Tulane studies pave the way for improved drug testing

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Researchers led by Mark Mondrinos, assistant professor of biomedical engineering at Tulane, have created a new method to improve how well lab results translate to real patient outcomes. (Photo by Kenny Lass)

New research from the Tulane University School of Science and Engineering has the potential to revolutionize how new pharmaceutical drugs are tested and increase the success rate of clinical trials.

Researchers led by Mark Mondrinos, assistant professor of biomedical engineering at Tulane, have created a new method to improve how well lab results translate to real patient outcomes. To develop the new method, he and his team compared how female and male cells react differently when grown in the lab for drug testing.

The team found that male cells had more difficulty growing in a commonly used cell culture medium because the medium contains high levels of estrogen.

To address this, he and his team developed a new process for creating better hormonal environments for male and female cells by using a hormone-free cell culture medium and adding estrogen or androgen, depending on the sex of the cells, to support optimal cell growth.

“Donor cell-based testing is notorious for having really wild variability, and I’m convinced that it’s tied to the fact that people weren’t paying attention to the sex of the cells,” Mondrinos said.

The results could lead to a better understanding of how hormones impact health and diseases, like diabetes or lung cancer, and help catch drug failures earlier — before they reach costly late-stage clinical trials.

This new method is focused on the earliest stages of drug development, when scientists use cells from a single source, such as an individual person, to test treatments. Such testing, however, does not account for the wide variations found in humans.

“We're individual people with our own individual biological and physiological characteristics,” said Mondrinos, who is also an investigator with Tulane’s Center of Excellence for Sex-Based Precision Medicine. Genetic background, sex, age, environmental exposures and other factors could alter how our bodies react to different drugs, he said.

The best way to counteract that, then, would be to use cells from many different sources.

“We started thinking about what we could do to capture more of this [variation], and probably the lowest and most defined rung on that ladder is biological sex,” Mondrinos said.

The new method resulted in healthier cells that had more consistent results in testing, underscoring the benefits of considering hormones in cell-based testing.

“The idea there is to eventually completely blow up and rethink the way that human cell culture is done,” said Mondrinos, who envisions a future in which researchers can easily purchase cell culture medium formulated for the cell type and sex they are studying.

By rethinking how cells are grown in the lab, Mondrinos and his team are addressing a long-standing gap between early drug testing and real-world patient outcomes.