

# Thoughts on a future without laboratory animals

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As a veterinarian working in laboratory animal science, I have always been committed to implementing the 3Rs, Replacement, Reduction and Refinement, both in teaching and research. By applying the methodology of systematic reviews in the preclinical field, we discovered this would 'automatically' lead to the implementation of the 3Rs and a lot more [1]. Unfortunately, the evidence from many preclinical systematic reviews has also revealed that publication quality from animal studies is insufficient and is hardly improving over time, despite the wide acceptance of the ARRIVE guidelines for reporting. Moreover, many animal studies do not translate well to the human situation [2,3].

For example, many adverse drug reactions occur in humans, despite the fact that drugs were considered safe for use in humans based on animal study results [3]. In a historical analysis, the evidence base for legally required animal studies turned out to be at least very uncertain, and that (new) requirements for animal studies in legislation were seen to be taken as a response to health disasters [4]. The Covid crisis in turn, seems to have led to a reversed situation. We analysed the case study of the marketing approval for the Pfizer/BioNTech mRNA vaccine. There was a much faster vaccine conditional marketing approval - in 1 year instead of 10 years – by allowing fewer animal studies and more alternatives in the regulatory process [5,6]: only 'essential' animal studies were required, animal studies ran in parallel – instead of sequentially - with clinical trials, historical results from earlier vaccines were also accepted and batch releases were performed with alternative tests only, as a result of the thorough characterization of the mRNA vaccine.

The evidence that new approach methods lead to better translation for humans is increasing, and as these new methodologies will lead to faster, better, more ethical and ultimately cheaper developmental chains as compared to animal studies, it is high time to investigate how these new methods can become widely accepted and implemented in practise soon, as the science and technologies to do this are here. It will now need interdisciplinary and transdisciplinary transition education and research in how this can be accomplished in the best possible way as fast as possible: to further validate new methodologies and processes at the niche level, to obtain new legislative guidelines at the regime level and to make societal/political changes at the landscape level [7,8]. It is essential to involve all key stakeholders in these collaborative action learning processes, to be able to implement the desired changes towards an animal-testing-free future fast and effectively.

## References

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