

# Never replicate a successful experiment – facing the reproducibility crisis in the life sciences

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The scientific literature is full of papers discussing poor reproducibility of results from animal experiments. Critics even go so far as to talk about a “reproducibility crisis”, a novel headword that increasingly finds its way into several high-impact journals. Viewed from a cynical perspective, Fett’s law of the lab “Never replicate a successful experiment” has thus taken on a completely new meaning. So far, reproducibility problems have mostly been attributed to a lack of scientific rigor, methodological and statistical pitfalls as well as to current publication ethics and animal welfare constraints. Only recently, another potential source of poor reproducibility has been identified. Rigorous standardization has long been regarded as the “gold standard” in animal research, but is currently becoming the subject of controversial debates. By reducing within-experiment variation, standardization limits the inference to the specific experimental conditions. In this way, however, individual phenotypic plasticity is largely neglected, resulting in statistically significant but possibly biologically irrelevant findings that are not reproducible under slightly different experimental conditions. By contrast, systematic heterogenization has been proposed as a concept to improve representativeness of study populations, contributing to improved external validity and hence improved reproducibility. Such approaches highlight the need for a rethinking of current methodologies and stimulate further research on possible ways out of the reproducibility crisis.