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Review: The Costs and Benefits of Animal Experiments by Andrew Knight

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Abstract

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As interest in and concern for animals grows one might expect the use of animals in research to be on the decline. In fact the opposite is true as a result of the development of genetic modification of animals and the hope that such engineered animals will lead to advances in biomedicine. The assumption behind most animal research in the biomedical sciences is that if animals naturally or through engineering can acquire human disease then we can use them to find vaccines or cures. They provide 'models' for humans. The key point coming out of Knight's very well researched book is that this is an assumption. We assume that what is found true for animals will hold for humans too. This assumption has in fact been tested and has been found wanting. A significant part of the book backs up this claim.

After looking at the impact of experiments on animals, with a special section on chimpanzees, Knight then deals with the central theme. He examines the clinical utility of animal models. Firstly he notes the severe adverse reactions including thousands of deaths that have resulted from the human use of medications found safe in animals. He notes that reviews of the findings of animal research do not support the claim that this research contributes to human clinical knowledge. Knight then details the empirical research he undertook in 2007 for which he randomly selected twenty reviews from a leading biomedical database. The reviews looked at research published in top journals concerning the predictivity or utility of animal experiments or 'their contributions to the development of diagnostic, therapeutic, or prophylactic interventions with clear potential for combating human diseases or injuries, or their consistency with human clinical outcomes' (42). In only two of the twenty studies did the animal models appear useful in the development of human clinical interventions, or were shown to be substantially consistent

with human clinical outcomes. In addition one of these reviews had significant methodological flaws, so the conclusions cannot be relied upon.

Knight approaches the question of the predictive value of animal research for humans in other ways as well. He looks at the chimpanzee data which might be thought to be the most promising. There is little here to back up the assumption of high predictive value despite the enormous toll that research takes on these animals. He looks at the research into highly cited animal experiments and argues that there is a very low rate of translation to clinical trials from these articles even ten years on. In addition, when animal research is used for human trials one cannot assume a successful outcome, as adverse reactions to approved interventions are a leading cause of death, as mentioned above.

The culmination of this complex argument is that animals are not good models for humans. Millions of animals suffer and die because we hold onto this false assumption. Meanwhile alternatives to animal experimentation are showing greater promise yet receiving less support. Knight's book provides extensive information on such alternatives and their successes, probably the most comprehensive in book form. (See also the Replace Animals website developed by Dr Melissa Boyde and me to provide an information base on educational opportunities, resource availability and reading lists for alternatives to using animals in research in Australia: www.uow.edu.au/arts/research/raat).

Another major study supporting Knight's position was published this year. The published findings in 'Genomic Responses in Mouse Models Poorly Mimic Human Inflammatory Diseases' (Soek et al.) is authored by an astounding forty-one scientists from many different countries and research centres. The study used alternatives (human tissue and genomics) to establish that mice are unsuitable models for human sepsis, burn and trauma and why this is so. There has been a history of research using mice for clinical studies in these areas. This research has failed to provide findings applicable to humans and now we know why. While this research has tremendous value, I hope that it serves to bolster alternatives rather than a rash of research projects aimed at finding why animal research fails to be a good model for human outcomes. Let us now take that as given.

This morning (2 August 2013), Fran Kelly on Radio National Australia announced purportedly ground-breaking research, the development of genetically modified mice who can be infected with Hepatitis C. However, as Knight points out, there have been hundreds of studies of this virus in chimpanzees, none of which have produced results for humans (44). Yet chimpanzees are much closer to us genetically. Even the author of the new study, Alexander Ploss, notes that ‘This [mouse] model still cannot replace chimpanzees’ (qtd in Mole). This is an instance of the public being primed to be enthusiastic about the value of animal experiments with insufficient basis. Fran Kelly did add ‘poor mice’. I would add ‘poor humans’ too. This misplaced enthusiasm not only causes immense suffering and distress in animals but stalls the development of alternatives that might have a better chance of success. The vaccines for Hepatitis A and Hepatitis B were not found in animal studies. The Hepatitis A vaccine was derived from human cell cultures. The Hepatitis B vaccine now in use was discovered by the Chilean biochemist, Pablo D.T. Valenzuela, using yeast.

Knight makes some important observations about animal ethics committees which are supposed to oversee animal research but I think he could have included more discussion about these committees. He points to the research which looked at the results of experiments that were passed by such committees because they ‘might lead to concrete advances towards the cure of human diseases’ (58). Ten years on none of these experiments led to any new therapies, or had any beneficial clinical impact. Knight also notes that these committees rely too heavily on the assumption that invasive experiments on chimpanzees and other laboratory animals will be of substantial use in advancing biomedical knowledge. Furthermore, ‘By approving these experiments on the basis of unfounded assumptions about their likely benefits, the ethics committees responsible failed in their duty to society and to the animals they were charged with protecting’ (189). I agree (see Russell ‘Why Animal Ethics Committees Don’t Work’), but we need to say more about why this system of ethical review is not working and what a better one would be.

The book will answer most questions about animal experimentation in basic research, in toxicology studies and in education. It does this in a very thorough but readable way. Useful summaries are included at the end of each chapter, as well as an extensive glossary and reference list. Knight’s earlier published articles detail some of this research but the book brings his many

papers together well and adds more. For anyone wanting to take a serious look at animal experimentation, what animals are involved, what sort of experiments are conducted and what the outcomes are – this is an essential read. Two other books fill out the field in different ways. *Faqs about the Use of Animals in Science*, by Ray Greek and Niall Shanks, add more weight to Knight’s key point about the lack of predictability of animal research for humans but also include some discussion of the politics around the resistance to questioning this predictability. Linda Birke’s *Feminism, Animals and Science* is a wonderful theoretical study about viewing animals as embodied beings rather than tools for research.

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