

appraise this work, learn from past mistakes, accept the serious nature of its ethics and embrace all that new human-specific technologies deliver, medical progress against diseases affecting billions of people will continue to stall. Intransigence is unacceptable in a scientific world.

Jarrold Bailey¹, Theodora Capaldo¹, Kathleen Conlee², Michelle Thew³ & John Pippin⁴

¹New England Anti-Vivisection Society, 333 Washington Street, Suite 850, Boston, Massachusetts 02108, USA. ²The Humane Society of the United States, 2100 L Street, Northwest, Washington, DC 20037, USA.

³British Union for the Abolition of Vivisection, 16a Crane Grove, London N7 8NN, UK. ⁴Physicians Committee for Responsible Medicine, 5100 Wisconsin Avenue, Northwest, Suite 400, Washington, DC 20016, USA.

To the Editor:

As your August 2008 editorial¹ pointed out, there are ethical and scientific issues when considering the use of animals in science. These are separate issues, as the implications of one position do not necessarily have an impact on the other. For example, one might oppose the use of nonhuman primates on ethical grounds while acknowledging that such use could advance science. Or one might have no ethical objections but may question the predictive value of using nonhuman primates as models for humans. From a scientific perspective, the arguments for and against using nonhuman primates in research are very different from the ethical arguments.

For example, studies comparing toxicity in animals, including nonhuman primates, consistently reveal positive and negative predictive values far less acceptable than those needed to substantiate the claim that they can be used to predict human response^{2–6}. HIV is a case in point; the use of nonhuman primates to predict the human response to HIV has been unsuccessful⁷. Vaccines that have protected nonhuman primates from HIV did not protect humans, and the mechanism of HIV attack varies among primates. Humans and nonhuman primates do share characteristics important to drug and disease response, but these shared characteristics are not quantitatively or qualitatively adequate to allow prediction in the scientific sense of the word.

The editorial appeals to the ‘intact biological systems’ argument to justify the use of nonhuman primates in research touted to predict human response. Most people would agree that *in vitro* and *in silico* approaches are not predictive of what a drug will do in an intact living human. But this invites the following question: does the use of nonhuman primates achieve positive and negative predictive values sufficient to claim that they are predictive of human outcomes? The answer is that they do not. Claiming that society should use nonhuman primates because *in vitro* and *in silico* approaches are not predictive is to commit the *ignoratio elenchi* (irrelevant conclusion) fallacy.

Basic research—research that is not goal oriented—in nonhuman primates can definitely increase our understanding of life’s processes.

Nature Medicine replies:

We welcome the correspondence^{1–3} we received on our August editorial⁴ and would like to clarify some points raised by these letters.

First, we did not want to imply that ethical considerations in relation to the use of nonhuman primates should be dismissed. However, we are not persuaded by the argument that the ability for language, ‘reasoned thought, abstraction, generalization and symbolic representation and... concept of self’² gives nonhuman primates an ethical status equivalent to that of humans. There are indeed other animals—the celebrated parrot Alex⁵ quickly comes to mind—for which such ‘high-order’ cogni-

e-mail: jarrod.bailey@ncl.ac.uk

1. Editorial. *Nat. Med.* **14**, 791–792 (2008).
2. Bailey, J., Knight, A. & Balcombe, J. *New England Anti-Vivisection Society* <<http://www.releasechimps.org/pdfs/chimp-efficacy-paper-main.pdf>> (2007).
3. Knight, A. *J. Appl. Anim. Welf. Sci.* **10**, 281–308 (2007).
4. Bailey, J. *Altern. Lab. Anim.* **36**, 381–428 (2008).
5. Caceres, M. *et al. Proc. Natl. Acad. Sci. USA* **100**, 13030–13035 (2003).
6. Marvanova, M. *et al. FASEB J.* **17**, 929–931 (2003).
7. Puente, X.S. *et al. Genomics* **86**, 638–647 (2005).
8. Puente, X.S. *et al. BMC Genomics* **7**, 15 (2006).
9. Calarco, J.A. *et al. Genes Dev.* **21**, 2963–2975 (2007).
10. Glazko, G., Veeramachaneni, V., Nei, M. & Makayowski, W. *Gene* **346**, 215–219 (2005).
11. Bradshaw, G.A., Capaldo, T., Lindner, L. & Grow, G. *J. Trauma Dissociation* **9**, 9–34 (2008).

It is almost tautological to say that we can learn things from studying nonhuman primates. If the scientific community wishes to use nonhuman primates in basic research, no educated person could argue that such use is scientifically illegitimate.

Jim Giles⁸ put the use of animals in research in context: ‘In the contentious world of animal research, one question surfaces time and again: how useful are animal experiments as a way to prepare for trials of medical treatments in humans? The issue is crucial, as public opinion is behind animal research only if it helps develop better drugs. Consequently, scientists defending animal experiments insist they are essential for safe clinical trials, whereas animal-rights activists vehemently maintain that they are useless.’

On the basis of the available evidence, we maintain that research on nonhuman primates, although valuable in the context of basic research, cannot be used to predict drug or disease response in humans. Before biomedical researchers continue to justify their use of nonhuman primates by appealing to the predictive nature of research in these animals, they should review the literature.

Niall Shanks¹ & Ray Greek²

¹Wichita State University, Department of History, 1845 North Fairmont, Fiske Hall, Wichita, Kansas 67260, USA. ²President, Americans for Medical Advancement, 2251 Refugio Road, Goleta, California 93117, USA. e-mail: drraygreek@aol.com

1. Editorial. *Nat. Med.* **14**, 791–792 (2008).
2. Olson, H. *et al. Regul. Toxicol. Pharmacol.* **32**, 56–67 (2000).
3. Sankar, U. *Scientist* **19**, 32 (2005).
4. Heywood, R. in *Animal Toxicity Studies: Their Relevance for Man* (eds. Lumley, C.E. & Walker, S.) 57–67 (Quay, Lancaster, 1990).
5. Spriet-Pourra, C. & Auriche, M. *Drug Withdrawal from Sale*. (PJB Publications, New York, 1994).
6. Igarashi, T. in *CMR Workshop: The Timing of Toxicological Studies to Support Clinical Trials* (eds. Parkinson, C., McAuslane, N., Lumley, C. & Walker, S.R.) 67–74 (Springer, Boston, 1994).
7. Editorial. *Nat. Biotechnol.* **25**, 1375 (2007).
8. Giles, J. *Nature* **444**, 981 (2006).

tive skills have been described, and critics don’t seem to worry about experimenting on those species as much as they care about monkeys and apes. Furthermore, it seems arbitrary to invoke those particular cognitive skills to make a case for monkeys instead of choosing, say, the faithfulness of voles and parakeets to their mates or the navigational skills of ants and bees.

We think that the ‘cognitive’ argument aims to add scientific clout to a view that remains largely subjective, owing to our relative lack of understanding of the mental processes of human and nonhuman primates. Thus, the ‘cognitive’ argument would be more compelling if one could