A Student's Perspective on Human-Relevant Testing Models

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Debating animal research was never a particularly central topic throughout my short life so far as a university student. There are the occasional animal activist campaigns about how companies need to stop using them to test cosmetics or drugs, and how 'Mouse Lives Matter Too!' I remember the flyers being passed around in the lecture theatres, the posters dotted around the various cafes and common rooms, and the conversations I'd have with my vegan lab partner while we waited for our centrifuges to finish spinning our tiny cell samples.

Truth be told I never really paid much attention to any of these incidents, and I can tell you why – from the moment I started studying life sciences, it was always implied that using animals was the only way to do research. The use of animal models in research has existed long before current biomedical science as we know it, and to this day animals are used in basic biomedical research and preclinical studies to test the safety of newly developed drugs, vaccines, or chemical products

As far as I was concerned, there were no alternatives to animal testing because I was never taught about any. Whether it is the responsibility of educational organizations to inform the student cohort about animal research alternatives or my own responsibility to do my own homework on this topic is another discussion altogether, but it does make me consider how my studies would be different if learning about human-biology based alternatives to animal research was part of the normal curriculum.

After participating in an internship program with the Center for Contemporary Sciences(CCS), I have learnt about various human-relevant testing methods encompassing cutting edge *in vitro* technologies such as organoids and microfluidic devices which can simulate organ functions. The recent boom in machine learning methods has also provided us with a whole new suite of tools which can be applied to assessing the safety and efficacy of drugs.

Awareness of these techniques has started to gain traction only recently, and we are still finding new ways to improve and apply them. There is an increasing amount of evidence to suggest that results obtained from animal models translate poorly to humans, which is why it is important to start looking at human-specific research methods that will benefit the welfare of both animals and humans.

It amazes me how disruptive and groundbreaking these human-based testing methods are, and how they have the potential to revolutionize our understanding of human diseases and the search for therapeutics in the foreseeable future. Incorporating these into normal university studies as well as pharmaceutical labs is an incredibly exciting prospect. I am confident that lectures which inform current students about these new approaches would generate a lot of enthusiasm, and maybe eventually allowing students to work with these sophisticated devices in a laboratory setting would encourage even more interest.

CCS conducted a pilot study involving biomedical students, most of whom were obtaining their PhDs. When asked of their interest in learning about human-based research methods, **97%** responded that they **were interested in gaining experience in human-specific testing methods**.

The main reasons cited for their interest (respondents were able to select more than one option) included:

- Ethics (i.e., animal suffering): 66%
- 'These methods are more human-relevant': 59%
- Human-based research is the 'future of science': 45%

However, half of the respondents felt there were not enough opportunities to learn about and train in these alternatives to animal testing.

Fostering a future generation of scientists who understand the value of human-specific research methods could allow us to find the answers to the most challenging problems in biology that animal models cannot give us, such as more effective treatments for cancer or dementia. Educating our current generation about these new testing methods could inspire us to innovate novel technologies and further refine emerging ones, which would perhaps accelerate the adoption and acceptance of human-relevant methods into the mainstream pharmaceutical industry in lieu of animal testing.

Animal testing has already been phased out from the cosmetic industry in many countries, and it is about time that we push for this same change in the pharmaceutical industry, basic biomedical research, and in education around the world. Some changes are underway, especially in drug and chemical safety testing, that enables scientists to understand how to best use the array of human-relevant methods. For example, standardized evaluation frameworks are helpful in educating scientists and regulators in how to evaluate the predictive validity of testing methods and how best to apply them.

I am optimistic that I will be able to witness many more changes in my lifetime, and that human-relevant testing methods, rather than animal testing, will become a normal part of my daily work as a scientist several years after I graduate. I remember quite vividly one of my professors saying that 'we've known how to cure cancer in mice for years', which is exactly why I think now is the right time to start directing our resources towards human-specific research. The current landscape of the life sciences sector is evolving and preparing students with the knowledge and skills necessary to work with the many exciting cutting-edge testing methods would enable us to thrive in this dynamic environment. I am convinced that my generation is perhaps the most empathetic and open-minded that this world has ever seen, and that the human-focused research revolution starts with us.