Study finds age hinders cancer development

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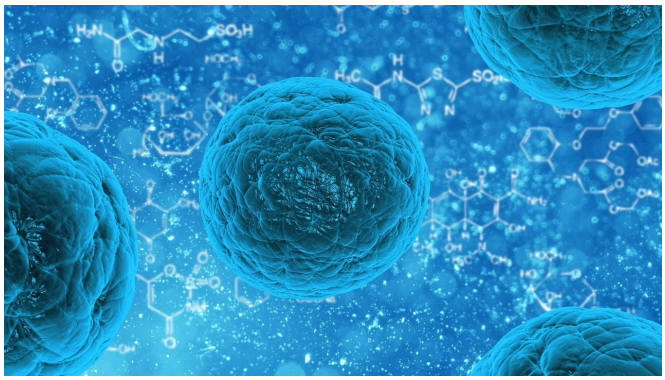

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A new study, published in *Aging Cell*, has found that human ageing processes may hinder cancer development.

Ageing is one of the biggest risk factor for cancer. However, the biological mechanisms behind this link are still unclear.

Each cell in the human body is specialised to carry out certain tasks and will only need to express certain genes. Gene expression is the process by which specific genes are activated to produce a required protein.

Gene expression analyses have been used to study cancer and ageing, but only a few studies have investigated the relationship between gene expression changes in these two processes.

In an effort to better understand the biological mechanisms researchers from the University of Liverpool's Integrative Genomics of Ageing Group, led by Dr. Joao Pedro De Magalhaes, compared how genes differentially expressed with age and genes differentially expressed in cancer among nine human tissues.

Normally, a healthy cell can divide in a controlled manner. In contrast, senescent or 'sleeping' cells have lost their ability to divide. As we age, the number of senescent cells in our bodies increase, which then drive many age-related processes and diseases.

Genetic mutations triggered by things such as UV exposure can sometimes cause cells to replicate uncontrollably—and uncontrolled cell growth is cancer. Cells are often able to detect these mutations and in response go to sleep to stop them dividing.

The researchers found that in most of the tissues examined, ageing and cancer gene expression 'surprisingly' changed in the opposite direction. These overlapping gene sets were related to several processes, mainly cell cycle and the immune system. Moreover, cellular senescence changed in the same direction as ageing and in the opposite direction of cancer signatures.

The researchers believe the changes in ageing and cellular senescence might relate to a decrease in cell proliferation, while cancer changes shift towards an increase in cell division.

Dr. De Magalhaes, said: "One of the reasons our bodies have evolved to have senescent cells is to suppress cancers. But then it seems that senescent cells accumulate in aged human tissues and may contribute to ageing and degeneration. Importantly, our work challenges the traditional view concerning the relationship between cancer and ageing and suggests that ageing processes may hinder cancer development. While mutations accumulate with age and are the main driver of cancer, ageing tissues may hinder cell proliferation and consequently cancer. So you have these two opposite forces, mutations driving cancer and tissue degeneration hindering it. This may explain why at very advanced ages cancer incidence levels off and may even decline."

However, an alternative explanation comes from evolutionary biology. First author Kasit Chatsirisupachai, explains: "And aged tissue might actually be a better environment for a rogue cancer cell to proliferate because the cancer cell will have an evolutionary advantage."

Dr. De Magalhaes: "Our results highlight the complex relationship between ageing, cancer and cellular senescence and suggest that in most human tissues ageing processes and senescence act in tandem while being detrimental to cancer. But more mechanistic studies are now needed."

More information: Kasit Chatsirisupachai et al, A human tissue?specific transcriptomic analysis reveals a complex relationship between aging, cancer, and cellular senescence, *Aging Cell* (2019). DOI: 10.1111/acel.13041