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Every cell in the human body has to be a particular size in order to function correctly. The research group led by Markus Hengstschläger of the Institute for Medical Genetics at the Medical University of Vienna has now discovered a new mechanism that regulates cell size.

An important mechanism in regulating the size of human cells is controlled via the IGF/Akt/mTOR cascade. It has often been suggested that the mTOR-dependent activity of S6 kinase might be relevant for this process. However, recent data from the research group led by Markus Hengstschläger of the Institute for Medical Genetics of the Medical University of Vienna now suggest that another protein complex,

known as eIF3, is an important cell size regulator. Firstly eIF3 is responsible for the interaction between mTOR and S6 kinase and secondly it is an important initiator of general protein synthesis (the new formation/translation of proteins) in the cell.

Protein complex elF3 controls cell size

In order for the body to function as a whole and all the individual organs to function separately, the number and size of every one of the countless cells in the human body have to be accurately controlled throughout the person's lifetime. The exact number of cells is regulated by means of cell division and cell size by control of cell growth. The scientists were able to show that cells, in which eIF3 is inactivated, are unable to maintain control of their cell size. This mechanism controls the size of normal primary human cells as well as that of tumour cells. The group also examined mutations of eIF3, which occur in various types of tumour, to determine their effect on cell size regulation. The results have been published in the renowned journal, *Oncotarget*.

In the human body, cell division and cell growth are not necessarily linked. For example, nerve cells can grow without multiplying and there is no cell growth during the initial cell divisions of the oocyte following fertilisation. Whilst, in recent years, a lot of research has been carried out into the mechanisms underlying cell division, very little attention has been given to the questions of how the different sizes of cells are regulated or why muscle cells, skin cells or blood cells need to be of different sizes. However, one thing is clear: if the control of cell growth goes awry, not only are the different types of cells no longer able to fulfil their various functions, tumours also start to form in most cases.

"These findings are an important further step in our understanding of the molecular control of cell size and may also be relevant for developing new tumour therapies in the future," explains Markus Hengstschläger.

More information: "eIF3 controls cell size independently of S6K1-activity," *Oncotarget*, www.impactjournals.com/oncotar … &op=view&path[]=4458

Provided by Medical University of Vienna