

The RSPCA believes that, when developing a strategy for UK biotechnology and biological sciences, the BBSRC should ensure that the drive to remain at the forefront of the bioscience 'revolution' by promoting 'creative, curiosity-driven "frontier bioscience"' does not add to the already highly significant impacts on laboratory (and other) animals.

Public concerns: New technologies, such as CRISPR-Cas gene editing techniques and optogenetics, enable the genotypes, phenotypes and behaviour of animals to be altered as never before – yet these and other fields are being pursued in the midst of a reproducibility crisis in the biosciences, and without reference to public concerns about whether and how animals should be used.

Replacing animal research: It is vital that the BBSRC ensures that issues with reproducibility, translatability and validity are addressed before seeking to push boundaries even further, and the short- and long-term infrastructure for biosciences should include significant investment into, and resource for, non-animal alternative technologies. Replacement of animal research and testing with humane alternatives should be the principal goal.

Skill sets: The essential skill set for the workforce should therefore include a thorough knowledge and acceptance of research integrity and good research conduct, and the BBSRC should also reinforce its expectations with respect to the Three Rs (replacement, reduction and refinement), ethics and animal welfare. The BBSRC's support for the NC3Rs is significant and positive, but it is also very important that every researcher using living animals or animal tissues recognises and engages with their *individual responsibility* to implement the Three Rs and pay due regard to animal welfare and ethical issues. The current culture of scientific research does not permit adequate time to reflect upon these essential factors, as recently reported by the Nuffield Council on Bioethics (nuffieldbioethics.org/project/research-culture), and the BBSRC should ensure that research strategies aim to address this. 'Soft skills' are also critical for the workforce, such as the confidence to challenge the *status quo*, for example if an animal 'model' is not enabling new therapies to be taken into the clinic; and the ability to identify and address ethical and societal concerns. The latter is especially pertinent to the BBSRC, as the public ultimately funds its research programmes.

While the public, or society, will in general benefit from properly designed and ethically conducted bioscience research, opinion polls (e.g. the regular Ipsos MORI polls on animal experiments), and the Academy of Medical Sciences study on animals containing human material (acmedsci.ac.uk/policy/policy-projects/animals-containing-human-material), have shown that a significant proportion of the public does not want these benefits at 'any cost' where animal use is involved.

Considering alternative approaches: Animals should not be exploited, or caused avoidable suffering, if there are other approaches to solving challenges to society. The RSPCA believes there is a clear case for more 'joined up thinking' with respect to bioscience research directions and wider Government policy when tackling the strategic challenges set out in the consultation document. For example, with respect to agriculture and food security, the RSPCA believes that it would be unethical to aim to address the issues set out in the consultation document by altering animals to fit human needs, e.g. by creating genetically altered animals with increased yields, or strains that could cope physiologically with being kept in severe environments. These are relatively extreme examples, but any biotechnology/bioscience-based approaches to the agri-food challenges should form part of a

programme that emphasises reducing food waste and developing alternative, supplementary sources of protein, rather than further manipulating animals.

Similarly, while we acknowledge that many human diseases are not avoidable and there is an ongoing need for pharmacological therapies for these, bioscience for health should be firmly within the context of encouraging behaviour that promotes good physical and mental health, with less 'medicalisation' of normal biological processes including some aspects of ageing, and in tandem with Government policy measures relating to industries which produce and/or market products that are recognised as leading to poor health. The consultation document says that the aim is to reduce the need for medical intervention, which does sound as though some of these considerations have been taken into account; an approach which the RSPCA would support.

Understanding impact: We also agree with the statement in the consultation document that the realisation of societal benefits relies on a deep, discipline-specific understanding of the diverse and diffuse routes to application, and effective knowledge exchange, but there is currently no way of knowing the extent to which this is achieved, and it is overly optimistic to assume that this is always the case. Similarly, partnerships with both the users and beneficiaries of medical research are important – in fact, they are essential. However, it is widely acknowledged that communication and liaison are poor between preclinical and clinical researchers, and patient groups, in many fields.

Any bioscience strategy should include mechanisms to ensure that the proposed benefits of preclinical research are wanted, needed and applicable in the clinic or field, all of which is intrinsic to the 'solid foundations' of the UK bioscience base. Otherwise, the situation will persist in which some research teams publish paper after paper, but do not bring practical solutions such as new treatments into the clinic. This is a major threat to UK bioscience, because it generates animal experiments that do not yield the intended benefits, causing avoidable suffering and raising valid questions about justification; wastes funding; and in the case of medical research holds up vital progress for patients in need.

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