Insight into cancer cells' abnormal behavior

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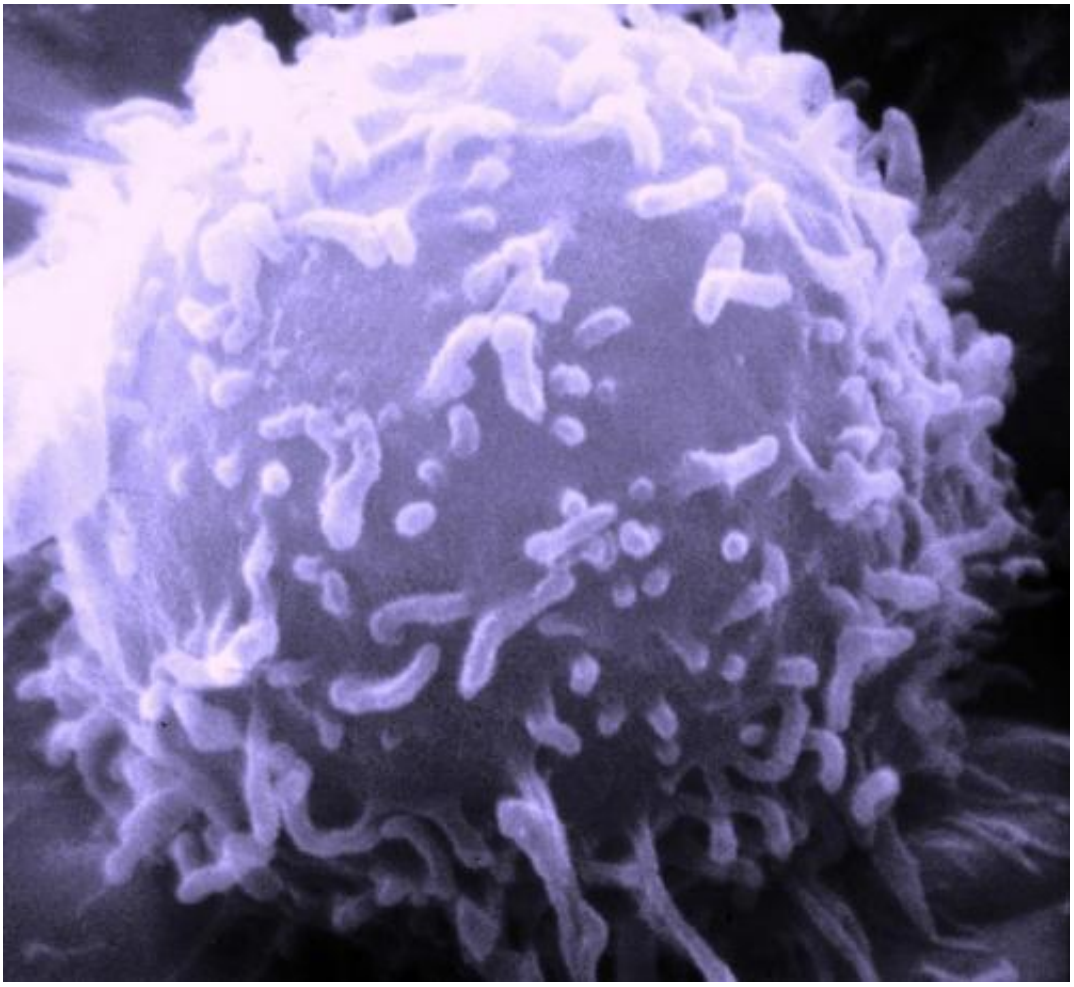

Electron microscopic image of a single human lymphocyte. Credit: Dr. Triche National Cancer Institute

Scientists at Lancaster University have shed light on the metabolic switch observed in abnormal cells like cancer.

The change in cellular energy metabolism is a hallmark of many diseases as cells change from healthy to abnormal metabolic states.

Cancer cells are known to switch from providing energy through aerobic respiration to instead providing energy from glycolysis, or burning sugar.

This is also seen in yeast cells, which enables scientists to study the phenomenon in the lab.

Data from yeast cells has been studied by physicists interested in biological oscillations, which they can describe using mathematical equations.

Their research in *Scientific Reports* looks at the dynamics of energy production in yeast cells to examine the metabolic oscillations behind this shift.

The team included Professor Aneta Stefanovska and Dr Gemma Lancaster from Lancaster with Dr Yevhen Suprunenko from Liverpool University and Kirsten Jenkins from King's College London.

Professor Aneta Stefanovska said: "Due to the thermodynamic openness of a living cell, the inability to instantaneously match fluctuating supply and demand in energy metabolism results in nonautonomous time-varying oscillatory dynamics.

Based on experimental evidence of metabolic oscillations provided by a group in Gothenburg, Sweden, led by Dr Mattias Goksör, they show that changes in metabolic state can be described robustly by alterations in the ability of the oscillator to resist external perturbations.

"I am delighted that our recent theory about how dynamical systems can maintain stability even with continuous perturbations has been shown to

be directly applicable in this very important context of cell energy metabolism."

The researchers suggest that this could be used to identifying transitions between metabolic states in a cell, for example the metabolic switch observed in cancer cells.

Dr Gemma Lancaster said: "Focusing on the transitions between metabolic states could facilitate the development of new therapeutic strategies."

More information: Gemma Lancaster et al. Modelling chronotaxicity of cellular energy metabolism to facilitate the identification of altered metabolic states, *Scientific Reports* (2016). DOI: 10.1038/srep29584

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