Do we really still need animal experiments?

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The question cannot be answered without saying for what. If we talk about veterinary drugs, we need them for sure as we need clinical trials in humans. If we study behavioral effects, we sure need them. But do we really need them for some of the main areas of use such as drug development, regulatory safety testing, production of antibodies and other biological materials and some basic research? Probably less than many people think.

The reason is that we can obtain the needed information at the same quality or better from other means. Increasingly, the limitations of animal-based toxicology to predict human health threats are recognized. Drug development becomes more and more aware of how much animal models misled product development. However, we also recognize more and more shortcomings of traditional (human) cell culture. These include cell identity, differentiation, genetic stability and mycoplasma infection as well as non-homeostatic and non-physiological culture conditions. The increasing pace of technological developments of modern cell culture and their integration leads to what is called “disruptive technologies”. The development of alternatives to traditional approaches for product development and safety assessment benefits from this. The creation of large toxicological databases (“big data”) and data-mining technologies (“artificial intelligence”) allow predictive computational approaches on a new scale. As an example, our new automated read-across (RASAR, i.e. read-across-based structure activity relationships) is given. At the same time, the combination of cell culture with bioengineering has led to a number of technologies to make cell culture more organo-typic, such as 3D culture, human stem cell-derived systems, perfusion, co-cultures, combinations with scaffolds and sensors etc.. Increasingly, they lead to “organ-on-chip” or even multi-organ “human-on-chip” solutions. By recreating organ architecture, homeostasis of the cell environment and organ functionality, these models mirror more closely the physiological situation. The example of our human iPSC-derived mini-brain is used to illustrate this. The commercial availability of organoids also improves standardization and reproducibility.

Such technological advances promise to be real “game-changers”. Combined with an increased mechanistic base of reasoning (e.g. Adverse Outcome Pathway concepts), Integrated Testing Strategies and evidence-based methods of data evaluation and integration, a revolutionary change for how we assess the biological effects of substances has been set into motion.