

# Ageing linked to cancer

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Ageing is an unavoidable part of life, and it is often accompanied by a number of age-related illnesses. One of the biggest diseases associated with ageing is cancer, which as a result is often referred to as a 'disease of ageing'. As well as being of significant concern to individuals, ageing also represents a major concern to healthcare providers and society as a

whole. However, while ageing is unavoidable, the diseases associated with old age need not be. And that's what the researchers at the Centre for Genomic Regulation (CRG) are trying to accomplish.

Throughout the ages and across the world people have tried to understand exactly what causes ageing, but even today we still don't fully understand the phenomenon. Why does the body undergo a [functional decline](#) over the course of time? The research team at the CRG believe that they may have uncovered a [clue](#) that may help them understand not only how ageing may occur, but also how ageing may promote the development of diseases such as cancer.

The researchers focused their attention on skin: one of the most obvious tissues to undergo ageing. Everybody can witness skin ageing, be it wrinkling or thinning of the skin, [hair loss](#) or even reduced wound-healing ability. In humans it is the largest organ, and just like the other parts of the body, it is constantly replacing dead and damaged cells with new healthy ones. In order to achieve this, each tissue relies on populations of [specialised cells](#) known as [stem cells](#). 'These cells are unique in their ability, as they are able to grow and differentiate into all the other different cells types in the [tissue](#), as well as tolerating stress and damage better than non-stem cells. This process of [rejuvenation](#) and renewal is something that was thought to occur all throughout life,' says Jason Doles, the first author on the study and a [postdoctoral researcher](#) at the CRG. By studying skin stem cells during the [ageing process](#), the researchers hoped to see if changes in stem cell function might contribute to ageing. What they found was that during the ageing process, skin stem cells actually lose their ability to function properly. 'We have discovered that major changes occur in these stem cells during ageing, whereby stem cells exhibit impaired growth in older animals as compared to their more youthful counterparts. We also found that the aged stem cells are not able to tolerate stress as well as young stem cells, strongly supporting the idea that changes in stem cell function might

actually drive the ageing process,' said Bill Keyes, who is group leader of the Mechanisms of Cancer and Aging lab at the CRG and lead author of the study, which was published in the journal *Genes & Development*.

The discoveries didn't stop there, however. Their research was also critical in uncovering novel processes driving skin stem cell ageing, and linking the ageing process with diseases such as cancer. According to a recent study from the same group, they demonstrated that these same stem cells become deregulated during the development of squamous cell carcinoma, a deadly type of skin cancer. The current study performed high-throughput profiling of the ageing stem cells and identified a likely cause of the loss of function during ageing. They demonstrated that during normal ageing, the entire skin changes: it produces many different proteins that mediate inflammation, and that it is the abnormal production of these inflammatory-mediators that contributes to the decline of stem cell function. Given that the link between inflammation and the development of cancer has been long known, the current study uncovers important findings on how the two might be linked.

Much like a jigsaw puzzle, the researchers believe that altogether, these findings help to explain the most likely principal cause of the ageing process and how this develops. As a result, it opens the door for future studies that may help to alleviate aspects of the ageing process. But in addition, with the identification of inflammation as a cause of stem cell dysfunction, the study also uncovers likely causes in the development of cancer.

**More information:** Centre for Genomic Regulation: [www.crg.es](http://www.crg.es)  
Genes & Development: [genesdev.cshlp.org/](http://genesdev.cshlp.org/)

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