BBC NEWS

Doubt cast on free radical theory

Scientists have questioned a widely accepted theory for a cause of diseases such as cancer and arthritis.

Many experts believe that molecules called free radicals, produced when the body fights infection, inflict damage on the body's tissues.

Drugs have been developed to mop up these excess amounts of the molecules, and thus prevent damage and disease.

But research by University College London, published in Nature, suggests the theory may be incorrect.

> **Many patients might be using expensive antioxidant drugs based upon completely invalid theories.**
> Dr Tony Segal

The researchers say their findings may have profound implications for the way conditions linked to free radicals are treated.

The theory holds that the molecules are capable of such widespread tissue damage that they may be a contributory factor in a wide range of disease.

These include not only cancer and arthritis, but also damage to the blood vessels that can cause heart disease.

As a result the pharmaceutical industry has, since the 1970s, sought to develop antioxidant drugs that can either stop the production of free radicals, or mop them up once they have been created to prevent them causing tissue damage.

Many vitamins, notably vitamin E and C, as well as other natural substances are regarded as healthy because they attack free radicals.

Blood cells

However, the UCL team say their research disproves the evidence on which the theory was first based.

Researcher Dr Tony Segal said: "White blood cells produce oxygen free radicals, and the process by which they do so is essential for the efficient killing of microbes.

"However, people in whom this process is defective are prone to severe, chronic and often fatal infections.

"This fact has led to the presumption that the oxygen free radicals themselves are highly toxic, and that if they can kill organisms as tough as bacteria and fungi they can also damage human tissues.

"However, our work shows that the basic theory underlying the toxicity of oxygen radicals is flawed."

The researchers discovered that it is not free radicals that give white blood cells their destructive power, but enzymes which effectively digest foreign invaders.

They discovered that production of these enzymes is triggered by the flow of the mineral potassium within the cell.

When this flow was blocked, using a chemical derived from scorpion venom, the cells were unable to kill off foreign invaders.

This, they postulate, shows that free radicals are by no means the toxic particles that had been assumed.

Expensive drugs

Dr Segal said the pharmaceutical industry had spent millions of pounds on what effectively amounted to a red herring.

"Many patients might be using expensive antioxidant drugs based upon completely invalid theories as to their therapeutic potential.

"All the theories relating to their causation of disease by oxygen free radicals, and the therapeutic value of antioxidants must, at the very least, be re-evaluated."

Richard Ley, of the Association of the British Pharmaceutical Industry, told BBC News Online: "All medicines have to prove their effectiveness to the government regulatory authority, so, if they have been granted a licence, they cannot be having no effect.

"If you are saying that some other approach might be better, we are working on that all the time, to the tune of spending £9m a day on research."