Philip Birget

Animal experiments in academia

Insights from a biologist

Every now and then it comes across my lips, be it in casual pub conversations or in job interviews, but never without that ever so slight feel of unease: I have done animal experiments. "We performed experimental infections of C57B6 mice with a clone of the rodent malaria parasite Plasmodium chabaudi", starts the sober scientific paragraph in the materials and methods section. "We recorded red blood cell densities and parasitaemia until day 10 post-infection", it continues, without saying what happens to these mice after day 10, because, indeed, it goes without saying. "Yep, I have killed loads of mice", I sometimes add after my coming-out of the laboratory cabinet. "But, it was definitely the least enjoyable part of my PhD." Anglo-Saxon culture does not live well with uncomfortable truths: toilets become "loos", to vomit becomes "being sick" and dying is "passing away". In the experimental mouse world of my lab in Edinburgh, killing a mouse became "to R.I.P. a mouse" (along the inscription on graves for "rest in peace").

Nevertheless, the verb "to R.I.P.", I think, reflects well the scientist's attitude towards experimental procedures on animals: it delivers to the fatal act a notion of respect and gratitude towards the deceased, since without the sacrifice of that mouse, important data could not have been obtained. Scientists are rarely the evil, career-driven Dr Frankensteins that they are sometimes portrayed to be. So far, I have not met a single person that is psychologically comfortable, or even neutral, towards sacrificing an animal for scientific purpose. On the contrary, I have witnessed a very high awareness among researchers of the moral dimension that animal experiments pose. Scientific units that host animals do not look like the mass-populated facilities in which meat or eggs are produced. Mice, for example, sit in clean, spacious and "enriched" (i.e. with objects for amusement like a paper roll or a hamster wheel) cages, whose minimal size is strictly regulated. The images of confined beagles or macaques, which have a high emotional shocking factor, is not how animal research facilities generally look like. In the UK, in 2016, over 90% of scientific procedures on animals involved small rodents and small fish (zebrafish), which are relatively easy to keep happy in captivity (dogs and primates made up only 0.2 % in 2016). Experiments that cause severe pain to animals are very rare (in Luxembourg only 0.58% in 2016) and also hard to get permission for. The leading principle in contemporary animal experiments is that suffering must be reduced at all levels of the experiment and at all costs (e.g. with anaesthetic or pain killers). It is imperative that animals are put down before they are likely to experience pain.

So far, I have not met a single person that is psychologically comfortable, or even neutral, towards sacrificing an animal for scientific purpose.

The design of animal experiments in the UK is strongly guided by the holy trinity of animal welfare, the so-called three Rs, which stand for replacement, reduction and refinement. Replacement means that whenever there is an alternative available to answer the same question without using animals (for example in the form of cell cultures) then that alternative should replace the animal. Reduction means that the minimal number of animals should be used in an experiment, i.e. just enough to achieve the statistical power needed. Refinement means that the experimental method should be optimised so as to cause minimal suffering to the animal. Replacement and reduction have not just an ethical but also an economical dimension. Indeed, the cost of laboratory mice (between 15 to 300 Euros, depending on the strain) and of animal husbandry imposes

Philip Birget, a Luxembourg national, is an evolutionary biologist who studies the ecology of malaria parasites at the University of Edinburgh, using both empirical and mathematical techniques. Several of his works have been published in reputable international scientific journals.

a significant burden on already stretched research budgets.

These guiding principles are strongly imposed by the Home Office (the British version of the Ministère de l'Intérieur), which regulates the use of animals in research in the UK. A researcher that wants a licence to work with vertebrates or cephalopods (octopuses and their friends) must pass a strict theoretical and practical training program, followed by an exam. The Home Office is also strongly present on an everyday basis: Each experimental design must be sent a few weeks in advance to a Home-Office licensed veterinarian for approval. This is far from being a mere formality as specific questions will need to be answered about how the three Rs were integrated into the experimental design. In the aftermath, a considerable part of a researcher's working schedule will be spent addressing concerns and suggestions by the watchdog and integrating them into an updated experimental design, if considered necessary. The same veterinarian will also perform nearly daily visits across all animal units to make sure that the agreed experimental design is followed.

Every year, new regulations come into existence, which requires researchers to be very wary, otherwise they may easily lose their licence. The easiest way of losing one's licence is by having an animal die unexpectedly, independent of the cause of death. This then triggers an internal enquiry that rarely results in the researcher's favour. The perceived burden of regulations associated with animal experiments can perhaps best be illustrated by the following anecdote: a professor of malaria research preferred to put his own forearm rather than a dead rat into a container hosting a few hundred blood-thirsty mosquitoes, when he did not have time to complete the necessary paperwork. In conclusion, animal welfare is not just a vague act of goodwill at the back of a researcher's mind, but very much part of the everyday business, with important implications for a researcher's career prospects.

The UK, with an academic tradition stretching back nearly a millennium, has developed probably the strictest regulations and laws on animal welfare in research in the world. It remains to be seen how legislations and regulations will develop in Luxembourg, with its very recent animal research facilities, but some good inspiration is available just across the pond.

Finding alternatives to using animals should always be a primary research goal. For some systems, cell cultures (flasks or petri dishes covered in a layer of cells) will do a decent job to serve as a model system for a living organism. However, not every organism will easily grow in an ex-vivo system. Furthermore, cell culture experiments do not allow to make any predictions on whole-organism responses. For example, if we want to know the effect of a pathogen onto a host's immune system, which implicates many types of cells and complex interactions in multiple organs of the body, then this cannot be studied in cell cultures.
Although many fail to realise the usefulness of animal experiments, we do harvest their fruits in our everyday lives. Having decent vaccines and medication, having options for cancer treatment or curing neuropathological diseases like Parkinson's are noble scientific goals that inevitably demand the sacrifice of animals (testing car exhausts or skin creams on animals is not a noble use and outlawed by the EU since 2013). Thanks to the sacrifice of those animals, we lead longer, better and happier lives than this was the case before the 1900s. These animals are the martyrs of the progress of our society, and they should be honoured as such.

Besides a population of lab mice, Edinburgh also hosts an extensive population of the wild kind, that live in your drawers and under your floorboards. Our long-term lab technician one day found such a little companion in the kitchen, nibbling away on his cookie supply. He caught the mouse in a bag and set it free on the street again. I thought that this action of kindness, performed by a man who for more than 20 years has been conducting experiments with mice on a near daily basis, summarised well what a researcher's attitude should be: a mature approach where love and respect towards animals should be an integral part of the daily working schedule. ◆