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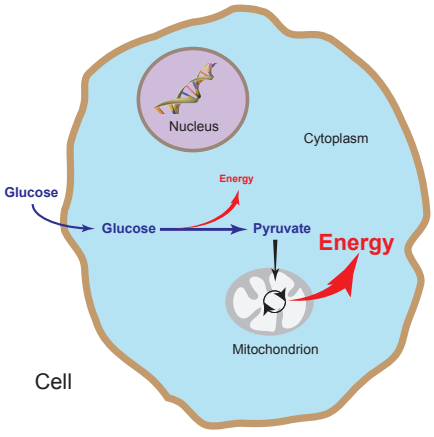
THE CELLS' PETROL PUMP IS FINALLY IDENTIFIED

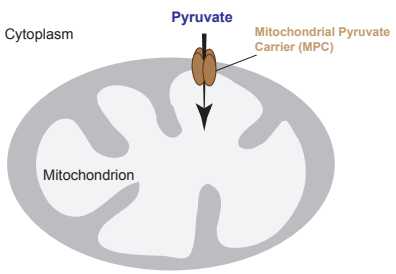
Researchers from the University of Geneva describe how mitochondria, the cell's power plants, are supplied with fuel.

The oxygen and food we consume are converted into energy by tiny organelles present in each cell, the mitochondria. These 'power plants' must be continuously supplied with fuel, to maintain all vital functions. A team led by Jean-Claude Martinou, professor at the University of Geneva, Switzerland, has identified this fuel's universal carrier, baptized MPC (Mitochondrial Pyruvate Carrier). The study, published online on May 24th 2012 by *Science* magazine, henceforth allows the researchers to investigate how the activity of the carrier is modulated. They hope to use this new opening to determine whether tumor cells can be coerced into adopting a pathway that is unfavorable, in terms of survival.

Our cells breathe and digest, as does the organism as a whole. They indeed use oxygen to draw the energy contained in the nutrients they ingest, before discarding the waste, as carbon dioxide and water. Glucose is a preferred nutrient for the cells. Its digestion occurs in the cytoplasm, in the absence of oxygen, and leads to the formation of pyruvate and a small amount of energy. Pyruvate is then carried into mitochondria, the cell's power plants, for a complete burning, thus providing a maximal energetic yield.



Glucose is converted in energy mainly within the mitochondria



The mechanism of cellular fuel transport discovered by the Geneva team

A mediocre energetic yield in tumor cells

'As opposed to healthy cells, tumor cells produce the energy they need mainly in the cytoplasm. For reasons that are still misunderstood, they have little use for their mitochondria', notes Jean-Claude Martinou, professor at the University of Geneva, Switzerland. However, cancer cells don't seem to lack energy. They compensate the low energetic yield by an increased consumption of glucose. This strategy allows them to do without oxygen, to a large extent. By short-cutting the mitochondria, these cells would thus escape from the deleterious effects of toxic molecules, such as free radicals, produced during the cellular respiration, within the power plants.

How can the fuel pipeline be redirected to its normal pathway? 'Biologists have been attempting for more than thirty years to understand how pyruvate is transferred from the cytoplasm to the interior of the mitochondrion. We finally identified the carrier, which was named Mitochondrial Pyruvate Carrier, abbreviated MPC», details Sébastien Herzig, researcher at the Department of cell biology of the University of Geneva and first author of the article.

MCP is a universal carrier, which is almost identical from yeast to human. 'From now on, we will be able to study how the cells can modulate the activity of this carrier, according to their needs in energy',

explains Jean-Claude Martinou. The next challenge will be to find a way to force the mitochondria of tumor cells to function normally, by stimulating pyruvate transport towards the interior of these power plants.

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