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A NIGHTMARE OF THE PAST

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Stress is undoubtedly a major health problem and something which many people have to face nowadays. Whether it is exams, friendship or too much work, stressful situations seem to arise all the time. A small amount of stress isn't harmful; however, prolonged stress can have a range of disastrous effects on the body, meaning we are more likely to develop illnesses, including heart disease, infections and even rapid ageing.

So how does prolonged stress make us more prone to illnesses? Well, it's all to do with how stress weakens the immune system.

The immune system is composed of billions of different immune cells. There are a range of lymphocytes which are produced in the lymph node, and are responsible for identifying, marking and destroying pathogens that enter the body. There are two types of lymphocytes: B-lymphocytes, which release antibodies that mark invading pathogens and T-lymphocytes which actively destroy invading pathogens. These immune cells work collectively to fight off infectious diseases.

Stress has different effects on these immune cells, depending on whether the stress is acute or prolonged. Acute stress is essentially short-term or immediate stress. In response to this, the body goes into what is known as the "fight or flight" response which causes the release of hormones which have a range of effects on the body, including higher blood pressure, increased heart rate and increased blood glucose levels. A stress hormone called cortisol is released from the adrenal gland which acts to perk up the immune system by directing immune cells to areas of the body which are susceptible to direct injury, such as the skin and bone marrow. All this leads to a temporarily boosted immune system, which returns to its normal functioning once the threat has passed

So how do the effects of prolonged stress differ to acute stress?

Prolonged stress is the long term experience of stressful situations, which leaves the body at a constant 'high alert' and can cause an imbalance of hormones in the blood. This can weaken the body and lead to high blood pressure, diabetes and even heart disease. Prolonged stress also dampens the immune system because high levels of cortisol and adrenaline in the blood (caused by prolonged stress) damage the immune cells in various ways. Cortisol shrinks the lymph node, lowering the levels of lymphocytes in the blood, but also suppresses T-lymphocytes, which makes it easier for pathogens to infect the body. Adrenaline also lowers the number of T-lymphocytes and inhibits immune cells by latching onto the cells themselves.

However, it's not all bad news! There are simple steps to reduce the effects of stress, such as regular exercise, socialising with friends and yoga. All these activities use up harmful stress hormones like cortisol and releases endorphins, which are 'feel good' chemicals that cause feelings of happiness. ■

Samit Patel


Stressed?

how to beat Insomnia

There are millions around the world who, every night, settle down for a good night's sleep ready to work the next day. But there are also many who, however hard they try, cannot get a wink of sleep. There are many ways in which you can secure a good 8 hours with some simple tips and trick to get your sleeping patterns back in shape.

Having a bath

It may seem a bit silly, but having a bath around an hour before you go to bed can really assist you in your efforts to get some sleep. So why then, can such a simple activity give us what sleeping pills and patches cannot? Aside from the fact that a nice, warm bath is soothing and relaxing, what we are really focusing on is the "warm" aspect. When we go to sleep our temperature will drop. Having a bath simulates the very same process. When we get into a hot bath, our temperature rises as expected, due the hot water. When we get out of the bath, however, our temperature will drop again. This sudden, and comparatively more rapid cooling tricks the body and the brain to feel sleepy and can, therefore, help you get more sleep. Never has there been such a simple way to get a good night's sleep.

Controlled sleep

Now, your first thoughts here may be, how can getting less sleep help you get more sleep? This remedy is for those who have irregular sleeping patterns. This is very disruptive towards your daily activities because it means you are constantly switching between being very awake to very drowsy throughout the day. Hopefully controlling your sleep will solve this problem, ensuring that the only time you spend in your room is the time you spend sleeping (or trying to sleep). Depending on your age, you should spend a certain amount of time (about 8 hrs for a teenager) sleeping every night (usually going to bed at around 10-11). You should then get up the next day and not return to your room until you go to bed again at the same time as the previous night (that factor is important). This should continue for about 1-2 weeks and should set block sleeping periods, thereby helping you to sleep when you need to.

Napping

It seems that, in this day and age, our lives are so much busier than what they used to be. Consequently, many people are being deprived of sleep and have to catch up whenever they have a chance. Napping is still a common activity, but for some it isn't for a good reason. If you're going to take a nap, it has been discovered that the best time to do so is from 2 to 5 in the afternoon. The body is unlikely to be able to nap in this way at any other time of the day (excluding when you go to sleep, although, strictly speaking, that isn't napping). Most naps should be between 30 mins and 1hr long and will generally work better when not in broad daylight as this means that the production of melatonin, (the sleep hormone), is not stimulated and you will find napping considerably harder.

So these are three effective ways to improve our sleep. Those who sleep more, generally, tend to live longer and have a lower risk of contracting heart related illnesses. What harm could getting that extra hour of sleep in do, eh? ■

Daniel Foran

sponges

You're in the shower, and you reach up to grab the shower gel and the sponge to wash yourself. But have you ever considered that the sponge you use, on a daily basis (hopefully) to wash yourself may have once been a living animal?

The sponge has been around for around 580 million years, and it has managed to stay virtually the same for all of that time. If you are a keen biologist, you may know that this does not happen very often at all.

We all know that sponges don't have rows of sharp teeth, or tough scales, so just how have they survived for so long?

Sponges are primitive animals. They have no brains, no nervous system, no digestive system, and no circulatory system. However, these animals have several clever ways of staying alive.

Firstly, there are between 5,000 and 10,000 known species of sponge. There are some freshwater sponges, but they are mostly seawater creatures. These sponges can live in an almost unbelievable range of water depth. Sponges have been found anywhere between 300ft below sea level to 8,800 metres below sea level (28,871ft). This is practically on the sea bed of the deepest place in the world, the Mariana Trench, at 8,848m down.

Secondly, sponges have a very unique and amazing ability to transform specialised cells into other types of specialised cells without making new ones. A sponge's individual cell can sense a change in environment, and transform into another type of cell.

If a sponge has an environmental change that it cannot live with, it can produce and release gemmules, which are essentially survival pods of unspecialised cells that remain dormant until conditions are ideal again. These gemmules can either join another sponge and grow, or it can create a whole new sponge.

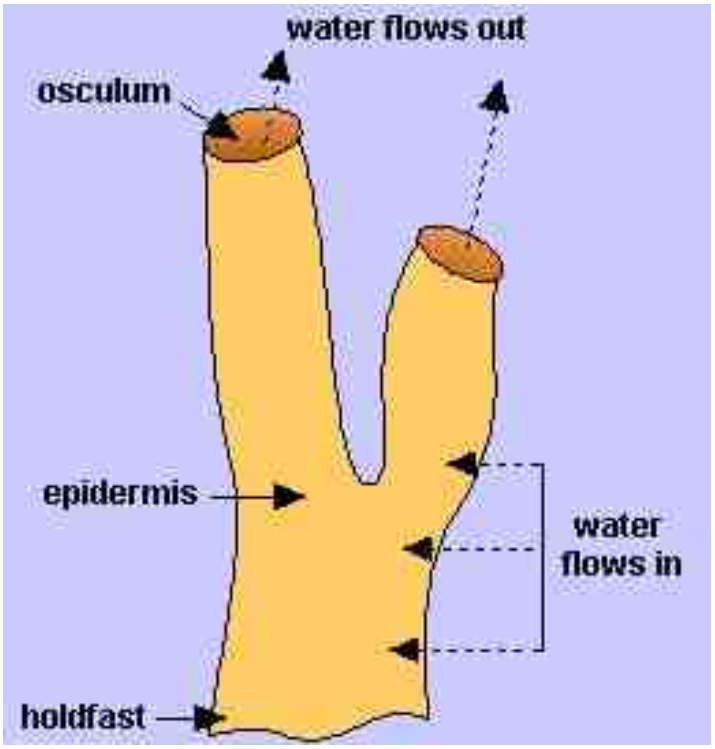
A sponge's body is made up of a jelly like substance called mesohly, and that is surrounded by the epidermis, a thin layer of cells.

Sponges feed on impurities in and bacteria in water, and its body is very well adapted for this. Sponges are porous animals, and water is channeled through their hollow bodies and all bacteria, dead and decomposing bodies, or excrement is consumed when it passes through them. The water comes through the pores in the sponges and it flows out of the a large opening called an osculum.

Some sponges have been known to turn carnivorous when there is a shortage of food, eating small crustaceans like crabs. This eating mechanism is very important and it is one of the main reasons that sponges have survived for so long without evolving.

If reading this has made you paranoid of washing yourself with your sponge, there is nothing to fear. These amazing animals have been very heavily overfished. In the 1950s, they were so heavily overfished that most sponges made nowadays are synthetic. Also, although sponges are picked alive, they die soon after being out of water, so you won't be washing yourself with a living creature. ■

Fergal Marrett



A classic example of a sponge

POLIO: A NIGHTMARE FROM THE PAST?

The year of 2012 could be the year in which this disease is finally eradicated. Despite being nowhere near as publicised as the eradication of small pox, this will be a great leap forward for mankind.
The table at the bottom shows some facts about Polio.

History

Polio has been around for thousands of years. An Egyptian stone carving portrays a priest with deformities in his leg characteristic of polio. From the late 19th century, there were major outbreaks in the US and Europe. The disease could cause crippling disability and death within hours, and thus it became greatly feared. In the late 20's the 'iron lung' was created to help patients paralyzed with polio to breath. The iron lung worked by periodically decreasing and increasing air pressure to get the lungs to expand and contract; normally, contraction of the diaphragm and intercostal muscles in the ribs decrease pressure to force air into the lungs. Despite their uncanny resemblance to giant tin cans, they saved countless lives. As early as 1952, the US saw a record 57,628 cases.

In 1988 the World Health Assembly set a target of eradicating polio by 2000.

Who	The mortality rate is 2-5% in children and 15-30% in Adults.
What	Polio is a viral, infectious disease that causes muscle weakness and severe deformity of limbs. To the right you can see a child displaying symptoms typical of a victim of Polio. It can also cause respiratory problems.
Where	At the moment, there are only 4 countries where Polio is endemic: Pakistan, Afghanistan, Nigeria and India. Chad and DR Congo have persistent outbreaks, usually due to infections from endemic countries. India is awaiting confirmation from scientific tests, which could remove India from the list of endemic countries.
How	This disease is transmitted via the fecal-oral route: that is, people eating food contaminated with fecal particles. Polio outbreaks have been vastly reduced with improvements in sewage systems.

'Iron lungs' - these tin cans help you breathe

That year, an estimated figure of 350,000 people were paralysed or killed by polio and the virus was endemic in 125 countries. A major battleground against polio has been India. In 1985, there were 150,000 cases. Even by 2009, they had 741 cases - that is more than any other country in the world. However, its last case was in January 2011 - a remarkable achievement. But it won't be officially removed from the list of polio endemic countries until the results of lab tests confirm that it is no longer found in sewage.

Vaccine

There are two vaccines against polio. The first is an injected dose - this was developed by Dr. Jonas Salk, and introduced in 1955. It works by the same principles as most vaccines, like the one that eradicated small pox. The patient is given a dose of inactivated (or killed) virus. Their lymphocytes (white blood cells) can produce the appropriate antibodies; the body isn't harmed, and it is prepared for any future attacks as the antibodies are remembered by memory cells.

A second, oral polio vaccine was created in 1961 by Dr. Albert Sabin using a live weakened strain of the virus. It has been this vaccine, given in drops, which has been the main tool of polio eradication.

The final percent

Since 2000, the number of cases has been reduced by more than 99%, but it is the final 1% which may prove the toughest to deal with. Until polio is fully eradicated, there will be the danger that the virus will be reintroduced to countries like India, across the border from Pakistan. Polio virus from Pakistan re-infected China in 2011, which had been polio free for more than a decade.

It may be difficult, but many people are predicting that this could be the year in which polio is finally eradicated. ■

Ajanth Varathanathan


MULTIPLE SCLEROSIS

Introduction

Multiple Sclerosis (MS) is an autoimmune disease. This means that the immune system targets your own body. The prognosis of the disease is very hard to judge because of the many sub types of the disease. This article will simply give a brief outline of multiple sclerosis.

The name of the disease: 'multiple sclerosis' means multiple plaques, lesions or scars seen particularly in the white matter of your brain and spinal cord which contains a large volume of myelin which is what the T cells target.

What does it do?

The disease makes the immune system target the myelin sheath of your nerves. The myelin sheath is a fatty tissue that acts as insulation around the axons which are for carrying the electrical impulses around your body. It is thought to be caused by genes, environmental factors, infectious factors and possibly other factors (for example, vascular problems).

What are the symptoms?

There are quite a few symptoms for this disease. For example, tingling or pricking feeling in muscles, muscle spasms, dysarthria (problems in speech) and most notably Uhtoff's phenomenon, which is the worsening of the neurological symptoms in MS. There are also many more symptoms but these are the main ones.

Are there any present cures?

Unfortunately, there are currently no cures for MS. However, there are five main disease-modifying treatments to help suppress it. Interferon beta-1a, which is the most popular (some may know it as its main trade name, Rebif), Interferon beta-1b, glatiramer acetate, mitoxantrone and natalizumab.

All of these work in slightly different ways but they all suppress the disease. Most people have to take some form of injection every other day or so. These injections are usually not directly into the blood, but are simply injected just below the skin.

Getting Diagnosed

The prevalence of MS ranges from two to one hundred and fifty per thousand people and there is an increasing trend of it occurring more often in women than men. On average, people with MS live five to ten years less than people without. It is essential that MS is diagnosed as soon as possible. This is due to Uhtoff's phenomenon which means that the neurological symptoms will deteriorate. The disease modifying treatments can help slow down this deterioration.

Parasitic Worms

Parasitic worms known as hook worms are undergoing testing on patients with MS to see whether they can successfully relieve the symptoms of relapsing/remitting multiple sclerosis- the most common type of MS. Professor Pritchard is recruiting 70 patients to test the parasitic worm treatment on. A double blind trial will take place; half of the volunteers will be given a placebo and the other half will be given the actual treatment. A rather low dosage of the hookworms will be injected (25 parasitic worms will be injected). They will travel through the circulatory system until they reach the lungs, then they will be 'coughed up' by the ciliated epithelial cells and then swallowed again. They will travel through the digestive system until the lining of the stomach, then feed on the host's blood that passes through the capillaries and relieve the symptoms of MS. Their eggs will be excreted by the patient. On the other hand, some are against this treatment as parasitic worms can cause other diseases and weakness but it is the volunteer's choice to participate. Also, seventy people seems like a very small figure to be able to accurately represent the global population with MS.

Stem Cells

In addition to the parasitic worm trial, trials regarding stem cells are being carried out. Currently, a £10,000,000 trial on 200 patients is being carried out. Scientists have found that stem cells can be used to repair neurological damage on most parts of the body. Now, they are attempting to try this treatment on brains that have been affected by multiple sclerosis. Stem cells harvested from the bone marrow and grown in a laboratory are injected into the circulatory system. They travel towards the brain where they will repair damage done to the brain by MS including repairing active lesions. It is not clear yet whether the treatment will stop, slow or reverse the damage that has been and is being done. If this is achieved successfully on a high percentage of the patients, it will definitely be more reliable due to the higher number of people taking part. ■

Shayan Fassih

MS

Multiple Sclerosis Society

3D printing in medicine

"*3D printing will provide us with many of the solutions we have been searching for*" says **Ko**

3D printing is a surprisingly unknown technology, having been given the interest it deserves only recently. As of now, it is mainly utilised by designers and architects who need to quickly print prototypes of their products. However, the recent successes in 3D printing exposed the huge potential for the technology to be used in medicine.

A jaw operation that happened in the Netherlands last June (but publicised this February) highlighted one of the possible uses for this upcoming technology. A woman who lost her lower jawbone was given a new one – all thanks to 3D printing. First, a combination of MRI scans and expert problem solving gave rise to a digital 3D design of the missing bone that took into account complex details such as the shape of the woman's face, muscle attachment as well as the direction of nerve and vein regrowth. But when the design was perfected, the jaw itself took only a few hours to print. Fine titanium powder was placed in layers and successive layers were fused using an electron beam to create the jaw. Finally, the jaw was attached to the patient's upper jaw in an operation that lasted 4 hours – a fifth of the time required for traditional reconstructive surgery. The new jaw weighs only a third of the weight before and the 83 year old woman was able to go home in just 4 days.

Similarly, the printers could be used to create new organs (for transplant) quickly, precisely and efficiently. This is especially useful as transplant rejection (a serious problem that directly and indirectly causes 70% of all patients to die) will become avoidable by using cells grown using the patient's own stem cells. If the organ required is a heart, lots of muscle tissue will be grown and stored in a 'reservoir' along with other needed cells. Then the printer will pick up the cells from it and glue them together according to a schematic stored on a computer. Not only does this method increase the chances of the organs growing in the right shapes and sizes, it does not require the complex and expensive scaffolding of the traditional way.

Although engineers have been able to create only simple organs such as blood vessels using the technology, if it continues to improve at the rate it is doing now, I have high hopes that 3D printing will provide us with many of the solutions we have been searching for in medicine. ■

Dong Sung Ko

Printing a prototype kidney