

Vitamin D 'affects more than 200 genes'

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Vitamin D influences more than 200 genes, including some that play a role in serious autoimmune conditions and cancer, a study has shown.

The research highlights the extent to which vitamin D protects against a wide range of diseases.

Scientists mapped 2776 points where the vitamin interacts with elements of DNA, including those that make up genes.

The sites were unusually concentrated near genes associated with autoimmune disorders such as multiple sclerosis (MS), Crohn's disease, lupus, and rheumatoid arthritis.

They were also found close to genes for cancers such as chronic lymphocytic leukaemia and bowel cancer.

The researchers showed that vitamin D had a significant impact on the activity of 229 specific genes, including ones previously associated with MS, Crohn's disease and type 1 diabetes - another autoimmune condition.

"Our study shows quite dramatically the wide-ranging influence that vitamin D exerts over our health," said Dr Andreas Heger, from the Medical Research Council Functional Genomics Unit at Oxford University.

Working in the laboratory, the scientists isolated fragments of DNA in cells to study the effects of exposure to calcitriol, the "active" form of vitamin D.

Their findings are published in the journal *Genome Research*.

Vitamin D influences DNA through a "go-between" protein called the vitamin D receptor (VDR).

The protein is activated by the vitamin and attaches itself to DNA at the binding sites the researchers identified.

VDR binding was enriched in disease-associated regions of the genetic code and also areas linked to traits such as tanning, height and hair colour.

Study leader Dr Sreeram Ramagopalan, from the Wellcome Trust Centre for Human Genetics, at Oxford University, said: "There is now evidence supporting a role for vitamin D in susceptibility to a host of diseases. Vitamin D supplements during pregnancy and the early years could have a beneficial effect on a child's health in later life.

"Some countries, such as France, have instituted this as a routine public health measure."

Vitamin D is chiefly made in the body as a result of the skin's exposure to sunlight. A small number of foods also contain the vitamin, including oily fish and eggs, but 90% comes from being in the sun.

In many northern countries, a lack of sun can lead to vitamin D deficiency. Over-zealous use of sunscreen can also prevent vitamin D production.

It is estimated that more than half the UK population do not get enough vitamin D, and worldwide a billion people may be deficient in the vitamin.

Lack of vitamin D affects bone growth and development, leading to rickets in children and bone fractures in adults.

The study supports the theory that lighter, more sun-sensitive skins evolved as people migrated north out of Africa to maximise vitamin D production in the body.

A significant number of the VDR binding sites were in DNA regions where genetic changes are commonly found in people of European and Asian descent.

"Vitamin D status is potentially one of the most powerful selective pressures on the genome in relatively recent times," said co-author Professor George Ebers, also from the Wellcome Trust Centre for Human Genetics.

"Our study appears to support this interpretation and it may be we have not had enough time to make all the adaptations we have needed to cope with our northern circumstances."