Novel Method for Labeling Cells and Living Animals with Isotopically Label Gases

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Technology

NYU researcher Dr. Pacold has developed a method for isotopic labeling in cells which includes allowing the cells to metabolize in the presence of a gaseous isotopic tracer in a hermetically sealed chamber. Using this method, researchers can identify metabolites in the cells based on detection of the isotopic tracer in the cells. Furthermore, modifications in the labeling chamber can allow for isotopic labeling of the cells of a whole living experimental animal as well. As a proof of concept, metabolome studies of radioactively-labeled O2 in the Pacold lab led to the discovery of a new enzyme in the Coenzyme Q10 (CoQ10) biosynthesis pathway.

Background

Gaseous oxygen (O2) is essential for cellular respiration, the production of reactive oxygen species (ROS), and the activity of oxygen-dependent enzymes, such as dioxygenases. Oxygen-utilizing enzymes are essential for sensing, regulatory, and biosynthetic processes that are critical for cell growth and survival. Although the necessity of oxygen in sustaining life has been known since the late 1700s, the scope of oxygen-dependent processes in mammalian cells remains unknown as there are no established methods for systematically identifying the targets of oxygen or any other labeled gas in mammalian cells. Identification of the targets and site-specific modifications of ROS and measuring the activity of oxygen-dependent enzymes in a systematic manner using direct mass spectrometric methods, would reveal these fundamental oxygen-dependent processes and novel biology.

Applications

- The new method for labeling gases allows researchers to trace metabolites in an easier, cost-effective way.
- The labeling chamber can be marketed as a device to be sold to chemistry and metabolome-focused research labs.

Advantages

- This is a new robust system for labeling cells with isotopically labeled gases.
- This method reduces the price of isotopically labeling experiments considerably.
- The labeling chamber makes gaseous labeling possible in both cells and living animals.

IP Status

Provisional patent application pending

References

1. Banh, R.S., Kim, E.S., Spillier, Q. et al. , The polar oxy-metabolome reveals the 4-hydroxymandelate CoQ10 synthesis pathway