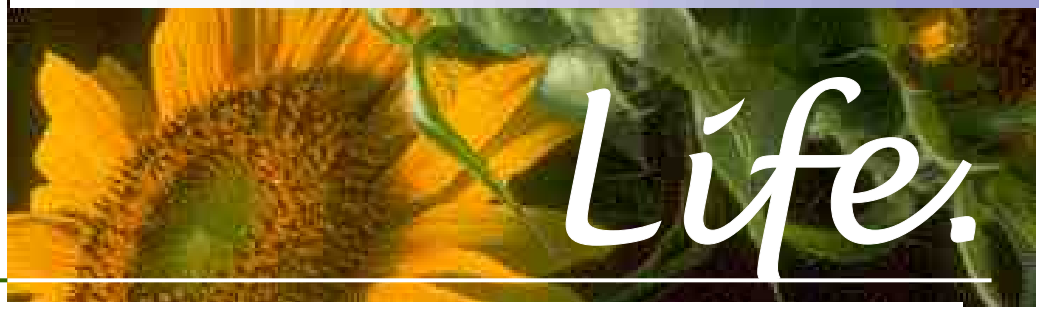
Issue 2

The Sutton Grammar School Biology Magazine



Multitasking

Does it save time, or just make you stressed?

Attempting to do two things at once can cause severe stress.

By Chris Manville

Ever been lying in bed reading a book whilst listening to music, as you turn the page you realise that one of your favourite songs is now playing, as you continue reading you find yourself singing along. The song finishes and you realise that as you turn the page again you do not have a clue about what you have just read and have to go back and read it again.

Imagine using your computer. A word document, excel, publisher and Internet page are all running. However, you do not use each program at the same time. You decide to write in a word document, you click it, and the required page comes up in full screen. The others are still working in the background but cannot be used. The focus is on the word document you have opened. This is very similar to the brain. If you claim to be 'Multitasking' you are not, you may be trying to do numerous things at once, but you can only focus on one thing at time. Your brain can only concentrate on one conscious action at the same time. Going back to the bed analogy, you focus on listening to music, and 'minimise' the task of reading your book.

Some people claim to be multitasking when they are walking along a street, chewing gum, and talking to their friends. Unfortunately, multitasking is the ability to focus your conscious awareness in more than one place at a time. The only conscious task you are completing here is the conversation with your friend. Concentrating on and understanding what they have said and then thinking about and eventually answering their question. For the majority of people walking is not a conscious task. We naturally walk forward, we do not say to ourselves "left foot forward, right forward" we just do it.

Other people believe that typing up something from a textbook is multitasking; it is not. First you read the sentence and store it in the short-term memory store, then your focus changes to the keyboard where you recall what you have stored in the short-term memory store. This happens at such high speeds, it may seem that you are multitasking.

Experiments carried out have shown that attempting to multitask does not save time but in fact waste it. The experiment was for participants to write a report and check their emails at the same time. Those who flicked between the two tasks took on average one and a half times longer that those people who completed the first task and then move on to the second.

The brain has only one single data processing channel meaning that true parallel processing of several tasks is fundamentally impossible. Combining tasks is only possible if we rapidly jump from one task to another. If we were trying to complete several tasks at once we would complete them in three-second intervals. Concentrating on one thing for three seconds and the next and so on. Similar to channel hopping on the television, watching three different channels, for three seconds each; eventually you would loose the plot and give up.

One big question about 'multitasking' is: "Are women better at it than men?" The answer is not a definite one. "Up to a point, people can improve their skills with practice, at least those that can become routine for example walking, as stated earlier."[1] Women seem to have more practice at multitasking than men, meaning that some tasks become routine and not a conscious task.

"By its nature, attempting to multitask is stressful, and the area in the brain most involved with 'multitasking' is also most affected by the resulting stress."[2] This area is the prefrontal cortex located just behind the forehead. Stress brought on by trying to multitask can affect other regions of the brain. The hippocampus, which enables us to form new links in the brain and form new memories, is affected meaning that is difficult to retain new information. Trying to revise chemistry and history at the same time will result in not revising either.

Lastly, I believe that true multitasking is impossible; trying to multitask wastes time, and surprisingly is a fundamental cause of stress. If you want to complete numerous tasks in a short space of time, do them in series and not in parallel. Your work will be of a higher standard; it will take you less time, and will save you an unwanted headache.

1 and 2 quoted from The American Mind.

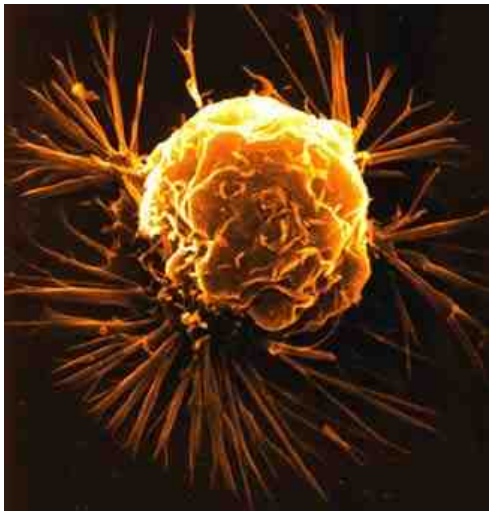
Inside This Issue of Life.

Anti - Cancer Drugs Found in Eggs?

By Sam Gardner

The headlines have spoken. A chicken is making anti-cancer drugs! At least, it's what the press say, it must be true, right? Surely this means the terrible scourge of modern life that cancer represents is at an end?

This certainly seems like a gold standard up close. Dispense with all that nasty chemotherapy? Make people better with scrambled egg and toast? Cut out that disfiguring hair condition you get after radiotherapy (baldness as those of us who have not yet succumbed to political correctness call it)? This may sound too good to be true, and indeed it is.



Cancer cell as seen through an electron microscope

The first problem is that these eggs on their own aren't particularly useful. "Anti-cancer drugs in chicken eggs!"? More like "Chicken eggs which contain some trace of miR24, a protein which *may* be useful in treating malignant melonoma (skin cancer)".

On the face of it, that may sound quite useful. It's still better than all those nasty chemicals, right? Well actually, no. miR24 is not used in any current treatments for malignant melonoma at all. In fact, there is no established medicinal use whatsoever, and as a protein is never going to be as effective as the (admittedly highly poisonous) drugs used in chemotherapy today.

The eggs are also rather lacklustre in delivery. Contrary to what the headline might lead you to believe, these eggs wouldn't actually do someone with cancer any good if they did eat them. Instead, they require a complex extraction process to actually get at the protein which we've already established doesn't do anything.

However, this discovery isn't completely useless. It might not be the miracle pill, or indeed miracle egg, that the papers present it as but it does have its uses. For example, the eggs can also produce Interferon b1-a, which has a molecular structure similar to modern treatments for multiple sclerosis. If these eggs can produce Interferon, then a whole new range of treatments is opened up, possibly extending to the production of cheap Interferon Alpha, the best known treatment for a variety of hepatitis types but which, sadly, many poor sufferers worldwide cannot afford. Other drug treatments requiring proteins can also presumably be produced.

The eggs also have another advantage – they're cheap. Whilst a year's treatment with Interferon Alpha produced conventionally may cost up to £40,000, this method allows it to be produced far more cheaply, possibly allowing the benefits of this lifesaving treatment to be extended around the world. This may well hold true for other treatments this method could be extended to.

In short, these chicken eggs may not be all the papers claim, but they might still be useful in saving millions of lives worldwide.

Number Crunch

5%

The percentage of the estimated 2 to 3 billion microbial species have been identified by man.

Entry to Medical School

By Partha Ray

As I went to buy my weekly lottery ticket yesterday, I proceeded to play my usual numbers: 4, 11, 27, 39 and Medicine.

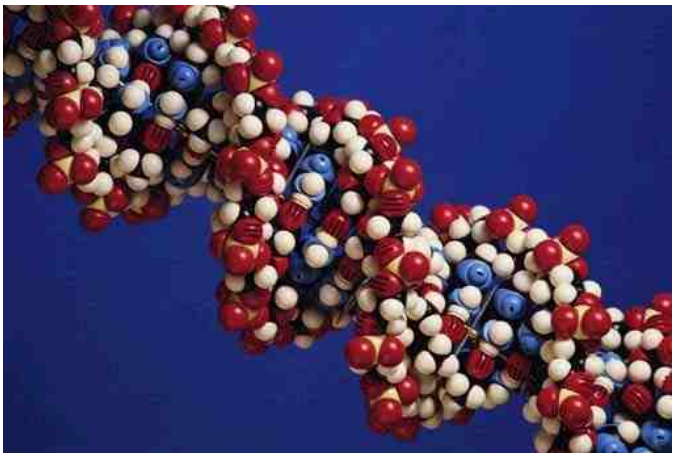
Over the recent years, the much sought after career of being a doctor has increased tenfold. Whether it be the satisfaction of making a difference to the mortality rate of the population; the thrill of playing god, or simply having the prestigious title of "Doctor" before one's name, entry to Medicine has never been more of a lottery to gain entry to. So how can you go that extra mile to make sure you get a place in the University of your Choice?

Over the coming weeks of this magazine, this regular article will give you interesting facts and tips that might help potential medical students to get that extra boost up to the next rung of the ladder towards the course and career of Medicine.

For those of you who do not currently know the basic entry requirements of the 5- year MBBS or MB/ChB course, most universities are looking for a minimum of 4 AS levels: all of which must be at least 60% theory and subjects which are academic, and must consist of Chemistry and/or Biology (though it is recommended that both are taken). 3 A2 levels of which, Chemistry and/or Biology and one other academic subject must be taken.

Although, Medical schools were known to favour the combination of the three sciences and maths; times have changed significantly and a number of universities prefer such a combination not to be taken, but a fourth AS level which should be a non-science, non-maths subject, but equally academic, with such examples as History, Geography and English to name a few. However the traditional combination is still accepted at many places. In addition to the pernickety selection process, the majority of universities (not only medicine) do not value General Studies as an A- level, even though it is a highly beneficial subject, *Continued on page 3*

Feats of Genetics: The Chimera



By Dominic S. Brown

In Greek mythology, the Chimera was a creature comprising the body of a goat, the tail of a snake and the fire breathing head of a lion. However bizarre such a monster may seem, scientists have succeeded in creating their own chimeras, although a flame spitting reptile/mammal hybrid is still quite far off. More prosaically, a chimera is an animal that has cells that differ in their DNA makeup.

Chimerism can occur naturally when two ova are fertilized by two sperm cells. These zygotes then fuse in the uterus and develop into a foetus containing two sets of genetic information. IVF treatment can increase the probability of this occurring, although it is still extremely uncommon and usually results in discoloured skin, eyes and hair and more importantly, intersexuality i.e. the foetus is of an indefinite gender and has ambiguous sexual organs. Because of its rarity, we must not dismiss congenital chimerism as inconsequential. It is the basis for an exciting and potentially shocking branch of biology.

Firstly, a chimera must not be confused with a hybrid, where the embryo originates from one zygote, which in turn came from a sperm and ovum from different species and only contains one set of genes. Hybrids, with the mule being the most obvious example, are common and ethically accepted. Chimeras, on the other hand, have too much scope for mutation to be so as they are essentially 'mosaics' of mismatched parts of two different species. Take for example the geep:

It will either produce either sheep or goat offspring, depending on which species' embryo it inherits its reproductive system from. More recently, teams have created human chimeras, with Chinese geneticists in 2003 successfully fusing a human zygote with a rabbit's. It was

destroyed during the blastocyst stage and its stem cells harvested. Nevertheless, the study opened the door to a number of ethically questionable new projects involving culturing human chimeric embryos for organs.

Did You Know...

Researchers have reversed the aging process in brain cells? They have successfully induced brain cells to revert back to neural stem cells.

Entry to Medical School Continued...

Continued from page 2… which is one of the reasons Sutton Grammar have ushered a shift towards Critical Thinking to replace it, which is valued as an additional subject.

The current grade entry requirements vary across the different universities, and details may be found on http://www.ucas.com for particular universities. Since Medicine has become so competitive, a large number of the institutions of higher education have initiated an additional entry examination to focus on aptitude. The two exams, which universities pick one or the other, consist of the BMAT (Biomedical Admissions Test) and the UKCAT (UK Clinical Aptitude Test) tests, which the school will give you sufficient information on, nearer the time.

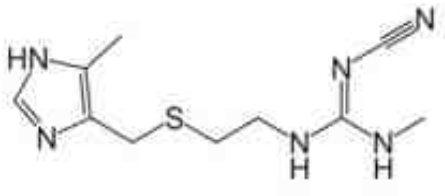
As well as these grade requirements, medical schools are interested in top GCSE results (a majority of grade A's and B's with at least B's in English Language, Mathematics and Double Award Science) and even KS3 SATs. But as well as being academically superior to the general population, those wishing to study medicine must offer that extra ingredient: the solution? Extra-curricular activities are a gold mine. Such activities as Public Speaking, Sports, CCF and the Orchestra are a few examples, and the more you partake in, the better. It is better to get 2 A's and a B in A levels and be a member of the orchestra (only an example) than get 4 A's and do absolutely nothing.

As if this isn't enough, all medical schools require participation in medical work experience to get an overview of the career. I personally travelled to Birmingham in year 10 since all London hospitals require a minimum age of 16 to observe live surgery (not the case in Birmingham). I found it extremely beneficial, and I would suggest live surgery as a must for all those aspiring to be a surgeon since a rather keen surgeon-to-be in my team fainted at the sight of a rather explicit vasectomy. However, as medical work experience is hard to attain, organisations such as MedLink and MedSim offer a lecture package which includes work experience **(see exclusive report on MedLink 2006 in this week's issue of Life.)**.

I will leave you future medics, this week with only these few (well…) entry requirements, which should help you mould your career so that you one day become the successful Dr. _ _ (please insert name). In the mean time, I will be holding onto my lottery ticket, hoping that I win the jackpot of getting into Medicine, and going to the university of my choice in a couple of years time.

Molecule of the Fortnight:

Cimetidine ($C_{10}H_{16}N_6S$)



By Richard Morris.

Cimetidine ($C_{10}H_{16}N_6S$) was first synthesised by James W. Black. It is a drug used to limit production of stomach acid, and its development went hand-in-hand with the discovery of different histamine receptors.

Histamine ($C_5H_9N_3$) is a chemical that takes part in immune response and regulation of conditions in the gut. It also acts as a neurotransmitter. It has a wide range of actions because there are several types of receptor that histamine binds to.

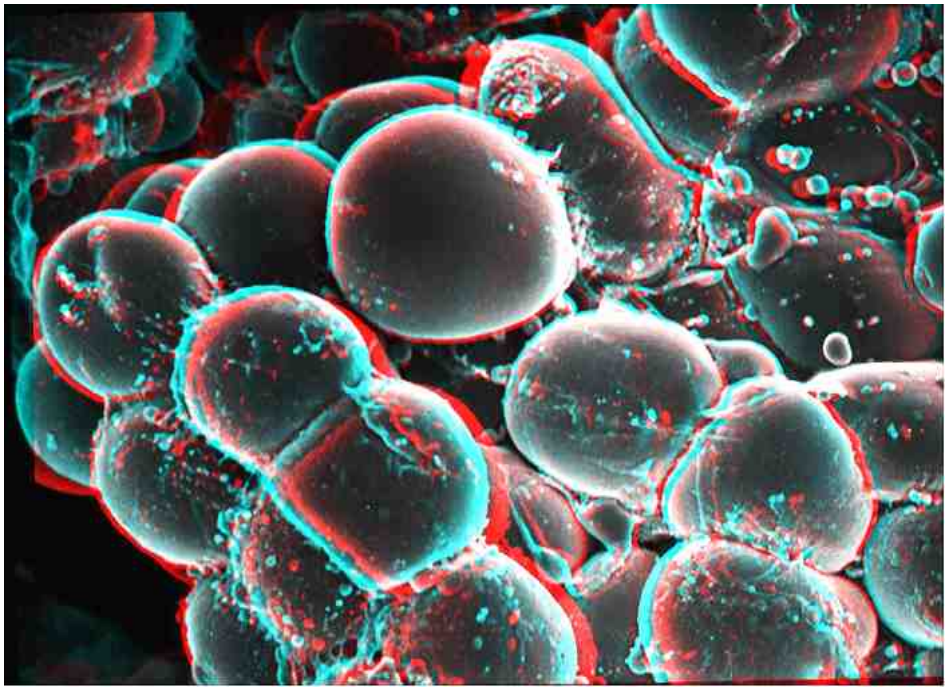
Most histamine is stored in mast cells, which are responsible for allergic reactions. When an allergen is detected, they release histamine, which causes the symptoms of the allergic response. The histamine dilates nearby blood vessels and increases their permeability, leading to inflammation and redness. It also irritates nerve endings causing pain and itching.

When cimetidine was first synthesised, only one histamine receptor was known. The H_1 receptor is responsible for vasodilatation, constriction of the bronchial tubes and pain and itching from insect stings. James Black knew that histamine could stimulate production of stomach acid, but it was not known why conventional antihistamines had no effect on such production.

It was then discovered that there were several types of histamine receptor, and that it was the second type (the H_2 receptor) that stimulated stomach acid production. We now know of two more receptors, H_3 and H_4. H_3 regulates the release of neurotransmitter molecules in the central nervous system, and it is not yet known what the action of the H_4 receptor is.

Having discovered this second receptor, it was possible to develop the drug cimetidine. Cimetidine is an H_2-receptor antagonist, and blocks histamine from binding to the cells in the stomach responsible for acid production. By limiting production of stomach acid, it is an effective treatment for heartburn.

Biological Imagery



Fatty Adipose tissue as seen under an electron microscope

The Fractured Skull

By George Butcher, John Gorringe and Adam Gillis

On 14 October 2006, Cech and Reading's Stephen Hunt challenged for the ball in the first minute of a league game at the Madejski Stadium. As Cech went down to grab the ball, Stephen Hunt, instead of jumping over him once he had been beaten to it, decided to leave in a trailing leg. His knee collided with the head of Peter Cech which left him unconscious on the pitch. Hunt claims it was an accident, but after watching the collision, there clearly was intention in that knee to the face; it could have easily been avoided. If you ask me, Hunt was frustrated at being beaten to the ball and decided to take his anger out on Cech. Pathetic! He should feel ashamed of himself; the injury could have been fatal. Anyway, accident or no accident, Cech was still immediately taken to accident and emergency, where he had to undergo surgery.

Serious brain trauma from incidents such as a fractured skull can have many effects linked to them. Some affect you for life and others are only short-term. Some of the major long-term effects associated with a fractured skull include permanent memory loss, severe headaches, sleep disorders, fatigue, depression and visual impairment. Peter Cech's case was lucky because although he needed a plate put into his skull to replace the lost bone he escaped most of these effects. The most he has been left with is suffering mild headaches. Compared to what he could have had he has come out reasonably well.

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Fact or Fiction?

Life. sorts out some biological myths

By Joe Robinson, Tom Irons and Carl Alexander

Chocolate gives you spots

Myth! Your parents may lead you to believe that eating chocolate gives you spots. Well I'm pleased to tell you that they do not. An experiment was carried out in which a man ate a chocolate heavy diet for one week. Before the experiment a test was carried out on him where the amount of sebum produced from his skin was taken. Sebum is the oil produced by pores in the skin that sometimes gets trapped in the pores causing spots. A clear skinned sebum rating is around 200mg per square centimetre of skin. Before the experiment, the man's reading was an average of 178mg; slightly below expected. He then underwent the treacherous task of eating chocolate for one week (it can't be that good, can it?) After the chocolate-filled week was finally over, the man had another sebum reading. The results this time showed an average of 131mg; significantly lower! This proved that chocolate has no effect on spots, so eat to your heart's content! But before you put that handful of chocolate into your mouth, remember that chocolate is high in sugar content and can lead to obesity.

Sitting too close to the television damages your eyesight

Myth! Sitting closer than necessary to the television may not damage your eyesight. However, parents may still have a point because it can lead to headaches. Also, televisions do not emit harmful radiation, so eye damage due to radiation is not a problem. Therefore, you can get as close to the television as you like without damaging your eyes, but, if you want to risk a headache it is your own choice.

Stretching before exercising reduces risk of injury

There is very little or no evidence to this. People who stretch before exercising are no more or less likely to injure themselves than people who don't. It can however, help to prepare and invigorate muscles for exercise.

A penny dropped from the top of a tall building could kill a pedestrian

A penny is not the most aerodynamic weapon. Its shape and the friction from the wind combined would mean that even if it was thrown from the top of the Empire State Building (1'250 ft) it would merely sting an unfortunate pedestrian.

Adults stop growing new brain cells

This is entirely false. Even though most of the crucial brain development happens during childhood, neurons are still growing and changing well into adulthood.

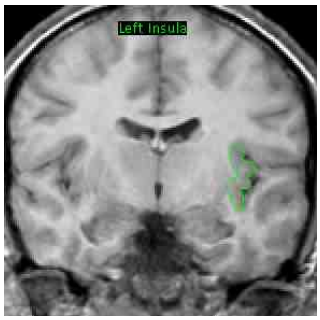
Coffee sobers up a drunk

Hopefully this will not concern most of you for some time to come. Research by The Surrey Alcohol and Drug Advisory Service (SADAS) proves that coffee will not sober up a drunk in anyway. All it will do is wake up a drunk so you will have a wide awake drunk. So far there is no way to speed up the removal of alcohol from the body.

Flamingos turn pink because of their diet

This is in fact true. All flamingos are born completely white. The favourite food of a flamingo is shrimp and there is a chemical in shrimps called Carotenoids which turns flamingos pink.

'Brain Damage' Helps You Quit



The Insula is believed to be connected to substance addiction

By David Crowhurst

Smokers who have a damaged insula – the part of the brain linked to emotions, quit smoking immediately according to a study in the magazine journal Science. The research was inspired by a survivor of a stroke who stated that he simply forgot about his addiction to cigarettes.

Dr. Antoine Bechara, of the University of Southern California, said that 'The quitting is like turning off a light switch in the brain.' She scanned the brains of 70 smokers and 70 non-smokers to find out this fact which she described as 'striking.'

Obviously creating brain damage isn't an option of treatment for solving the addiction problems of smoking but it does point scientists towards new ways of preventing smoking by targeting the insula.

'It's a fantastic finding,' said Bechara. 'This shows that the key structures for taking up smoking or other addictive drugs lie in the insula.'

That's Life - test yourself

By Amir Zadeh-Kochek

1)What causes freckles?

2)Does double jointed mean that you have to joints? If not, so what does it mean?

3)How many harmful chemicals does a normal nicotine cigarette's smoke have?

4)What is the strongest muscle in the human body?

5)How far can a flea jump?

6)What part of butterflies bodies tastes?

7)What is the only animal that cannot jump?

8)What is the most efficient thing to eat to wake up?

Freckles can be caused by UV exposure

1)If your skin is exposed to the sun's ultraviolet rays, it will burn. Following a burn, skin may tan. If the tan is even, it will be brown all over but it might tan in certain spots, in which case freckles are found.

2)Double jointed does not mean that a person has two joints. It simply means that their join can be made to travel further

3)Cigarette smoke contains 4000 harmful chemicals

4)The strongest muscle in the human body is the tongue

5)A flea can jump 450 times higher than its own height.

6)The butterflies legs allows the butterfly to taste

7)The elephant is the only animal that cannot jump

8)It has been proven that having an apple is the best thing to 'wake you' in the morning.