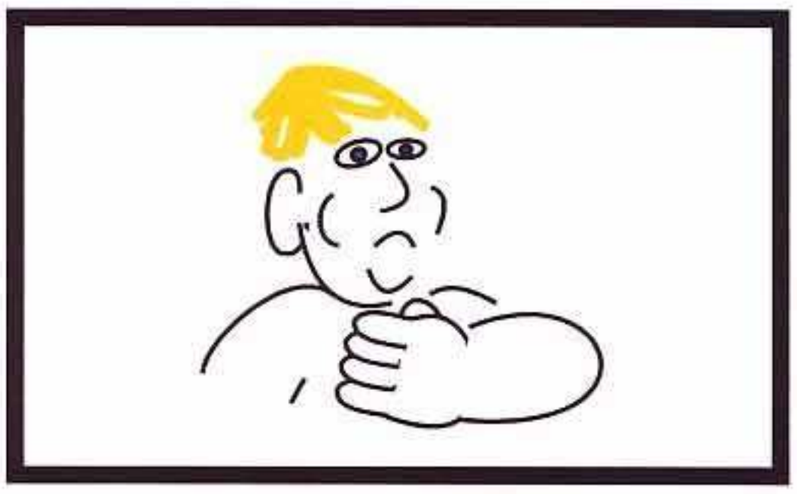
CHAPTER NINE

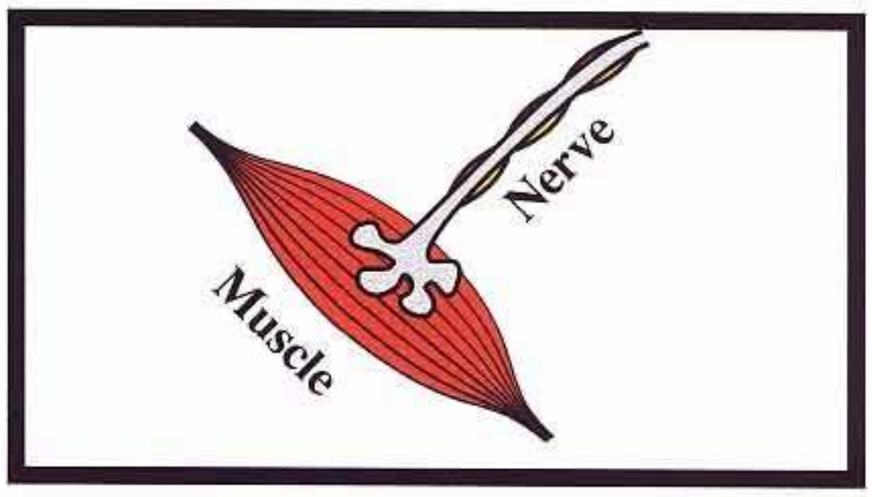
AUTOIMMUNITY

MYASTHENIA GRAVIS

A hard act to swallow!



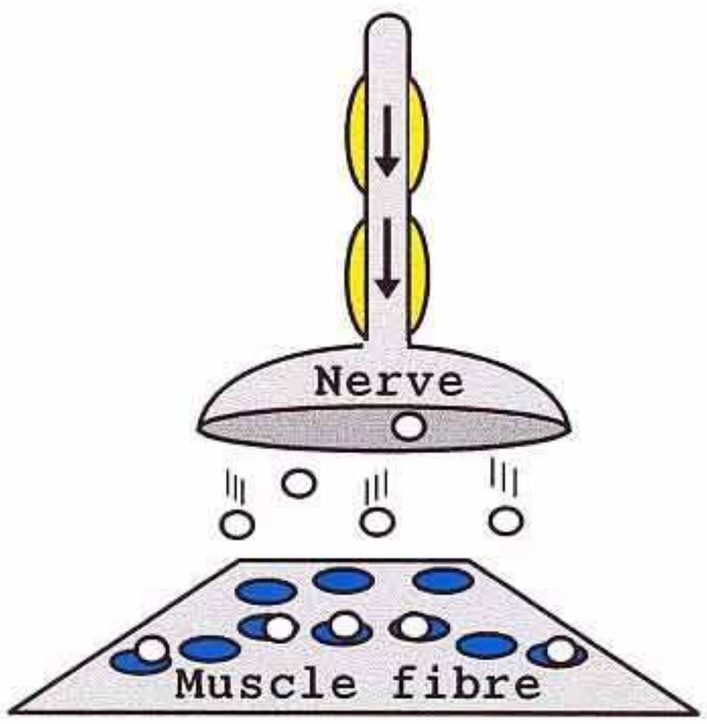
This man is having difficulty with breathing, chewing and swallowing.



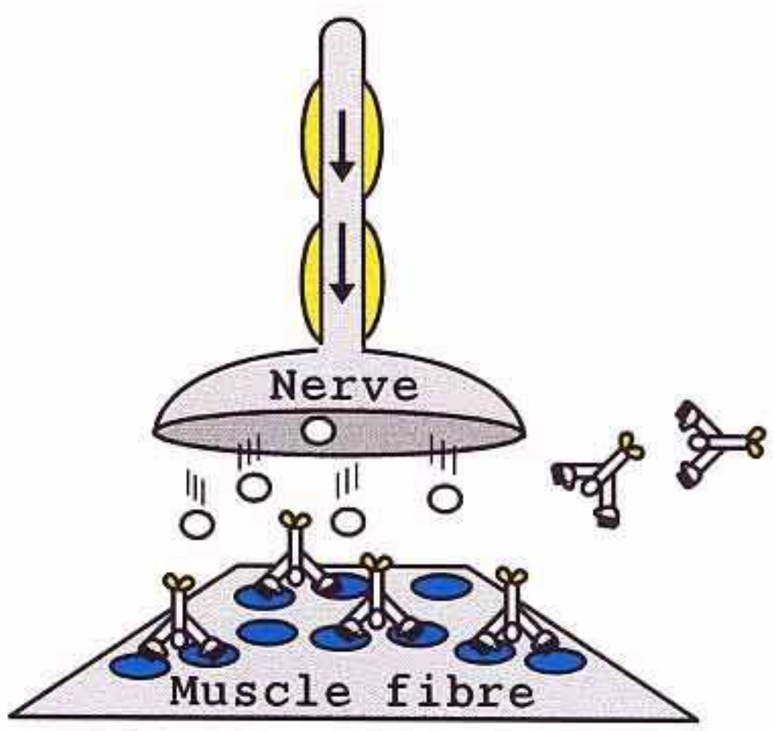
These problems are caused by nerve impulses not reaching certain muscles.

Easy reading

Technical information

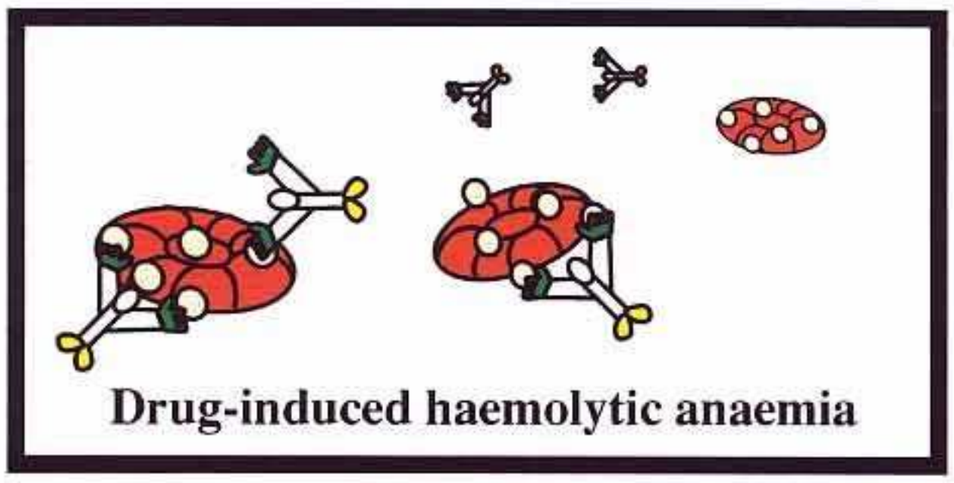


Normally, nerve impulses reaching the end of a nerve, cause the release of acetylcholine onto the muscle fibre.

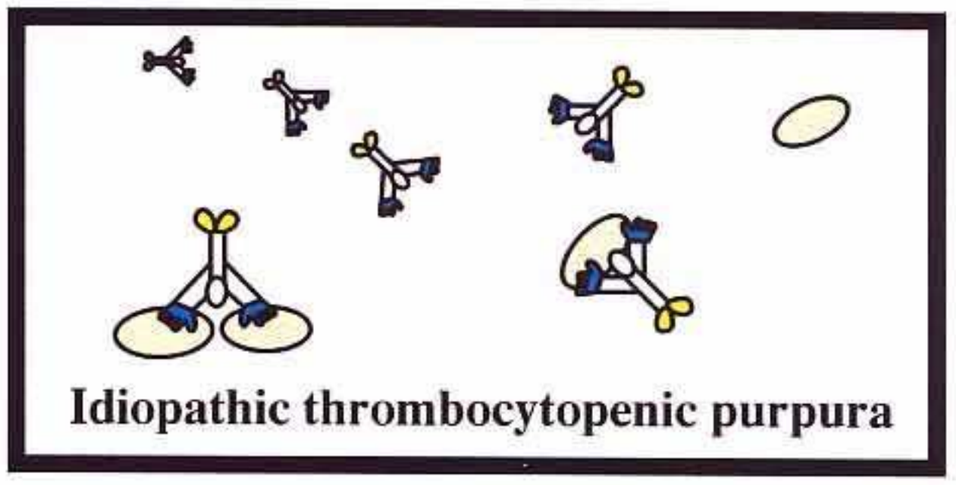


With this disorder, antibodies are made which have 'hands' that fit the acetylcholine receptors and so block the nerve impulse.

DRUG - INDUCED AND IDIOPATHIC AUTOIMMUNITY



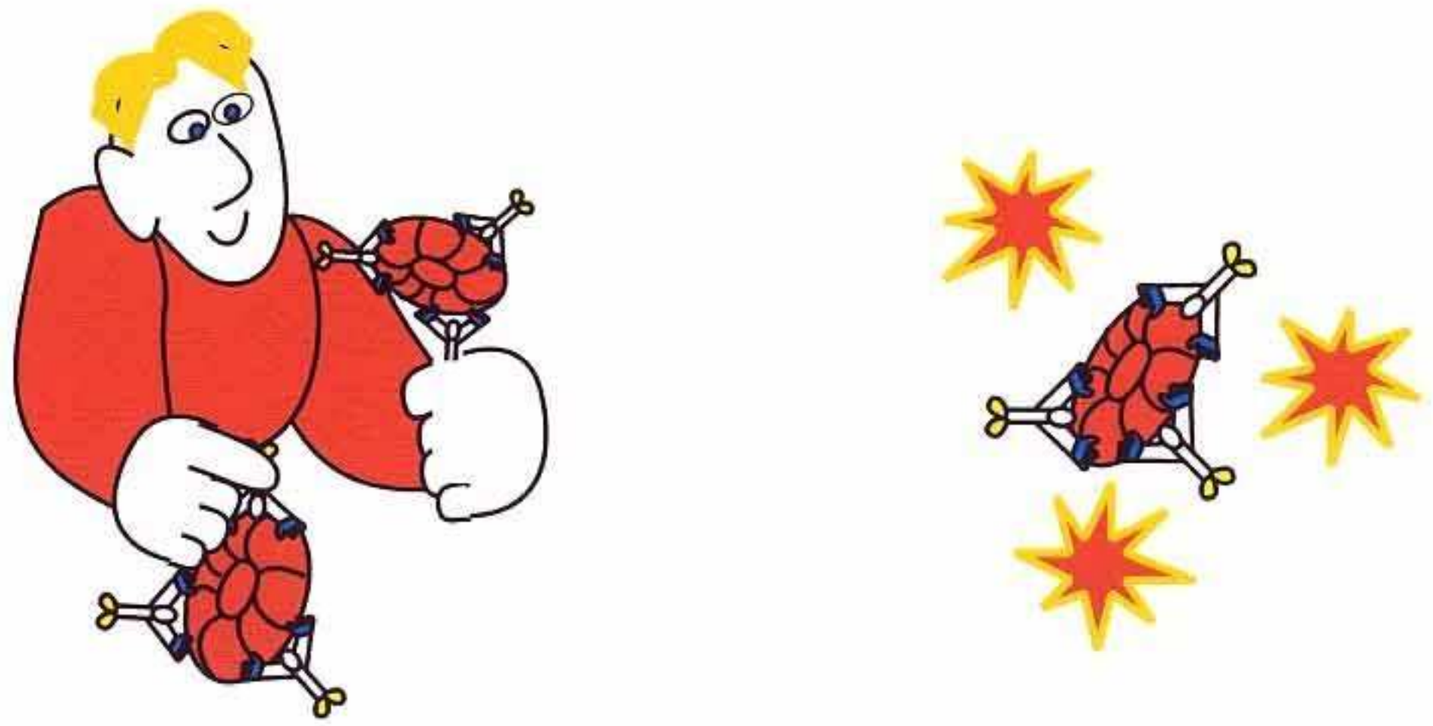
Drug-induced haemolytic anaemia



Idiopathic thrombocytopenic purpura

Occasionally, when drugs like penicillin become bound to cells such as RBC's, this can trigger an immune response.

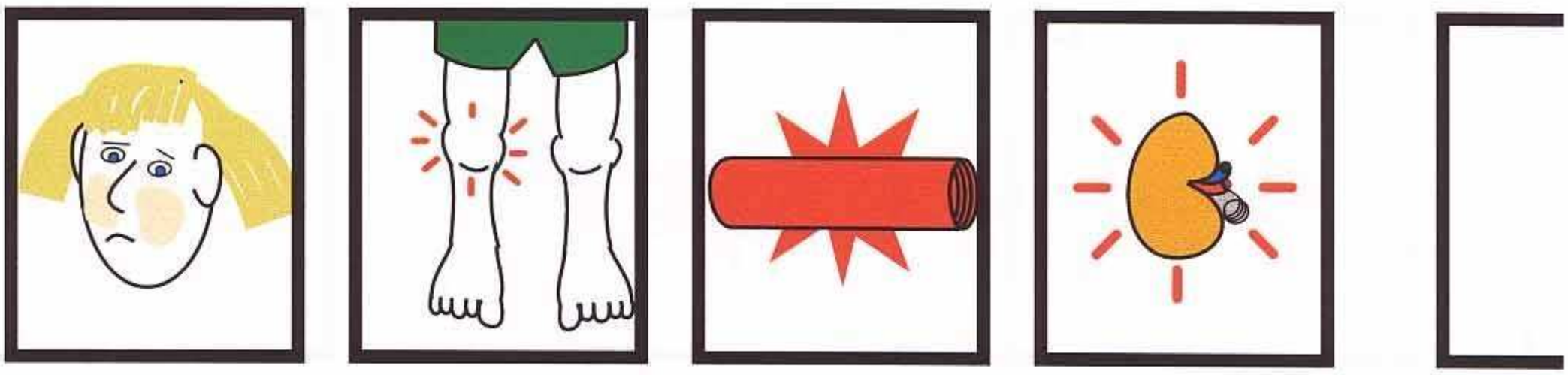
But on other occasions, for no apparent reason, the immune system eliminates useful cells such as platelets.



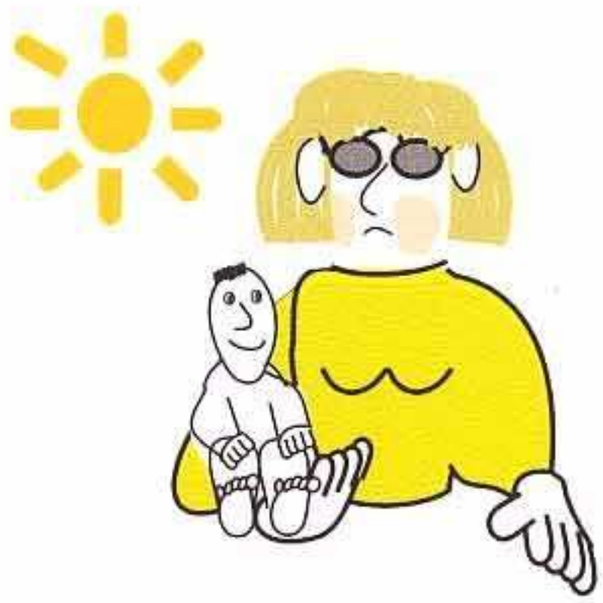
Once something becomes coated in antibodies, it will be 'eaten' by macrophages in the spleen or the liver, or 'blown apart' by complement.

SYSTEMIC LUPUS ERYTHEMATOSUS (SLE)

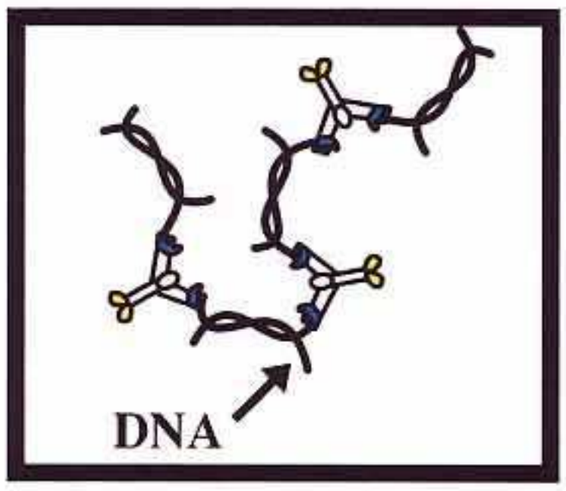
Making a rash decision.



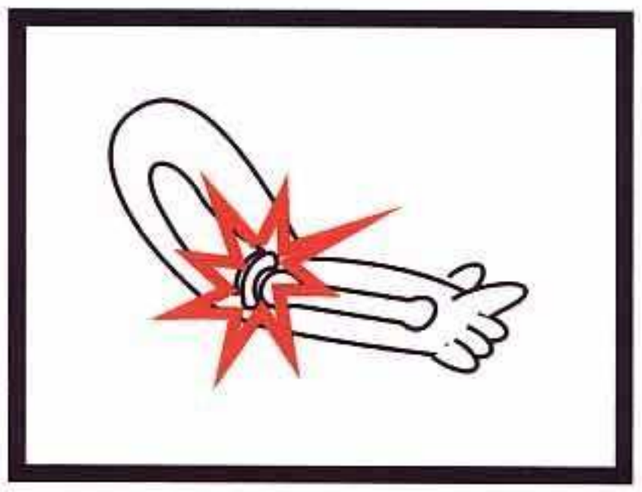
As its name suggests, this condition affects the whole body, with symptoms such as:- facial rashes, arthritis, arterial inflammation and kidney damage.



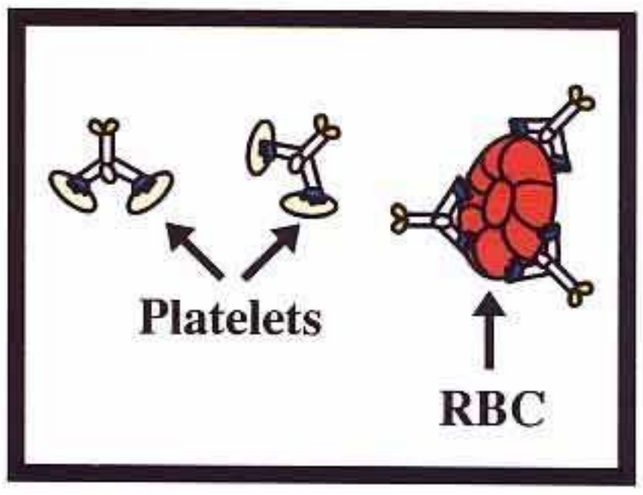
Tending to 'run' in families, this autoimmune disorder is made worse by ultraviolet light and affects 10 times more women than men.



Antibodies with 'hands' fitting the patients own DNA, start to appear.

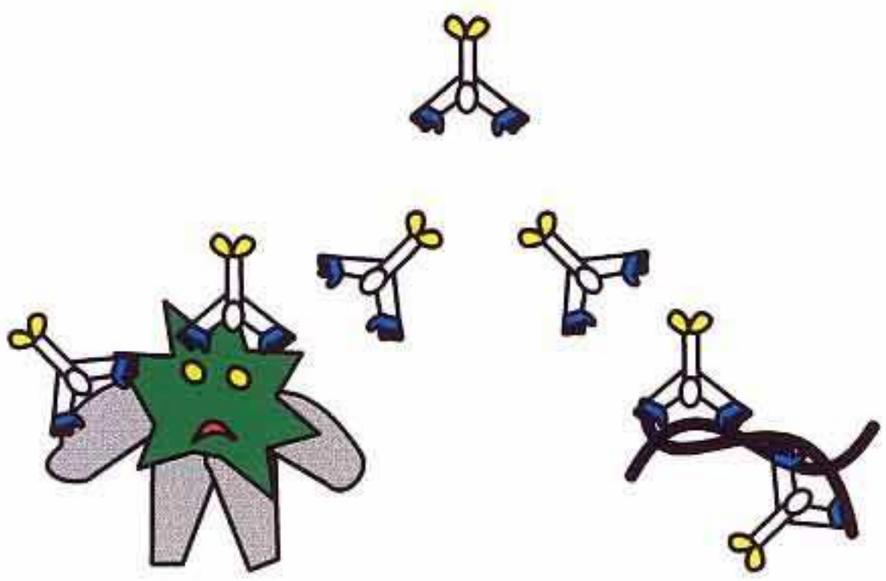


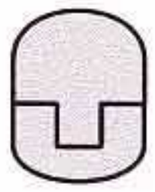
These complexes then become trapped in the joints and kidneys, activating complement.



RBC's and platelets can also be targetted, causing bleeding disorders and anaemia.

Worn out cells are constantly being broken down. This releases DNA into the circulation. Although this is not a problem for most of us, SLE patients make anti-DNA antibodies.





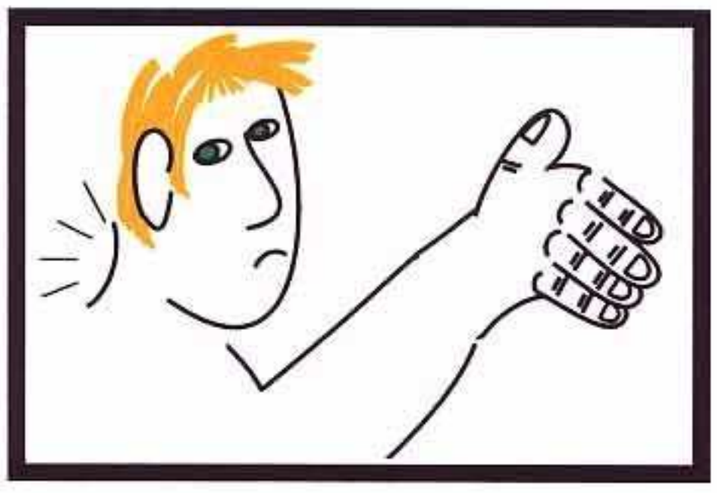
Complement C4
(see page 266)

SLE sufferers make antibodies against certain microbes such as the klebsiella bacteria, which also fit their own DNA.

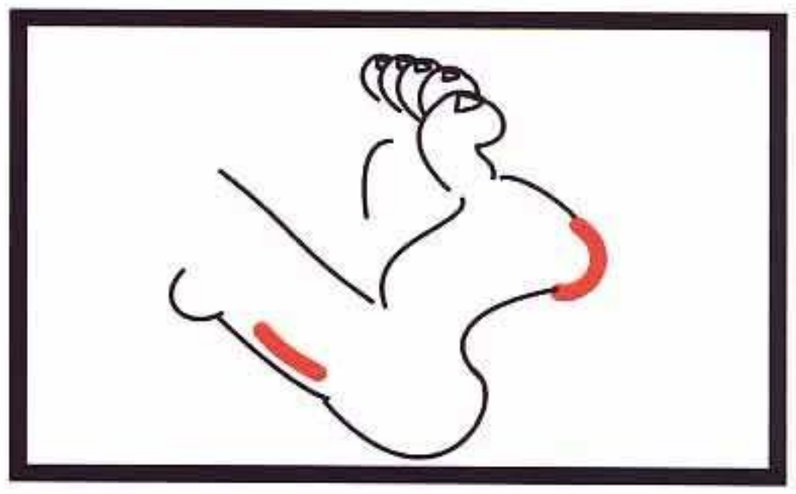
As they also often lack complement C4, it may be harder for macrophages to eliminate immune complexes, which then get trapped in the wrong places!

RHEUMATOID ARTHRITIS (RA)

A bone of contention.

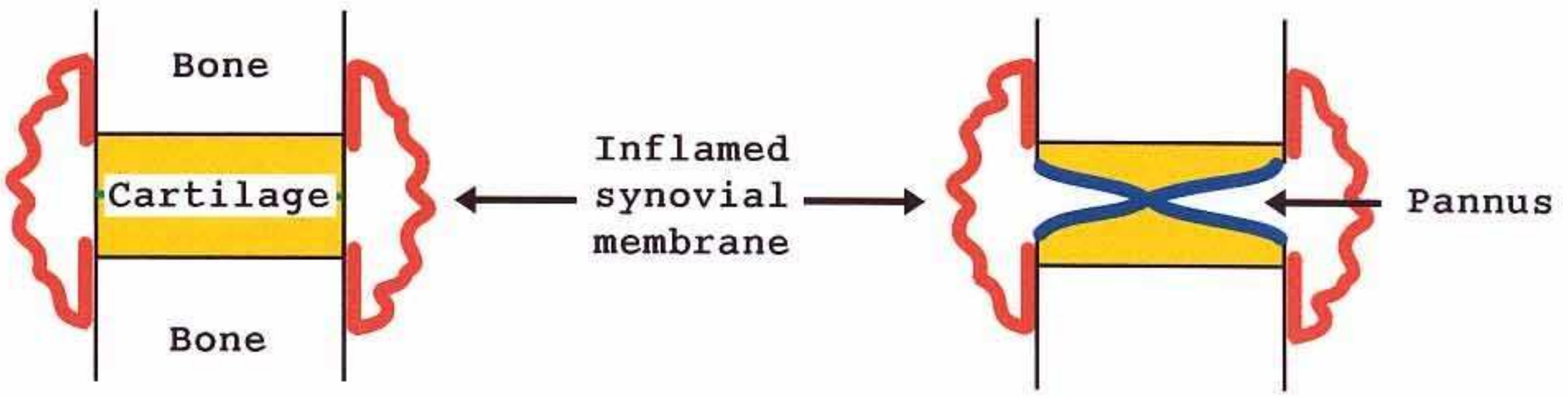


This chronic connective tissue disorder frequently produces deformed, painful joints.



Other features common to RA, include:- subcutaneous nodules and inflamed tendons and bursas.

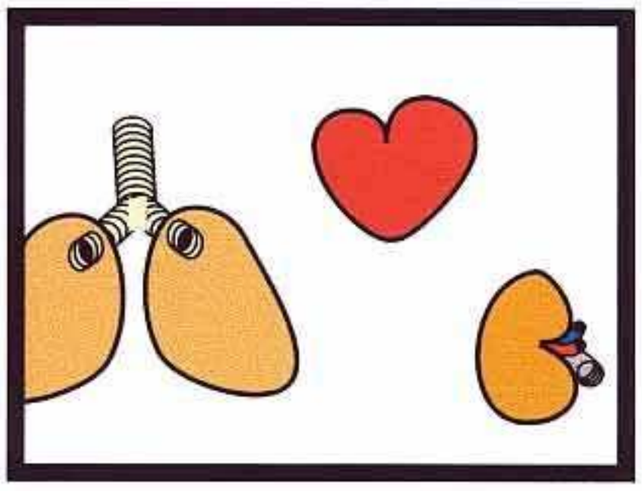
AN AFFECTED JOINT IN A RHEUMATOID PATIENT



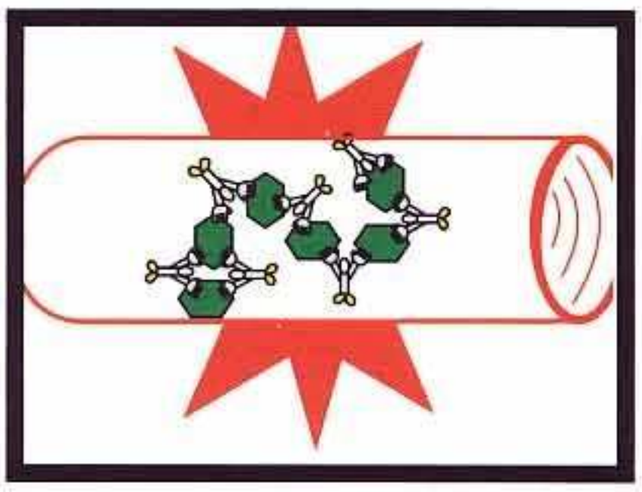
First there is acute inflammation of the synovial membrane.

Then enzymes slowly digest the cartilage and pannus spreads over the articulating surface.

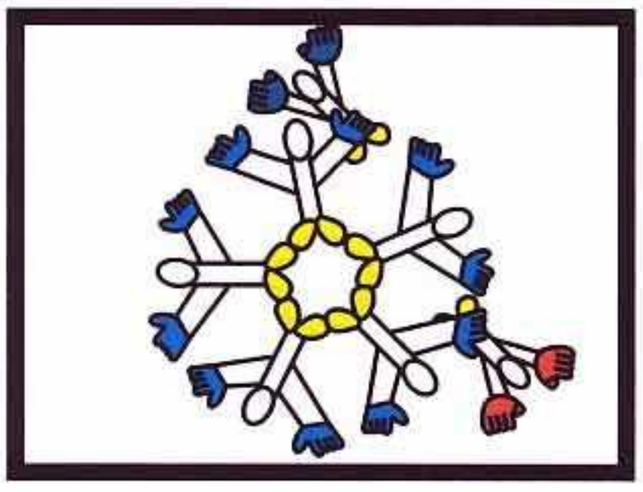
OTHER COMMON FEATURES ASSOCIATED WITH RA



Chronic joint inflamation associated with this auto-immune disorder, sometimes causes a prolonged acute phase response. This can lead to damaging amyloid deposits being laid down in the lungs, heart and kidneys.



Immune complexes can become trapped in the patient's blood vessels, activating complement and triggering an inflammatory response (vasculitis).

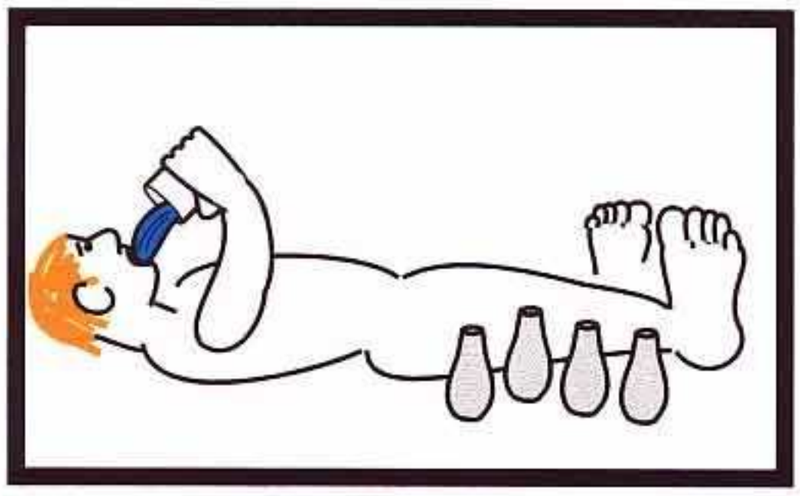


Rheumatoid patients frequently produce rhematoid factors, which are IgG or IgM antibodies with 'hands' that fit the 'bodies' of other antibodies.

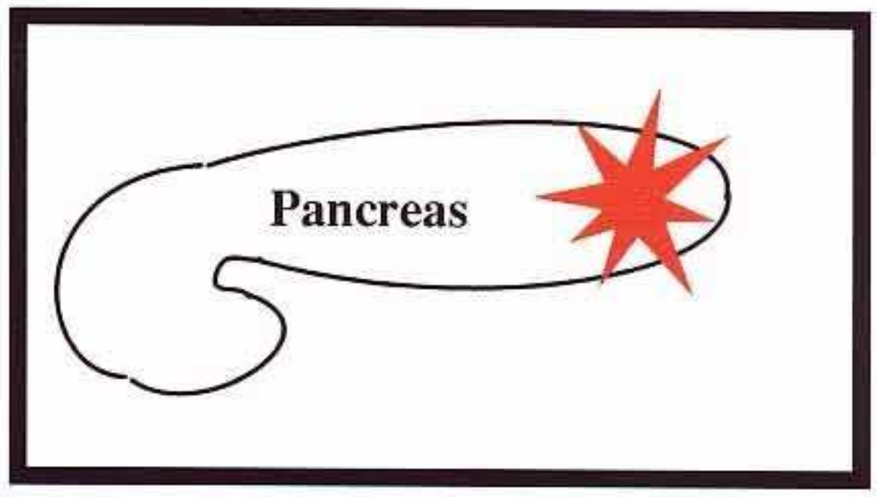
Although the cause or causes of rheumatoid arthritis are not known, it often recurrs in families. It affects many more women than men and usually first appears between the ages of 30 and 40.

INSULIN - DEPENDANT DIABETES MELLITUS

A sweet little mystery.

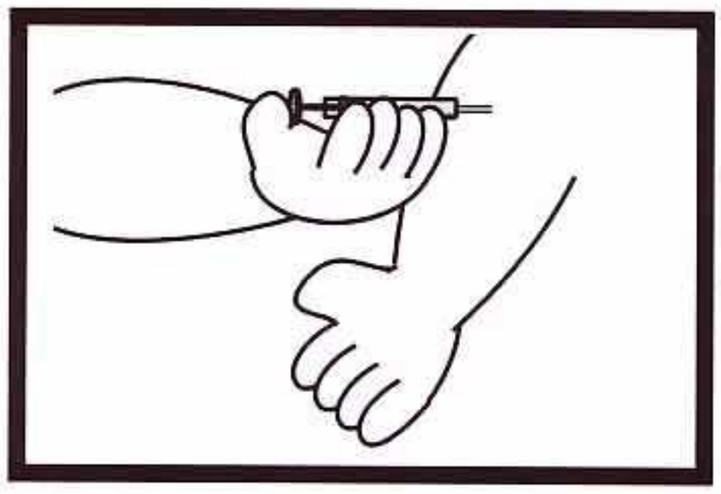


James feels lethargic, is constantly thirsty and is passing 'gallons' of dilute urine.

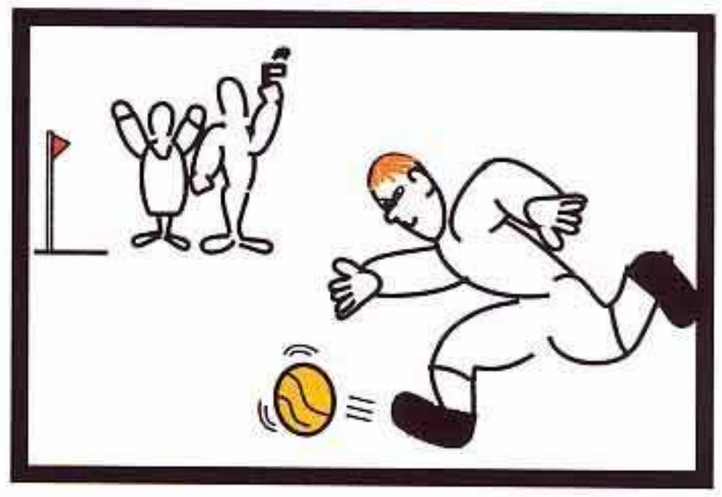


For an unknown reason, his immune system has destroyed the insulin producing beta cells in his pancreas.

Insulin released from the pancreas, enables cells in the the body to absorb glucose.

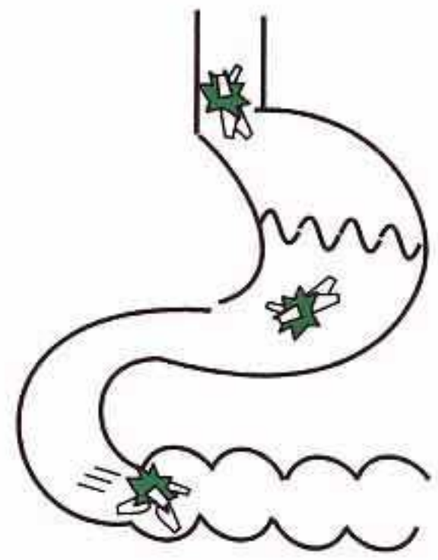


So from now on he must have daily insulin injections.



Soon James is back to normal and feeling full of energy!

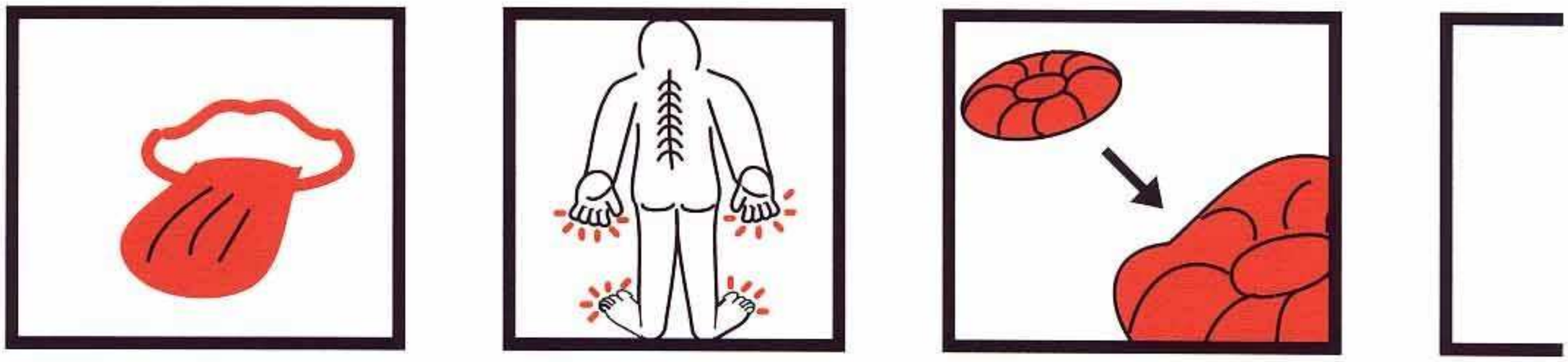
Frequntly starting before the age of 30, insulin-dependant diabetes seems to 'run' in families.



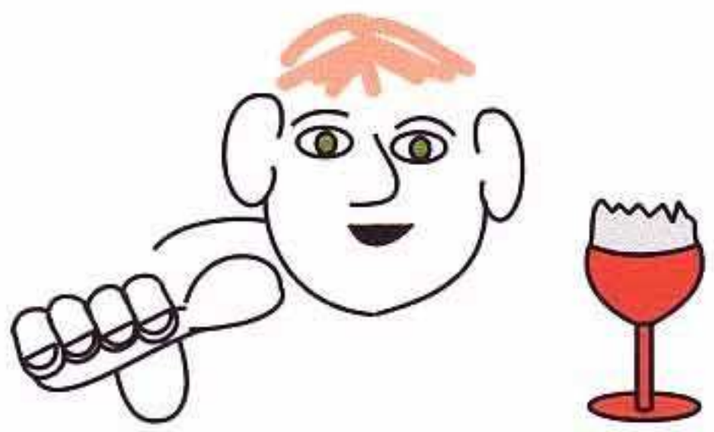
The onset of this disorder, frequently follows a viral infection, by organisms such as the coxsackie enterovirus.

PERNICIOUS ANAEMIA

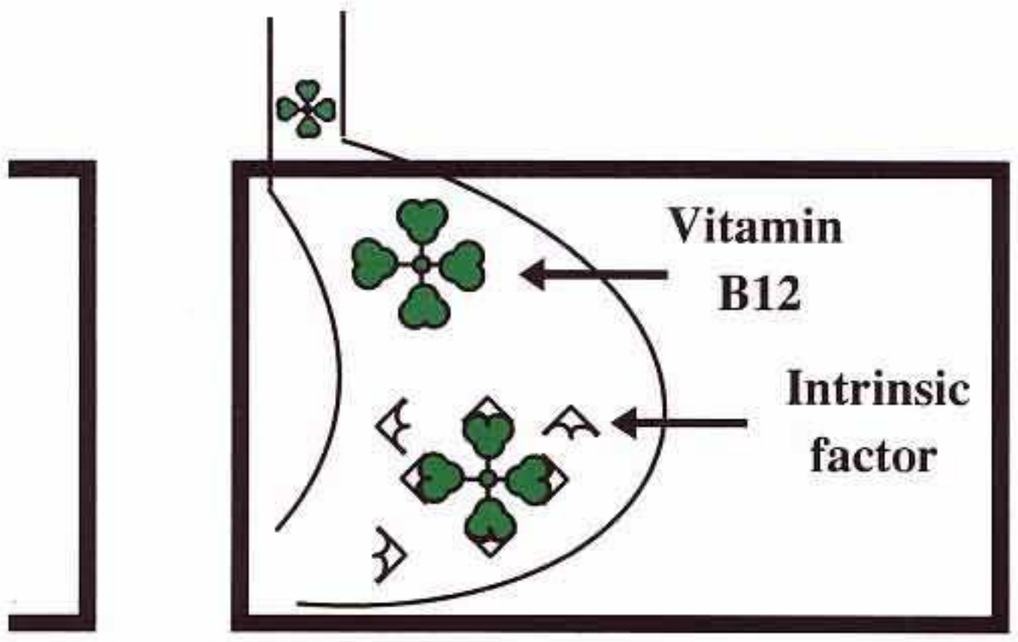
**If you cannot stomach this,
it will get on your nerves.**



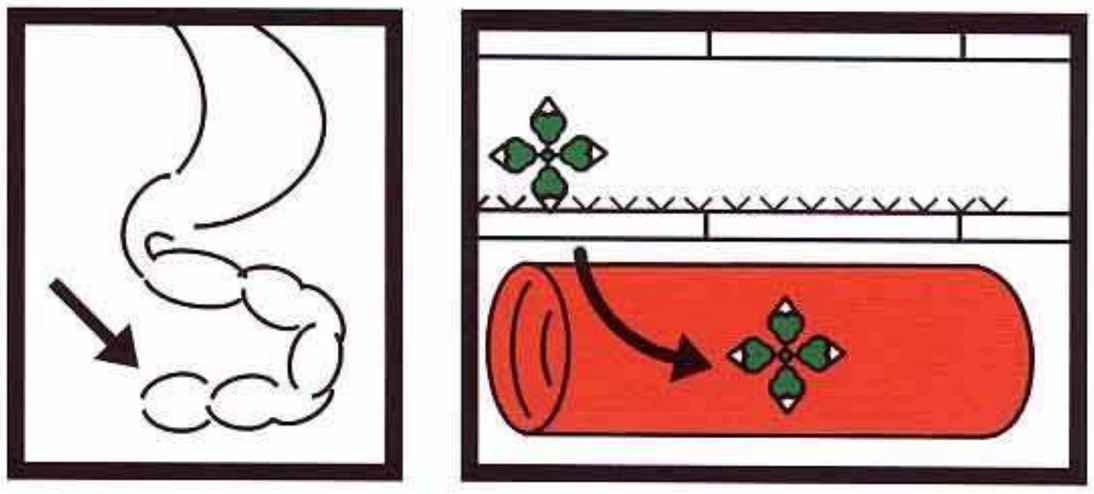
**Signs and symptoms commonly associated with this autoimmune disorder include:-
a smooth tongue, 'pins and needles' in the feet and hands and enlarged RBC's.**



It occurs when the body is unable to absorb vitamin B12, which is found in foods such as eggs.

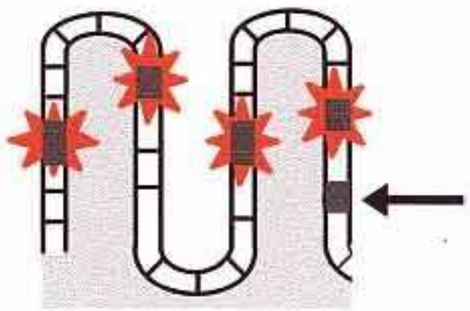


Normally, when vitamin B12 enters the stomach, it becomes coated in intrinsic factor.

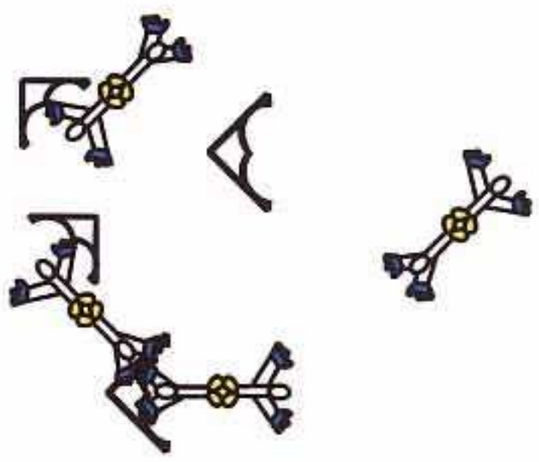


These complexes then passes on to the terminal ileum, where receptors lining this part of the gut transport them into the bloodstream.

Pernicious anaemia develops when intrinsic factor ceases to appear.



In the stomach, immune cells destroy the parietal cells which make intrinsic factor.

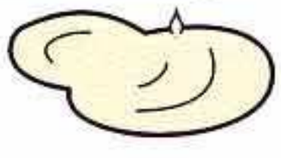


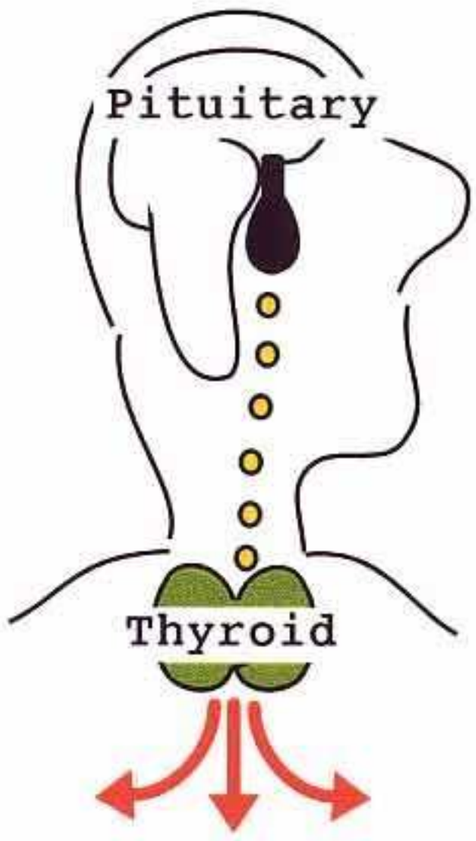
IgA with 'hands' that fit intrinsic factor, are also produced.

GRAVES' DISEASE

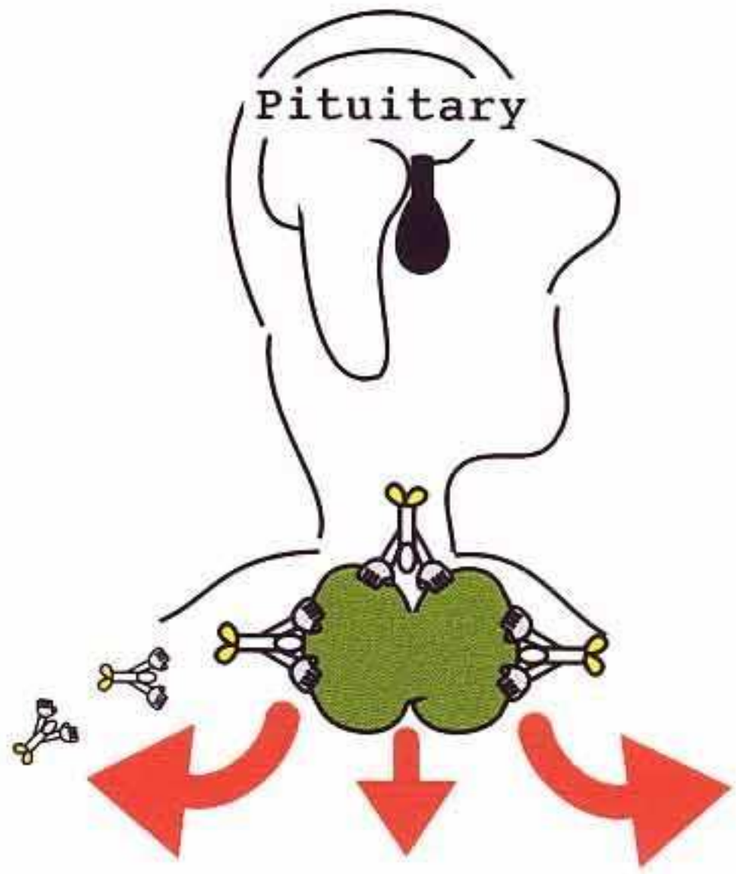
Geting all hot under the collar!

The swelling in his neck, is an enlarged thyroid gland, which became swollen through being over stimulated.



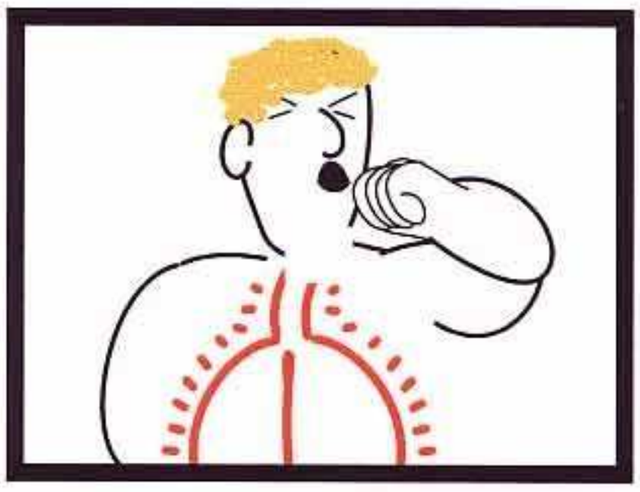


The amount of thyroxine released by the thyroid, is normally controlled by the pituitary gland.



With Graves' disease, auto anti-bodies attach onto the thyroid, causing its over-stimulation and excessive release of thyroxine.

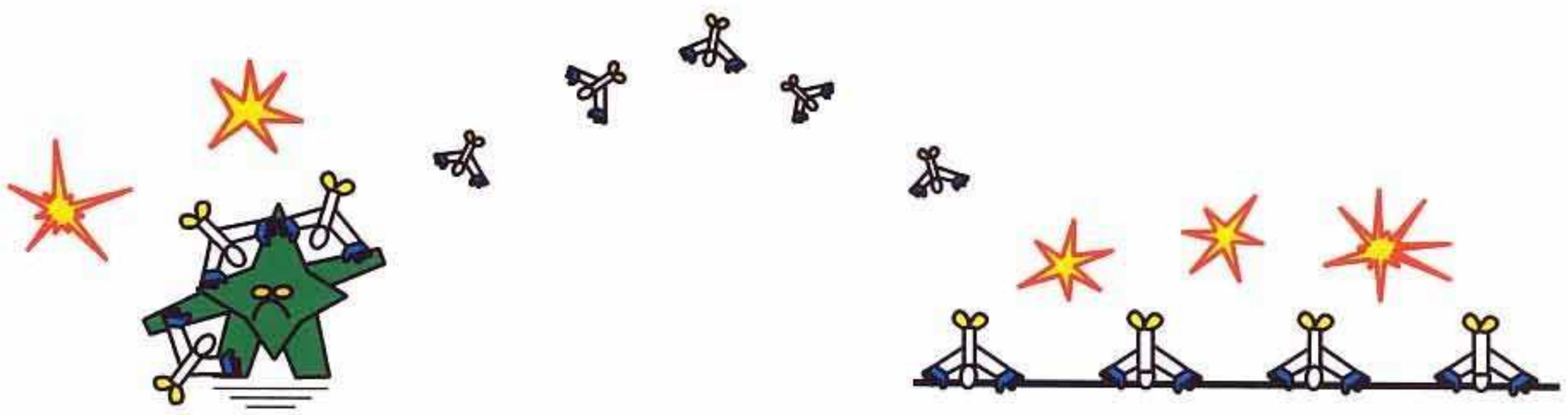
GOODPASTURE'S SYNDROME



Charlie develops a routine chest infection caused by the influenza A2 virus.

But 2 weeks later he starts to cough up blood and have problems with his kidneys.

WHAT WENT WRONG WITH THIS IMMUNE RESPONSE?



After a couple of weeks, antibodies with 'hands' fitting the virus appear.

Unfortunately their 'hands' also fit type 4 collagen, in the kidneys and lungs.

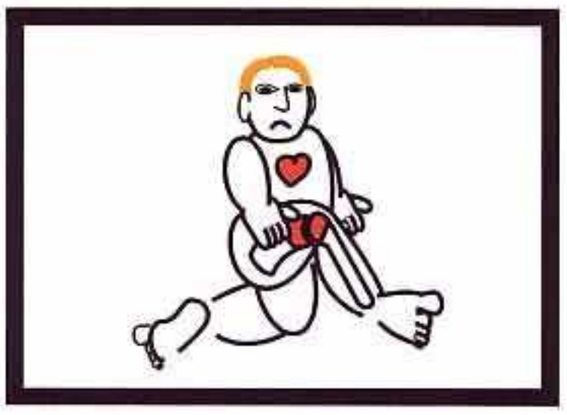
COLD AUTO - ANTIBODIES

If Peter goes out in cold weather without enough clothing, he experiences extreme pain in his limbs, which only resolves when he is back in the warm.

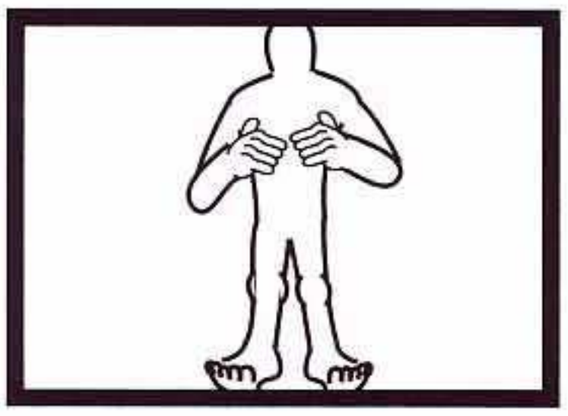
It is unknown why some people make cold auto - antibodies. When exposed to the cold, these IgM 'grab' his RBC's and activate complement. They detach once the temperature returns to normal.

COULD OUR HORMONES HELP TRIGGER AUTOIMMUNITY?

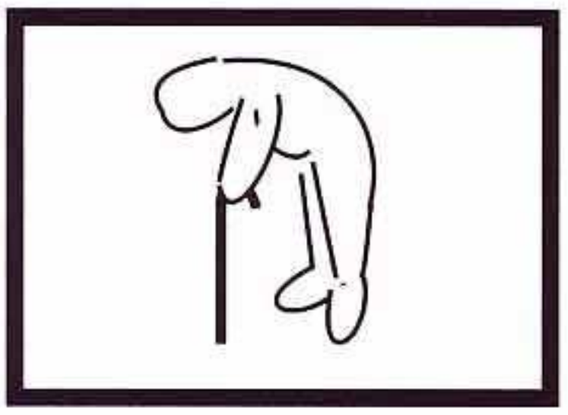
Hormones will alter the shape of our body during our lifetime. So it is possible that for a few people, their immune systems, could 'see' a changed body part as foreign and attack it.



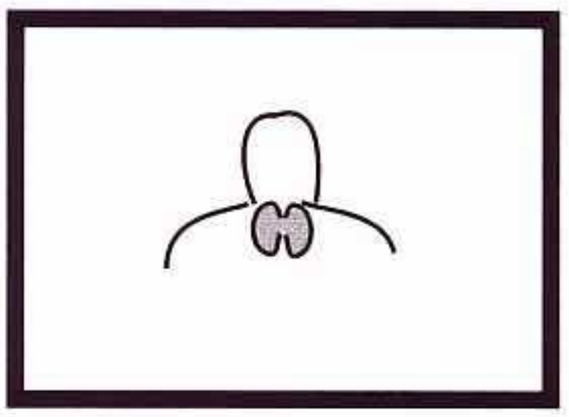
Rheumatic heart disease is most common in children and adolescents.



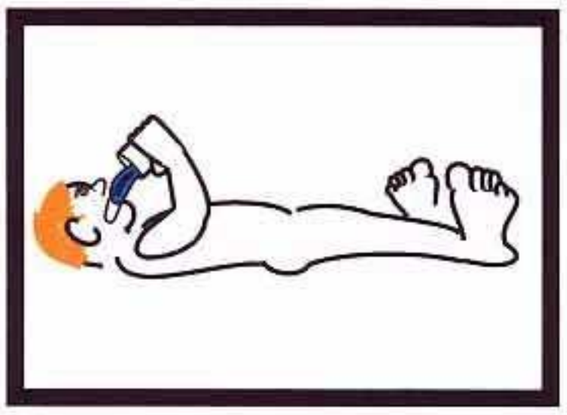
Rheumatoid arthritis most frequently appears in women between 30 and 40.



Ankylosing spondylitis is 8 times more common in men than women.

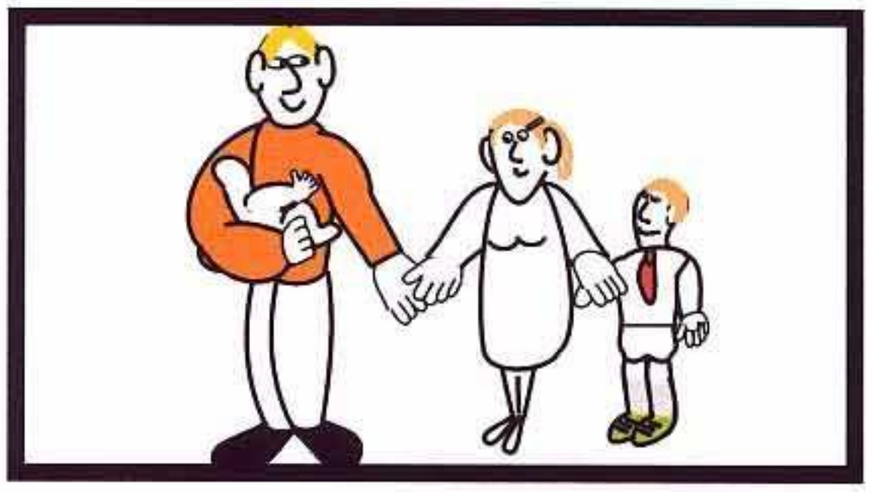


With graves' disease, the highest incidence is in women over 40.

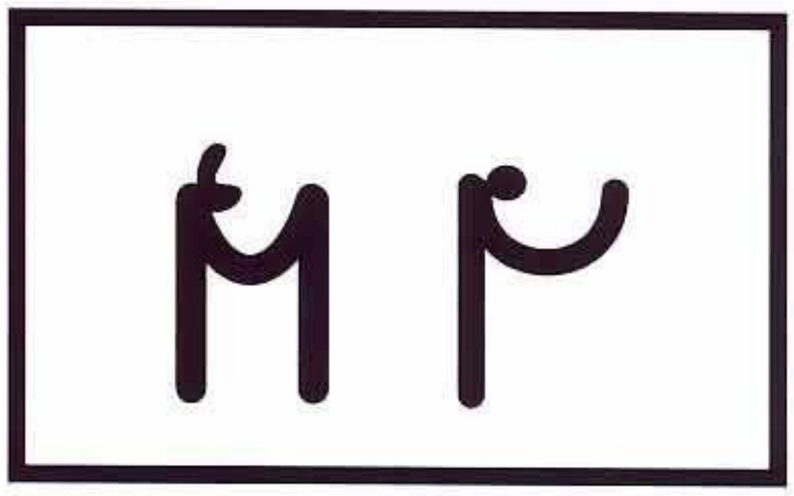


Insulin-dependant diabetes is much less likely to start after the age of 30.

AUTOIMMUNE DISEASES OFTEN APPEAR TO 'RUN' IN FAMILIES



Genes from our parents allow family characteristics like hair colour, to be passed onto the following generation.



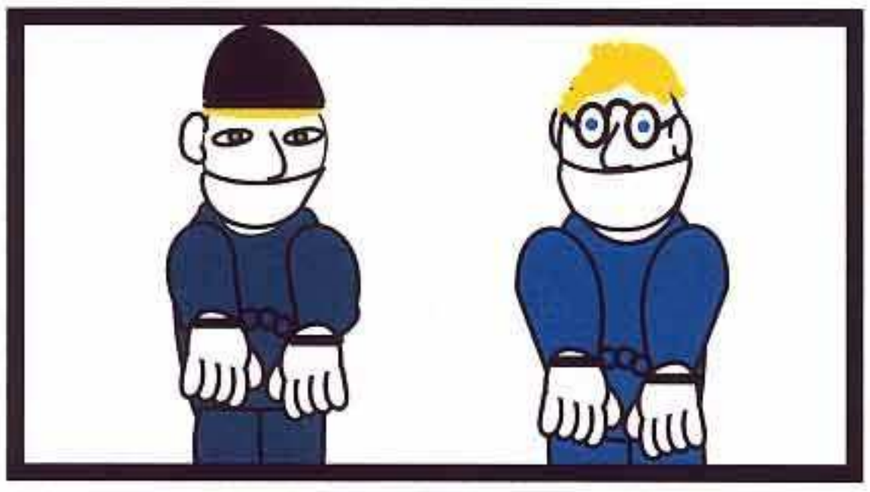
We inherit subtle shape variations at the top of the 'attack' and 'defence' proteins, like those shown above.

Inherited shape variations at the top of the 'attack' and 'defence' proteins are covered in much greater detail in chapter 11 (see page 221).

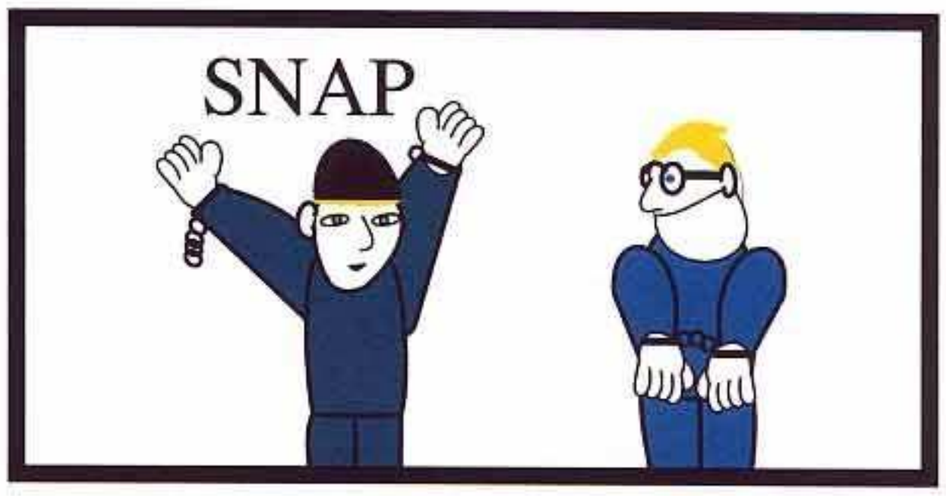
A NON-INFECTED CELL IS ATTACKED!

We inherit certain shape variations to our 'attack' and 'defence' proteins. Therefore, some people could be at risk if an immune cell mistakes a non-infected cell for an infected one. This might follow a viral infection (cross-reaction).

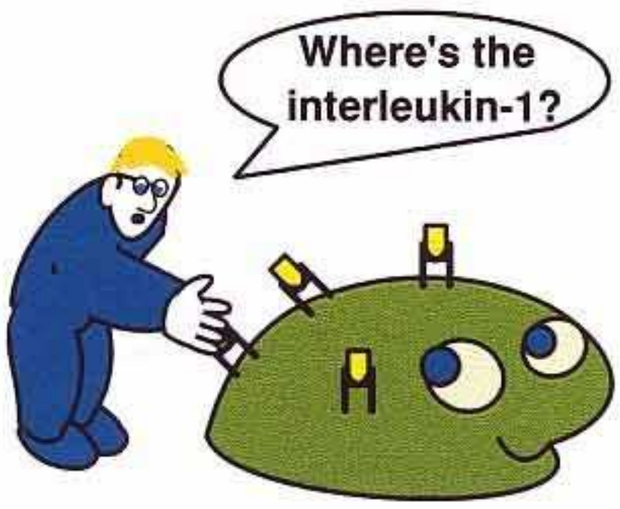
ANERGY



Anergy refers to those mature T cells which appear to have been inactivated, possibly because they had the potential of harming the host.



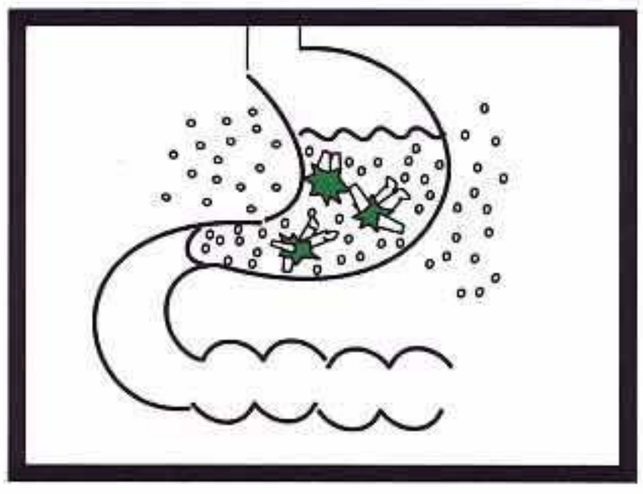
It is likely that we all have a few of these T cells. So if something was to reactivate one or more of these cells, then this could initiate an autoimmune disorder.



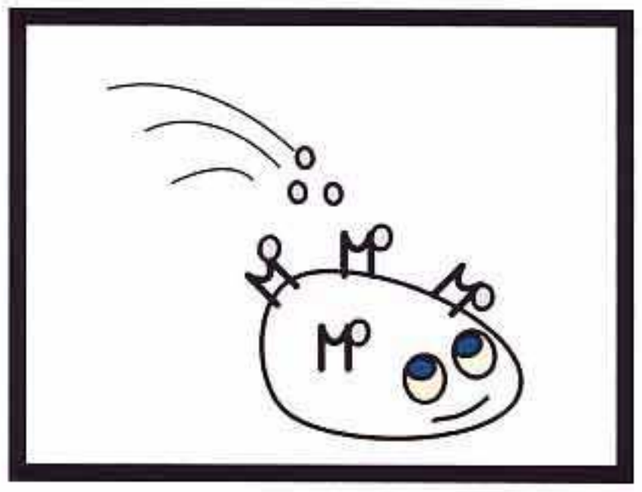
One theory postulates, that if a T cell's 'hand' fits material expressed at a cell's surface, but a second signal is then not received (see page 88), the T cell becomes inactivated.

COULD ENTEROTOXINS TRIGGER AUTOIMMUNITY?

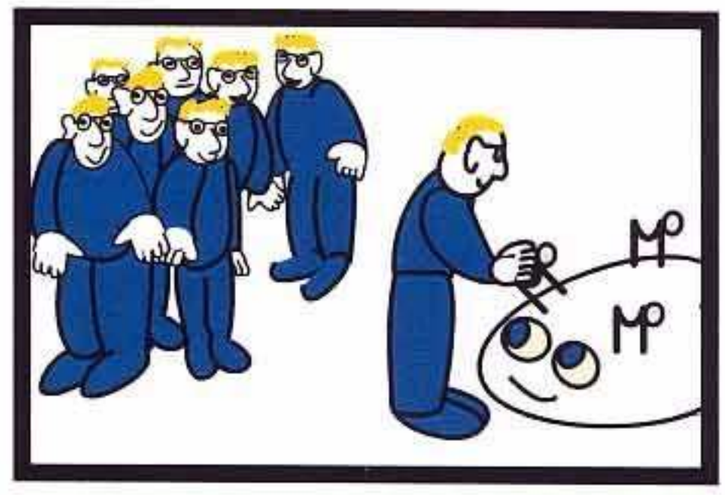
Enterotxins are waste, produced by bacteria that can harm us.



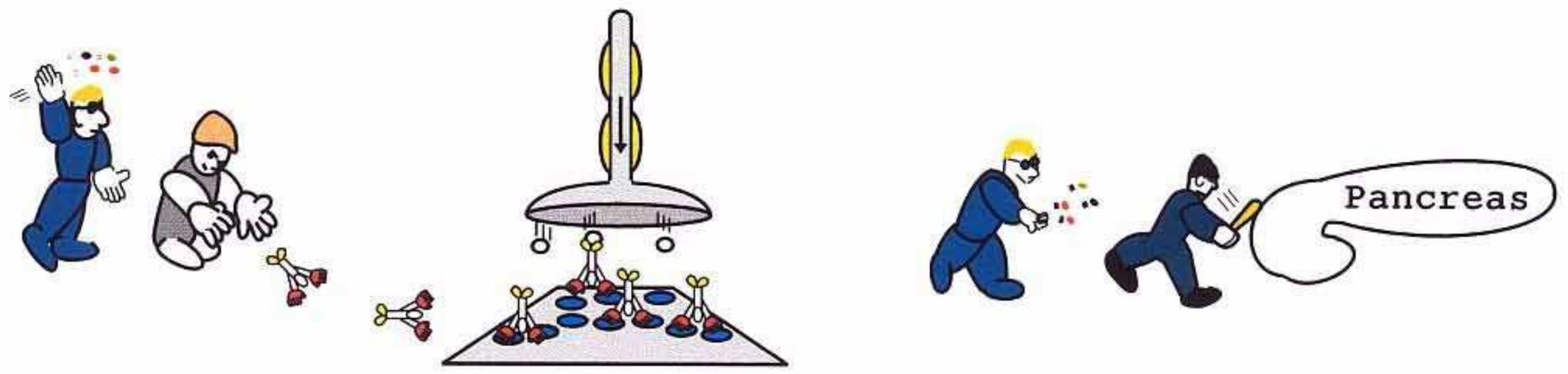
This person has just eaten some contaminated food laced with enterotoxins.



The enterotoxins are soon attaching abnormally onto the 'attack' proteins .

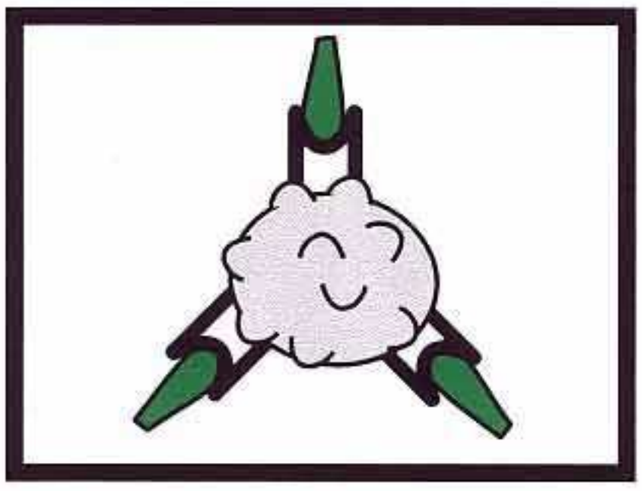


Many more T helpers than normal will now be stimulated (see page 101).



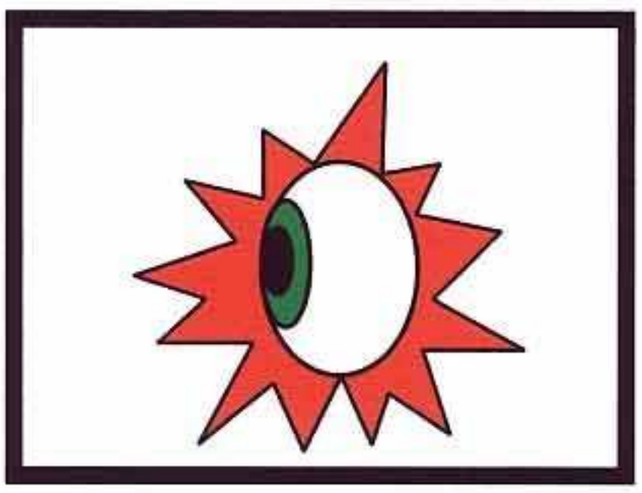
It is possible that something like enterotoxins, could reactivate T cells, which had been inactivated (anergised). This could then lead to an autoimmune disorder such as myasthenia gravis.

OTHER FACTORS WHICH COULD TRIGGER AUTOIMMUNITY



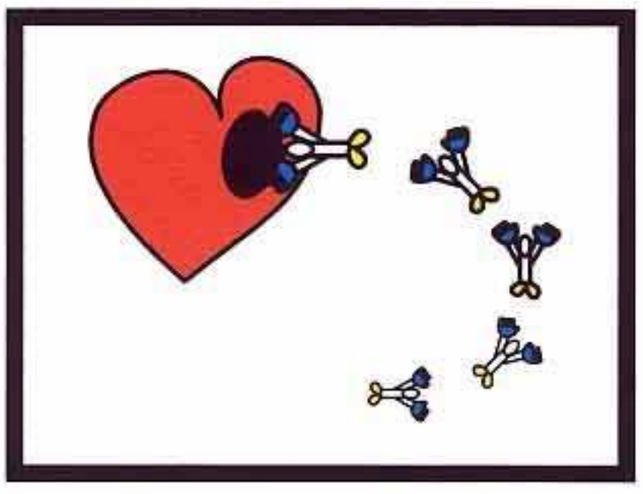
Normally, a virally infected cell expresses viral particles attached to 'defence' proteins. These foreign proteins will be detected by a T cytotoxic cell which will then kill the infected cell (see page 113).

But if a virally infected cell was to express viral particles attached to 'attack' proteins, then an abnormal T helper response could be triggered (see page 80).



Normally, immune cells are prevented from entering certain parts of the body, such as the eye.

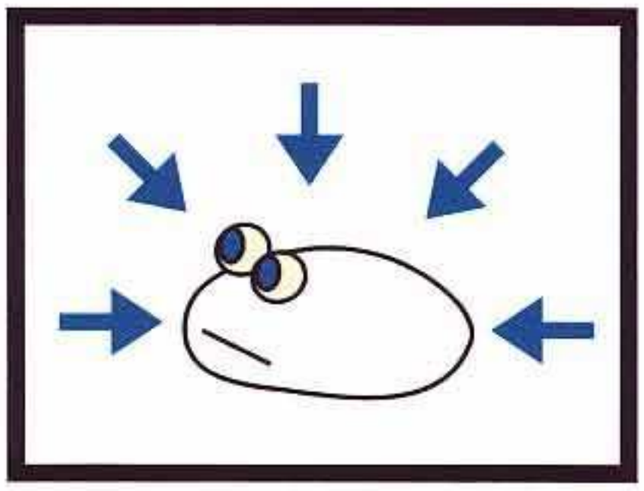
But when immune cells do gain access to these 'hidden' (sequested) areas of the body, the part will be 'seen' as foreign and attacked.



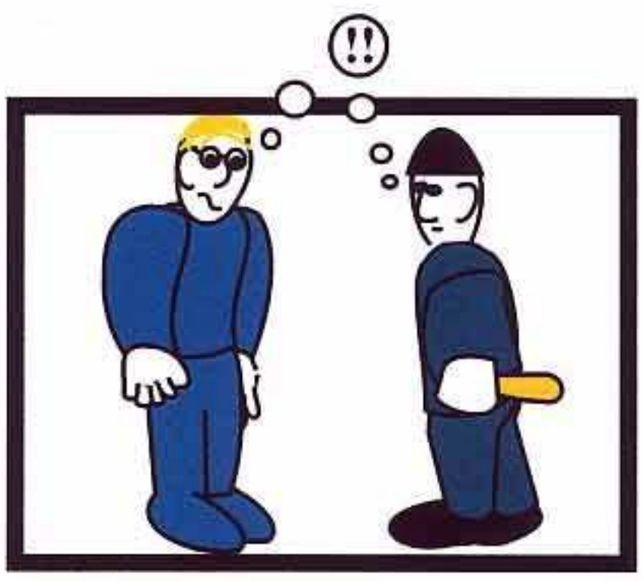
Could an injured (damaged) part of the body be at risk from an immune assult, due to changes in its physical appearance?

This is possible. After a heart attack, it has been known for antibodies to be produced against necrotic heart muscle.

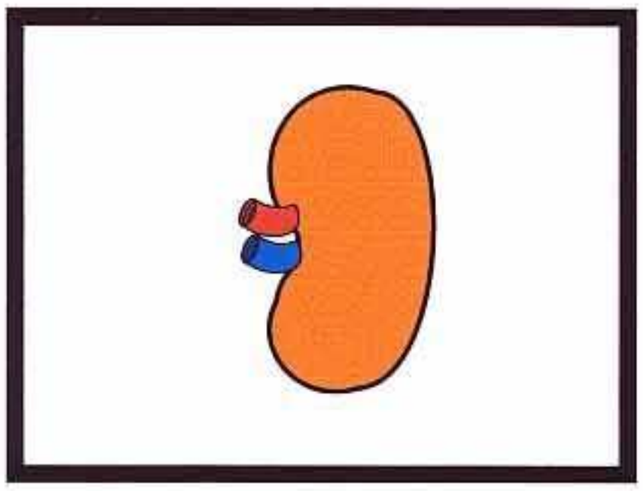
TREATMENTS FOR AUTOIMMUNE DISEASES



Steroids prevent the release of inflammatory mediators from mast cells and neutrophils.

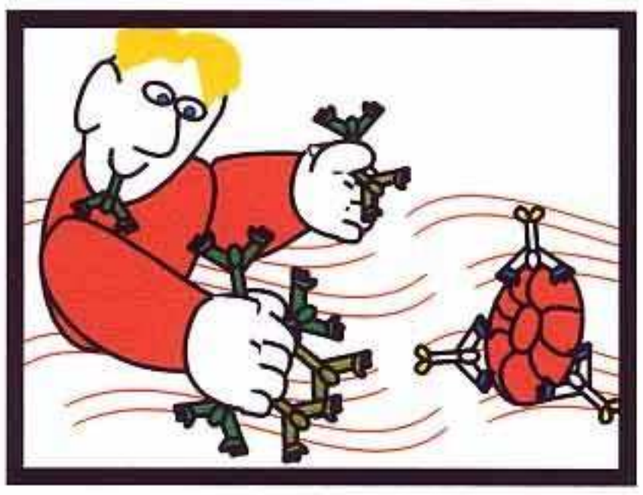


Cytotoxic drugs (ie azathioprine) work by incapacitating the T cells.



The spleen contains macrophages which will 'eat' any host cell coated in antibodies entering it.

So by removing the spleen, the rate at which these coated cells are removed, is greatly reduced.



By injecting a large number of antibodies, certain autoimmune conditions, will improve for a while. These occupy the macrophages so that they ignore any host cell coated in auto-antibodies, until all the foreign antibodies have been removed.