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Scientists solve ageing puzzle (w/ Video)

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(PhysOrg.com) -- A discovery by Newcastle University experts could provide the next step in fighting age related diseases, such as diabetes and heart disease.

Scientists from the University's Institute for Ageing and Health have used state-of-the-art laboratory techniques and sophisticated mathematical modelling to help crack the problem of why cells age.

The ageing process has its roots deep within the cells and molecules that make up our bodies and experts have identified the molecular pathway that reacts to cell damage and stems the cell's ability to divide.

The results should help us understand not only ageing itself, but also how cancer cells escape ageing to wreak their destructive power.

Published in the current edition of the journal *Molecular Systems Biology*, the research identifies the precise molecular pathway that reacts to internal signals that a cell is in trouble because of damage to its DNA and then responds by triggering a managed shut down of the cell's ability to divide.

This results in loss of the cell's capacity to support tissue regeneration and repair, which gradually leads to the physical signs of ageing, as more and more cells suffer the same fate. The damaged cell is also stopped from becoming cancerous.

Professor Thomas von Zglinicki, who led the research, said: "There are

some real possibilities for this research. The next stage would be to develop drugs which can be used to target these molecules to help us combat many age related illnesses such as diabetes and heart disease where cell ageing plays an important part.

“For many years scientists around the world have struggled to understand the complex factors that cause cells to stop dividing as they get older.

“Now that we know the precise pathway that is involved, it becomes feasible to begin to think about how it can be modified to improve ageing without increasing the risk of cancer. It is absolutely essential to tread carefully in trying to alter processes that cause cells to age, because the last thing we want is to help age-damaged cells from breaking out to become malignant.”

The Newcastle University discovery shows that the cell reacts to DNA damage by first upsetting the functions of the mitochondria - units within the cell that use oxygen to produce the all-important chemical energy on which everything else in our bodies depends. When the mitochondria are affected in this way, they pump out increased amounts of ‘free radicals’ which themselves cause DNA damage. This fresh damage in turn causes more free radicals to be produced so the cell effectively locks itself out of the possibility of any future division.

The research also highlights the unique power of the new way of conducting biomedical research that is called “systems biology”. The team is based at the Centre for Integrated Systems Biology of Ageing and Nutrition (CISBAN) within the multidisciplinary Institute for Ageing and Health. CISBAN creates and harnesses an intense synergy between experimental and computational science to address the most complicated biological challenges. CISBAN is funded by the Biotechnology and Biological Sciences Research Council and is a world leader in this groundbreaking way to tackle the deep complexities of

ageing.

“What is so exciting about this discovery,” said Professor Tom Kirkwood who directs CISBAN and the Institute for Ageing and Health, “is that it shows the power of systems biology. There is no way that this advance could have been made without combining the expertise of experimental biologists, mathematicians and computer scientists. The BBSRC took a bold step when it began to fund big new programmes of research in systems biology five years ago. We are delighted at the fruits this imaginative investment is yielding. It’s no exaggeration to say that without systems biology, we will not understand something as complicated as the ageing process.”

Provided by Newcastle University