Peering into a more 'human' petri dish

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Jason Cantor is a metabolism investigator at the Morgridge Institute for Research in Madison and an assistant professor of biochemistry at the University of Wisconsin-Madison. Credit: Morgridge Institute for Research

Cell culture media, the cocktail of chemicals and nutrients that keep cells alive and thriving in a dish, have been an essential tool of biology for more than 70 years. Remarkably, the composition of these potions

hasn't fundamentally changed much over that time, primarily because they deliver what scientists need: Cells that stay viable and rapidly divide.

But Jason Cantor is thinking about cell culture media from another angle: Can we make it more human?

Cantor, a metabolism investigator at the Morgridge Institute for Research and assistant professor of biochemistry at the University of Wisconsin-Madison, is a pioneer in the new development of "physiologic media," which are intended to place laboratory cells into an environment that very closely mimics real biological conditions.

A few years ago, while at the Whitehead Institute for Biomedical Research in Cambridge, Cantor was part of a team in the laboratory of David M. Sabatini that developed human plasma-like medium (HPLM), a project that painstakingly recreated many of the common biochemical characteristics of adult human plasma.

HPLM is now being used experimentally across more than 30 labs on a variety of research projects, and has the potential to provide broad scientific value as a basic research tool.

Cantor describes the promise of physiologic media in a commentary in the November 2019 issue of *Trends in Cell Biology*, along with an illustration featured on the journal's cover. Mainly, Cantor argues that physiologic media open a new world to biologists wanting to understand how cells behave in the human body.

"The recent development of physiologic media, like other efforts designed to address the modeling capacity of cell culture, holds immense potential to improve understanding and interpretation of diverse biological and pharmacological studies," Cantor wrote.

They fit conceptually with other technologies trying to achieve the same goal of closely modeling physiological conditions. Those include, for example, 3-D culture systems, microfluidics, organs-on-a-chip and airtight chambers that mimic the oxygen-deprived conditions of solid tumors.

One focus of the Cantor lab is asking how the cell biology of human blood cancer cells, such as different subtypes of leukemia, cultured in HPLM compares to that in more traditional media recipes. And because HPLM was designed to more closely mimic biochemical conditions cells encounter in the body, his lab hopes that such findings may ultimately reveal both fundamental and translational insights that hold greater physiologic relevance. Those have perhaps been masked through studies using classic culture media.

The primary goals of traditional media have often been applications-based, most typically that of promoting rapid growth, whereas physiologic media represents a new approach to instead design culture media with a modeling-based goal in mind.

"In most cases, people are using media to make something happen," he says. "In our case, we just want to study biology or drug efficacy in the conditions we are more likely to see in the human body. Modeling how a cell behaves is a different line of thinking."

More information: Jason R. Cantor. The Rise of Physiologic Media, *Trends in Cell Biology* (2019). DOI: 10.1016/j.tcb.2019.08.009

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