhibitors and similar drugs, seems likely to be unlocked to provide a prolific advance in our battle to defeat cancer. Δ

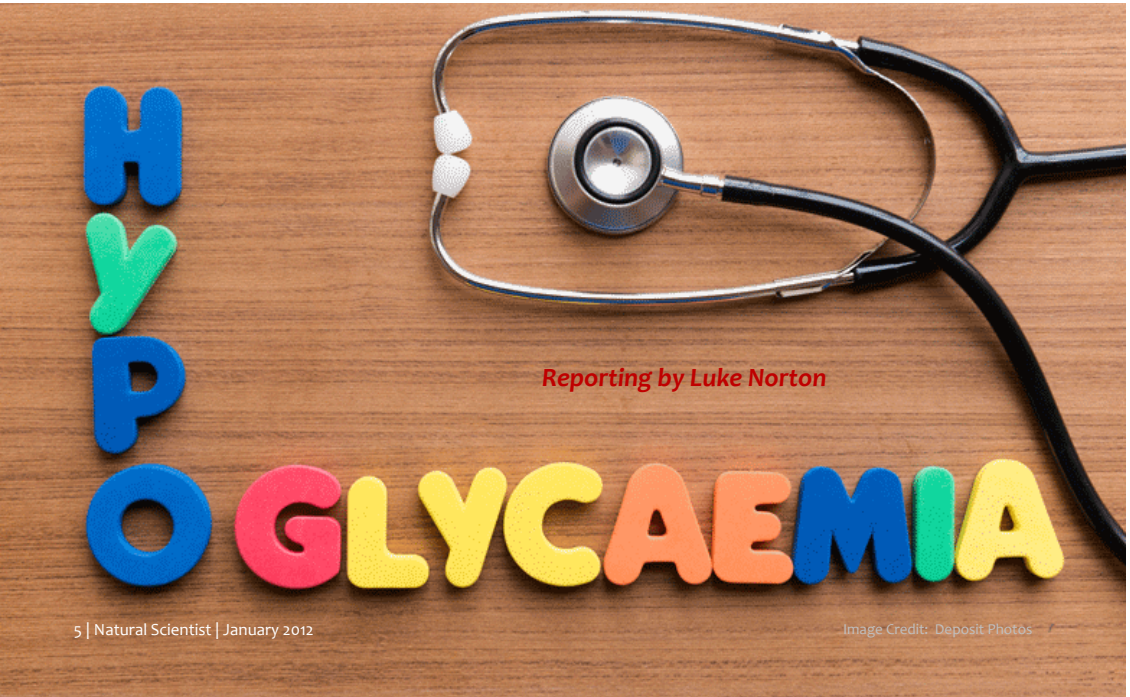


Image Credit: Deposit Photos

Hypoglycaemia, literally "under-sweet blood", is a serious condition where glucose levels in the blood decrease dramatically. Glucose is the body's main source of energy and the brain's only safe source of energy. Therefore, very low levels means the body does not have the energy required for its normal functions.

This condition can occur in anyone and at any age however, it is commonly associated with people who have Type I Diabetes. People with Type I Diabetes cannot produce insulin naturally so have to inject it regularly to control their blood glucose levels. Any change in diet without a change in their insulin dose could lead to an overdose of insulin, which can result in hypoglycaemia.

Hypoglycaemia can also be the result of prolonged starvation, kidney/liver failure, the use of alcohol and some medications (e.g. beta-blockers), and even the presence of cancer/tumours.

Typical symptoms to look out for in a hypoglycaemic person can include hunger, sweating, headaches, difficulty in thinking, seizures, and eventually a coma and death. Treating hypoglycaemia can be relatively simple. If the person is awake and alert, a sugary drink such as fruit juice, glucose gel, or even water with added sugar can work to quickly treat somebody with the above symptoms. If a person is confused or unconscious, emergency services need to be called and a glucagon injection would need to be administered. Glucagon is a hormone that has the opposite effect of insulin and quickly increases sugar levels in a person's blood using other stores in their body.

It has recently been discovered that some cases (1 in 100,000) of severe hypoglycaemia are as a result of a genetic defect as opposed to insulin overproduction. A gene known as AKT2 creates a signalling molecule which stimulates the uptake of sugar from the blood. A mutation in the AKT2 gene causes the signal to be constantly turned partly on. As a result, the body's cells are constantly taking up glucose, even when levels are already low. This can result in dangerously low blood sugars and can be life threatening, especially overnight when levels are difficult to monitor and symptoms can go unnoticed.

A current treatment for people with this genetic defect involves implantation of a surgical feeding tube. The tube enters through the front of the person's stomach and allows constant feeding throughout the night to prevent hypoglycaemic symptoms from occurring.

The discovery of this mutation has led to the proposal for a potential treatment. The AKT2 molecule is very similar in structure to a molecule, AKT1 that is activated in some cancers. It is thought that anti-cancer drugs that are currently being trialled to block the action of AKT1 may also be used to block the action of AKT2 and so could be used to treat this rare case of hypoglycaemia. Δ

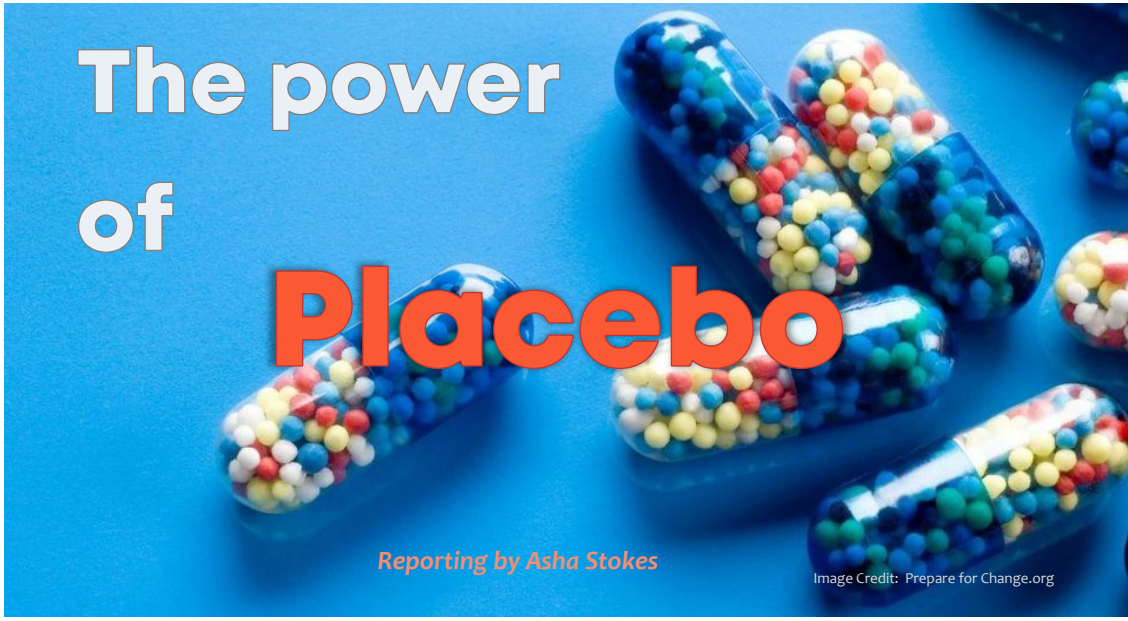


Image Credit: Prepare for Change.org

Placebos are treatments with no known pharmacological effect, which are commonly used in medical research as control treatments to determine whether a new drug causes significant improvements in the medical condition. Placebos include sugar pills, capsules, saline injections and sham surgery (in which the surgery scenario is set up but once the patient has been put to sleep no operation actually takes place). The placebo effect is when a person reports an observable or felt improvement in health or well-being after receiving a placebo treatment.

The placebo effect works by activating the endorphin system when a placebo is administered. This causes endogenous μ-opioids to be released in those regions of the brain where pain is generated. These opioids reduce pain by inhibiting nociceptive pain transmission in the central nervous system.

The presentation of the placebo is important with the size, price, colour, dosage and method of administering all influencing its effectiveness. The effectiveness of the placebo, or rather the strength of the placebo effect, are also thought to be linked with the relationship and the care shown by the doctor or nurses involved.

Studies into Irritable Bowel Syndrome showed that 59% of patients given a placebo pill along with consultations reported adequate relief after 3 weeks compared to 35% who received consultations and no pill. The response rate of those suffering from mild or short term depression is often indistinguishable between those taking placebo pills and those taking anti-depressants or those receiving psychotherapy.

Recent research into the effects of treatments on headaches and migraines has shown that in many cases placebo treatments have worked just as well as drugs in improving and reducing symptoms.

A study by the German Medical Association (BÄK) showed that half of all German doctors had prescribed placebo drugs to patients. Although the placebo effect has been an adequate symptom relief for many patients, the use of placebos by doctors is a grey area as doctors swear a Hippocratic oath to practice medicine ethically and many would believe that it is unethical to lead patients to believe you are prescribing them a medicine when you are not.

The study into Irritable Bowel Syndrome also showed that patients who were told they were receiving a placebo still showed signs of improvement which may mean placebos could be used by doctors without deceit in the future.

Evidence suggests the placebo effect can be as effective as many prescribed medicines. If it could be harnessed it could be used to further improve current medical treatments and to save health-care budget money. Δ

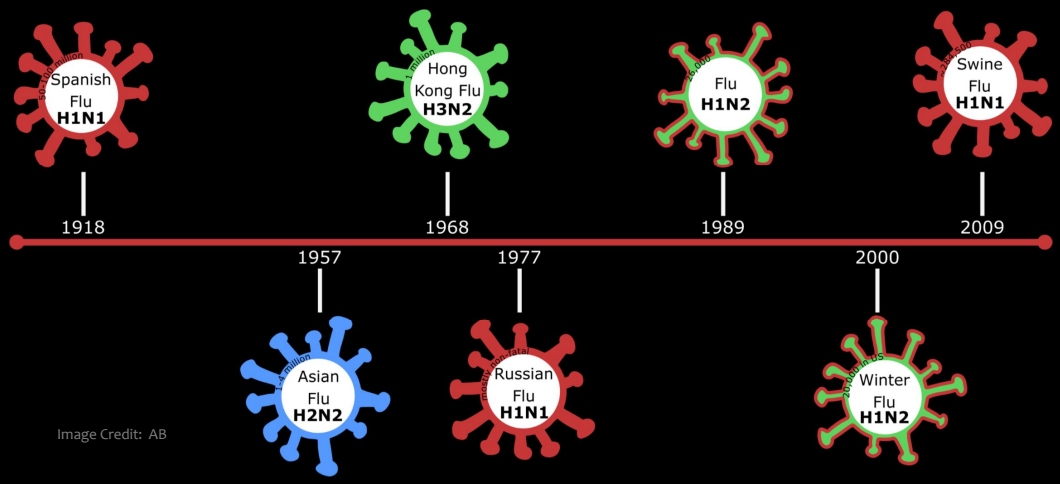


Image Credit: AB

PANDEMIC?

Every time there is a new outbreak it is splashed across the news, with everything treated as breaking news it is hard to know the truth from the scaremongering. Caroline Harris provides you with a summary of the key facts behind the flu. What makes a pandemic and why is influenza such a pandemic risk?

A flu pandemic is defined as a worldwide outbreak of the influenza virus. It differs from an epidemic which only occurs in a region or a community. Pandemics are often deadly to those affected as there is no resistance to them and the body is unable to fight the infection. Young children and the elderly are thought to be most at risk from these outbreaks.

The influenza virus has a number of proteins protruding from the surface. Two of these proteins are hemagglutinin and neuraminidase. There are 16 different forms of hemagglutinin and 9 different forms of the neuraminidase protein. The combinations of these different hemagglutinin and neuraminidase proteins change in order to go unrecognised by the immune system and give a flu virus it's name — e.g. H1N1.

A pandemic generally occurs when there is a change in the combination of neuraminidase and hemagglutinin on the surface of a virus cell that the body is unable to recognise. This can happen in two ways: drift and shift. Drift is when the DNA of the virus changes over time by mutation; these changes accumulate until there is an entirely new virus. As a result the immune system is unable to recognise the virus, so it ca be in the body for a longer period of time before it is destroyed - this time lag can be fatal. Shift is more complex and involves the re-assortment of animal and human viruses. An animal and a human viral cell are able to combine and release new viral cells that have not been previously recognised by the body. The virus is able to be transmitted between animals and humans.

It is difficult for scientists to produce a vaccine for an influenza virus as the virus constantly changes. The hemagglutinin and neuraminidase proteins on the cell surface do change and there is constant recombination between animal and human viruses. Each year scientists try to predict the path of change to keep up with the transforming virus cells. When a pandemic occurs vaccines are made available to young children and pregnant women as a priority.

There were three major pandemics in the twentieth century: Spanish, Asian and Hong Kong. The 1918 Spanish flu is renowned as death was rapid; often within hours of contracting the virus. Further deaths were caused by sufferers contracting pneumonia. An estimated 20-40 million people died in just eight months. Unusually a high death rate was seen in seemingly healthy 25-34 year olds which researchers believe was due to soldiers working in close quarters and travelling around aiding the spread of the disease around the World. This pandemic came in three waves: first early in 1918; second winter of 1918 (the deadlier wave) and final in 1919. Interestingly people infected in the first wave had mild symptoms in the second and usually survived as they had gained resistance to the virus.

During a more recent outbreak of Swine flu that originated in Mexico, a combination of bird, swine and human viruses, people were advised against non-essential travel to stem the spread of the virus. Although vaccinations were extremely effective, the World Health Organisation estimated that around 18,000 people died worldwide. Δ

Super Antibody

Reporting by Chloe Arbisman

A new antibody has recently been discovered which is the first to be able to fight nearly every single strain of the influenza A virus; the virus which is responsible for outbreaks of influenza and influenza pandemics across the world.

The discovery of this antibody, called CH65, has tremendous potential as it can be used not only as a therapeutic treatment for those infected but also to produce an effective vaccine allowing people to have just one flu shot for life, instead of one every year. Antibodies are proteins produced by the body's immune system in response to infection by a virus. They float in body fluids and are able to bind to specific parts of the virus and mark it for the destruction of other cells of the body.

Currently, a new flu vaccine needs to be developed each year as different strains circulate. Vaccines are intended to provide immunity against strains of flu that are expected to be most common and serious that year. However, this process takes a lot of time and money and a new vaccine can't be instantly produced when a new strain of flu arises.

Although for most healthy adults the flu is merely an unpleasant couple of weeks, for those who are particularly vulnerable such as the young, the elderly and those with impaired immune systems, the flu may be life-threatening. Current flu vaccines stimulate the immune system to protect you against the viruses in the vaccine and not any other strains of it. But the ultimate goal is to come up with a universal, longer-lasting flu vaccine that could protect people from all strains of the flu, and this is one step closer to being achieved with the discovery of the super antibody CH65.

CH65 was found in a human volunteer who was immunized in 2007. The discovery was made using patented technology which screened thousands of plasma cells and isolated the ones which secreted the antibody. Everyone produces slightly different antibodies which recognise different parts of the virus. The part of the flu virus which mutates every season to create different strains are the surface proteins. When these mutate, the antibodies the body created due to previous infection or vaccination will no longer be able to fight against it. But there is a tiny part of the virus that does not mutate, and this is the area that recognizes and binds to human cells. If this area mutates, the virus is no longer infectious to humans.

Scientists previously believed that antibodies couldn't target this small binding area with such specificity, however, CH65 has done exactly this. According to lead investigator Stephen Harrison, "It has been assumed that because antibodies have a larger contact area than most virus receptors, an antibody might target that receptor binding area, but it would still also recognize surrounding, changeable areas." This means that if the surrounding area mutated, the antibodies would no longer bind. However, CH65 binds so tightly to the tiny area, that it is not affected by mutation of the surrounding proteins. Collaborators at the U.S. FDA found that the antibody recognised 30 out of 36 strains of flu that have arisen between 1988 to 2007.

There are still problems which need to be overcome before a vaccine can be produced. For instance, use of a vaccine using the new CH65 antibody could result in the flu virus mutating in the binding area, causing the vaccine to become obsolete. So the current, aim is to learn how to make the body produce the CH65 antibody itself as opposed to other antibodies.

Because of its broad specificity the discovery of CH65 means we now have the potential to create a therapeutic treatment for severe flu cases and also a vaccine which will be able to save thousands of lives from upcoming, inevitable pandemics. Δ

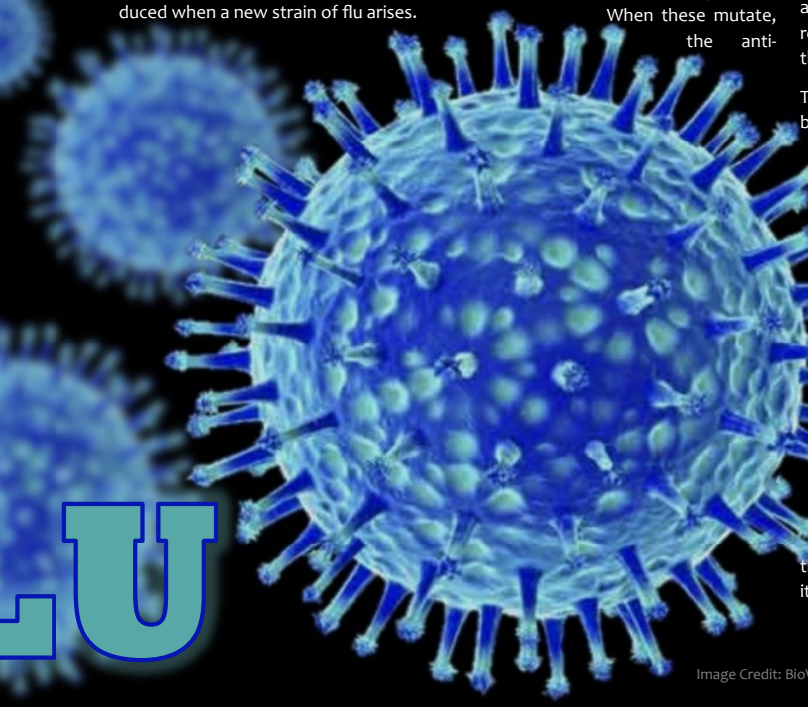


Image Credit: BioWars

What Are Stem Cells

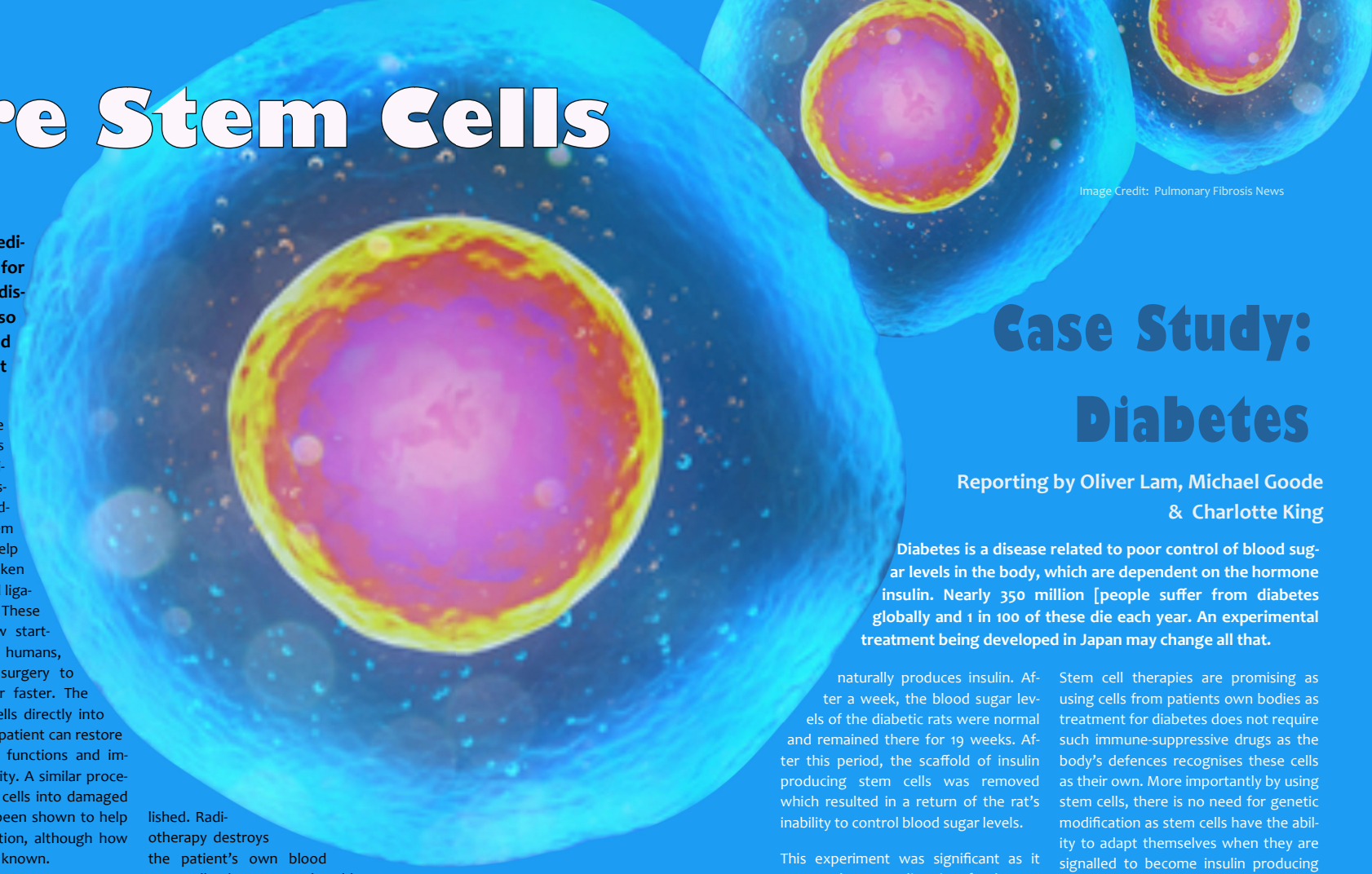


Image Credit: Pulmonary Fibrosis News

Reporting by Ellen Clarke

Stem cells are extremely important in modern medicine, and have potential to provide treatment for many serious diseases including, cancers, heart disease, Parkinson's and Alzheimer's. They could also be used in treating spina cord injuries, vision and hearing problems, diabetes and broken bones. But what are stem cells and why are they so useful?

Stem cells are a specific type of cell with the ability to develop into any possible cell type of the body and can repair tissues by dividing to form two new cells. There are two types of stem cell: embryonic and adult. Embyonic stem cells can, theoretically, keep dividing an unlimited amount of times whereas adult stem cells are usually limited. When a stem cell divides, each new cell can either remain as a stem cell or develop into a cell of a particular type.

The regenerative potential of stem cells makes them an important area of current research. They are being used to find out about human development, the cause of birth defects, and in the development of new drugs. The most important potential use of stem cells is developing tissues and organs for transplants. Transplants today have long waiting lists with not enough donors available and a high chance of transplant rejection. Stem cells could potentially alleviate these problems as their regenerative abilities mean the replacement tissues required could be grown in laboratories. Stem cells could be taken from the patient and used to grow replacement tissues/organs. Rejection is avoided as the replacement tissues are identical to the patient's own. This method could also be used for producing skin grafts for burns patients.

Stem cell treatments for diseases by injection into the affected areas are currently being developed. This could treat degenerative diseases such as Alzheimer's, arthritis, and heart disease. Veterinary medicine has used stem cell injections to help the healing of broken bones and damaged ligaments in animals. These techniques are now starting to be used in humans, such as in spinal surgery to make growth occur faster. The injection of stem cells directly into the spinal cord of a patient can restore some of the cords functions and improve patient mobility. A similar procedure injecting stem cells into damaged hearts in mice has been shown to help improve heart function, although how this works is not yet known.

As discussed in the case study, stem cells could be used to treat type 1 diabetes where cells that normally produce insulin are destroyed. Other diseases potentially treated using stem cells include deafness and vision problems where there is the potential that stem cells could regenerate the damaged parts of the organs. Missing teeth could be replaced using stem cell grown replacements and they may even lead to a cure for baldness.

Whilst the use of stem cells in these cases is still being developed, their use in treating leukaemia is well established. Radiotherapy destroys the patient's own blood stem cells; these are replaced by transplanting bone marrow that contains haematopoietic (blood-forming) stem cells. The patient's blood system is restored .

Although they have many potential benefits, lots more research is required before stem cell treatments can be used. Current problems in stem cell research include how to make stem cells develop into the cell types required, what transplantation and growth methods can be used to produce organs and tissues, and the many potential side effects of this currently untested technology. Δ

Case Study: Diabetes

Reporting by Oliver Lam, Michael Goode & Charlotte King

Diabetes is a disease related to poor control of blood sugar levels in the body, which are dependent on the hormone insulin. Nearly 350 million [people suffer from diabetes globally and 1 in 100 of these die each year. An experimental treatment being developed in Japan may change all that.

It was recently demonstrated by Tomoko Kuwabara and colleagues at the National Institute of Advanced Industrial Science and Technology in Japan, that Stem cells extracted from rats with diabetes could be used to cure them. In the experiment, the stem cells were extracted from parts of the rat's brain involved in smell reception and memory and were then treated with a protein to simulate them to produce insulin (which diabetics cannot normally produce) . These were then grown on collagen (a natural scaffold). The scaffold containing the insulin producing stem cells was implanted onto the surface of the rat's pancreas, the organ which naturally produces insulin. After a week, the blood sugar levels of the diabetic rats were normal and remained there for 19 weeks. After this period, the scaffold of insulin producing stem cells was removed which resulted in a return of the rat's inability to control blood sugar levels.

This experiment was significant as it proposed a new direction for human treatment of the disease. Currently there is no cure for diabetes and diabetics have to constantly measure their blood glucose level and inject themselves with synthetic insulin to control blood sugar. One of the limited treatments available is to have a complete pancreas transplant (1300 people a year of which 80% are effective in completely stopping symptoms) which allows the patient to produce and regulate their own insulin supply. However, there is poor availability of organs and patient remain reliant on immune system-suppressive drugs which make you prone to infections

Stem cell therapies are promising as using cells from patients own bodies as treatment for diabetes does not require such immune-suppressive drugs as the body's defences recognises these cells as their own. More importantly by using stem cells, there is no need for genetic modification as stem cells have the ability to adapt themselves when they are signalled to become insulin producing cells. This not only sidesteps the problematic side effects of altering genes but also the ethical issues, since the treatment comes from the diabetic patient themselves.

Whilst still a very long way away from being a treatment commonly and cheaply available to everyone, this research has hinted that diabetes and it's many complications may soon be at an end. There is also hope that this technique could be used to cure other diseases in the future. Δ

Image Credit: Nasa Archive

Groaning under the weight of an ever growing population

By the end of this month, the world's population is expected to reach 7 billion. The growing number of humans occupying the planet, along with the rate of expansion in our number is a cause for concern – practically, socially and environmentally. We need to come up with new and practical solutions in response to the growing demands on agriculture, healthcare and the world's energy resources if we are to sustain a decent quality of life for every human. Claire Wallace investigates what the future may hold.

Looking back 20,000 years to the end of the Ice Age, the human race was almost extinct. Yet our ingenuity and superior brain power enabled us to survive. By using natural materials to devise better equipment for hunting, shelter and clothing, we flourished as a race. We invented agriculture, harnessed the powers of nature and were able to settle. By 1805 the world's population reached its first billion.

With more people living in closer proximity, disease could spread more easily and competition for food meant that mortality was also high. Couples had many children as the likelihood of them reaching adulthood was slim. In 1798 Thomas Malthus put forward the theory in his 'Essay on the Principle of Population' that, "Population growth would always be checked by famine and disease". However, the advances in our understanding of healthcare and sanitation, along with industrial, agricultural and technological revolutions enabled better healthcare facilities to be provided for the population, including vaccinations to prevent diseases. This, coupled with better food supplies, cleaner drinking water and increased sewage management, meant that the population continued to grow.

In the last 2 centuries the rate of population expansion has dramatically increased. It took 122 years to get from a population 1 million in 1805 to 2 million in 1927, a further 33 years to reach 3 million in 1960, 14 years to reach the fourth in 1974, 13 to get to the fifth, with the sixth and seventh each taking only 12 years. At this rate we are expecting to get to 9 billion people by the middle of this century. In the last 100 years the population of the earth has more than trebled. It is not difficult to imagine the consequences of this.

Firstly, there are environmental concerns. A growing population puts higher demands on finite energy resources, and contributes ever more to the increasing carbon dioxide in the atmosphere, which is already at critical levels. Pollution of the air and seas, and problems of sewage and waste disposal systems can only worsen with our growing consumption levels. Alongside this, providing housing for all will mean destruction of forests and other natural habitats, putting other species at risk of extinction and decreasing the biodiversity of our planet.

Socially and practically there are great concerns as well. A conflict for resources, in particular food and shelter space, will mean that many are left hungry and homeless, denying the poorest of their basic human rights. 90% of population growth is taking place in developing countries in Africa and Asia, but already 1 billion people have no access to clean water or electricity supplies, and 2.5 billion do not have adequate sanitation.

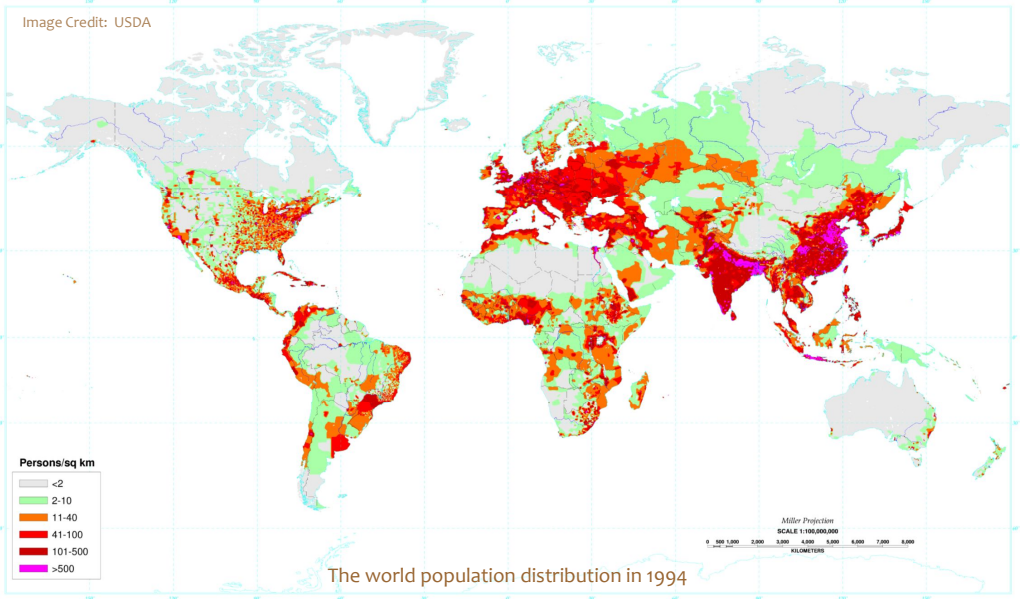
But what can be done in response to this? History has shown that the human race has been able to adapt and develop in response to growing numbers of people. Previous concerns of famine were combated with agricultural and technological methods to come up with higher yields. Clearly science has a huge part to play in coping with the increasing demands of our population, a role not only in agriculture, but also in providing energy for the masses by developing renewable and sustainable solutions.

Socially, governments have the responsibility to ensure resources reach those in need. The challenge remains however, in providing not only the necessary resources for a growing population, but also providing a decent quality of life, encompassing healthcare, education, sanitation, housing and nutrition so that each individual may flourish.

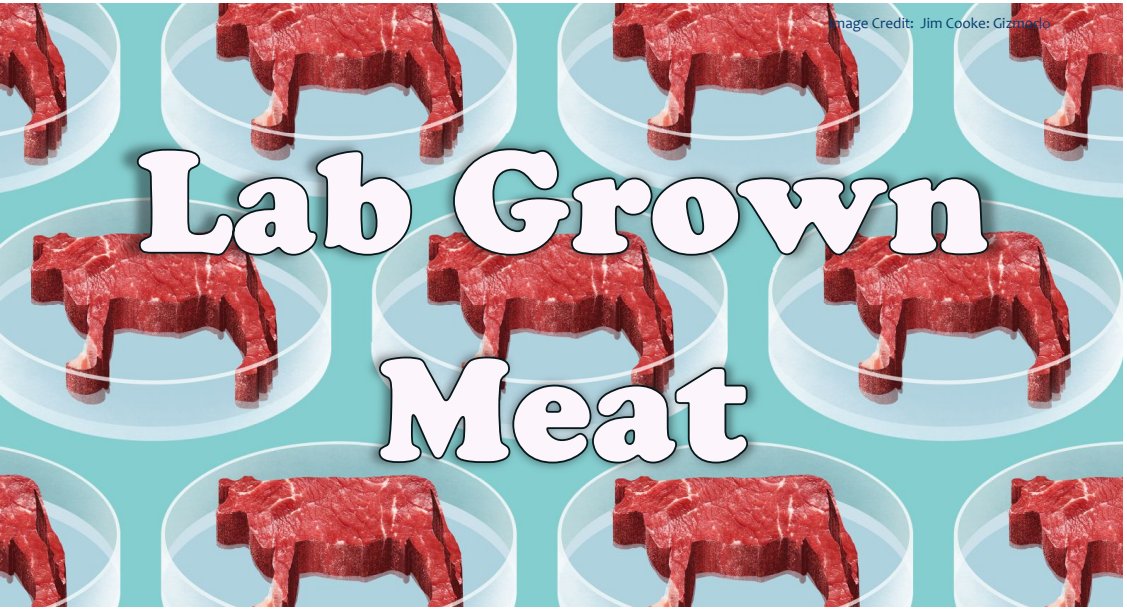
Population control and enforced birth limits may be a required step in ensuring the population does not expand any further beyond our means. Elimination of poverty is a key step here too, as it has been shown that those living out of poverty not only live longer with a better quality of life, but also have fewer children.

Therefore the responsibility lies with us as humans to again develop methods to thrive as a population, make the most of the resources that we have (including our own ingenuity) and curb our individual consumption levels; solving the socio-economic problems that accompany our population growth may in fact require more thought and brainpower than even the most complex scientific approaches, but it is our duty to succeed. Δ

Image Credit: USDA



The world population distribution in 1994



The prospect of our supermarkets being filled with lab-grown, cruelty-free meat is becoming a reality. Lauren Cholewa finds out more about the process of meat growth and the potential impact of this new development on our diet and our planet.

Growing meat in the lab, rather than raising the whole animal, may become reality at some point in the not too distant future. Cells could be cultured in bioreactors in a lab to give chunks of meat. Without the slaughter of animals many people, even some vegetarians, might feel obliged to turn to such an alternative, especially one which would be so much better for the environment.

Lab grown meat would reduce animal suffering significantly, as it is not necessary to kill or hurt the animals in order to obtain the cells needed to start the lab culture. Vegetarians who only object to meat on these grounds would be able to eat meat knowing that no animals had been slaughtered, instead of eating a meat protein substitute. Some religious requirements for meat preparation, such as Halal, could also be avoided, as requirements for slaughter would no longer be applicable.

Dr Tuomisto at the University of Helsinki has shown that, currently, producing meat uses large amount of land and water, as well as causing high greenhouse gas emissions. Intensive farming can also result in the growth of drug resistant bacteria, as antibiotics are often used to increase the rate of the animals' growth and to reduce losses. Environmental impacts of meat produced in labs would be significantly lower, in part due to the much lower food miles; the labs could be built in a large variety of places, rather than being limited to land suitable for grazing. Such land could be returned to nature. It would also be a more efficient process, as only specific, parts of the animal would need to be produced, resulting in much lower energy consumption per kilo of useful meat.

Keeping livestock is unreliable commercially, due to illness, stress, and uneven growth of the animals, with animal epidemics having a severe effect on the food market. It also takes a large amount of time to rear animals to the correct size, which could be significantly cut with lab production.

To produce synthetic meat, muscle stem cells are taken from the animal and transferred to a growth medium, which contains nutrients, energy and growth factors for the cells. They are cultured in bioreactors, which can be stacked on top of one another. The cells need to be grown on a scaffold, to give them support, and allow them to be stretched as normal muscle cells.

One of the problems with lab meat production is the fact that developing the right growth medium is extremely complex. Lots of the experiments have used animal foetal serum, which would have ethical implications. No-one has actually eaten the synthetic meats yet, as it is grown with calf-foetal serum, which could pose a health risk. A better solution that has been recently demonstrated would be to use cyanobacteria to produce the nutrients needed. Another problem is finding cells that will divide many times in a lab as normal muscle cells will not.

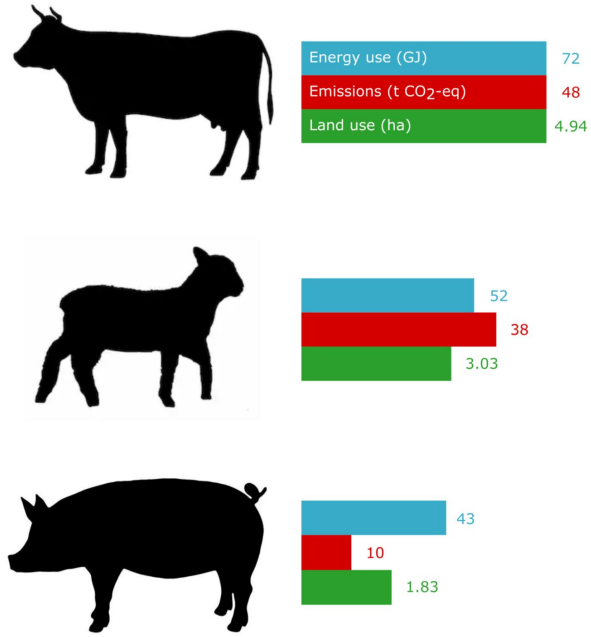
Meat is a good source of several important nutrients, such as omega-3, vitamin B12, iron and protein. By growing meat tissues in a laboratory environment, this high source of protein could be useful in famine stricken areas, as it could be produced nearby. It could also help to solve food scarcity and wastage problems in the future as supply could be more closely matched to demand.

Synthetic meat could be made a healthier alternative to traditional meat too, by controlling which nutrients it receives, for example by reducing saturated fat content. This could have significant health effects, such as reducing cardiovascular disease. Other food borne diseases would be reduced, due to the high food production and safety standards.

The animals used would no longer have to be limited to those that are easily domesticated; those with the best tastes and textures could be used. Even meat from rare or endangered animals could be produced, as it would not harm the animal to do so. However, this would have to be done carefully, as it may then be easier for poachers to sell the actual animals as meat.

People such as astronauts and polar research scientists, who live in very remote or confined areas for large periods of time, could produce meat for themselves in small bioreactors with minimal initial inputs. This would reduce the amount of food they have to take with them, increase the variety and appeal of their food, and may help towards allowing longer space travel.

One question is whether this cultured meat should be treated like traditional meat or not. However, we're still a long way from producing recognisable cuts of meat; the first synthetic meat is likely to be used in more processed foods, such as sausages and burgers, but even if researchers achieve this soon, it is likely to be a while before it appears in shops. Δ



Data source: Dr Toumiso—Life cycle assessment of cultured meat production

The environmental impacts for 1000kg of meat from different meat sources, including lab-grown.

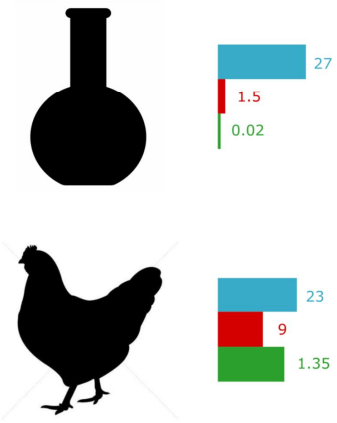


Image Credit: AB

Polluting the air we breathe

Air pollution is a broad term which covers all introductions into the atmosphere of harmful chemicals, particles or biological materials which cause damage to organisms or the environment. Air pollution can lead to a wide range of environmental issues such as smog, acid rain and global warming.

Reporting by Kirsty McGregor

Image Credit: Getty Images

There are a wide range of sources which create air pollution to different extents. Natural pollutants include dust, methane emitted by animals, radon gas formed by radiation within the earth's crust, smoke and carbon monoxide from wildfires and ash and other chemicals emitted by erupting volcanoes. However by far the largest proportion of air pollutants are released as a result of human activities.

Most pollution created by human activity comes from burning fossil fuels, such as coal, in different ways; this includes burning fuel in power stations, factories and vehicles as well as personal fires including bonfires and BBQs. Other chemicals can be released from paint, hairspray, aerosols and other solvents. Landfills can cause the release of large amounts of methane and it is possible for military combat to cause pollution through use of rockets as well as other weapons such as nuclear warheads, toxic gases and germ warfare.

Smog , a term created by combining the words smoke and fog, is present to varying extents in all major cities worldwide. Photochemical smog is caused when chemicals released from car exhaust or industrial processes react in sunlight to produce harmful chemicals. It is most common in cities with warm, dry climates as well as a large amount of traffic. Smog can also be caused from the black smoke created by burning coal. Although not such a problem in the UK today, this was a serious problem for many years in London. The Great Smog of London in 1952 lead to the deaths of at least 4000 people in 4 days followed by another 8000 in the following months.

An additional form of air pollution is acid rain, which is caused by chemicals dissolving in water vapour causing it to become slightly acidic before condensing and falling as rain. This can damage plants and other organisms as well as weakening building structures.

Global warming is the gradual increase in average temperature of the Earth. Air pollutants, termed greenhouse gases, blanket the Earth absorbing some of the heat radiation being reflecting and re-emitting it towards the Earth. This means that less heat leaves the atmosphere and there is a rise in temperature, which further exacerbates the greenhouse effect and heats the Earth further.

All types of air pollution pose major health risks, especially to high risk groups such as the young, the elderly or those with health problems such as asthma or lung disease. Short term effects of pollutants include irritation to the eyes, nose and throat, respiratory infections such as pneumonia, as well as headaches, nausea and possible allergic reactions. Long term exposure can cause chronic (continuous) respiratory disease, lung cancer, heart disease and can also damage other organs such as the brain, liver or kidneys.

There are many methods used to control the release of pollutants. Factories and power stations often use chemicals called scrubbing medias to absorb fumes from the air before they leave the site. Another method used is biofiltration in which micro-organisms are used to absorb the harmful pollutants. In the case of vehicles most developed countries have regulations that cars must be fitted with a catalytic converter to absorb harmful chemicals produced by burning fuel, preventing them being released into the environment and lowering carbon emissions.

Air pollution has been a very 'hot topic' in media in recent years with lots of different methods being suggested by different groups to provide a solution. As recently as the 9th October 2011, Milan imposed a 'car-free' Sunday, banning all traffic from the city in an attempt to reduce smog. The city of Milan is one of the most polluted cities in the world and imposes the ban whenever pollution levels are above the statutory limit of 50µg of particulates per cubic metre of air for 12 consecutive days. No cars are allowed within the city for 10 hours, and longer bans are imposed on other more highly polluting vehicles.

Elsewhere, Australia has just passed a carbon tax which, if their current government remains in office, will come into effect on 1 July 2012, this will tax Australia's biggest carbon polluters for each tonne of carbon dioxide they emit. This year London was the only city within the European Union which failed to meet the required EU cleaner air standards, which could result in a hefty fine. Despite schemes such as Barclay's bike hire and the congestion charge, air pollution is still a major issue for the capital and new restrictions may be needed on vehicles in the capital.

There is yet to be any 'solve-all' method to prevent air pollution and, despite the many preventative methods used, it is still a major problem in the world today. According to a survey by the International Energy Agency this year global carbon emissions are at a record high, raising doubts as to whether any of the range of preventative measures being used worldwide are having any positive effect on the issue. We can only hope that new technologies help us to solve this pollution problem before we experience another 'Great Smog' level event. Δ

Helium:

Making it stretch

Reporting by Daniel Gallanders

When you hear the term "finite resource" you probably think of fossil fuels such as oil, coal, and natural gas. But Helium, the second most abundant element in the universe, also falls into this category as a finite, non-renewable resource and, according to the stark warning from Nobel Laureate Robert Richardson, what we have is only set to last another 25 years.

The United States is responsible for a large majority of the world's helium output. Amarillo, Texas - otherwise known as the helium capital of the world - has reserves that account for approximately half of the helium worldwide.

Professor Richardson and others have voiced their concerns over the 1996 Helium Privatisation Act. This law requires all of the US reserves to be sold at prices sufficient only to repay the federal government's initial outlays spent on the gas. As a result helium has become an extremely cheap global commodity that it is seldom recycled in large scale industry as it is rarely economically viable to do so.

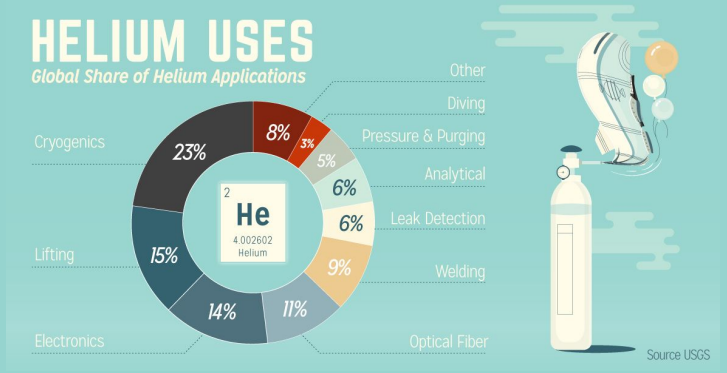
Helium is not just used in floating party balloons or as a gimmick to make your voice higher in pitch, but is an essential component in medicine, space exploration and across different fields of scientific research and industry.

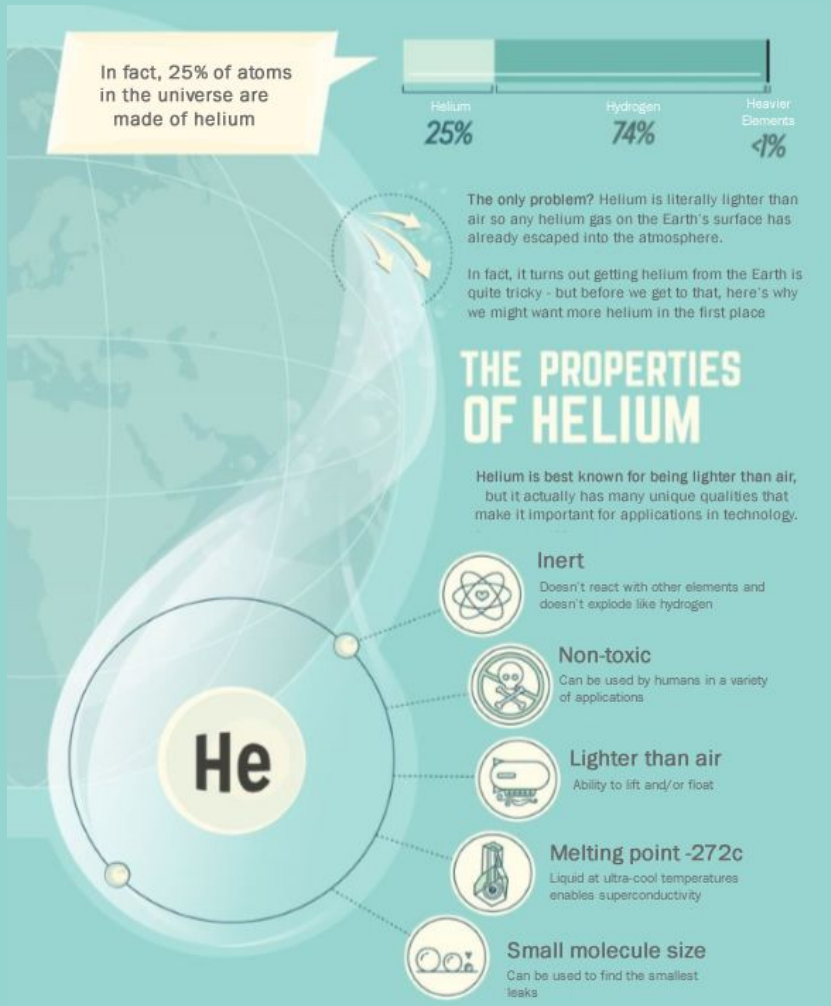
The chemical properties of helium directly influence the many applications that it has. Helium is the second lightest element in the Universe after hydrogen, making it lighter than air, therefore when suspended helium exhibits buoyancy. This buoyancy is illustrated when we release a balloon filled with helium into the air and observe it rising far into the sky. However it is the fact that helium has the lowest boiling point of any gas (-269°C) that makes it such a useful and fundamentally essential resource, particularly in modern medicine.

Helium is a vital component of Magnetic Resonance Imaging (MRI), a technique which allows physicians to diagnose many health conditions that affect organs, tissue and bone. The helium is used for cooling the superconducting magnets in the MRI scanners that allow an image to be created. Whilst the development of MRI scanning has been successful in saving many lives worldwide, the future outlook for this medical technique is bleak as there is no possible substitute for helium in this application.

In some other applications of helium, alternatives can be found and developed, but for others such as MRI scanning, the only option is to recycle. Large scale recycling of helium could go some way to stem the rate of consumption of the gas, but ultimately the cost of helium must rise to stop such a precious resource from being carelessly wasted.

To only option to preserve the helium we have left for what we really need it for is for the price of helium to rise. If this happens it will also make it more viable to invest in helium recycling across many industries. Δ

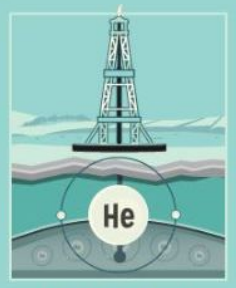




Helium Primary

High concentration helium deposits are those associated with nitrogen and other non-hydrocarbon gases.

Example: The Harley Dome Field in Utah has a 7% concentration of helium



Gas By-product

It may be economic to recover helium from natural gas fields if they are large enough to have an appreciable helium concentration.

Example: The Hugoton field of the Mid-Continent of the United States has helium in 0.3%-1.p% concentrations alongside significant amounts of natural gas.

Image Credit both pages: Helium-One.com

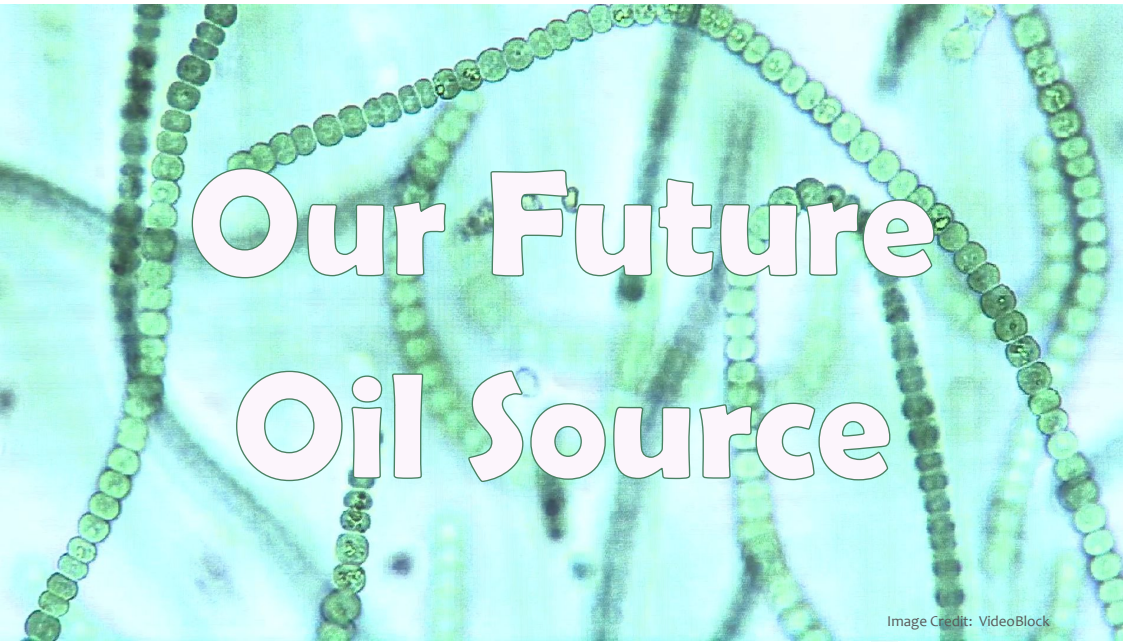


Image Credit: VideoBlock

With the world's oil predicted to run out over the next hundred years and climate change becoming a more dangerous threat everyday, alternatives to fossil fuels are eagerly being sorted. One potential solution is the production of oil by bacteria. Sam Duffy investigates.

With continuing strains being put on our existing oil and gas resources by emerging economies such as China, India, and Brazil, more elaborate methods of producing oil have been researched and implemented. Many of these involve developing oil and gas drilling techniques, but new methods for the production of oil have been introduced, such as bioethanol production. However, this has the main drawback of using a large amount of land space to produce the crops required for biofuel production. However, there is new research into the use of bacteria to produce oil, which could then be used to produce energy or plastics.

The bacteria used in this research are cyanobacteria, these bacteria can gain their energy requirements via photosynthesis. This makes them ideal for the production of fuel sources, as a middle step which would consume energy is not required. Therefore, via genetic manipulation, these bacteria can be "programmed" to continually produce and secrete fatty acids, which can be collected and manipulated to produce oil. Other non-essential functions which use up energy can be coded to be switched off, through genetic manipulations, to help improve the efficiency of oil production.

The ability to produce fuel is done by introducing the genes for the enzyme, thioesterase. This enzyme helps break the bond between fatty acids and other chemical compounds, such as acetyl CoA, thus causing the build of fatty acids in the cell. These fatty acids will then move out of the cell and can be collected without damaging the bacteria producing them. These fatty acids can then be modified to produce the chemicals required for oil production.

To improve the efficiency of this method, other genes have been inserted to cause the removal of the cellular envelope enclosing the bacteria, allowing easier release of fatty acids from the cell. Also, other genes which cause the overproduction of fatty acids can be inserted into the bacteria to help increase the amount of oil produced. This form of oil production is sustainable as creation takes a very short time in comparison to current oil and gas supplies.

In addition, this is seen as a green form of energy production, as even though it produces oil, which when consumed for energy gives off carbon dioxide, the actual process of forming via photosynthesis takes the same amount of carbon dioxide out of the atmosphere. This is because the photosynthetic formation of the oils is exactly the reverse of the combustion of the oil product. This makes it a net-zero carbon product. Also, as this is produced by bacteria and not plants, this form of bio-oil production does not take up as much land space as all that is required are sunlight, carbon dioxide and water for the bacteria to function. The production process could even take place in large tankers out at sea.

Whilst all this sounds promising for our future energy needs, there are certain problems that still need to be solved before this is an economically viable method for oil production. The cyanobacteria do not currently produce enough oil on a large enough scale to be commercially viable; therefore, there are plans to modify the bacteria so they can produce oil on greater scales. In addition, to help make the production more commercially viable, there are many by products which if utilised could help make this method further widespread. Details of possible uses are shown below and include animal feed and biomass to burn.

Therefore, whilst this technology is still in its developmental stage and still needs to be vastly improved, it could be a realistic source of energy in the near future. It gives hope for alternative forms of producing the oil on which society as a whole relies so heavily upon and means that society can continue with it's current use of plastics. Δ

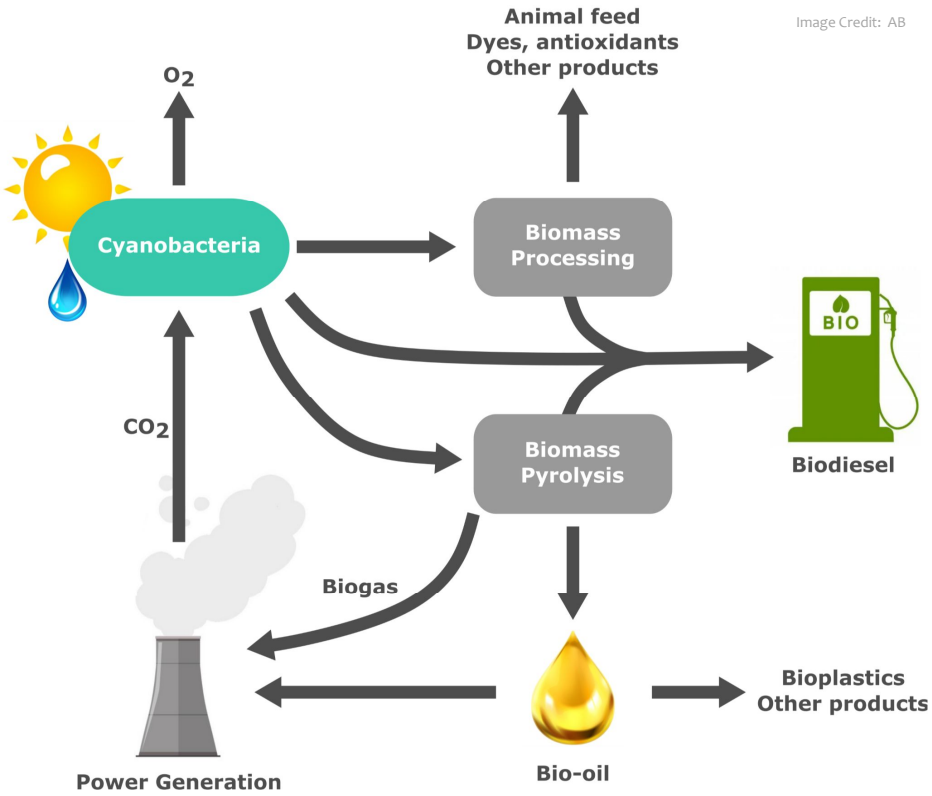


Image Credit: AB

The Future is Bright

As pressure for renewable energy sources rises, research into solar cells and how to make it more readily available increases. Michelle Bound breaks down on the current state of solar cell technology.

Image credit: Carl Attard, Pexels

Solar cells have been around since the 1950's but the low efficiency and high cost has always put the technology in the background of available energy sources. However, with the rising prices of petroleum and fossil fuels, research in the area is increasing and recently there have been significant breakthroughs to make the technology look like it could be more available to the public in the coming years.

The basic function of a solar cell is to take the energy from sunlight and turn it into the electrical energy that we can use to power everyday objects. The cells are made of materials such as silicon which are semiconductors. When they absorb the sunlight which knocks off electrons in the material, they can conduct the electrons to produce a useable amount of electricity.

The first solar cells to be produced had 6% efficiency but this increased to 15% over the next few years which meant they were made at the perfect time to be put into their first major use. In 1957, Sputnik was launched and solar cells fitted the bill for a remote electric source as they are lightweight and low-maintenance. They are still used for this purpose today as silicon solar cells power the space station but they now have many other applications.

Solar water pumping means that water can be pumped underground when the sun is shining. In developing countries villages can get clean drinking water this way and it can also power air conditioning units. Due to their low efficiency, solar cells are being used in combination systems to produce electricity. For example solar/wind systems tend to be quite efficient as usually one is available. Calculators provide an everyday use for amorphous silicon solar cells which are fitted into the top and mean that the calculator will work far longer than with just the normal battery.

Residential areas are becoming home to more and more solar cells as with a south-facing roof this can help out with bills. Any energy produced and not used is pumped back into the national grid and the government will pay for this electricity. However, although these solar cells are very efficient, they cost thousands of pounds to build putting a limit to the amount of people who can afford to do this.

Many researchers are trying to find a way to bring the costs down. A breakthrough for engineers at Oregon State University could change the way solar cells are made. They have found a way to produce the cells using inkjet printing which reduces the cost and also reduces the amount of raw material waste by up to 90% [2]. Although the solar cells they are producing this way are much lower in efficiency comparing more to the first ones made the quick method and cost could balance this out.

Further research is being carried out to improve the efficiencies of these solar cells but if these problems can be solved there is potential for solar cells to become the future of energy sources for homes. Δ

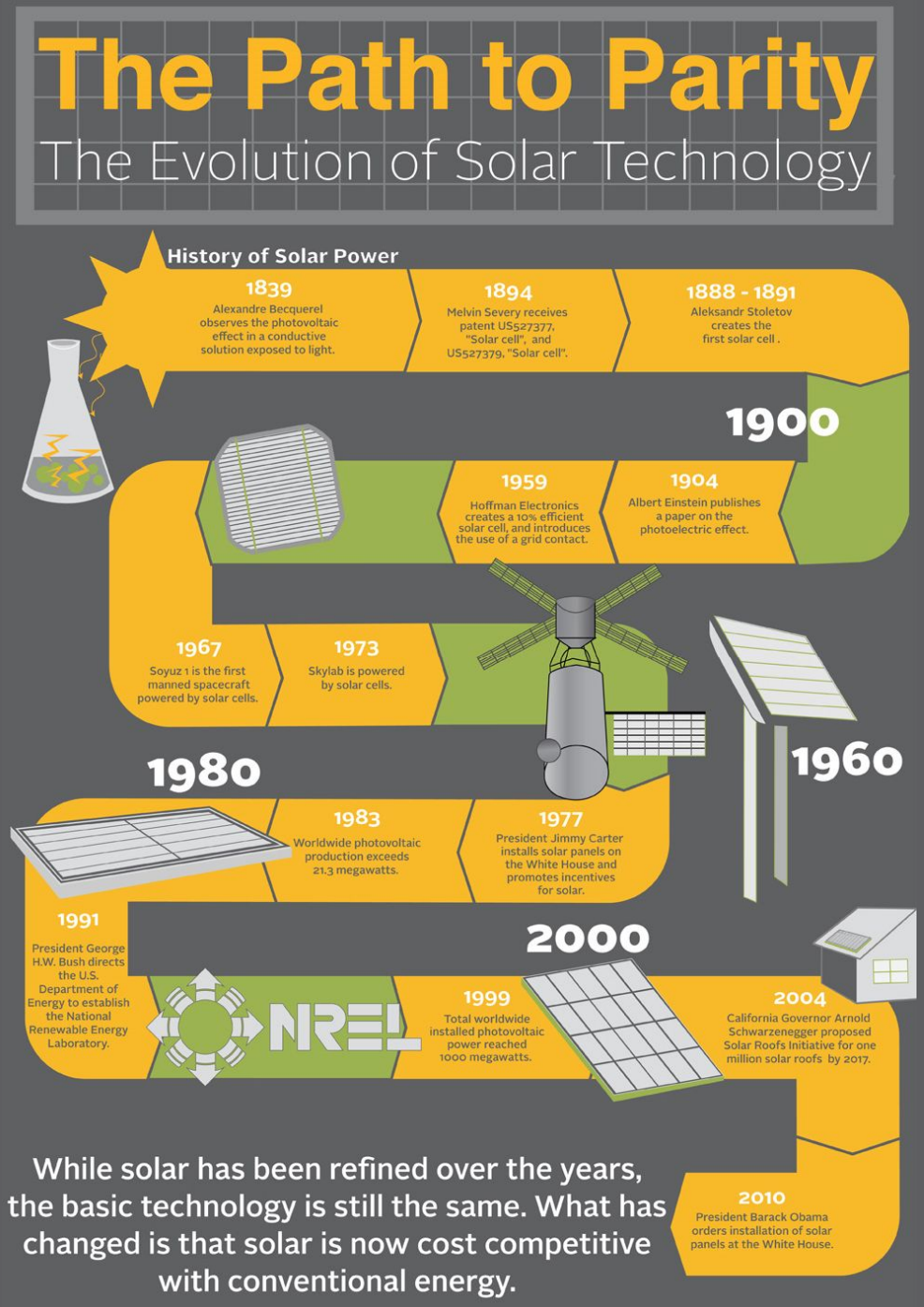


Image Credit: Extreme Tech

Image Credit: Gemalto.com

Biometrics:

who are you really?

Biometrics is the recognition of a person's unique physical characteristics. This involves a sensor or camera scanning the person in question for certain measurements, and a computer comparing that to its store of information. So, the computer should be able to scan someone, and be able to tell whether or not they are who they say they are. This works because the physical detail is unique to everyone and the characteristic can be measured and compared to others.

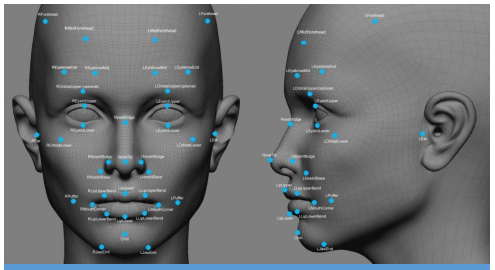
Reporting by Henry Burrows

Image Credits: Fingerprint: Andrey Prokhorovis iStock Photo | Face Recognition: eForensics Magazine | Ear Recognition: Naika Lieva Flickr | Iris recognition: Medical News Today

Fingerprints + hand geometry

Fingerprints are already known to not change throughout a person's life span, and are unique to each person; even twins do not share the same fingerprint. However, prints can appear different if the conditions are not the same as when the original was taken, e.g. if the finger is too dry.

US immigration use a system called the INSPASS system, which takes nine measurements of the hand. This system has proved itself to be very accurate but, though it saves immigration time, INSPASS is not very cost-effective.



Face Recognition

This can require around 120 measurements, usually analysing the position, size and sometimes the shape of the key features of the face, such as the nose, eyes and cheek bone. Problems can occur with changes in facial expressions and in poor lighting.

Ear Recognition

This used to be done in a similar way to facial recognition, detecting the key features, such as the ear channel, and comparing it to the rest of the ear. A new approach captures the whole ear and represents it as a code, allowing for more accurate comparisons between people than facial recognition, says Mark Nixon, University of Southampton.

Iris Recognition

This uses a camera with a slight infrared illumination to obtain a mathematical pattern. It observes the detailed structures of the iris, unique to everyone, and is one of the most accurate biometric techniques. Iris recognition is not to be confused with retina scanning, which recognises the pattern of blood vessels at the back of the eye, so requires the subject to be much closer to the camera than iris recognition. However, due to the nature of the iris recognition system, its accuracy can vary on the lighting.

What are Biometrics good for?

Other forms of security technology, such as PINs and keys, work by positive recognition, i.e. 'is this person who they say you are?' Only biometrics can work by negative recognition, i.e. 'is this person who they say they aren't?' Negative recognition is useful in preventing someone from having multiple identities, and is used in verification systems to prevent, for example, a terrorist from boarding a plane.

Though not seen everywhere, biometrics is a technology that is being used in more and more security systems around the world. Will biometrics be the future of what defines us as individuals? Δ

Is there a speed faster than light?

Image Credit: Shutterstock

Reporting by Charlotte Weaver

Recently physicists ran experiments on tiny particles called neutrinos, sending them 730km from CERN's Geneva HQ to the OPERA detector at Gran Sasso laboratory in Italy. They were surprised to discover that these neutrinos were travelling faster than the speed of light!

Einstein's special theory of relativity showed that the speed of light is the fastest speed in the universe, and is therefore a constant ("c" in the famous equation $E= mc^2$). Does this mean then that CERN's physicists have proven the great Einstein wrong? That E no longer equals mc^2? Well, maybe…

The particles used in this experiment were neutrinos, which are electrically neutral, elementary subatomic particles with very small masses, created through radioactive decay or nuclear reactions (fusing lighter elements into heavier ones). Being neutral (having neither positive nor negative charge), they are unaffected by electromagnetic forces therefore do not interact with normal matter. This means they travelled straight through earth to the OPERA detector without being absorbed by the earth.

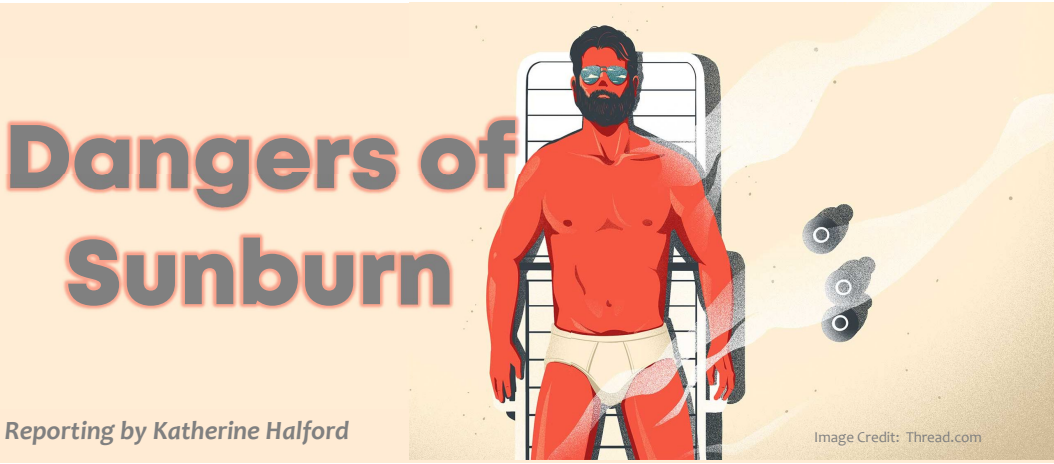
The distance between the CERN laboratory in Geneva and the Gran Sasso laboratory in Italy is 455 miles. The neutrinos arrived 60 nanoseconds (60×10^{-9} seconds) earlier than they would if they been travelling at the speed of light.

As of yet no-one knows the reason for this bizarre occurrence. However, scientists including Thomas Weiler at Vanderbilt University in Nashville speculate that the neutrinos travelled through a 'fourth dimension'. He says that we live in a 3+1 dimensional space-time (3 spacial dimensions and 1 time dimension), or membrane, also known as 'brane'. Light travels easily through this dimensional world, and it is believed that the brane is situated in a higher-dimensional space-time called the 'bulk' and that instead of the neutrinos following the normal path through the brane (which light would travel through) they escaped into this bulk and then returned back to the brane to be detected, therefore travelling a shorter distance from CERN to Gran Sasso, consequently reaching their destination in a shorter time.

If this possible explanation is found to be the truth it would mean that Einstein's theory that the speed of light is ultimately the fastest speed is still correct! However, it would also mean that there is a higher dimension than the ones we are already aware of.

Physicists are still not sure of the reason for this anomaly; maybe the neutrinos really did travel slightly faster than light speed. The Guardian newspaper states that experiments T2K in Japan and MINOS near Chicago in the US are now in the process of trying to replicate these findings. In addition, CERN is continuing to run this experiment to collect more data and confirm their findings. There is still much scepticism in the scientific world as to whether the CERN calculations are correct, but on the other hand no-one as of yet has managed to prove them wrong.

Update: CERN have now released more data revealing anomalies in the original measurements and confirming that the time taken for the neutrinos to travel the 730km is consistent with the agreed speed of light. Δ



Dangers of Sunburn

Reporting by Katherine Halford

Image Credit: Thread.com

Looking at someone suffering from sunburn you may know the visible signs but sunburn is actually your body's way of fixing permanent damage caused by harmful UV Rays. Recent studies show that sunburn is a visible sign that UV radiation has damaged the genetic material in skin cells, and redness and swelling is our bodies answer to this dilemma. So what is sunburn and how can we reduce our risk of genetic damage?

Sunburn is often red, hot and swollen, and this is down to the damage that UV radiation causes. The cells in our body try to repair the damage caused, and blood rushes to the site of sunburn due to the swelling of blood vessels. Peeling of the skin removes damaged cells, as it is these cells that are now known to be linked to the cause of specific skin cancers. Although the repair system is an effective way to remove the damage, it's not perfect. This is the main reason why sun burn can have such detrimental effects and can scar.

Different types of UV Rays affect our skin in different ways. UV Ray Type A (UVA) penetrates deep into the skin and is involved much more in the process of ageing than the cause of skin cancer. It is thought that UV Ray Type B (UVB) is responsible for the majority of sunburn, therefore exposure to UVB rays can increase the chances of developing skin cancer.

So what are the dangers of sunburn and long term UV exposure? There are three main forms of skin cancer – basal cell carcinoma, squamous cell carcinoma and melanoma. The first two of these types are known to be caused by long and persistent exposure to UV Rays, and is often seen in areas of the body exposed to the sun, such as face and hands. Melanoma however is thought to be caused by short intense bursts of UV light, and statistics from the skin cancer organisation show that being burnt five times or over in our lifetime doubles the chance of getting skin cancer.

It's not just holidaying to other countries that can cause sun burn. Being outdoors in the UK or trying to get a fake tan on a sunbed can be equally as dangerous. A study in the journal 'Paediatrics' by Gellar AC. et al showed that in the year 1999 10% of children aged 12-18 were thought to use sunbeds, massively increasing their chances of getting skin cancer later in life. Recent interventions have made it illegal for children under the age of 18 in the UK to use sunbeds, due to the knowledge that people using these devices under the age of 20 are thought to have increased chances of developing skin cancer. Half of sunbed users are thought to suffer from sunburn, and it is said that 10 minutes in a tanning salon can match the cancer causing effects of 10 minutes unprotected in the Mediterranean sun.

Melanoma is not the most common type of skin cancer but is in fact the most lethal. If recognised early then treatment is often successful, however if left, it can easily spread to other parts of the body, thus making it much harder to treat. Skin type, family history and having moles also increase the risk, and changes in these moles are thought to be precursors to the cancer itself.

So yes, sun burn is really that dangerous and only adequate sun protection and staying out of direct sunlight during midday hours is the definitive way to prevent your skin from burning. Severe sunburn must be treated appropriately and any complications checked out with your GP. Reduce your chances of getting skin cancer, don't increase them. Δ