

# References

Atlas, R. M., 2009: Responsible conduct by life scientists in an age of terrorism. *Science and Engineering Ethics*, 15, 293–301.

Badash, L., 2004: Science and social responsibility. *Minerva*, 42, 290–291.

Bakandize, L., Imnadze, P. and Perkins, D., 2010: Biosafety and biosecurity as essential pillars of international health security and cross-cutting elements of biological non-proliferation. *BMC Public Health* 2010 3;10 Suppl 1:S12.

Barr, D., 2007: Integrity in science. *Journal of Exposure Science and Environmental Epidemiology*, 17, 123. doi: doi:10.1038/sj.jes.7500573.

Britten, N., 1995: Qualitative research: Qualitative interviews in medical research. *British Medical Journal*, 311, 251–253.

Chopra, M., Lawn, J. E., Sanders, D., Barron, P., Abdool Karim, S. S., Bradshaw, D., Jewkes, R., Abdool Karim, Q., Flisher, A. J., Mayosi, B. M., Tollman, S. M., Churchyard, G. J., Coovadia, H. and *Lancet South Africa*, t., 2009: Achieving the health Millennium Development Goals for South Africa: Challenges and priorities. *Lancet*, 374(9694), 1023-1031. doi: 10.1016/s0140-6736(09)61122-3.

Cello, J., Paul, A. V. and Wimmer, E., 2002: Chemical synthesis of poliovirus cDNA: Generation of infectious virus in the absence of natural template. *Science*, 297, 1016–1018.

Dunbar, R., van Hest, R., Lawrence, K., Verver, S., Enarson, D. A., Lombard, C., Beyers, N. and Barnes, J. M., 2011: Capture-recapture to estimate completeness of tuberculosis surveillance in two communities in South Africa. *International Journal of Tuberculosis and Lung Disease*, 15(8), 1038-1043. doi: 10.5588/ijtld.10.0695.

Ehni, H. J., 2008: Dual-use and the ethical responsibility of scientists. *Archivum Immunologiae et Therapia Experimentalis*, 56, 147–152.

European Commission for Standardisation., 2008: CEN Workshop Agreement. Laboratory National Institute of Communicable Diseases management standard. Retrieved on 31 March 2015 from: <ftp://ftp.cenorm.be/PUBLIC/CWAs/wokrshop31/CWA15793.pdf>.

Eisfeld-Reschike, J., Herb, U. and Wenzlaff, K. Research funding in Open Science. Retrieved from [http://book.openingscience.org/vision/research\\_funding.html](http://book.openingscience.org/vision/research_funding.html). (Last accessed 14 April 2015.)

- Feyerabend, P. K., 1975: *Against Method*. London: Verso Books.
- Forge, J., 2010: A note on the definition of 'Dual-Use'. *Science and Engineering Ethics*, 16, 111–118.
- Frieden, T. R., Tappero, J. W., Dowell, S. F., Hien, N. T., Guillaume, F. D. and Aceng, J. R., 2014: Safer countries through global health security. *Lancet*, 383(9919), 764–766. doi: 10.1016/s0140-6736(14)60189-6.
- Friedman, D., Rager-Zisman, B., Bibi, E. and Keynan, A., 2010: The bioterrorism threat and dual-use biotechnological research: An Israeli perspective. *Science and Engineering Ethics*, 16, 85–97.
- Jackson, R. J., Ramsay, A. J., Christensen, C. D., Beaton, S., Hall, D. F. and Ramshaw, I. A., 2001: Expression of mouse interleukin-4 by a recombinant ectromelia virus suppresses cytolytic lymphocyte responses overcomes genetic resistance to mouse pox. *Journal of Virology*, 75, 1205–1210.
- Kant, L. and Mourya, D. T., 2010: Managing dual-use technology: It takes two to tango. *Science and Engineering Ethics*, 16, 77–83.
- Kenya, E., Muturi, M. and Gould, C., 2012: An assessment of the capacity of research and diagnostic laboratories in Nairobi: World Health Organisation.
- Keuleyan, E., 2010: Liberty to decide on dual-use biomedical research: An acknowledged necessity. *Science and Engineering Ethics*, 16, 43–58.
- Koepsell, D., 2010: On genies and bottles: Scientists' moral responsibility and dangerous technology R&D. *Science and Engineering Ethics*, 16, 119–133.
- Kuhlau, F., Eriksson, S., Evers, K. and Høglund, A. T., 2008: Taking due care: Moral obligations in dual use research. *Bioethics*, 22, 477–487.
- Kuhn, T. S., 1962: *The Structure of Scientific Revolutions*. Chicago: University of Chicago Press.
- Mays, N. and Pope, C., 1995: Qualitative research: rigour and qualitative research. *British Medical Journal*, 311, 109–112.
- Miller, S. and Selgelid, M. J., 2007: Ethical and philosophical consideration of the dual-use dilemma in the biological sciences. *Science and Engineering Ethics*, 13, 523–580.

National Institute for Health. Opportunities and guidelines to facilitate scientific collaborations. Retrieved from <http://www.niaid.nih.gov/researchfunding/grant/pages/extraintracollab.aspx>. (Last accessed 3 September 2014.)

Nkgudi, B., Robertson, K. A., Volmink, J. and Mayosi, B. M., 2006: Notification of rheumatic fever in South Africa – evidence for underreporting by health-care professionals and administrators. *South African Medical Journal*, 96(3), 206–208.

Office of the Deputy Secretary Department of the Interior. Departmental Manual, Chapter 3: Integrity of scientific and scholarly activities, 2011: Retrieved from <http://elips.doi.gov/elips/Browse.aspx?startid=971>. (Last accessed 3 September 2014.)

Resnik, D. B., 2006: Openness versus secrecy in Scientific Abstract. *Episteme*, 2(3), 135–147.

Revoll, J. and Dando, M. R., 2006: A hippocratic oath for life scientists. *EMBO Reports*, 7, S55–S60.

Rossouw, H. W., 1980: *Verskuiwinge in die filosofiese wetenskapsbeeld*. In H. W. Rossouw (Ed.), *Wetenskap, Interpretasie, Wysheid*. Port Elizabeth: *Universiteit van Port Elizabeth Seminare, Simposia en Lesings* B7, 1–16.

Selgelid, M. J., 2006: Commentary: the ethics of dangerous discovery. *Cambridge Quarterly of Healthcare Ethics*, 15, 444–447.

Selgelid, M. J., 2009: Dual-use research codes of conduct: Lessons from the life Sciences. *Nanoethics*, 3, 175–183.

Smith, A. M., Gouws, A. M., Hoyland, G., Sooka, A. and Keddy, K. H., 2007: Outbreaks of food-borne disease – a common occurrence but rarely reported. *S Afr Med J*, 97(12), 1272.

Truth and Reconciliation Commission., 1998: Truth and Reconciliation Commission of South Africa Report (Vol. Two). Cape Town: TRC.

Tumpey, T. M., Basler, C. F., Aguilar, P. V., Zeng, H., Solorzano, A., Swayne, D. E., Cox, N. J., Katz, J. M., Taubenberger, J. K., Palese, P. and Garcia-Sastre, A., 2005: Characterisation of the reconstructed 1918 Spanish influenza pandemic virus. *Science*, 310(5745), 77–80. doi: 10.1126/science.11119392.

United States Department of Interior. Integrity of scientific and scholarly activities. Retrieved from <http://www.doi.gov/scientificintegrity/index.cfm>. (Last accessed 3 September 2014.)

United States National Science Advisory Board for Biosecurity. Retrieved from [http://osp.od.nih.gov/sites/default/files/resources/A\\_code\\_of\\_conduct\\_tool\\_kit\\_PPJan2012.pdf](http://osp.od.nih.gov/sites/default/files/resources/A_code_of_conduct_tool_kit_PPJan2012.pdf). (Last accessed 14 April 2015.)

Van Niekerk, A. A., 1992: *Rasionaliteit en relativisme: Op soek na 'n rasionaliteitsmodel vir die Menswetenskappe*. Pretoria: Raad vir Geesteswetenskaplike Navorsing.

Van Niekerk, A. A., 2003: Can more business ethics teaching halt corruption in companies? *South Africa Journal of Philosophy*, 22, 128–138.

Van Niekerk, A. A., 2011: Does teaching ethics make a difference? *IRENSA Impact Report*, 124–125. Bioethics Centre, University of Cape Town.

Van Niekerk, A. A. and Nortjé, N., 2013: Phronesis and an ethics of responsibility. *South African Journal of Bioethics and Law*, 6, 28–31.

Winslow C. E., 1920: The untilled fields of public health. *Science*, 1920, 51:23–33.

World Health Organisation, 2004: Laboratory biosafety manual. Third edition.

World Health Organisation, 2005: Life science research: opportunities and risks for public health. Mapping the issues. Retrieved on 1 April 2015 from: [http://www.who.int/csr/resources/publications/deliberate/WHO\\_CDS\\_CSR\\_LYO\\_2005\\_20/en/](http://www.who.int/csr/resources/publications/deliberate/WHO_CDS_CSR_LYO_2005_20/en/).

World Health Organisation 2006: Biorisk management: Laboratory biosecurity guidance. September 2006.

World Health Organisation, 2007a: Scientific working group on life science research and global health security. Report of the first meeting. Retrieved on 1 April 2015 from: [http://whqlibdoc.who.int/hq/2007/WHO\\_CDS\\_EPR\\_2007.4\\_eng.pdf](http://whqlibdoc.who.int/hq/2007/WHO_CDS_EPR_2007.4_eng.pdf).

World Health Organisation, 2007b: The world health report 2007. A safer future: global public health security in the 21<sup>st</sup> century.

World Health Organisation, 2008: International Health Regulations 2005. Retrieved 23 March, 2014, from [http://whqlibdoc.who.int/publications/2008/9789241580410\\_eng.pdf?ua=1](http://whqlibdoc.who.int/publications/2008/9789241580410_eng.pdf?ua=1).

World Health Organisation, 2010: Responsible life science research for global health security. Retrieved from [http://whqlibdoc.who.int/hq/2010/WHO\\_HSE\\_GAR\\_BDP\\_2010.2\\_eng.pdf](http://whqlibdoc.who.int/hq/2010/WHO_HSE_GAR_BDP_2010.2_eng.pdf).

# Appendices

## Appendix 1: Biographies of panel members

(in alphabetical order)

### 1. Professor Daniel du Toit, PhD

Prof Du Toit joined Technikon Pretoria (now Tshwane University of Technology) in 1997 after a career at the University of Pretoria. He holds a PhD in Medical Sciences (Human Physiology). His research expertise and focus is on bio-ethics and human reproduction. His academic outputs have included supervision of doctorate studies and supervision of Masters degree studies. He has authored and co-authored over 42 publications, 150 papers and posters, focusing mainly on reproductive physiology, presented at national and international level. He is the Chairperson of the Medical Research Council Ethics Committee.

### 2. Professor Jill Farrant, PhD, MASSAf; FRSSAf; FTWAS – Panel Chairperson

Prof Farrant holds a Research Chair (Molecular Physiology of Plant Desiccation Tolerance) at the Department of Molecular and Cell Biology, University of Cape Town. She obtained an MSc and PhD from the University of Natal (now University of KwaZulu-Natal). Her MSc was with distinction and was awarded the South African Association for the Advancement of Science Bronze Medal and also the Junior Captain Scott Memorial Bronze Medal in 1986. She obtained the PhD in 1992 and the South African Association of Botanists (SAAB) Junior Medal for Excellence in Botany was awarded for that work. She has also received the SAAB Silver medal of excellence in Botany and has been President of the Society. She obtained the NRF President's award in 1993, the Oppenheimer Memorial Trust Fellowship in 2009; the DST Distinguished Women in Science award in 2010 and the L'Oreal-UNESCO award in 2012 that recognises women "whose exceptional careers in science have opened up new and sometimes revolutionary ways of improving human well-being". Her research is on the mechanisms of desiccation tolerance in rare and endemic South African flora and she holds an NRF A-rating. She has over 106 peer-reviewed publications in international journals and an excess of 200 conference abstracts. She has graduated a number of MSc and PhD students and is an Associate Editor for *Plant Growth Regulation*, *South African Journal of Botany* and *Frontiers in Plant Biotechnology*.

### **3. Dr Chandré Gould, DPhil**

Dr Gould is a senior researcher in the Crime and Justice Programme of the Institute for Security Studies (ISS). Between 1996 and 1999 she was an investigator and evidence analyst for the Truth and Reconciliation Commission, where she was involved in the investigation of Project Coast – the chemical and biological weapons programme of the apartheid government. After 1999 she continued researching Project Coast and co-authored a monograph published by the United Nations' Institute for Disarmament Research, and numerous papers and articles. She also co-authored a commercially published book about the trial of Dr Wouter Basson in 2002. In 2004 and 2005, she was the global network coordinator for the BioWeapons Prevention Project. Her areas of expertise are: biological weapons control and prevention; social crime prevention; human trafficking and sex work. She is an Editor of *South African Crime Quarterly*, a quarterly journal that is accredited by the Department of Higher Education in South Africa and published by ISS. She's an author and editor of several books and numerous papers on crime and criminal justice in South Africa; biological weapons control; South Africa's apartheid chemical and biological weapons programme; small arms control and human trafficking.

### **4. Dr Petrus Jansen van Vuren, PhD**

Dr Jansen van Vuren is a Medical Scientist at the Centre for Emerging and Zoonotic Diseases at the National Institute for Communicable Diseases (NICD). His research at NICD includes development and validation of new diagnostic tests for viral hemorrhagic fever and arbovirus infections. He is also responsible for supervision of work in the Biosafety Level 4 laboratory, production and quality control testing of diagnostic reagents, laboratory animal work for research purposes at Level 3 and 4, and assisting in field research and outbreak response during outbreaks of arthropod-borne and hemorrhagic fever viruses and VHF ecology studies. His research towards his PhD included evaluation of a recombinant antigen of Rift Valley Fever virus as a possible vaccine candidate and pathogenesis on a gene expression level. He has an interest in the role that bats play in the maintenance and transmission of dangerous pathogens, in particular those causing VHF. He has been involved in field and laboratory studies involving bats, including the first experimental infection of the Egyptian fruit bat with Marburg Virus. He has published in international peer-reviewed journals, as well as presented results at various local and international meetings. He currently co-supervise one MSc student and one PhD student. He has a South Africa NRF Y2 researcher rating.

### **5. Dr Shadrack Moephuli, PhD**

Dr Moephuli is the President and Chief Executive Officer of the Agricultural Research Council (ARC). He is also a member of the Genetic Resource Policy Committee of the Consultative Group of International Agricultural Research. He has chaired the

National Agricultural Research Forum, a multi-stakeholder consultative initiative. Prior to joining the ARC, he served as acting Deputy Director-General responsible for production and natural resource management in the Department of Agriculture, South Africa. He has also served as the Chief Director for agricultural production in the same department as well as the country's representative on various agricultural matters at the Convention for Biological Diversity, Cartagena Protocol for Biosafety, Food and Agriculture Organisation (FAO), International Treaty for Plant Genetic Resources for Food and Agriculture, Organisation for Economic Cooperation and Development. Prior to joining government, he was a biochemistry lecturer at the University of the Witwatersrand. To his credit are a number of research publications, including invited speaking events. He obtained his PhD from the University of Connecticut, USA.

## **6. *Dr Nhlanhla Msomi, PhD***

Dr Msomi is a consultant and the former Chief Executive Officer for Technology Innovation Agency (TIA) and Executive Chairman for City Works (Pty) Ltd, an Indo-South Africa joint venture company. He completed his postgraduate training in biotechnology, science policy and innovation from Sussex. He also has qualifications in finance (CIBM), international executive development (Wits) and corporate governance. His professional career has spanned scientific research, lecturing, innovation management, corporate finance and entrepreneurship. He was previously a partner and Executive Director for Principal Investments at Africa Vukani Capital. He has founded and invested in a number of businesses in the medical biotechnology and ICT sectors. His recent career has included serving on the Investment Committee of the Southern African Intellectual Property Fund and the Boards of the National Advisory Committee on Innovation, Council for Scientific and Industrial Research, KZN Government Central Procurement Committee, LIFELab (CEO and Deputy Chair), National Bioinformatics Network (Chair), and SA Bioproducts. He is a former Advisor to the Senior Vice-Presidents of the International AIDS Vaccine Initiative. He still serves on the Boards of Trade and Investment KwaZulu-Natal, International Centre for Genetic Engineering and Biotechnology, SA Society of Biochemistry and Molecular Biology, United World College- SA Trust, as well as the TIA.

## **7. *Professor Iqbal Parker, PhD, MASSAf***

Prof Parker is the Director of the International Centre for Genetic Engineering and Biotechnology Cape Town Component. Previously he was the Head of the Division of Medical Biochemistry and Director of Research in the Health Science Faculty at the University of Cape Town. He obtained his PhD in Biochemistry in 1979, completed a postdoctoral fellowship with Gary Stein in the USA and returned to join the Department of Medical Biochemistry in 1981. He was President of the South African Society of Biochemistry and Molecular Biology (1998-2001), founder Secretary-General of the

Federation of African Societies of Biochemistry and Molecular Biology from 1996 to 2003. He is a founder member of the Academy of Science of South Africa and served as General Secretary from 2000-2004 and Vice-President since 2010. He served on the international jury panel for the Loreal/UNESCO Awards for Women in Science for the period 1997-2002. In 2006, he was elected to the Executive Committee of the International Union of Biochemistry and Molecular Biology as the Chair of the Committee on Symposia since 2006. In 2004, he was awarded the South African Society for Biochemistry and Molecular Biology Gold Medal for his contributions to biochemistry and the National Science and Technology Forum award for Outstanding Contributions in Science, Engineering and Technology in 2003.

### **8. Dr James Southern**

Dr Southern is currently a consultant to the biotechnology industry, advisor to the National Medicines Regulatory Agency (Biological Medicines, Clinical Trials & Pharmacovigilance) and temporary evaluator for WHO Prequalification of Vaccines. He is also the Chair of the Developing Countries Vaccine Regulators' Network. He has worked in all aspects of vaccine development, production and control between 1968 and 2000 and he has been a member of the Biological Weapons Working Group reporting to the Non-Proliferation Council since 1993, and was a member of the Non-Proliferation Council from 1994 to 2009. He advises the Biosafety Directorate of the Department of Agriculture on the safety of medicines incorporating genetically modified organisms.

### **9. Professor Anton van Niekerk, DPhil, MASSAf**

Prof Van Niekerk is a Distinguished Professor of Philosophy and Director of the Centre for Applied Ethics at Stellenbosch University. He specialises in the fields of bioethics, philosophy of religion and philosophy of the human sciences. He is the author, co-author and editor of 18 books and more than 140 peer-reviewed journal articles and book chapters. He holds a B-rating as researcher by the NRF. He was awarded the Chancellor's Medal of Stellenbosch University in 1980 and the Stals Prize for Philosophy in 1995. He is Chairperson of the Board of the Ethics Institute of South Africa, former member of the Ethics Committee of the Medical Research Council and a former Director of the International Association of Bioethics. He has recently been appointed as a member of the National Health Research Ethics Council of South Africa. He is a former President of the Philosophical Society of Southern Africa, a former editor of the *South African Journal of Philosophy* and a former member of the council of the Stellenbosch University. He has delivered 66 papers at international conferences and has supervised over 72 completed Masters and 21 completed doctoral dissertations.



## **10. Ms Delille Wessels**

Ms Wessels is the Quality Assurance Manager at the Agricultural Research Council – Onderstepoort Veterinary Institute responsible for the Quality Management Systems policy and accreditation of the Institute, standardisation of policies and procedures and the harmonisation and co-ordination of quality standards and procedures in all the laboratories. She is also the Acting Safety Officer. She is the President and Founder Member of the South African Biorisk Association. She is a member of several other committees/boards which include board member – Southern Africa Centre for Infectious Diseases (SACIDS), SACIDS Work Package Coordinator for Biosafety and Quality Management, member of various committees of the South African Bureau of Standards, member of various committees of the International Dairy Federation, SADC Subcommittee for Veterinary Diagnostic Laboratories, South African Veterinary Laboratory Scientific Forum, African Biological Safety Association and Consultant for the International Atomic Energy Agency on Quality Management Systems since 2003.

## Appendix 2: Key biosafety and biosecurity legislation relating to agriculture and bio-diversity

Piece of legislation concerned	The key objectives of the act	Legislative impact on business operations	Permit or licence, registration or other formal authority required or judicial-court process
<b>Department of Agriculture, Forestry and Fisheries</b>			
Fertilisers, Farm Feeds, Agricultural Remedies and Stock Remedies Act (Act 36 of 1947 and as amended in 1961, 1970, 1972, 1977, 1980 and 1996)	The registration of fertilisers, farm feeds, agricultural remedies, stock remedies, sterilising plants and pest control operator is regulated by this Act. Provision is also made for control over the acquisition, disposal, sale and use of fertilisers, farm feeds, agricultural remedies and stock remedies.	<p>This impact in the field of analysis and treatment of samples.</p> <p>To the extent that institutions in its research fields and laboratory and sterilising facilities it employs certain pest control equipment, it has to always be currently registered as a pest controller.</p> <p>Institutions have to continuously ensure that its equipment in pest control in all respects complies with the Act's provisions pertaining to the prevention of registered pest control operators from using certain disapproved equipment.</p>	<p>No formal statutory licence as such, rather statutory certificate of registration.</p> <p>The Act makes it obligatory to be at all times currently registered and hold a certificate of registration before any entity can sell any fertiliser, farm, feed and agricultural remedy.</p>
Fencing Act (Act 31 of 1963)	The Act regulates matters with regard to boundary fences of farms and provides for the obligatory contribution to the erection and maintenance of boundary fences and their conversion into jackal-proof fences in proclaimed areas.	<p>Ensures farms under its control, whether for research or otherwise, are fenced in a manner compliant with this statute. The larger the landmass an institution is responsible for the larger the infrastructure cost of ensuring adequate and robust fencing is in place at times and that the gates are also in sound condition at all times.</p> <p>Failure does not only attract criminal sanction but potentially significant damages if cattle kept for veterinary research and development of superior livestock breeding products end up causing heavy duty trucks to collide resulting in huge losses.</p> <p>If hypothetically by any chance it could be shown that livestock that had been exposed to a rare viral organism for the testing of a new vaccine through research gone wrong had through physical contact out of a veterinary or breeding farm caused the spread of the very rare disease sought to be prevented against in the vaccine.</p> <p>This scenario could also attract serious damages claims against the institution were it scientifically provable in court.</p>	<p>Rather that permit or licence based regime, the Act creates qualified statutory access and servitude regimes enabling <i>inter alia</i> certain access in relation to Gates in fencing, fencing off of railway lines, public roads, access for boundary fencing in favour of affected public institutions and other persons.</p> <p>The Act also makes the following to be offences in a defined way; i) leaving gates open ii) neglecting gates found open and not closing them; iii) climbing over fences or through fences; iv) wilful damaging or removal of fences.</p> <p>While this Act may not speak directly to core biosafety /biosecurity and biodiversity in the classical disease related and conservation senses thereof respectively, in the context of controlling disease like foot and mouth the fencing promoting and maintenance regime institutionalised by this Statute becomes quite pertinent in the containment of disease spread through roaming livestock, as distinct from the more obvious benefit of livestock and motorist safety in relation to public roads.</p>

Piece of legislation concerned	The key objectives of the act	Legislative impact on business operations	Permit or licence, registration or other formal authority required or judicial-court process
Plant Improvement Act (Act 53 of 1976)	This Act provides for the registration of establishments where plants and propagation material are sold and packed, for the introduction of schemes for the certification of certain propagation material, for the requirements to which plants and propagation material sold for the purposes of cultivation must conform and for quality control over plants and propagation material imported or exported. The Directorate of Plant Production is responsible for the enforcement thereof.	Operationally the cleansing or sale of propagating material plants not intended for cultivation shall not be subject to the operation of this Act.	
Veterinary and Para-Veterinary Professions Act (Act 19 of 1982)	This Act provides for the establishment, powers and functions of the South African Veterinary Council, for the registration of persons practising veterinary and para-veterinary professions. The South African Veterinary Council is responsible for the enforcement thereof.	<p>The provision of veterinary services is premised on the public impliedly being informed that there are competent professionals in veterinary medicine availing such services.</p> <p>Were it to be proved that at any point a non-registered veterinarian was employed and that as a result certain veterinary procedures had not been performed correctly causing unnecessary and avoidable death of livestock the institution could be sued for civil damages in that regard, besides the criminal implications for the bogus vet and the huge reputational damage to the organisation as a reliable research champion.</p>	<p>The Act affords a statutory mechanism for the prescribing by Statutory Council of academic qualifications necessary to entitle holders to be registered as veterinary professional or para veterinary professionals.</p> <p>No person who is not registered in terms of the Act shall practice as a veterinary professional or as a para veterinary professional.</p> <p>All veterinary students must register in terms of the Act unless they are already professionals and are specialising in the field.</p>
Perishable Products Export Control Act (Act 9 of 1983) [Enforced through the Perishable Products Export Control Board (PPECB) – a public entity,]	This Act provides for the control of perishable products intended for export from the Republic of South Africa and for the continued existence of a statutory board to bring about the orderly and efficient export of perishable products from the Republic.		<p>Through the regulatory body that it creates the Act affords a platform for</p> <ol style="list-style-type: none"> <li>1. Product and Equipment Certification</li> <li>2. Systems Certification and Auditing</li> <li>3. Export Control certification</li> <li>4. Specialised (Steri-Certification)</li> </ol> <p>According to Regulatory Body's website it also offers:</p> <ol style="list-style-type: none"> <li>1. Cold Chain Management</li> <li>2. Laboratory Services</li> <li>3. Statistical Information</li> <li>4. Standards &amp; Protocol Management</li> </ol>

Piece of legislation concerned	The key objectives of the act	Legislative impact on business operations	Permit or licence, registration or other formal authority required or judicial-court process
Agricultural Pests Act (Act 36 of 1983)	This Act introduces measures for the prevention and combating of agricultural pests.	It is required to keep ensuring in all laboratory and field research projects and operations that it continues to meet or even beats the standards imposed by this Act in respect to the control of pests. This extends to need for testing varieties and cultivars and related matter imported for purposes of research to be pre-cleaned and be free from pests.	The Act provides for defined controlled goods to be importable only with a permit as a measure to control the spread of pests. In this vein, none of the following may be imported without such permit, to wit, any plant, pathogen, insect, exotic animal, growth medium, infectious thing, honey, beeswax or used apiany equipment; anything determined by the Minister by notice in the Gazette.
Animal Disease Act (Act 35 of 1984)	This Act provides for control measures for the prevention of diseases and parasites and for schemes to promote animal health. The Directorate of Veterinary Quarantine and Human Health is responsible for the enforcement thereof.	The continuous need for the organisation to keep complying with the precepts of this statute in particular with regards to its veterinary and animal breeding operations to the extent it becomes necessary to acquire animals from outside its relevant research stations.	No person shall import into or convey in transit through the Republic any animal, parasite or contaminated or infectious thing except under the authority of a permit and in compliance with any condition imposed in such permit.
Genetically Modified Organisms Act (Act 15 of 1997) as amended in 2006 (Administered through DAF, but DST, DEA, DOH, DTI & DOL participates in Executive Council and decisions are consensus based.)	To provide for measures to promote the responsible development, production, use and application of genetically modified organisms; to ensure that all activities involving the use of genetically modified organisms (including importation, production, release and distribution) shall be carried out in such a way as to limit possible harmful consequences to the environment; to give attention to the prevention of accidents and the effective management of waste; to establish common measures for the evaluation and reduction of the potential risks arising out of activities involving the use of genetically modified organisms; to lay down the necessary requirements and criteria for risk assessments; to establish a council for genetically modified organisms; to ensure that genetically modified organisms are appropriate and do not present a hazard to the environment; and to establish appropriate procedures for the notification of specific activities involving the use of genetically modified organisms. Directorate Biosafety is responsible for the administration of this Act.	GMOs are an increasingly more important phenomenon internationally in disease prevention and making agricultural varieties more resistant to harsher climatic conditions, where more and more need to be achieved with less and less in terms of environmental conduciveness to combating hunger and feeding an exploding World population projected to 2050. The country has ratified key international Conventions relating to GMOs and the ARC's business model likewise keeps interpreting the demands of being compliant with this Stance of the State, especially as a State-owned Institution.  The South African Constitution also enjoins the Country to ratify in legislation International Conventions to which the country is a signatory.  This Act is a good example of such ratification.	In order to understand the true range of the practical purposes of the Act in action and applicable permits regime, it is best to consider the Statutory Mandate of the Regulatory Council created by the Act herein which is:  In order to achieve its objectives, the Council may require any applicant for a permit to use facilities for the development, production, use or application of GMOs or to release such organisms into the environment, to submit to the Council through the registrar, an assessment of the risk and, where required, an assessment of the impact on the environment of such development, production, use, application or release, as the case may be; require the registrar to  1. examine the conformity of an application to the requirements of this Act; 2. maintain a register of all facilities involved in the contained use or the trial release of GMOs; 3. require notification by the applicant of any intended change in the type of activities or release involving GMOs being undertaken at facilities for which approval was granted; 4. arrange for the inspection by an inspector of facilities where activities with or the release of GMOs are being undertaken;

Piece of legislation concerned	The key objectives of the act	Legislative impact on business operations	Permit or licence, registration or other formal authority required or judicial-court process
			<p>5. arrange for the inspection of all activities as he or she may deem necessary, including contained use, trial release and general release to ensure that all terms and conditions attached to a permit issued under this Act are complied with; require that the user immediately notify the registrar both orally and in writing of any accident involving GMOs and require that the registrar be supplied with information on the circumstances of the accident, the identity and quantity of genetically modified organisms released, any information necessary to assess the impact of the accident on the environment and the emergency measures taken to avoid or mitigate any adverse impact of such accident on the environment; require the registrar to appoint a panel to enquire into and report on the causes of an accident, and to make recommendations to the Minister with a view to avoiding similar accidents in the future and with a view to limiting the adverse impact of such accidents; inform any other country of any accident that may have an impact on that country's environment; co-operate or enter into agreements with any person or institution upon such conditions as the Council and the person or institution concerned may agree upon; promote co-operation between the Republic and any other country with regard to R&amp;D and technology transfer in the field of the GMOs; with the consent of the Minister approve and publish guidelines for all uses of genetically modified organisms; advise the Minister on-</p> <ol style="list-style-type: none"> <li>1. prohibitions;</li> <li>2. the authorisation and exercise of the necessary control of imports;</li> <li>3. the development, production, use, application, release and distribution of GMOs;</li> <li>4. the authorisation or notification of contained uses;</li> <li>5. the authorisation of trial or general releases;</li> <li>6. the control measures to be taken in the event of an accident;</li> </ol>

Piece of legislation concerned	The key objectives of the act	Legislative impact on business operations	Permit or licence, registration or other formal authority required or judicial-court process
Meat Safety Act (Act 40 of 2000)	To provide for measures to promote meat safety and the safety of animal products; to establish and maintain essential national standards in respect of abattoirs; to regulate the importation and exportation of meat; to establish meat safety. The maintenance of proper standards of hygiene in the slaughtering of animals and in the handling of meat and animal products. The Directorate of Veterinary Quarantine and Human Health is responsible for the enforcement thereof.		<p>7. any other matter with regard to genetically modified organisms; make recommendations to the Minister on the appointment of members to the Committee.</p> <p>An application for registration of a slaughter facility must be submitted to the national executive officer in the prescribed manner and be accompanied by the prescribed fee.</p> <p>To ensure meat to be sold to the public is healthy and safe, each abattoir in the Country must hold a current valid statutory registration certificate issued in terms of the Act, a control measure for the upholding of hygienic standards.</p> <p>Owner of abattoir requires inspection service prescribed by the Act.</p> <p>'Import permit' required for meat imported from outside the Republic.</p> <p>Application of the Act extremely wide including game and horse meat for example.</p>
Animal Identification Act (Act 6 of 2002)	Provide for the identification of animals and procedures to be followed when applying for an identification mark. Directorates Animal Production and Veterinary Quarantine and Human Health are responsible for the administration of this Act.	Traceability of animals and animal material for biosafety and biosecurity purposes.	<p>The Act provides for the compulsory marking of defined animals and that any person who wants to mark animals other than his or her own animals for financial gain must apply in the prescribed manner to the registrar for registration as a marking operator and pay the prescribed fee.</p> <p>So authorisation is that as "marking operator".</p>
The Animal Health Act (Act 7 of 2002)	To provide for measures to promote animal health and to control animal diseases; to assign executive authority with regard to certain provisions of this Act to provinces; to regulate the importation and exportation of animals and things; to establish animal health schemes; and to provide for matters connected therewith.	The ARC has to keep ensuring that it complies with this Statute in all its handling of animals, not only because it's legal to do so, but also for reputational risk-related issues which are becoming more and more important in the global economy and in who certain institutions are willing to partner with in terms of funding and research collaboration.	<p>The Act prescribes that no person may import any animal or thing into the country or convey any imported animal or thing in transit through the Republic except upon successful application for on the an import permit and</p> <p>(ii) a transit permit obtainable on due application and the payment of a prescribed fee for moving or conveying animals accompanied by the prescribed fee.</p>

Piece of legislation concerned	The key objectives of the act	Legislative impact on business operations	Permit or licence, registration or other formal authority required or judicial-court process
<p>The Abattoir Hygiene Act (Act 121 of 1992)</p>	<p>Provides for the maintenance of proper standards of hygiene in the slaughtering of animals for the purpose of handling, keeping and conveyance of such meat for human and animal consumption and in the handling, keeping and conveyance of such meat and animal products at and from abattoirs which complies with certain requirements with regard to the outlay and structures thereof, and the fixed equipment and other facilities to be installed or provided and which have been approved in terms of the Act to require that such meat and animal products shall be handled or kept at and be removed from abattoirs in accordance with prescribed requirements to provide that meat shall not be imported except on the authority of a permit issued by the Director and to provide for matters connected therewith.</p>	<p>To the extent that ARC operations entail slaughter of animals and poultry this Statute has to be complied with and suitable facilities must keep being renewed to ensure suitable compliance in that regard.</p>	<p>Provides for the handling of meat under duly authorised abattoirs and for meat importation under statutory permit.</p> <p>This in a quest to optimise hygiene and eliminate or reduce disease associated with the handling and conveyancing of animal meat.</p>
<p>National Environmental Management Act (Act 107 of 1998)</p>	<p>Provide for measures to prevent pollution and ecological degradation; promote conservation; and secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development. Department of Environmental Affairs (DEAT) is responsible for the administration of the Act.</p>		<p>In order to give effect to the general objectives of integrated environmental management laid down in this chapter, the potential consequences for or impacts on the environment of listed activities or specified activities must be considered, investigated, assessed and reported on to the competent authority or the Minister of Minerals and Energy, as the case may be, except in respect of those activities that may commence without having to obtain an environmental authorisation in terms of this Act.</p>
<p>National Environmental Management: Biodiversity Act (Act 10 of 2004) and Regulations on Bioprospecting, Access and Benefit Sharing</p>	<p>To provide for the management and conservation of South Africa's biodiversity within the framework of the National Environmental Management Act, 1998; the protection of species and ecosystems that warrant national protection; the sustainable use of indigenous biological resources; the fair and equitable sharing of benefits arising from bioprospecting involving indigenous biological resources. Department of Environmental Affairs (DEAT) is responsible for the administration of the Act.</p>		<p>The Act provides for three key types of permits</p> <ol style="list-style-type: none"> <li>1. Bioprospecting permits.</li> <li>2. Integrated export and bioprospecting permits.</li> <li>3. Export permit for research other than bioprospecting.</li> </ol>



Piece of legislation concerned	The key objectives of the act	Legislative impact on business operations	Permit or licence, registration or other formal authority required or judicial-court process
Foodstuff, Cosmetics & Disinfectant Act (Act 54 of 1972)	To control the sale, manufacture and importation of foodstuff, cosmetics and disinfectants. The Department of Health is responsible for the administration of this Act.		No permits or licences as such; rather a statutory regime that prohibits the sale of contaminated food and empowers inspectors to inspect and makes it offences in respect of obstructing or frustrating in any way this inspection process.
The Pharmacy Act (Act 53 of 1974)	To provide for the establishment of the South African Pharmacy Council and for its objects and general powers; to extend the control of the council to the public sector; and to provide for pharmacy education and training, requirements for registration, the practice of pharmacy, the ownership of pharmacies and the investigative and disciplinary powers of the council; and to provide for matters connected therewith.	The institution has to always ensure that its handling of pharmaceuticals in its research and laboratory operations is compliant with this Statute and sector best practice.	The Act provides for the registration and disciplining of professionals in the pharmacy discipline and for the registration of pharmaceuticals outlets and establishments.  This, with a view to protecting the public from unregulated and unprotected access to pharmaceutical products and the possible abuse of such products causing disease to the public.
<b>Department of Labour</b>			
Hazardous Substances Act (Act 15 of 1973)	To provide for the control of substances which may cause injury or ill-health to or death of human beings by reason of their toxic, corrosive, irritant, strongly sensitising or flammable nature or the generation of pressure thereby in certain circumstances, and for the control of certain electronic products; to provide for the division of such substances or products into groups in relation to the degree of danger; to provide for the prohibition and control of the importation, manufacture, sale, use, operation, application, modification, disposal or dumping of such substances and products. The Department of Health is responsible for the administration of this Act.		The Act provides that subject to certain of its provisions of the Director-General may on application in the prescribed manner and on payment of the prescribed fee (if any) and subject to the prescribed conditions and such further conditions as the Director-General may in each case determine, issue to any person a licence -  (a) to carry on business as a supplier of Group I hazardous substances; (b) to sell, let, use, operate or apply any Group III hazardous substance; (c) to install a Group III hazardous substance on any premises mentioned in such licence.



Piece of legislation concerned	The key objectives of the act	Legislative impact on business operations	Permit or licence, registration or other formal authority required or judicial-court process
<b>South African Police Services</b>			
Protection of Constitutional Democracy against Terrorist and Related Activities Act (Act 33 of 2004)	To provide for measures to prevent and combat terrorist and related activities; to provide for an offence of terrorism and other offences associated or connected with terrorist activities; to provide for Convention offences; to give effect to international instruments dealing with terrorist and related activities; to provide for a mechanism to comply with United Nations Security Council Resolutions, which are binding on member States, in respect of terrorist and related activities; to provide for measures to prevent and combat the financing of terrorist and related activities; to provide for investigative measures in respect of terrorist and related activities; and to provide for matters connected therewith.		The key emergent challenge for an institution in this regard is remote and that is the very far-fetched possibility that an employee could not totally inconceivably secretly use facilities to produce a biological weapon without the knowledge of his superiors. There is a need to always be vigilant about such unlawful conduct even though it is purely demonstrative and hypothetical as a matter to which this Act applies and is so unlikely to occur as to be almost impossible with prevailing acridity on research facilities by Executive and Senior Managers.

### Appendix 3: Human infectious agents and the regulations in which they are specifically named highlighted in colour

Agent name (or disease)	Type of agent (virus/bacteria/fungus)	US HHS & USDA select agents & toxins 7 CFR part 331, 9 CFR part 121, & 42 CFR part 73	Notifiable in South Africa – human list	South African Non-Proliferation of Weapons of Mass Destruction Act	Occupational Health and Safety Act, Regulations for Hazardous Biological Agents	OHSA, 1993, Regulations for Hazardous Biological Agents Classification
<i>Clostridium botulinum</i>	Bacteria	Yes	Yes	Yes	Yes	2
<i>Yersinia pestis</i>	Bacteria	Yes	Yes	Yes	Yes	3
<i>Ebola virus</i>	Virus	Yes	Yes	Yes	Yes	4
<i>Lassa fever virus</i>	Virus	Yes	Yes	Yes	Yes	2
<i>Marburg virus</i>	Virus	Yes	Yes	Yes	Yes	4
<i>Variola major virus (smallpox)</i>	Virus	Yes	Yes	Yes	Yes	4
<i>Variola minor virus (alastrim)</i>	Virus	Yes	Yes	Yes	Yes	4
<i>Rickettsia prowazekii</i>	Bacteria	Yes		Yes	Yes	3
<i>Junin</i>	Virus	Yes		Yes	Yes	
<i>Tick-bourne encephalitis complex (flavi) viruses</i>	Virus	Yes		Yes	Yes	3
<i>Abrin</i>	Toxin	Yes		Yes		
<i>Botulinum neurotoxins</i>	Toxin	Yes		Yes		
<i>Conotoxins</i>	Toxin	Yes		Yes		
<i>Diacetoxyscirpenol toxin</i>	Toxin	Yes		Yes		
<i>Ricin (biotoxin)</i>	Toxin	Yes		Yes		
<i>Saxitoxin</i>	Toxin	Yes		Yes		
<i>Staphylococcal enterotoxins</i>	Toxin	Yes		Yes		
<i>T-2 toxin</i>	Toxin	Yes		Yes		
<i>Tetrodotoxin</i>	Toxin	Yes		Yes		
<i>Far Eastern tick-bourne encephalitis virus (formerly known as Russian Spring and Summer encephalitis)</i>	Virus	Yes		Yes		
<i>Guanarito</i>	Virus	Yes		Yes		
<i>Kyasanur forest disease virus</i>	Virus	Yes		Yes		

Agent name (or disease)	Type of agent (virus/ bacteria/fungus)	US HHS & USDA select agents & toxins 7 CFR part 331, 9 CFR part 121, & 42 CFR part 73	Notifiable in South Africa – human list	South African Non- Proliferation of Weapons of Mass Destruction Act	Occupational Health and Safety Act, Regulations for Hazardous Biological Agents	OHSA, 1993, Regulations for Hazardous Biological Agents Classification
<i>Lujo virus</i>	Virus	Yes		Yes		
<i>Machupo</i>	Virus	Yes		Yes		
<i>Monkeypox virus</i>	Virus	Yes		Yes		
<i>Omsk haemorrhagic fever</i>	Virus	Yes		Yes		
<i>Sabia</i>	Virus	Yes		Yes		
<i>Chapare</i>	Virus	Yes				
<i>Reconstructed 1918 influenza</i>	Virus	Yes				
<i>SARS-associated coronavirus</i>	Virus	Yes				
<i>South American haemorrhagic fever virus</i>	Virus	Yes				
<i>Clostridium perfringens epsilon toxin-producing types</i>	Bacteria		Yes	Yes	Yes	2
<i>Clostridium tetani</i>	Bacteria		Yes	Yes	Yes	2
<i>Legionella pneumophila</i> (OHSA HBA reg <i>Fluorobacter</i> )	Bacteria		Yes	Yes	Yes	2
<i>Salmonella typhi</i>	Bacteria		Yes	Yes	Yes	3
<i>Vibrio cholerae</i>	Bacteria		Yes	Yes	Yes	2
<i>Yellow fever</i>	Virus		Yes	Yes	Yes	3
<i>Cholera toxin</i>	Toxin		Yes	Yes		
<i>Clostridium perfringens toxin</i>	Toxin		Yes	Yes		
<i>Tetanus toxin</i>	Toxin		Yes	Yes		
<i>Bacillus cereus</i>	Bacteria		Yes		Yes	2
<i>Bordetella pertussis</i>	Bacteria		Yes		Yes	2
<i>Chlamydia trachomatis</i>	Bacteria		Yes		Yes	2
<i>Corynebacterium diphtheria</i>	Bacteria		Yes		Yes	2
<i>Haemophilus influenza</i>	Bacteria		Yes		Yes	2
<i>Mycobacterium leprae</i>	Bacteria		Yes		Yes	3

Agent name (or disease)	Type of agent (virus/ bacteria/fungus)	US HHS & USDA select agents & toxins 7 CFR part 331, 9 CFR part 121, & 42 CFR part 73	Notifiable in South Africa – human list	South African Non- Proliferation of Weapons of Mass Destruction Act	Occupational Health and Safety Act, Regulations for Hazardous Biological Agents	OHSA, 1993, Regulations for Hazardous Biological Agents Classification
<i>Mycobacterium tuberculosis</i>	Bacteria		Yes		Yes	3
<i>Neisseria meningitidis</i>	Bacteria		Yes		Yes	2
<i>Streptococcus spp</i> (Rheumatic fever is notifiable)	Bacteria		Yes		Yes	2
<i>Treponema spp</i>	Bacteria		Yes		Yes	2
Malaria ( <i>Plasmodium falciparum</i> )	Parasite		Yes		Yes	3
Hepatitis A (Human enterovirus type 72)	Virus		Yes		Yes	2
Hepatitis B	Virus		Yes		Yes	3
Hepatitis C	Virus		Yes		Yes	3
Hepatitis D	Virus		Yes		Yes	3
Hepatitis E	Virus		Yes		Yes	3
Measles	Virus		Yes		Yes	2
Polioviruses	Virus		Yes		Yes	2
<i>Bartonella quintana</i>	Bacteria			Yes	Yes	2
Enterohaemorrhagic <i>Escherichia coli</i> , serotype 0157 and other verotoxin- producing sub-types	Bacteria			Yes	Yes	2
<i>Rickettsia rickettsii</i>	Bacteria			Yes	Yes	3
<i>Shigella dysenteriae</i>	Bacteria			Yes	Yes	3
<i>Yersinia pseudotuberculosis</i>	Bacteria			Yes	Yes	2
Chikungunya	Virus			Yes	Yes	3
Dengue	Virus			Yes	Yes	3
Hanta virus	Virus			Yes	Yes	3
<i>Coccidioides posadasii</i> / <i>Coccidioides immitis</i>	Fungi			Yes		
Aflatoxin	Toxin			Yes		

Agent name (or disease)	Type of agent (virus/ bacteria/fungus)	US HHS & USDA select agents & toxins 7 CFR part 331, 9 CFR part 121, & 42 CFR part 73	Notifiable in South Africa – human list	South African Non- Proliferation of Weapons of Mass Destruction Act	Occupational Health and Safety Act, Regulations for Hazardous Biological Agents	OHSA, 1993, Regulations for Hazardous Biological Agents Classification
<i>Microcystin (Cyanginosin)</i>	Toxin			Yes		
<i>Modeccin toxin</i>	Toxin			Yes		
<i>Mycotoxin</i>	Toxin			Yes		
<i>Shiga toxins</i>	Toxin			Yes		
<i>Verotoxin</i>	Toxin			Yes		
<i>Viscum album lectin 1</i>	Toxin			Yes		
<i>Volkensin</i>	Toxin			Yes		
<i>Dandenong</i>	Virus			Yes		
<i>Flexal</i>	Virus			Yes		
<i>Murray valley encephalitis</i>	Virus			Yes		
<i>Oropouche virus</i>	Virus			Yes		
<i>Rocio</i>	Virus			Yes		
<i>St Louis encephalitis virus</i>	Virus			Yes		
<i>Acinetobacter calcoaceticus</i>	Bacteria				Yes	2
<i>Acinetobacter iwoffii</i>	Bacteria				Yes	2
<i>Actinobacillus actinomycetemcomitans</i>	Bacteria				Yes	2
<i>Actinomadura madurae</i>	Bacteria				Yes	2
<i>Actinomadura pelletieri</i>	Bacteria				Yes	2
<i>Alcaligenes spp</i>	Bacteria				Yes	2
<i>Arcanobacterium haemolyticum (Corynebacterium haemolyticum)</i>	Bacteria				Yes	2
<i>Bacteroides spp</i>	Bacteria				Yes	2
<i>Bartonella spp</i>	Bacteria				Yes	2
<i>Bordetella parapertussis</i>	Bacteria				Yes	2
<i>Borellia burgdorferi</i>	Bacteria				Yes	2

Agent name (or disease)	Type of agent (virus/ bacteria/fungus)	US HHS & USDA select agents & toxins 7 CFR part 331, 9 CFR part 121, & 42 CFR part 73	Notifiable in South Africa – human list	South African Non- Proliferation of Weapons of Mass Destruction Act	Occupational Health and Safety Act, Regulations for Hazardous Biological Agents	OHSA, 1993, Regulations for Hazardous Biological Agents Classification
<i>Burkholderia cepacia</i>	Bacteria				Yes	2
<i>Cardiobacterium hominis</i>	Bacteria				Yes	2
<i>Corynebacterium minutissimum</i>	Bacteria				Yes	2
<i>Ehrlichia spp</i>	Bacteria				Yes	3
<i>Eikenella corrodens</i>	Bacteria				Yes	2
<i>Enterobacter spp</i>	Bacteria				Yes	2
<i>Enterococcus spp</i>	Bacteria				Yes	2
<i>Flavobacterium meningosepticum</i>	Bacteria				Yes	2
<i>Fusobacterium spp</i>	Bacteria				Yes	2
<i>Gardnerella vaginalis</i>	Bacteria				Yes	2
<i>Haemophilus ducreyi</i>	Bacteria				Yes	2
<i>Haemophilus spp</i>	Bacteria				Yes	2
<i>Helicobacter pylori</i>	Bacteria				Yes	2
<i>Klebsiella oxytoca</i>	Bacteria				Yes	2
<i>Klebsiella pneumoniae</i>	Bacteria				Yes	2
<i>Klebsiella spp</i>	Bacteria				Yes	2
<i>Moraxella catarrhalis</i>	Bacteria				Yes	2
<i>Moraxella lacunata</i>	Bacteria				Yes	2
<i>Morganella morganii</i>	Bacteria				Yes	2
<i>Mycobacterium africanum</i>	Bacteria				Yes	3
<i>Mycobacterium bovis</i> (BCG strain)	Bacteria				Yes	2
<i>Mycobacterium chelonae</i>	Bacteria				Yes	2
<i>Mycobacterium fortuitum</i>	Bacteria				Yes	2
<i>Mycobacterium kansasii</i>	Bacteria				Yes	3
<i>Mycobacterium malmoense</i>	Bacteria				Yes	3

Agent name (or disease)	Type of agent (virus/ bacteria/fungus)	US HHS & USDA select agents & toxins 7 CFR part 331, 9 CFR part 121, & 42 CFR part 73	Notifiable in South Africa – human list	South African Non- Proliferation of Weapons of Mass Destruction Act	Occupational Health and Safety Act, Regulations for Hazardous Biological Agents	OHSA, 1993, Regulations for Hazardous Biological Agents Classification
<i>Mycobacterium marinum</i>	Bacteria				Yes	2
<i>Mycobacterium scrofulaceum</i>	Bacteria				Yes	3
<i>Mycobacterium szulgai</i>	Bacteria				Yes	3
<i>Mycobacterium ulcerans</i> (Buruli ulcer)	Bacteria				Yes	3
<i>Mycoplasma hominis</i>	Bacteria				Yes	2
<i>Mycoplasma pneumoniae</i>	Bacteria				Yes	2
<i>Neisseria gonorrhoeae</i>	Bacteria				Yes	2
<i>Nocardia</i> spp	Bacteria				Yes	2
<i>Pasteurella</i> spp	Bacteria				Yes	2
<i>Peptostreptococcus</i> spp	Bacteria				Yes	2
<i>Plesiomonas shigelioides</i>	Bacteria				Yes	2
<i>Prevotella</i> spp	Bacteria				Yes	2
<i>Proteus mirabilis</i>	Bacteria				Yes	2
<i>Proteus penneri</i>	Bacteria				Yes	2
<i>Proteus vulgaris</i>	Bacteria				Yes	2
<i>Providencia</i> spp	Bacteria				Yes	2
<i>Pseudomonas aeruginosa</i>	Bacteria				Yes	2
<i>Serratia liquefaciens</i>	Bacteria				Yes	2
<i>Serratia marcescens</i>	Bacteria				Yes	2
<i>Shigella boydi</i>	Bacteria				Yes	2
<i>Shigella flexneri</i>	Bacteria				Yes	2
<i>Shigella sonnei</i>	Bacteria				Yes	2
<i>Staphylococcus aureus</i>	Bacteria				Yes	2
<i>Stenotrophomonas maltophilia</i>	Bacteria				Yes	2
<i>Streptobacillus moniliformis</i> (Rat bite fever)	Bacteria				Yes	2

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<i>Ureaplasma urealyticum</i>	Bacteria				Yes	2
<i>Vibrio parahaemolyticus</i>	Bacteria				Yes	2
<i>Vibrio spp</i>	Bacteria				Yes	2
<i>Yersinia enterocolitica</i>	Bacteria				Yes	2
<i>Yersinia spp</i>	Bacteria				Yes	2
<i>Acanthamoeba spp</i>	Parasite				Yes	2
<i>Ancylostoma duodenale</i>	Parasite				Yes	2
<i>Ascaris lumbricoides</i>	Parasite				Yes	2
<i>Balantidium coli</i>	Parasite				Yes	2
<i>Blastocystis homines</i>	Parasite				Yes	2
<i>Brugia spp</i>	Parasite				Yes	2
<i>Capillaria spp</i>	Parasite				Yes	2
<i>Cyclospora cayetanensis</i>	Parasite				Yes	2
<i>Dientamoeba fragilis</i>	Parasite				Yes	2
<i>Dracunculus medinensis</i>	Parasite				Yes	2
<i>Entamoeba histolytica</i>	Parasite				Yes	2
<i>Entamoeba vermicularis</i>	Parasite				Yes	2
<i>Isopora belli</i>	Parasite				Yes	2
<i>Loa loa</i>	Parasite				Yes	2
<i>Mansonella ozzardi</i>	Parasite				Yes	2
<i>Mansonella perstans</i>	Parasite				Yes	2
<i>Mansonella streptocoerca</i>	Parasite				Yes	2
<i>Naegleria fowleri</i>	Parasite				Yes	3
<i>Necator americanus</i>	Parasite				Yes	2
<i>Onchocerca volvulus</i>	Parasite				Yes	2
<i>Schistosoma spp</i>	Parasite				Yes	2
<i>Strongyloides spp</i>	Parasite				Yes	2



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<i>Trichomonas vaginalis</i>	Parasite				Yes	2
<i>Trichuris trichiura</i>	Parasite				Yes	2
<i>Wuchereria bancrofti</i> (Lymphatic filariasis)	Parasite				Yes	2
Unconventional agents associated with Gerstmann- Strussler-Scheinker	PRION				Yes	3
Unconventional agents associated with Kuru	PRION				Yes	3
Acute haemorrhagic conjunctivitis virus	Virus				Yes	2
Adenoviridae	Virus				Yes	2
Alphavirus	Virus				Yes	2
Astroviridae	Virus				Yes	2
BK and JC viruses	Virus				Yes	2
Blood-borne hepatitis viruses not yet identified	Virus				Yes	3
Coronaviridae	Virus				Yes	2
Coxsackie viruses	Virus				Yes	2
Cytomegalovirus	Virus				Yes	2
Echoviruses	Virus				Yes	2
Epstein-Barr	Virus				Yes	2
Flaviviruses known to be pathogenic	Virus				Yes	2
Herpes simplex type 1 and 2	Virus				Yes	2
Herpesvirus varicella-zoster	Virus				Yes	2
Human herpesvirus type 6	Virus				Yes	2
Human herpesvirus type 7	Virus				Yes	2
Human immunodeficiency viruses	Virus				Yes	3

Agent name (or disease)	Type of agent (virus/ bacteria/fungus)	US HHS & USDA select agents & toxins 7 CFR part 331, 9 CFR part 121, & 42 CFR part 73	Notifiable in South Africa – human list	South African Non- Proliferation of Weapons of Mass Destruction Act	Occupational Health and Safety Act, Regulations for Hazardous Biological Agents	OHSA, 1993, Regulations for Hazardous Biological Agents Classification
<i>Human papillomaviruses</i>	Virus				Yes	2
<i>Human parvovirus (B19)</i>	Virus				Yes	2
<i>Human rotaviruses</i>	Virus				Yes	2
<i>Human T-cell lymphotropic virus</i>	Virus				Yes	3
<i>Influenza types A, B and C2</i>	Virus				Yes	2
<i>Lymphocytic choriomeningitis</i>	Virus				Yes	3
<i>Mobala</i>	Virus				Yes	2
<i>Molluscum contagiosum virus</i>	Virus				Yes	2
<i>Monkeypox</i>	Virus				Yes	3
<i>Mopeia</i>	Virus				Yes	3
<i>Mumps</i>	Virus				Yes	2
<i>Norwalk (Norovirus)</i>	Virus				Yes	2
<i>O'nyong-nyong</i>	Virus				Yes	2
<i>Other Calciviridae</i>	Virus				Yes	2
<i>Parainfluenza (Types 1 to 4)</i>	Virus				Yes	2
<i>Respiratory syncytial virus</i>	Virus				Yes	2
<i>Rhinoviruses</i>	Virus				Yes	2
<i>Rubella</i>	Virus				Yes	2
<i>Spondweni</i>	Virus				Yes	3
<i>Vaccinia (including strains originally classified as rabbitpox)</i>	Virus				Yes	2

## Appendix 4: Animal infectious agents and the regulations in which they are specifically named highlighted in colour

Agent name (or disease)	Type of agent (virus/bacteria/fungus)	OIE Terrestrial Manual 2012 for Animal Health	US HHS & USDA select agents & toxins 7 CFR part 331, 9 CFR part 121, & 42 CFR part 73	South African Animal Diseases Act 35 of 1984, List of Controlled & Notifiable Animal Diseases (2010)	South African Non-Proliferation of Weapons of Mass Destruction Act 87 of 1993, amended 2010	Occupational Health and Safety Act 85 of 1993, Regulations for Hazardous Biological Agents	OHSA, 1993, Regulations for Hazardous Biological Agents Classification
African horse sickness ( <i>Orbivirus serogroup L</i> )	Virus	Yes	Yes	Yes	Yes	Yes	2
Rinderpest	Virus	Yes	Yes	Yes	Yes	Yes	4
Bluetongue ( <i>Orbivirus serogroup L</i> )	Virus	Yes	Yes	Yes	Yes	Yes	2
Classical swine fever ( <i>Hog cholera</i> )	Virus	Yes	Yes	Yes	Yes		
Foot and mouth disease	Virus	Yes	Yes	Yes	Yes		
Lumpy skin disease	Virus	Yes	Yes	Yes	Yes		
Porcine enterovirus type 9 ( <i>Swine vesicular disease</i> )	Virus	Yes	Yes	Yes	Yes		
Sheep pox virus	Virus	Yes	Yes	Yes	Yes		
African swine fever	Virus	Yes	Yes	Yes	Yes		
Avian influenza	Virus	Yes	Yes	Yes	Yes		
<i>Mycoplasma capricolum</i>	Bacteria	Yes	Yes		Yes		
<i>Mycoplasma mycoides</i>	Bacteria	Yes	Yes		Yes		
Goat pox virus	Virus	Yes	Yes		Yes		
Peste des petits ruminants	Virus	Yes	Yes		Yes		
Porcine herpesvirus ( <i>Aujeszky's disease</i> )	Virus	Yes		Yes	Yes		
<i>Mycobacterium paratuberculosis</i> ( <i>Johne's disease</i> )	Bacteria	Yes		Yes		Yes	2
<i>Salmonella gallinarum</i> ( <i>Fowl typhoid</i> )	Bacteria	Yes		Yes		Yes	2

Agent name (or disease)	Type of agent (virus/bacteria/fungus)	OIE Terrestrial Manual 2012 for Animal Health	US HHS & USDA select agents & toxins 7 CFR part 331, 9 CFR part 121, & 42 CFR part 73	South African Animal Diseases Act 35 of 1984, List of Controlled & Notifiable Animal Diseases (2010)	South African Non-Proliferation of Weapons of Mass Destruction Act 87 of 1993, amended 2010	Occupational Health and Safety Act 85 of 1993, Regulations for Hazardous Biological Agents	OHSA, 1993, Regulations for Hazardous Biological Agents Classification
<i>Salmonella pullorum</i>	Bacteria	Yes		Yes		Yes	2
<i>Trypanosoma brucei brucei</i> (Nagana)	Parasite	Yes		Yes		Yes	2
Contagious equine metritis	Bacteria	Yes		Yes			
Glanders	Bacteria	Yes		Yes			
Haemorrhagic septicaemia	Bacteria	Yes		Yes			
Dourine	Parasite	Yes		Yes			
Bovine spongiform encephalopathy	PRION	Yes		Yes			
Scrapie	PRION	Yes		Yes			
Equine infectious anaemia	Virus	Yes		Yes			
Equine influenza	Virus	Yes		Yes			
Equine viral arteritis	Virus	Yes		Yes			
Porcine reproductive and respiratory syndrome virus	Virus	Yes		Yes			
Porcine enterovirus type 1 (Teschen disease)	Virus	Yes			Yes		
Vesicular stomatitis virus (VSV-IN2, VSV-IN3)	Virus	Yes			Yes		
<i>Pasteurella multocida</i> (Fowl cholera)	Bacteria	Yes				Yes	2
<i>Pasteurella multocida</i> (Atrophic rhinitis of swine)	Bacteria	Yes				Yes	2
<i>Salmonella abortusovis</i>	Bacteria	Yes				Yes	2
Bovine babesiosis ( <i>Babesia divergens</i> )	Parasite	Yes				Yes	2

Agent name (or disease)	Type of agent (virus/bacteria/fungus)	OIE Terrestrial Manual 2012 for Animal Health	US HHS & USDA select agents & toxins 7 CFR part 331, 9 CFR part 121, & 42 CFR part 73	South African Animal Diseases Act 35 of 1984, List of Controlled & Notifiable Animal Diseases (2010)	South African Non-Proliferation of Weapons of Mass Destruction Act 87 of 1993, amended 2010	Occupational Health and Safety Act 85 of 1993, Regulations for Hazardous Biological Agents	OHSA, 1993, Regulations for Hazardous Biological Agents Classification
<i>Ehrlichia ruminantium</i> (Heartwater)	Bacteria	Yes				Yes	3
West Nile fever	Virus	Yes				Yes	3
Bovine anaplasmosis	Bacteria	Yes					
Bovine genital campylobacteriosis	Bacteria	Yes					
Caprine and ovine brucellosis (excluding <i>Brucella ovis</i> )	Bacteria	Yes					
Contagious agalactia	Bacteria	Yes					
Contagious bovine pleuropneumonia	Bacteria	Yes					
Contagious caprine pleuropneumonia	Bacteria	Yes					
Dermatophilosis	Bacteria	Yes					
Enzootic abortion of ewes ( <i>Ovine chlamydiosis</i> )	Bacteria	Yes					
<i>Melissococcus plutonius</i> (European foulbrood of honey bees)	Bacteria	Yes					
<i>Mycoplasma gallisepticum</i> , <i>M. synoviae</i> (Avian mycoplasmosis)	Bacteria	Yes					
Ovine epididymitis ( <i>Brucella ovis</i> )	Bacteria	Yes					
<i>Paenibacillus larvae</i> (American foulbrood of honey bees)	Bacteria	Yes					
Porcine brucellosis	Bacteria	Yes					
Trichomoniasis (animal)	Bacteria	Yes					

Agent name (or disease)	Type of agent (virus/bacteria/fungus)	OIE Terrestrial Manual 2012 for Animal Health	US HHS & USDA select agents & toxins 7 CFR part 331, 9 CFR part 121, & 42 CFR part 73	South African Animal Diseases Act 35 of 1984, List of Controlled & Notifiable Animal Diseases (2010)	South African Non-Proliferation of Weapons of Mass Destruction Act 87 of 1993, amended 2010	Occupational Health and Safety Act 85 of 1993, Regulations for Hazardous Biological Agents	OHSA, 1993, Regulations for Hazardous Biological Agents Classification
<i>Chrysomya bezziana</i> (Old World screwworm)	Fly	Yes					
<i>Cochliomyia hominivorax</i> (New World screwworm)	Fly	Yes					
<i>Epizootic lymphangitis</i>	Fungi	Yes					
Nosemosis of bees	Fungi	Yes					
Small hive beetle infestation	Insect	Yes					
Acaraposis of honey bees	Mite	Yes					
Horse mange	Mite	Yes					
Mange	Mite	Yes					
<i>Tropilaelaps</i> infestation of honey bees	Mite	Yes					
Varroosis of honey bees	Mite	Yes					
<i>Trypanosoma evansi</i> infections	Parasite	Yes					
Equine piroplasmiasis	Parasite	Yes					
Theileriosis	Parasite	Yes					
Birnavirus (Infectious bursal disease – Gumboro disease)	Virus	Yes					
Border disease	Virus	Yes					
Bovine viral diarrhea	Virus	Yes					
Bunyaviral disease of animals (excluding Rift valley fever)	Virus	Yes					
Camelpox	Virus	Yes					

Agent name (or disease)	Type of agent (virus/bacteria/fungus)	OIE Terrestrial Manual 2012 for Animal Health	US HHS & USDA select agents & toxins 7 CFR part 331, 9 CFR part 121, & 42 CFR part 73	South African Animal Diseases Act 35 of 1984, List of Controlled & Notifiable Animal Diseases (2010)	South African Non-Proliferation of Weapons of Mass Destruction Act 87 of 1993, amended 2010	Occupational Health and Safety Act 85 of 1993, Regulations for Hazardous Biological Agents	OHSA, 1993, Regulations for Hazardous Biological Agents Classification
<i>Caprine arthritis/encephalitis and Maedi-visna</i>	Virus	Yes					
<i>Duck virus enteritis</i>	Virus	Yes					
<i>Enzootic bovine leukosis</i>	Virus	Yes					
<i>Equine rhinopneumonitis</i>	Virus	Yes					
<i>Fowl pox virus</i>	Virus	Yes					
<i>Infectious bovine rhinotracheitis/infectious pustular vulvovaginitis</i>	Virus	Yes					
<i>Marek's disease</i>	Virus	Yes					
<i>Menangle virus</i>	Virus	Yes					
<i>Myxomatosis</i>	Virus	Yes					
<i>Nairobi sheep disease virus</i>	Virus	Yes					
<i>Ovine pulmonary adenocarcinoma</i>	Virus	Yes					
<i>Rabbit haemorrhagic disease</i>	Virus	Yes					
<i>Swine influenza</i>	Virus	Yes					
<i>Transmissible gastroenteritis</i>	Virus	Yes					
<i>Turkey rhinotracheitis (avian metapneumovirus)</i>	Virus	Yes					
<i>Alcelaphine herpesvirus type 1 (Malignant catarrhal fever)</i>	Virus	Yes					
<i>Avian infectious bronchitis virus</i>	Virus	Yes					

Agent name (or disease)	Type of agent (virus/bacteria/fungus)	OIE Terrestrial Manual 2012 for Animal Health	US HHS & USDA select agents & toxins 7 CFR part 331, 9 CFR part 121, & 42 CFR part 73	South African Animal Diseases Act 35 of 1984, List of Controlled & Notifiable Animal Diseases (2010)	South African Non-Proliferation of Weapons of Mass Destruction Act 87 of 1993, amended 2010	Occupational Health and Safety Act 85 of 1993, Regulations for Hazardous Biological Agents	OHSA, 1993, Regulations for Hazardous Biological Agents Classification
<i>Avian infectious laryngotracheitis herpesvirus</i>	Virus	Yes					
<i>Teschovirus encephalomyelitis</i> (previously <i>Enterovirus encephalomyelitis</i> or <i>Teschen/Talfan disease</i> )	Virus	Yes					
<i>Zoonoses transmissible from non-human primates</i>		Yes					
<i>Erysipelothrix rhusiopathiae</i> (Swine erysipelas)	Bacteria			Yes		Yes	2
<i>Bacterial kidney disease (fish)</i>	Bacteria			Yes			
<i>Bovine contagious pleuropneumonia</i>	Bacteria			Yes			
<i>Contagious haemopoetic necrosis (fish)</i>	Bacteria			Yes			
<i>Contagious pancreatic necrosis (fish)</i>	Bacteria			Yes			
<i>Corridor or buffalo disease</i>	Bacteria			Yes			
<i>Johne's disease</i>	Bacteria			Yes			
<i>Psittacosis</i>	Bacteria			Yes			
<i>Streptococcus equi</i> (Strangels)	Bacteria			Yes			
<i>Sheep scab</i>	Mite			Yes			
<i>Bovine malignant catarrhal fever</i>	Virus			Yes			



Agent name (or disease)	Type of agent (virus/bacteria/fungus)	OIE Terrestrial Manual 2012 for Animal Health	US HHS & USDA select agents & toxins 7 CFR part 331, 9 CFR part 121, & 42 CFR part 73	South African Animal Diseases Act 35 of 1984, List of Controlled & Notifiable Animal Diseases (2010)	South African Non-Proliferation of Weapons of Mass Destruction Act 87 of 1993, amended 2010	Occupational Health and Safety Act 85 of 1993, Regulations for Hazardous Biological Agents	OHSA, 1993, Regulations for Hazardous Biological Agents Classification
East Coast fever	Virus			Yes			
Skin conditions in sheep				Yes			
<i>Bordetella bronchiseptica</i>	Bacteria					Yes	2
<i>Corynebacterium pseudotuberculosis</i>	Bacteria					Yes	2
<i>Serpulina spp</i>	Bacteria					Yes	2
<i>Ascaris suum</i>	Parasite					Yes	2
<i>Trypanosoma rangeli</i>	Parasite					Yes	2
Hazara	Virus					Yes	2
Middelburg	Virus					Yes	2
Ndumu	Virus					Yes	2
Yatapox (Tana & Yaba)	Virus					Yes	2
Israel turkey virus	Virus					Yes	3
Mokola virus	Virus					Yes	3
Simian immunodeficiency virus	Virus					Yes	3
Akabane	Virus					Yes	3
Akabane virus	Virus					Yes	3
Canine distemper	Virus					Yes	
Unconventional agents associated with strains including whitepox virus	Virus					Yes	

## Appendix 5: Human and animal infectious agents and the regulations in which they are specifically named highlighted in colour

Agent name (or disease)	Type of agent (virus/bacteria/fungus)	OIE Terrestrial Manual 2012 for Animal Health	US HHS & USDA select agents & toxins 7 CFR Part 331, 9 CFR Part 121, & 42 CFR Part 73	South African Animal Diseases Act List of Controlled & Notifiable Animal Diseases	Notifiable in South Africa -Human list	South African Non-Proliferation of Weapons of Mass Destruction Act	Occupational Health and Safety Act, Regulations for Hazardous Biological Agents	OHSA, 1993, Regulations for Hazardous Biological Agents Classification
<i>Bacillus anthracis</i>	Bacteria	Yes	Yes	Yes	Yes	Yes	Yes	3
<i>Brucella abortus</i>	Bacteria	Yes	Yes	Yes	Yes	Yes	Yes	3
<i>Brucella melitensis</i>	Bacteria	Yes	Yes	Yes	Yes	Yes	Yes	3
<i>Brucella suis</i>	Bacteria	Yes	Yes	Yes	Yes	Yes	Yes	3
Rift valley fever	Virus	Yes	Yes	Yes		Yes	Yes	3
Newcastle disease	Virus	Yes	Yes	Yes		Yes	Yes	2
<i>Coxiella burnetii</i> (Q fever)	Bacteria	Yes	Yes		Yes		Yes	3
<i>Francisella tularensis</i> (Tuleremia)	Bacteria	Yes	Yes			Yes	Yes	2
Hendra virus (Equine morbillivirus)	Virus	Yes	Yes			Yes	Yes	3
Eastern equine encephalitis virus	Virus	Yes	Yes			Yes		
Nipah virus encephalitis	Virus	Yes	Yes			Yes		
Venezuelan equine encephalomyelitis	Virus	Yes	Yes			Yes		
<i>Bacillus anthracis</i> (Pasteur strain)	Bacteria	Yes	Yes					
Crimean-Congo haemorrhagic fever	Virus		Yes		Yes	Yes	Yes	4
<i>Burkholderia mallei</i> ( <i>Pseudomonas mallei</i> )	Bacteria		Yes			Yes	Yes	3
<i>Burkholderia pseudomallei</i> ( <i>Pseudomonas pseudomallei</i> )	Bacteria		Yes			Yes	Yes	3

Agent name (or disease)	Type of agent (virus/bacteria/fungus)	OIE Terrestrial Manual 2012 for Animal Health	US HHS & USDA select agents & toxins 7 CFR Part 331, 9 CFR Part 121, & 42 CFR Part 73	South African Animal Diseases Act List of Controlled & Notifiable Animal Diseases	Notifiable in South Africa -Human list	South African Non-Proliferation of Weapons of Mass Destruction Act	Occupational Health and Safety Act, Regulations for Hazardous Biological Agents	OHSA, 1993, Regulations for Hazardous Biological Agents Classification
Rabies	Virus	Yes		Yes	Yes	Yes	Yes	3
Salmonella enteritidis	Bacteria	Yes		Yes	Yes		Yes	2
Japanese encephalitis	Virus	Yes				Yes		
Western equine encephalitis virus	Virus	Yes				Yes		
Leishmaniosis	Bacteria	Yes					Yes	3
Mycobacterium avium/intracellulare	Bacteria	Yes					Yes	3
Mycobacterium bovis	Bacteria	Yes					Yes	3
Echinococcosis/ Hydatidosis	Parasite	Yes					Yes	3
Leishmania brasiliensis	Parasite	Yes					Yes	3
Leishmania donovani	Parasite	Yes					Yes	3
Taenia solium (Cystercicosis)	Parasite	Yes					Yes	3
Campylobacter jejuni and C. Coli	Bacteria	Yes					Yes	2
Leptospirosis	Bacteria	Yes					Yes	2
Listeria monocytogenes	Bacteria	Yes					Yes	2
Leishmania major	Parasite	Yes					Yes	2
Leishmania tropica	Parasite	Yes					Yes	2
Taenia saginata (Bovine cysticercosis)	Parasite	Yes					Yes	2
Toxoplasma gondii (Toxoplasmosis)	Parasite	Yes					Yes	2

Agent name (or disease)	Type of agent (virus/bacteria/fungus)	OIE Terrestrial Manual 2012 for Animal Health	US HHS & USDA select agents & toxins 7 CFR Part 331, 9 CFR Part 121, & 42 CFR Part 73	South African Animal Diseases Act List of Controlled & Notifiable Animal Diseases	Notifiable in South Africa -Human list	South African Non-Proliferation of Weapons of Mass Destruction Act	Occupational Health and Safety Act, Regulations for Hazardous Biological Agents	OHSA, 1993, Regulations for Hazardous Biological Agents Classification
<i>Trichinella nativa</i>	Parasite	Yes					Yes	2
<i>Trichinella nelsoni</i>	Parasite	Yes					Yes	2
<i>Trichinella pseudospiralis</i>	Parasite	Yes					Yes	2
<i>Trichinella spiralis</i>	Parasite	Yes					Yes	2
Cysticercosis	Parasite	Yes						
Cryptosporidiosis	Parasite	Yes						
<i>Salmonella paratyphi</i>	Bacteria	Yes			Yes			
<i>Chlamydia psittaci</i> (Avian strains)	Bacteria	Yes				Yes	Yes	3
Lyssaviruses	Virus					Yes		
Ippv 2	Virus						Yes	4
<i>Mycobacterium microti</i>	Bacteria						Yes	3
<i>Mycobacterium simiae</i>	Bacteria						Yes	3
<i>Mycobacterium xenopi</i>	Bacteria						Yes	3
<i>Rickettsia</i> spp	Bacteria						Yes	3
<i>Trypanosoma cruzi</i> (Chagas disease)	Parasite						Yes	3
Bhanja	Virus						Yes	3
Duvenhage	Virus						Yes	3
Germiston	Virus						Yes	3
<i>Herpesvirus simaie</i> (B virus)	Virus						Yes	3
Lagos bat	Virus						Yes	3
Semliki forest	Virus						Yes	3

Agent name (or disease)	Type of agent (virus/bacteria/fungus)	OIE Terrestrial Manual 2012 for Animal Health	US HHS & USDA select agents & toxins 7 CFR Part 331, 9 CFR Part 121, & 42 CFR Part 73	South African Animal Diseases Act List of Controlled & Notifiable Animal Diseases	Notifiable in South Africa -Human list	South African Non-Proliferation of Weapons of Mass Destruction Act	Occupational Health and Safety Act, Regulations for Hazardous Biological Agents	OHSA, 1993, Regulations for Hazardous Biological Agents Classification
<i>Unconventional agents associated with Creutzfeldt-Jakob disease</i>	Virus						Yes	3
<i>Wesselsbron</i>	Virus						Yes	3
<i>Actinomyces spp</i>	Bacteria						Yes	2
<i>Borellia spp</i>	Bacteria						Yes	2
<i>Chlamydia psittaci (Non-avian strains)</i>	Bacteria						Yes	2
<i>Porphyromonas spp</i>	Bacteria						Yes	2
<i>Rhodococcus equi</i>	Bacteria						Yes	2
<i>Salmonella arizona</i>	Bacteria						Yes	2
<i>Angiostrongylus cantonensis</i>	Parasite						Yes	2
<i>Angiostrongylus cantonensis</i>	Parasite						Yes	2
<i>Babesia microti</i>	Parasite						Yes	2
<i>Cyclospora species</i>	Parasite						Yes	2
<i>Diphyllobothrium latum</i>	Parasite						Yes	2
<i>Enterocytozon bieneusi</i>	Parasite						Yes	2
<i>Fasciola gigantica</i>	Parasite						Yes	2
<i>Fasciola hepatica</i>	Parasite						Yes	2
<i>Fasciolopsis buski</i>	Parasite						Yes	2
<i>Giardia lamblia</i>	Parasite						Yes	2
<i>Hymenolepis diminuta</i>	Parasite						Yes	2
<i>Hymenolepis nana</i>	Parasite						Yes	2
<i>Opisthorcis fellicus</i>	Parasite						Yes	2

Agent name (or disease)	Type of agent (virus/bacteria/fungus)	OIE Terrestrial Manual 2012 for Animal Health	US HHS & USDA select agents & toxins 7 CFR Part 331, 9 CFR Part 121, & 42 CFR Part 73	South African Animal Diseases Act List of Controlled & Notifiable Animal Diseases	Notifiable in South Africa -Human list	South African Non-Proliferation of Weapons of Mass Destruction Act	Occupational Health and Safety Act, Regulations for Hazardous Biological Agents	OHSA, 1993, Regulations for Hazardous Biological Agents Classification
<i>Opisthorcis sinensis</i> ( <i>Chlonorchis sinensis</i> )	Parasite						Yes	2
<i>Opisthorcis viverrini</i> ( <i>Chlonorchis viverrini</i> )	Parasite						Yes	2
<i>Opsithorcis spp</i>	Parasite						Yes	2
<i>Paragonimus</i>	Parasite						Yes	2
<i>Plasmodium spp</i> (human and simian)	Parasite						Yes	2
<i>Sarcocystis sui/hominis</i>	Parasite						Yes	2
<i>Toxocara canis</i>	Parasite						Yes	2
<i>Toxocara cati</i>	Parasite						Yes	2
<i>Trichostrongylus orientalis</i>	Parasite						Yes	2
<i>Trichostrongylus spp</i>	Parasite						Yes	2
<i>Trypanosoma brucei gambiense</i>	Parasite						Yes	2
<i>Trypanosoma brucei rhodesiense</i>	Parasite						Yes	2
Buffalopox	Virus						Yes	2
Bunyamwera	Virus						Yes	2
Coltivirus	Virus						Yes	2
Cowpox	Virus						Yes	2
Dhori and Thogoto	Virus						Yes	2
Milker's nodes	Virus						Yes	2
Reoviruses	Virus						Yes	2
Sindbis	Virus						Yes	2
Toroviridae	Virus						Yes	2

## Appendix 6: Plant infectious agents and the regulations in which they are specifically named highlighted in colour

Agent name (or disease)	Type of agent (virus/bacteria/fungus)	US HHS & USDA SELECT AGENTS & TOXINS 7 CFR Part 331, 9 CFR Part 121, & 42 CFR Part 73	South African Non-proliferation of Weapons of Mass Destruction Act	Occupational Health and Safety Act, Regulations for Hazardous Biological Agents	OHSA, 1993, Regulations for Hazardous Biological Agents Classification
<i>Ralstonia solanacearum</i> (Race 3, biovar 2)	Bacteria	Yes	Yes		
<i>Xanthomonas oryzae</i>	Bacteria	Yes	Yes		
<i>Peronosclerospora philippinensis</i> ( <i>Peronosclerospora sacchari</i> )	Oomycete	Yes			
<i>Rathayibacter toxicus</i>	Bacteria	Yes			
<i>Phoma glycinicola</i> ( <i>Pyrenochaeta glycinis</i> )	Fungi	Yes			
<i>Sclerophthora rayssiae</i> var <i>zeae</i>	Fungi	Yes			
<i>Synchytrium endobioticum</i>	Fungi	Yes			
<i>Clavibacter michiganensis</i>	Bacteria		Yes		
<i>Xanthomonas albilineans</i>	Bacteria		Yes		
<i>Xanthomonas campestris</i>	Bacteria		Yes		
<i>Xylella fastidiosa</i> ( <i>Citrus variegated chlorosis</i> strain)	Bacteria		Yes		
<i>Cochliobolus miyabeanus</i>	Fungi		Yes		
<i>Colletotrichum kahawae</i>	Fungi		Yes		
<i>Deuterophonas tracheiphila</i>	Fungi		Yes		
<i>Magnaporthe grisea</i>	Fungi		Yes		
<i>Microcyclus ulei</i>	Fungi		Yes		
<i>Monilia rorei</i>	Fungi		Yes		
<i>Puccinia graminis</i>	Fungi		Yes		
<i>Puccinia striiformis</i>	Fungi		Yes		
Banana bunchy top virus	Virus		Yes		
Potato andean latent tymovirus	Virus		Yes		
Potato spindle tuber viroid	Virus		Yes		

## **Appendix 7: Life sciences mapping information sheet**

The Academy of Science of South Africa (ASSAf) invites you to take part in a mapping study on life science research and diagnostic facilities in South Africa which will assess the distribution, types and research focus of laboratories within the country. This mapping study is voluntary; however you are strongly encouraged to participate as the information you provide will significantly contribute towards understanding the distribution of life science research in South Africa.

In order to build a clear understanding of laboratory-based life science research in South Africa we request that you fill in this survey on behalf of your diagnostic facility or research department. The study consists of 10 questions and will take no more than 5 minutes to complete. The results of the survey will form a database which will be stored at the Academy of Science of South Africa. The results will be securely held, and will not be distributed to any third party for commercial gain.

This database resulting from this survey will be used for a subsequent survey which will assess the extent to which systems are in place in to ensure high-quality, safe, secure and responsible life science research and assess the penetrance of biosafety, biosecurity and bioethics knowledge amongst the scientific community. Participants for this later survey will be identified from the database, although participation in each survey is independent and voluntary.

### **Researchers:**

If you have any questions or queries about taking part you can contact the principle researchers: Prof Jill Farrant and Dr Chandre Gould.

### **Contact addresses:**

Prof Jill Farrant  
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University of Cape Town  
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This research is being undertaken by the ASSAf.

### **Contact address:**

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Meiring Naude Road, Lynnwood, Pretoria, 0020  
Dr Louise Bezuidenhout      E-mail: [Louiseb@assaf.org.za](mailto:Louiseb@assaf.org.za)

Thank you for taking the time to contribute to this research.



## **Appendix 8: Participation information sheet for qualitative interviews**



*Applying scientific thinking  
in the service of society*

### **Participant Information Sheet**

You are invited to take part in a study on responsible life science research. This study examines biosafety, biosecurity and bioethics provisions within South African laboratories and the strengths and weaknesses of current national policies that guide this risk management.

This interview will focus on your experience of current biosafety and biosecurity management policies in South Africa, and your perceptions of the strengths and weaknesses of the current regulatory system. This is a voluntary interview and the information you provide will be treated as confidential.

If you agree to participate the interview will last approximately 15 minutes.

### **Purpose of the study**

This project seeks to:

- Contribute to knowledge about laboratory research and diagnostic capacity in South Africa;
- Contribute to assessing the extent to which systems are in place to ensure high-quality, safe, secure and responsible life science research; and
- Identify the needs and capacities of laboratories and to assist laboratories to develop appropriate system to access the services and expertise that exists at national and international levels.

### **Voluntary participation**

Participation in this interview is entirely voluntary and you are entitled to terminate the interview at any time. You are free to withdraw from the interview process at any time, and this action will not have any effect on your current or future employment. As a voluntary process, participants will not be remunerated for their involvement.

## **Data Management and Confidentiality**

The interview may be digitally recorded and your consent for this process is required on the attached consent sheet. If for any reason you would prefer not to be recorded please let the researcher know prior to the commencement of the interview.

The information you provide to us will be treated as strictly confidential. You will not be identified in any of the transcripts or publications unless you agree to being quoted. Your data will be stored on the password protected Academy of Science of South Africa server and will be destroyed at the end of the project. Access to the data will be limited to the researchers involved in the project.

## **Researchers**

If you have any questions or queries about taking part you can contact the principal researchers: Prof Jill Farrant and Dr Chandre Gould, or the contracted researcher Dr Nandi Siegfried.

### **Contact:**

Prof Jill Farrant

[jill.farrant@uct.ac.za](mailto:jill.farrant@uct.ac.za)

Dr Chandre Gould

[cgould@issafrica.org](mailto:cgould@issafrica.org)

Dr Nandi Siegfried

[Nandi.Siegfried@gmail.com](mailto:Nandi.Siegfried@gmail.com)

## Appendix 9: Question guide for semi-structured interviews regarding responsiveness to infectious disease outbreaks in South Africa



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### Interview Schedule

These questions serve to guide the interview. Should the interviewee raise other concerns these will be addressed if relevant to the topic. The interview will be tailored to the experience and knowledge of the interviewee.

1. Please describe your work to me as it relates to detection, identification, response and/or recording of infectious disease outbreaks.
2. Please explain your involvement nationally or internationally, with regard to developing or contributing to policies and procedures for the detection, identification, response and/or recording of infectious disease outbreaks?
3. Could you talk about the policies and regulations for the detection, identification, response and/or recording of infectious disease outbreaks in SA?
4. Strengths and weaknesses in current implementation strategies
  - o From your experience, what is currently done well when it comes to implementation of strategies to manage disease outbreaks at a national level?
  - o Are there any problems with implementing the strategies nationally?
  - o What do you think could be done to improve the implementation of national strategies to manage disease outbreaks?
5. From your experience, do you have any comments on:
  - o Cross-sectoral co-operation with respect to implementation of policies and strategies?
  - o Overall co-ordination nationally and provincially?
  - o Are there opportunities for information-sharing between sectors?
  - o If not, what are the obstacles to sharing information?
6. Areas for future development
  - o What do you think should be done in the future to better manage disease outbreaks nationally?
7. Do you wish to raise any other issues related to this topic?

## Appendix 10: Informed consent form for qualitative interviews



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### Life Science Research and Diagnostic Laboratories in South Africa

#### Consent form for interviewees

Please tick the boxes, fill in the lines below and sign the form. Thank you for your help. Please note that this consent form is accompanied by an information sheet detailing the nature of this project.

- [ ] I confirm that I have read and understood the information sheet for the above study and have had the opportunity to ask questions about participating in the research.
- [ ] My questions concerning participation in this study have been answered by the Academy of Science of South Africa researcher to my satisfaction.
- [ ] I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason.
- [ ] I agree to take part in the research and to the use of my data for the purposes of the study specified in the information sheet.
- [ ] I agree to any interviews being recorded and understand that the data will be kept securely and will remain confidential except in the case of legal subpoena.
- [ ] Should any quotes be used, I will not be identified in any subsequent transcription or publication unless I indicate otherwise.

Name of Interviewee: \_\_\_\_\_

Organisation: \_\_\_\_\_

Contact Email: \_\_\_\_\_

Date: \_\_\_\_\_

Signature: \_\_\_\_\_

## **Appendix 11: Information sheet and questionnaire for mapping life science facilities**

### **QUESTIONNAIRE**

#### **Responsible life sciences research for global health security**

You are invited to take part in a study on responsible life science research. Answering this questionnaire will contribute to assessing the capacity of life science research, diagnostic and manufacturing facilities in South Africa. This is a voluntary survey and the information you provide will be treated as confidential. If you agree to answer this questionnaire, it will take you between 10 to 20 minutes to complete.

By completing the questionnaire you will be contributing to research that aims at assessing diagnostic, research and manufacturing capacities in South Africa. You will be contributing to the identification and promotion of best practices for responsible life science research.

*When you have completed this survey please return it to [louiseb@assaf.org.za](mailto:louiseb@assaf.org.za).*

#### **Purpose**

This project seeks to:

- Contribute to knowledge about life science research, diagnostic and manufacturing capacity in South Africa; and
- Contribute to assessing the extent to which systems are in place in to ensure high-quality, safe, secure and responsible life science research.

#### **Voluntary responses**

This is a voluntary survey so you do not have to take in part, but if you do it will be of great help to us. We are interested in your opinion so there are no “wrong” or “right” answers. The questionnaire should take about 10 to 20 minutes to complete. If you do not have the answer to all the questions, you can simply put a cross next to the “don’t know” box. Please note that you will not be paid for your participation in this study. No known disadvantages or risk are associated with taking part in this research.

#### **Confidentiality**

The information you provide to us will be treated as strictly confidential. You do not need to put your name on the questionnaire. We do ask that you tell us your position in the facility so that we are able to distinguish between the answers given by managers, junior staff, senior staff and technical staff. This is important in order for us to understand the perspective of each level of employee. This information should not identify you. If you do provide any information which might identify you, it will be kept securely and separately by the researchers. Moreover, the research findings will

be reported in an aggregate manner and in such a way that the specific results of the survey for each laboratory will not be linked to the laboratory or facility by name.

Your completed questionnaire will be handed to the researchers who will capture the data on a computer. Your answers will be kept confidential by the researchers and will only be reported as part of an overall report to the facility.

### **Results of the study**

The results of the survey for each laboratory will be made available to all staff in the institution and will be discussed with the managers of the facility. At the end of the research project the overall research results will be published in a report. The results will be presented at meetings to discuss and promote best practices on responsible life sciences research. You will not be identifiable from any report or publication.

### **Researchers**

If you have any questions or queries about taking part you can contact the principle researchers:

Prof Jill Farrant and Dr Chandre Gould.

#### **Contact address:**

Prof Jill Farrant  
Department of Molecular and Cell Biology  
University of Cape Town  
Email: [jill.farrant@uct.ac.za](mailto:jill.farrant@uct.ac.za)

Dr Chandre Gould  
Institute for Security Studies  
  
Email: [cgould@issafrica.org](mailto:cgould@issafrica.org)

This research is being undertaken by the Academy of Science of South Africa (ASSAf).

#### **Contact address:**

ASSAf  
c/o Dr Louise Bezuidenhout  
1<sup>st</sup> Floor Block A, The Woods, 41 de Havilland Crescent,  
Persekor Park, Meiring Naude Road, Lynnwood, Pretoria, 0020  
Email: [louiseb@assaf.org.za](mailto:louiseb@assaf.org.za)

**Preliminary data** – please complete the following:

<p>i. Province in which you work</p>	<p>1. Eastern Cape [ ]                  2. Free State [ ]                  3. Gauteng [ ]                  4. KwaZulu-Natal [ ]                  5. Limpopo [ ]                  6. Mpumalanga [ ]                  7. Northern Cape [ ]                  8. North-West [ ]                  9. Western Cape [ ]</p>
<p>ii. Type of life science activities you are engaged in</p>	<p>1. Publically-funded research [ ]                  2. Publically-funded diagnostics [ ]                  3. Commercial research [ ]                  4. Commercial diagnostics [ ]                  5. Other (therapeutics, forensics etc.) [ ]</p> <p>Please specify:</p>
<p>ii. Your position within the institution</p>	<p>1. Senior researcher [ ]                  2. Junior researcher (less than 5 years' work experience) [ ]                  3. Senior technicians [ ]                  4. Junior technician (less than 5 years' work experience) [ ]                  5. Support staff [ ]                  6. Postgraduate student [ ]                  7. NHLS Laboratory manager [ ]                  8. NHLS technologist [ ]                  9. NHLS technician [ ]</p>
<p>ii. Gender</p>	<p>1. Male [ ]                  2. Female [ ]                  3. Undisclosed [ ]</p>
<p>iii. Main focus of your work</p>	<p>1. Plant [ ]                  2. Animal [ ]                  3. Human [ ]</p>

Your responses to the following survey questions should reflect *your perceptions* of your current work environment and your activities as a life scientist. Please put a cross in the box next to the answer that you choose. Where answer boxes are marked with **PTO**, please turn over the page for more options.

## PILLAR 1: RESEARCH EXCELLENCE

1.1 Scientific collaboration is encouraged within your department

1. Always [ ]
2. Often [ ]
3. Sometimes [ ]
4. Rarely [ ]
5. Never [ ]
6. Not applicable [ ]
7. Don't know [ ]

1.2 Scientific collaboration is encouraged **within** your institution

1. Always [ ]
2. Often [ ]
3. Sometimes [ ]
4. Rarely [ ]
5. Never [ ]
6. Not applicable [ ]
7. Don't know [ ]

1.3 Scientific collaboration **between** your institution and other institutions is facilitated

1. Always [ ]
2. Often [ ]
3. Sometimes [ ]
4. Rarely [ ]
5. Never [ ]
6. Not applicable [ ]
7. Don't know [ ]

1.4 Your institution makes efforts to make any funding it receives transparent

1. Strongly agree [ ]
2. Agree [ ]
3. Disagree [ ]
4. Strongly disagree [ ]
5. Not applicable [ ]
6. Don't know [ ]



1.5 Accountability is required (e.g. through regular reporting of financial expenditure as well as scientific progress)

- 1. Strongly agree [ ]
- 2. Agree [ ]
- 3. Disagree [ ]
- 4. Strongly disagree [ ]
- 5. Not applicable [ ]
- 6. Don't know [ ]

1.6 Your institution clearly states its research priorities

- 1. Strongly agree [ ]
- 2. Agree [ ]
- 3. Disagree [ ]
- 4. Strongly disagree [ ]
- 5. Not applicable [ ]
- 6. Don't know [ ]

1.7 Research findings are routinely published

- 1. Strongly agree [ ]
- 2. Agree [ ]
- 3. Disagree [ ]
- 4. Strongly disagree [ ]
- 5. Not applicable [ ]
- 6. Don't know [ ]

1.8 Good communication exists between policymakers at your facility and the life science community

- 1. Strongly agree [ ]
- 2. Agree [ ]
- 3. Disagree [ ]
- 4. Strongly disagree [ ]
- 5. Not applicable [ ]
- 6. Don't know [ ]

1.9 Good communication exists between policymakers at a national level and the life science community

- 1. Strongly agree [ ]
- 2. Agree [ ]
- 3. Disagree [ ]
- 4. Strongly disagree [ ]

- 5. Not applicable [ ]
- 6. Don't know [ ]

1.10 On-going formal and/or informal research training takes place (that is not for postgraduate degree purposes)

- 1. Always [ ]
- 2. Often [ ]
- 3. Sometimes [ ]
- 4. Rarely [ ]
- 5. Never [ ]
- 6. Not applicable [ ]
- 7. Don't know [ ]

1.11 Junior researchers and/or staff are nurtured and supported

- 1. Always [ ]
- 2. Often [ ]
- 3. Sometimes [ ]
- 4. Rarely [ ]
- 5. Never [ ]
- 6. Not applicable [ ]
- 7. Don't know [ ]

1.12 Staff conducting research have been properly trained

- 1. Strongly agree [ ]
- 2. Agree [ ]
- 3. Disagree [ ]
- 4. Strongly disagree [ ]
- 5. Not applicable [ ]
- 6. Don't know [ ]

1.13 Quality control is conducted within the institution for relevant diagnostic tests or experiments to avoid false positives or negative results

- 1. Always [ ]
- 2. Often [ ]
- 3. Sometimes [ ]
- 4. Rarely [ ]
- 5. Never [ ]
- 6. Not applicable [ ]
- 7. Don't know [ ]

1.14 Quality control is conducted between institutions for relevant diagnostic tests or experiments to avoid false positives or negative results

- 1. Always [ ]
- 2. Often [ ]
- 3. Sometimes [ ]
- 4. Rarely [ ]
- 5. Never [ ]
- 6. Not applicable [ ]
- 7. Don't know [ ]

1.15 Samples and reagents are checked to ensure that they match accompanying documentation

- 1. Always [ ]
- 2. Often [ ]
- 3. Sometimes [ ]
- 4. Rarely [ ]
- 5. Never [ ]
- 6. Not applicable [ ]
- 7. Don't know [ ]

1.16 Measures are in place to double check results before they are given to patients/clinicians (for diagnostic laboratories) or published (for research laboratories)

- 1. Strongly agree [ ]
- 2. Agree [ ]
- 3. Disagree [ ]
- 4. Strongly disagree [ ]
- 5. Not applicable [ ]
- 6. Don't know [ ]

1.17 Education and/or training is offered on dual-use issues. This refers to the potential for data that was generated for beneficial purposes to be misused for malicious purposes by a third party.

- 1. Strongly agree [ ]
- 2. Agree [ ]
- 3. Disagree [ ]
- 4. Strongly disagree [ ]
- 5. Not applicable [ ]
- 6. Don't know [ ]

1.18 Skilled staff are valued and retained

- 1. Always [ ]
- 2. Often [ ]
- 3. Sometimes [ ]
- 4. Rarely [ ]
- 5. Never [ ]
- 6. Not applicable [ ]
- 7. Don't know [ ]

1.19 National legislation and policy fosters scientific development and freedom

- 1. Strongly agree [ ]
- 2. Agree [ ]
- 3. Disagree [ ]
- 4. Strongly disagree [ ]
- 5. Not applicable [ ]
- 6. Don't know [ ]

**PILLAR 2: ETHICS**

2.1 Education and/or training is offered on research ethics including issues such as scientific misconduct (falsification, fabrication and plagiarism)

- 1. Always [ ]
- 2. Often [ ]
- 3. Sometimes [ ]
- 4. Rarely [ ]
- 5. Never [ ]
- 6. Not applicable [ ]
- 7. Don't know [ ]

2.2 Appropriate ethical research guidelines and practices have been published

- 1. Strongly agree [ ]
- 2. Agree [ ]
- 3. Disagree [ ]
- 4. Strongly disagree [ ]
- 5. Not applicable [ ]
- 6. Don't know [ ]

2.3 Appropriate ethical research guidelines and practices are implemented

- 1. Always [ ]
- 2. Often [ ]
- 3. Sometimes [ ]

- 4. Rarely [ ]
- 5. Never [ ]
- 6. Not applicable [ ]
- 7. Don't know [ ]

2.4 Adequate mechanisms exist for investigating and responding to non-adherence to ethical standards

- 1. Strongly agree [ ]
- 2. Agree [ ]
- 3. Disagree [ ]
- 4. Strongly disagree [ ]
- 5. Not applicable [ ]
- 6. Don't know [ ]

2.5 Measures are in place to prevent non-laboratory individuals from obtaining access to samples or biological materials

- 1. Strongly agree [ ]
- 2. Agree [ ]
- 3. Disagree [ ]
- 4. Strongly disagree [ ]
- 5. Not applicable [ ]
- 6. Don't know [ ]

2.6 Measures are in place to prevent non-laboratory individuals from providing confidential information to people outside the laboratory

- 1. Strongly agree [ ]
- 2. Agree [ ]
- 3. Disagree [ ]
- 4. Strongly disagree [ ]
- 5. Not applicable [ ]
- 6. Don't know [ ]

2.7 Discussions in the facility focus on the broader implications of your life science activities for society in general

- 1. Always [ ]
- 2. Often [ ]
- 3. Sometimes [ ]
- 4. Rarely [ ]
- 5. Never [ ]
- 6. Not applicable [ ]
- 7. Don't know [ ]

2.8 Researchers are competent to assess the potential broader implications of their life science activities for society in general

- 1. Strongly agree [ ]
- 2. Agree [ ]
- 3. Disagree [ ]
- 4. Strongly disagree [ ]
- 5. Not applicable [ ]
- 6. Don't know [ ]

2.9 Research is subject to a risk assessment that includes considerations of the broader implications of their life science activities for the environment

- 1. Always [ ]
- 2. Often [ ]
- 3. Sometimes [ ]
- 4. Rarely [ ]
- 5. Never [ ]
- 6. Not applicable [ ]
- 7. Don't know [ ]

2.10 Researchers are competent to make the assessment of the broader implications of their life science activities for the environment

- 1. Strongly agree [ ]
- 2. Agree [ ]
- 3. Disagree [ ]
- 4. Strongly disagree [ ]
- 5. Not applicable [ ]
- 6. Don't know [ ]

2.11 Potential for misuse of the research is considered at all stages of research/ diagnostic processes and appropriate action taken if necessary

- 1. Strongly agree [ ]
- 2. Agree [ ]
- 3. Disagree [ ]
- 4. Strongly disagree [ ]
- 5. Not applicable [ ]
- 6. Don't know [ ]

2.12 Researchers know how to assess whether the risk outweighs the benefit of continuing with their research activities

- 1. Strongly agree [ ]
- 2. Agree [ ]

3. Disagree [ ]
4. Strongly disagree [ ]
5. Not applicable [ ]
6. Don't know [ ]

2.13 A code of conduct/practice for life scientists exists at an institutional level

1. Strongly agree [ ]
2. Agree [ ]
3. Disagree [ ]
4. Strongly disagree [ ]
5. Not applicable [ ]
6. Don't know [ ]

2.14 A code of conduct/practice for life scientists exists at a national level

1. Strongly agree [ ]
2. Agree [ ]
3. Disagree [ ]
4. Strongly disagree [ ]
5. Not applicable [ ]
6. Don't know [ ]

2.15 Researchers are aware of and informed about national and international conventions, laws and regulations related to their research

1. Strongly agree [ ]
2. Agree [ ]
3. Disagree [ ]
4. Strongly disagree [ ]
5. Not applicable [ ]
6. Don't know [ ]

2.16. An ethics committee assesses research proposals involving human subjects

1. Always [ ]
2. Often [ ]
3. Sometimes [ ]
4. Rarely [ ]
5. Never [ ]
6. Not applicable [ ]
7. Don't know [ ]

2.17 An ethics committee assesses research proposals involving animal subjects

1. Always [ ]
2. Often [ ]

3. Sometimes [ ]
4. Rarely [ ]
5. Never [ ]
6. Not applicable [ ]
7. Don't know [ ]

2.18 A review process exists to assess ethical issues raised by research proposals not involving human or animal subjects

1. Strongly agree [ ]
2. Agree [ ]
3. Disagree [ ]
4. Strongly disagree [ ]
5. Not applicable [ ]
6. Don't know [ ]

2.19 Information about the national and international conventions and regulations related to all fields of science is easily accessible

1. Strongly agree [ ]
2. Agree [ ]
3. Disagree [ ]
4. Strongly disagree [ ]
5. Not applicable [ ]
6. Don't know [ ]

2.20 National legislation and policy relevant to the life sciences provides protection against the misuse of science

1. Strongly agree [ ]
2. Agree [ ]
3. Disagree [ ]
4. Strongly disagree [ ]
5. Not applicable [ ]
6. Don't know [ ]

### **PILLAR 3: LABORATORY BIOSAFETY AND BIOSECURITY**

3.1. Facilities and equipment are appropriate to the level of work being done and are adequately maintained

1. Strongly agree [ ]
2. Agree [ ]
3. Disagree [ ]
4. Strongly disagree [ ]



- 5. Not applicable [ ]
- 6. Don't know [ ]

3.2 Training of staff is appropriate to the facilities and equipment and the work being conducted

- 1. Strongly agree [ ]
- 2. Agree [ ]
- 3. Disagree [ ]
- 4. Strongly disagree [ ]
- 5. Not applicable [ ]
- 6. Don't know [ ]

3.3 Researchers have somewhere to turn to get competent advice if they have safety or security questions relating to their research

- 1. Strongly agree [ ]
- 2. Agree [ ]
- 3. Disagree [ ]
- 4. Strongly disagree [ ]
- 5. Not applicable [ ]
- 6. Don't know [ ]

3.4 National legislation/regulation exists that sets safety and security practices and procedures for laboratories

- 1. Strongly agree [ ]
- 2. Agree [ ]
- 3. Disagree [ ]
- 4. Strongly disagree [ ]
- 5. Not applicable [ ]
- 6. Don't know [ ]

3.5 An assessment of the biosafety and biosecurity risk associated with research activities is conducted

- 1. Always [ ]
- 2. Often [ ]
- 3. Sometimes [ ]
- 4. Rarely [ ]
- 5. Never [ ]
- 6. Not applicable [ ]
- 7. Don't know [ ]

3.6 Risk assessments are able to identify requirements for risk reduction measures including the level of containment required

- 1. Strongly agree [ ]
- 2. Agree [ ]
- 3. Disagree [ ]
- 4. Strongly disagree [ ]
- 5. Not applicable [ ]
- 6. Don't know [ ]

3.7 Biosafety training is provided to all those working in laboratories when appropriate

- 1. Strongly agree [ ]
- 2. Agree [ ]
- 3. Disagree [ ]
- 4. Strongly disagree [ ]
- 5. Not applicable [ ]
- 6. Don't know [ ]

3.8 Biosecurity training is provided to all those working in laboratories when appropriate

- 1. Strongly agree [ ]
- 2. Agree [ ]
- 3. Disagree [ ]
- 4. Strongly disagree [ ]
- 5. Not applicable [ ]
- 6. Don't know [ ]

3.9 Biosafety training includes a test of competence

- 1. Always [ ]
- 2. Often [ ]
- 3. Sometimes [ ]
- 4. Rarely [ ]
- 5. Never [ ]
- 6. Not applicable [ ]
- 7. Don't know [ ]

3.10 Biosecurity training includes a test of competence

- 1. Always [ ]
- 2. Often [ ]
- 3. Sometimes [ ]
- 4. Rarely [ ]

- 5. Never [ ]
- 6. Not applicable [ ]
- 7. Don't know [ ]

3.11 Standard Operating Procedures have been developed (in your facility)

- 1. Strongly agree [ ]
- 2. Agree [ ]
- 3. Disagree [ ]
- 4. Strongly disagree [ ]
- 5. Not applicable [ ]
- 6. Don't know [ ]

3.12 Staff are trained to work according to the Standard Operating Procedures

- 1. Strongly agree [ ]
- 2. Agree [ ]
- 3. Disagree [ ]
- 4. Strongly disagree [ ]
- 5. Not applicable [ ]
- 6. Don't know [ ]

3.13 Staff are regularly tested to ensure competence in the Standard Operating Procedures

- 1. Strongly agree [ ]
- 2. Agree [ ]
- 3. Disagree [ ]
- 4. Strongly disagree [ ]
- 5. Not applicable [ ]
- 6. Don't know [ ]

3.14 Legislation/regulations exist to address hazardous waste disposal

- 1. Strongly agree [ ]
- 2. Agree [ ]
- 3. Disagree [ ]
- 4. Strongly disagree [ ]
- 5. Not applicable [ ]
- 6. Don't know [ ]

3.15 Legislation/regulations regarding hazardous waste disposal are followed

- 1. Always [ ]
- 2. Often [ ]
- 3. Sometimes [ ]

- 4. Rarely [ ]
- 5. Never [ ]
- 6. Not applicable [ ]
- 7. Don't know [ ]

3.16 Occupational health surveillance mechanisms exist and are followed (at institutional level)

- 1. Strongly agree [ ]
- 2. Agree [ ]
- 3. Disagree [ ]
- 4. Strongly disagree [ ]
- 5. Not applicable [ ]
- 6. Don't know [ ]

3.17 Occupational health reporting mechanisms effective at institutional level

- 1. Always [ ]
- 2. Often [ ]
- 3. Sometimes [ ]
- 4. Rarely [ ]
- 5. Never [ ]
- 6. Not applicable [ ]
- 7. Don't know [ ]

3.18 Staff are required to report laboratory accidents, and incidents

- 1. Strongly agree [ ]
- 2. Agree [ ]
- 3. Disagree [ ]
- 4. Strongly disagree [ ]
- 5. Not applicable [ ]
- 6. Don't know [ ]

3.19 A record of research projects exists and is maintained at institutional level

- 1. Strongly agree [ ]
- 2. Agree [ ]
- 3. Disagree [ ]
- 4. Strongly disagree [ ]
- 5. Not applicable [ ]
- 6. Don't know [ ]

3.17 A record of hazardous biological materials exists and is maintained at institutional level

- 1. Strongly agree [ ]
- 2. Agree [ ]
- 3. Disagree [ ]
- 4. Strongly disagree [ ]
- 5. Not applicable [ ]
- 6. Don't know [ ]

3.18 Hazardous biological material is safely and securely stored

- 1. Always [ ]
- 2. Often [ ]
- 3. Sometimes [ ]
- 4. Rarely [ ]
- 5. Never [ ]
- 6. Not applicable [ ]
- 7. Don't know [ ]

3.19 Mechanisms exist for staff to report unlawful or irregular conduct (i.e. whistleblowing mechanisms exist)

- 1. Strongly agree [ ]
- 2. Agree [ ]
- 3. Disagree [ ]
- 4. Strongly disagree [ ]
- 5. Not applicable [ ]
- 6. Don't know [ ]

3.20 Measures exist to protect staff who report unlawful or irregular conduct from occupational detriment

- 1. Strongly agree [ ]
- 2. Agree [ ]
- 3. Disagree [ ]
- 4. Strongly disagree [ ]
- 5. Not applicable [ ]
- 6. Don't know [ ]

## Appendix 12: Data tables of responses to survey questions

All figures are percentages of total (n).

I. Research Excellence					
1. Scientific collaboration is encouraged within your department					
	Always and often	Sometimes	Rarely and never	N/A	Don't know
All responses (n=350)	74.57	14.86	8.57	1.14	0.86
Senior staff (n=213)	73.71	16.43	7.98	0.47	1.41
Junior staff (n=135)	75.56	12.59	9.63	1.48	0.74
Technical staff (n=64)	65.63	21.88	6.25	3.13	3.13
Research staff (n=284)	76.41	13.38	9.15	0.35	0.70
2. Scientific collaboration is encouraged within your institution					
	Always and often	Sometimes	Rarely and never	N/A	Don't know
All responses (n=348)	72.99	17.53	8.05	0.29	1.15
Senior staff (n=213)	73.71	18.31	6.57	0.47	0.94
Junior staff (n=133)	71.43	16.54	10.53	0.00	1.50
Technical staff (n=64)	76.56	14.06	7.81	0.00	1.56
Research staff (n=282)	71.99	18.44	8.16	0.35	1.06
3. Scientific collaboration between your institution and other institutions is facilitated					
	Always and often	Sometimes	Rarely and never	N/A	Don't know
All responses (n=348)	54.31	27.87	12.93	0.86	4.02
Senior staff (n=207)	53.62	32.37	8.21	0.48	5.31
Junior staff (n=122)	63.93	22.95	11.48	0.00	1.64
Technical staff (n=64)	56.25	25.00	9.38	1.56	7.81
Research staff (n=282)	54.26	28.01	13.83	0.71	3.19
4. Your institution makes efforts to make any funding it receives transparent					
	Strongly agree and agree	Disagree and strongly disagree	N/A	Don't know	
All responses (n=350)	57.71	24.86	4.00	13.43	
Senior staff (n=213)	58.22	24.41	5.63	11.74	
Junior staff (n=135)	56.30	25.93	1.48	16.30	
Technical staff (n=64)	51.56	20.31	9.38	18.75	
Research staff (n=284)	58.80	26.06	2.82	12.32	

<b>I. Research Excellence</b>				
<b>5. Accountability is required (e.g. through regular reporting of financial expenditure as well as scientific progress)</b>				
	<b>Strongly agree and agree</b>	<b>Disagree and strongly disagree</b>	<b>N/A</b>	<b>Don't know</b>
All responses (n=348)	89.08	5.17	1.44	4.31
Senior staff (n=212)	91.51	3.77	1.89	2.83
Junior staff (n=134)	85.07	7.46	0.75	6.72
Technical staff (n=63)	82.54	4.76	0.00	12.70
Research staff (n=283)	90.46	5.30	1.77	2.47
<b>6. Your institution clearly states its research priorities</b>				
	<b>Strongly agree and agree</b>	<b>Disagree and strongly disagree</b>	<b>N/A</b>	<b>Don't know</b>
All responses (n=348)	75.29	18.10	3.45	3.16
Senior staff (n=211)	71.56	19.91	5.21	3.32
Junior staff (n=135)	80.74	15.56	0.74	2.96
Technical staff (n=64)	73.44	9.38	9.38	7.81
Research staff (n=282)	75.53	20.21	2.13	2.13
<b>7. Research findings are routinely published</b>				
	<b>Strongly agree and agree</b>	<b>Disagree and strongly disagree</b>	<b>N/A</b>	<b>Don't know</b>
All responses (n=349)	82.52	10.03	5.16	2.29
Senior staff (n=212)	80.19	10.85	7.08	1.89
Junior staff (n=135)	86.67	8.15	2.22	2.96
Technical staff (n=64)	67.19	10.94	17.19	4.69
Research staff (n=283)	86.22	9.54	2.47	1.77
<b>8. Good communication exists between policymakers at your facility and the life science community</b>				
	<b>Strongly agree and agree</b>	<b>Disagree and strongly disagree</b>	<b>N/A</b>	<b>Don't know</b>
All responses (n=344)	38.08	45.35	2.33	14.24
Senior staff (n=207)	37.20	47.83	3.86	11.11
Junior staff (n=133)	38.35	42.11	0.00	19.55
Technical staff (n=64)	42.19	34.38	3.13	20.31
Research staff (n=278)	37.05	47.84	2.16	12.95

<b>I. Research Excellence</b>					
<b>9. Good communication exists between policymakers at a national level and the life science community</b>					
	Strongly agree and agree	Disagree and strongly disagree	N/A	Don't know	
All responses (n=347)	21.61	52.45	4.03	21.90	
Senior staff (n=211)	21.80	54.50	6.16	17.54	
Junior staff (n=134)	21.64	49.25	0.00	29.10	
Technical staff (n=64)	28.13	31.25	3.13	37.50	
Research staff (n=281)	20.28	57.30	3.91	18.51	
<b>10. On-going formal and/or informal career training takes place (that is not for postgraduate degree purposes)</b>					
	Always and often	Sometimes	Rarely and never	N/A	Don't know
All responses (n=347)	44.67	32.56	16.43	2.88	3.46
Senior staff (n=212)	46.70	34.91	13.68	1.89	2.83
Junior staff (n=133)	41.35	28.57	21.05	4.51	4.51
Technical staff (n=64)	45.31	25.00	17.19	3.13	9.38
Research staff (n=281)	44.48	34.16	16.37	2.85	2.14
<b>11. Junior researchers and/or staff are nurtured and supported</b>					
	Always and often	Sometimes	Rarely and never	N/A	Don't know
All responses (n=346)	52.31	29.19	14.45	1.73	2.31
Senior staff (n=211)	56.40	25.59	16.11	1.42	0.47
Junior staff (n=133)	45.11	35.34	12.03	2.26	5.26
Technical staff (n=63)	39.68	44.44	9.52	1.59	4.76
Research staff (n=281)	54.80	25.98	15.66	1.78	1.78
<b>12. Staff conducting life science activities have been properly trained</b>					
	Strongly agree and agree	Disagree and strongly disagree	N/A	Don't know	
All responses (n=345)	75.07	16.81	2.03	6.09	
Senior staff (n=210)	73.33	18.10	2.86	5.71	
Junior staff (n=133)	77.44	15.04	0.75	6.77	
Technical staff (n=63)	69.84	17.46	3.17	9.52	
Research staff (n=280)	76.07	16.79	1.79	5.36	



## I. Research Excellence

### 13. Quality control is conducted within the institution for relevant diagnostic tests or experiments to avoid false positives or negative results

	Always and often	Sometimes	Rarely and never	N/A	Don't know
All responses (n=344)	53.49	12.79	9.01	12.21	12.50
Senior staff (n=209)	54.07	11.96	7.66	15.79	10.53
Junior staff (n=133)	51.88	14.29	11.28	6.77	15.79
Technical staff (n=63)	74.60	4.76	4.76	6.35	9.52
Research staff (n=279)	48.39	14.70	10.04	13.62	13.26

### 14. Quality control is conducted between institutions for relevant diagnostic tests or experiments to avoid false positives or negative results

	Always and often	Sometimes	Rarely and never	N/A	Don't know
All responses (n=344)	37.21	12.21	10.47	15.99	24.13
Senior staff (n=209)	35.89	12.92	10.53	20.57	20.10
Junior staff (n=133)	38.35	11.28	10.53	9.02	30.83
Technical staff (n=62)	50.00	11.29	4.84	8.06	25.81
Research staff (n=280)	33.93	12.50	11.79	17.86	23.93

### 15. Samples and reagents are checked to ensure that they match accompanying documentation

	Always and often	Sometimes	Rarely and never	N/A	Don't know
All responses (n=346)	60.40	10.69	5.78	12.14	10.98
Senior staff (n=210)	57.62	10.48	4.76	14.76	12.38
Junior staff (n=134)	64.18	11.19	7.46	5.22	11.94
Technical staff (n=63)	74.60	7.94	4.76	1.59	11.11
Research staff (n=281)	56.94	11.39	6.05	13.17	12.46

### 16. Measures are in place to double check results before they are given to patients/clinicians (for diagnostic laboratories) or published (for research laboratories)

	Strongly agree and agree	Disagree and strongly disagree	N/A	Don't know
All responses (n=344)	58.14	8.14	21.51	12.21
Senior staff (n=209)	55.98	6.70	27.27	10.05
Junior staff (n=133)	60.90	10.53	12.78	15.79
Technical staff (n=63)	69.84	1.59	20.63	7.94
Research staff (n=279)	55.20	9.68	21.86	13.26

## I. Research Excellence

17. Education and/or training is offered on dual-use issues. This refers to the potential for data that was generated for beneficial purposes to be misused for malicious purposes by a third party.

	Strongly agree and agree	Disagree and strongly disagree	N/A	Don't know
All responses (n=344)	28.20	18.31	18.31	35.17
Senior staff (n=211)	26.54	21.33	22.27	29.86
Junior staff (n=132)	30.30	13.64	12.12	43.94
Technical staff (n=64)	32.81	14.06	17.19	35.94
Research staff (n=279)	26.88	19.35	18.64	35.13

18. Skilled staff are valued and retained

	Always and often	Sometimes	Rarely and never	N/A	Don't know
All responses (n=347)	31.70	38.04	25.36	0.58	4.32
Senior staff(n=211)	29.38	40.76	28.91	0.00	0.95
Junior staff (n=146)	20.55	21.23	47.26	8.90	2.05
Technical staff (n=64)	35.94	28.13	32.81	0.00	3.13
Research staff (n=281)	30.60	40.21	23.84	0.71	4.63

19. National legislation and policy fosters scientific development and freedom

	Strongly agree and agree	Disagree and strongly disagree	N/A	Don't know
All responses (n=336)	41.37	39.58	1.19	17.86
Senior staff (n=206)	39.32	42.72	0.97	16.99
Junior staff (n=128)	45.31	34.38	1.56	18.75
Technical staff (n=61)	40.98	37.70	3.28	18.03
Research staff (n=273)	41.76	39.93	0.73	17.58

<b>II. Ethics</b>					
<b>1. Education and/or training is offered on research ethics including issues such as scientific misconduct (falsification, fabrication and plagiarism)</b>					
	Always and often	Sometimes	Rarely and never	N/A	Don't know
All responses (n=323)	43.65	29.10	23.84	1.55	1.86
Senior staff (n=197)	39.09	31.98	24.87	2.03	2.03
Junior staff (n=151)	41.72	19.21	34.44	1.32	3.31
Technical staff (n=59)	35.59	33.90	22.03	1.69	6.78
Research staff (n=262)	45.80	28.24	23.66	1.53	0.76
<b>2. Appropriate ethical research guidelines and practices have been published</b>					
		Strongly agree and agree	Disagree and strongly disagree	N/A	Don't know
All responses (n=323)		63.78	17.96	6.81	11.46
Senior staff (n=211)		56.40	21.33	13.27	9.00
Junior staff (n=124)		70.16	9.68	6.45	13.71
Technical staff (n=59)		59.32	10.17	11.86	18.64
Research staff (n=262)		65.27	19.47	5.73	9.54
<b>3. Appropriate ethical research guidelines and practices are implemented</b>					
	Always and often	Sometimes	Rarely and never	N/A	Don't know
All responses (n=322)	66.77	14.91	3.11	6.21	9.01
Senior staff (n=197)	66.50	15.23	3.05	7.11	8.12
Junior staff (n=123)	67.48	14.63	3.25	4.88	9.76
Technical staff (n=59)	66.10	13.56	1.69	5.08	13.56
Research staff (n=261)	67.05	15.33	3.45	6.51	7.66
<b>4. Adequate mechanisms exist for investigating and responding to non-adherence to ethical standards</b>					
		Strongly agree and agree	Disagree and strongly disagree	N/A	Don't know
All responses (n=350)		48.57	20.57	3.14	19.43
Senior staff (n=213)		51.17	20.66	1.88	18.31
Junior staff (n=135)		30.37	24.44	22.22	5.19
Technical staff (n=64)		43.75	20.31	3.13	25.00
Research staff (n=284)		49.65	20.42	3.17	18.31

## II. Ethics

### 5. Measures are in place to prevent non-laboratory individuals from obtaining access to samples or biological materials

	Strongly agree and agree	Disagree and strongly disagree	N/A	Don't know
All responses (n=350)	62.57	14.29	7.14	7.43
Senior staff (n=213)	61.03	13.62	8.92	7.98
Junior staff (n=135)	64.44	15.56	5.19	5.93
Technical staff (n=64)	71.88	10.94	1.56	6.25
Research staff (n=284)	60.21	15.14	8.80	7.39

### 6. Measures are in place to prevent non-laboratory individuals from providing confidential information to people outside the laboratory

	Strongly agree and agree	Disagree and strongly disagree	N/A	Don't know
All responses (n=350)	54.00	13.71	12.86	10.86
Senior staff (n=213)	61.03	13.62	8.92	7.98
Junior staff (n=135)	64.44	15.56	5.19	5.93
Technical staff (n=64)	71.88	10.94	1.56	6.25
Research staff (n=284)	60.21	15.14	8.80	7.39

### 7. Discussions in the facility focus on the broader implications of your life science activities for society in general

	Always and often	Sometimes	Rarely and never	N/A	Don't know
All responses (n=322)	38.20	30.43	22.36	3.73	5.28
Senior staff (n=196)	34.69	31.12	25.51	5.10	3.57
Junior staff (n=124)	42.74	29.84	17.74	1.61	8.06
Technical staff (n=58)	36.21	27.59	17.24	6.90	12.07
Research staff (n=262)	38.17	31.30	23.66	3.05	3.82

### 8. Scientists are competent to assess the potential broader implications of their life science activities for society in general

	Strongly agree and agree	Disagree and strongly disagree	N/A	Don't know
All responses (n=350)	70.29	14.00	6.29	1.71
Senior staff (n=213)	69.01	15.02	2.35	6.10
Junior staff (n=135)	71.85	12.59	6.67	1.48
Technical staff (n=64)	65.63	14.06	3.13	9.38
Research staff (n=284)	71.13	14.08	1.41	5.63

## II. Ethics

### 9. Research is subject to a risk assessment that includes considerations of the broader implications of their life science activities for the environment

	Always and often	Sometimes	Rarely and never	N/A	Don't know
All responses (n=320)	44.38	22.50	15.31	4.69	13.13
Senior staff (n=196)	45.92	20.92	16.33	6.63	10.20
Junior staff (n=122)	40.98	25.41	13.93	1.64	18.03
Technical staff (n=59)	44.07	20.34	10.17	5.08	20.34
Research staff (n=259)	44.02	23.17	16.60	4.63	11.58

### 10. Scientists are competent to make the assessment of the broader implications of their life science activities for the environment

	Strongly agree and agree	Disagree and strongly disagree	N/A	Don't know
All responses (n=350)	66.86	10.29	3.14	10.57
Senior staff (n=213)	65.26	12.21	3.76	10.33
Junior staff (n=135)	68.89	7.41	2.22	11.11
Technical staff (n=64)	59.38	7.81	6.25	17.19
Research staff (n=284)	68.31	10.92	2.46	9.15

### 11. Potential for misuse of the research is considered at all stages of research/ diagnostic processes and appropriate action taken if necessary

	Strongly agree and agree	Disagree and strongly disagree	N/A	Don't know
All responses (n=350)	50.00	17.71	8.29	16.29
Senior staff (n=213)	48.83	18.31	9.86	15.49
Junior staff (n=135)	51.85	16.30	5.93	17.78
Technical staff (n=64)	42.19	18.75	10.94	20.31
Research staff (n=284)	51.76	17.25	7.75	15.49

### 12. Researchers know how to assess whether the risk outweighs the benefit of continuing with their research activities

	Strongly agree and agree	Disagree and strongly disagree	N/A	Don't know
All responses (n=350)	54.86	19.14	10.86	8.29
Senior staff (n=213)	52.11	20.66	7.98	10.80
Junior staff (n=135)	58.52	17.04	4.44	11.11
Technical staff (n=64)	43.75	15.63	10.94	21.88
Research staff (n=284)	57.04	20.07	8.45	1.76

<b>II. Ethics</b>						
<b>13. A code of conduct/practice for life scientists exists at an institutional level</b>						
		<b>Strongly agree and agree</b>	<b>Disagree and strongly disagree</b>	<b>N/A</b>	<b>Don't know</b>	
All responses (n=350)		57.71	16.29	1.14	17.14	
Senior staff (n=213)		54.93	19.72	1.41	16.43	
Junior staff (n=135)		62.22	11.11	0.74	17.78	
Technical staff (n=64)		54.69	18.75	0.00	18.75	
Research staff (n=284)		58.45	15.85	1.41	16.55	
<b>14. A code of conduct/practice for life scientists exists at a national level</b>						
		<b>Strongly agree and agree</b>	<b>Disagree and strongly disagree</b>	<b>N/A</b>	<b>Don't know</b>	
All responses (n=350)		36.86	14.29	0.57	40.29	
Senior staff (n=213)		36.15	16.90	0.94	38.03	
Junior staff (n=135)		38.52	10.37	0.00	42.96	
Technical staff (n=64)		42.19	10.94	0.00	39.06	
Research staff (n=284)		35.92	15.14	0.70	40.14	
<b>15. Researchers are aware of and informed about national and international conventions, laws and regulations related to their research</b>						
		<b>Strongly agree and agree</b>	<b>Disagree and strongly disagree</b>	<b>N/A</b>	<b>Don't know</b>	
All responses (n=350)		47.43	28.00	1.43	15.14	
Senior staff (n=213)		47.42	27.70	2.35	14.55	
Junior staff (n=135)		48.15	28.15	0.00	15.56	
Technical staff (n=64)		51.56	21.88	1.56	17.19	
Research staff (n=284)		46.83	29.23	1.41	14.44	
<b>16. An ethics committee assesses research proposals involving human subjects</b>						
		<b>Always and often</b>	<b>Sometimes</b>	<b>Rarely and never</b>	<b>N/A</b>	<b>Don't know</b>
All responses (n=322)		69.88	3.11	0.31	19.88	6.83
Senior staff (n=197)		69.04	4.57	0.00	22.84	3.55
Junior staff (n=123)		72.36	0.81	0.81	13.82	12.20
Technical staff (n=58)		53.45	5.17	0.00	31.03	10.34
Research staff (n=262)		74.05	2.67	0.38	16.79	6.11

<b>II. Ethics</b>					
<b>17. An ethics committee assesses research proposals involving animal subjects</b>					
	Always and often	Sometimes	Rarely and never	N/A	Don't know
All responses (n=323)	80.80	1.24	1.24	11.15	5.57
Senior staff (n=197)	81.22	1.52	1.02	11.68	4.57
Junior staff (n=124)	79.84	0.81	1.61	10.48	7.26
Technical staff (n=59)	67.80	5.08	0.00	16.95	10.17
Research staff (n=262)	83.59	0.38	1.53	9.92	4.58
<b>18. A review process exists to assess ethical issues raised by research proposals not involving human or animal subjects</b>					
	Strongly agree and agree	Disagree and strongly disagree	N/A	Don't know	
All responses (n=350)	44.57	12.86	7.43	26.57	
Senior staff (n=213)	44.60	15.49	7.98	23.47	
Junior staff (n=135)	44.44	8.15	6.67	31.85	
Technical staff (n=64)	40.63	3.13	14.06	32.81	
Research staff (n=284)	45.42	14.79	5.99	25.35	
<b>19. Information about the national and international conventions and regulations related to all fields of science is easily accessible</b>					
	Strongly agree and agree	Disagree and strongly disagree	N/A	Don't know	
All responses (n=350)	38.57	32.57	0.29	20.57	
Senior staff (n=213)	37.56	32.86	0.47	21.60	
Junior staff (n=135)	40.74	31.11	0.00	19.26	
Technical staff (n=64)	35.94	29.69	0.00	26.56	
Research staff (n=284)	39.44	32.75	0.35	19.37	
<b>20. National legislation and policy relevant to the life sciences provides protection against the misuse of science</b>					
	Strongly agree and agree	Disagree and strongly disagree	N/A	Don't know	
All responses (n=350)	34.86	17.71	1.14	38.00	
Senior staff (n=213)	35.21	19.25	1.41	36.15	
Junior staff (n=135)	34.07	15.56	0.74	40.74	
Technical staff (n=64)	29.69	15.63	1.56	45.31	
Research staff (n=284)	35.92	18.31	1.06	36.27	

### III. Laboratory Biosafety and Biosecurity

#### 1. Facilities and equipment are appropriate to the level of work being done and are adequately maintained

	Strongly agree and agree	Disagree and strongly disagree	N/A	Don't know
All responses (n=305)	72.79	23.93	1.31	1.97
Senior staff (n=190)	69.47	26.32	2.11	2.11
Junior staff (n=113)	77.88	20.35	0.00	1.77
Technical staff (n=57)	87.72	8.77	0.00	3.51
Research staff (n=246)	69.11	27.64	1.63	1.63

#### 2. Training of staff is appropriate to the facilities and equipment and the work being conducted

	Strongly agree and agree	Disagree and strongly disagree	N/A	Don't know
All responses (n=304)	77.96	18.09	1.32	2.63
Senior staff (n=190)	77.89	17.89	2.11	2.11
Junior staff (n=112)	77.68	18.75	0.00	3.57
Technical staff (n=56)	76.79	14.29	1.79	7.14
Research staff (n=246)	78.05	19.11	1.22	1.63

#### 3. Researchers have somewhere to turn to get competent advice if they have safety or security questions relating to their research

	Strongly agree and agree	Disagree and strongly disagree	N/A	Don't know
All responses (n=303)	69.31	21.78	1.65	7.26
Senior staff (n=188)	67.02	22.87	2.66	7.45
Junior staff (n=113)	72.57	20.35	0.00	7.08
Technical staff (n=57)	73.68	14.04	1.75	10.53
Research staff (n=244)	68.03	23.77	1.64	6.56

#### 4. National legislation/regulation exists that sets safety and security practices and procedures for laboratories

	Strongly agree and agree	Disagree and strongly disagree	N/A	Don't know
All responses (n=304)	64.47	10.86	2.63	22.04
Senior staff (n=189)	64.02	11.11	4.23	20.63



<b>III. Laboratory Biosafety and Biosecurity</b>					
Junior staff (n=113)	65.49	10.62	0.00	23.89	
Technical staff (n=57)	68.42	7.02	1.75	22.81	
Research staff (n=245)	63.67	11.84	2.86	21.63	
<b>5. An assessment of the biosafety and biosecurity risk associated with research activities is conducted</b>					
	<b>Always and often</b>	<b>Sometimes</b>	<b>Rarely and never</b>	<b>N/A</b>	<b>Don't know</b>
All responses (n=305)	43.61	20.33	15.08	6.56	14.43
Senior staff (n=190)	43.68	20.53	14.74	8.95	12.11
Junior staff (n=113)	42.48	20.35	15.93	2.65	18.58
Technical staff (n=57)	40.35	28.07	14.04	3.51	14.04
Research staff (n=246)	43.90	18.70	15.45	7.32	14.63
<b>6. Risk assessments are able to identify requirements for risk reduction measures including the level of containment required</b>					
		<b>Strongly agree and agree</b>	<b>Disagree and strongly disagree</b>	<b>N/A</b>	<b>Don't know</b>
All responses (n=298)		59.40	11.07	8.72	20.81
Senior staff (n=184)		57.07	12.50	11.41	19.02
Junior staff (n=112)		63.39	8.93	3.57	24.11
Technical staff (n=56)		67.86	7.14	0.00	25.00
Research staff (n=240)		57.50	12.08	10.42	20.00
<b>7. Biosafety training is provided to all those working in laboratories when appropriate</b>					
		<b>Strongly agree and agree</b>	<b>Disagree and strongly disagree</b>	<b>N/A</b>	<b>Don't know</b>
All responses (n=300)		66.00	17.33	6.00	10.67
Senior staff (n=188)		62.77	19.15	8.51	9.57
Junior staff (n=110)		70.91	14.55	1.82	12.73
Technical staff (n=57)		77.19	12.28	1.75	8.77
Research staff (n=241)		63.07	18.67	7.05	11.20

### III. Laboratory Biosafety and Biosecurity

#### 8. Biosecurity training is provided to all those working in laboratories when appropriate

	Strongly agree and agree	Disagree and strongly disagree	N/A	Don't know
All responses (n=300)	66.00	17.33	6.00	10.67
Senior staff (n=189)	44.97	29.63	11.11	14.29
Junior staff (n=113)	59.29	16.81	4.42	19.47
Technical staff (n=57)	66.67	17.54	1.75	14.04
Research staff (n=245)	46.53	26.53	10.20	16.73

#### 9. Biosafety training includes a test of competence

	Always and often	Sometimes	Rarely and never	N/A	Don't know
All responses (n=302)	26.82	12.91	23.51	10.93	25.83
Senior staff (n=188)	25.00	13.83	22.34	13.83	25.00
Junior staff (n=112)	29.46	11.61	25.89	5.36	27.68
Technical staff (n=57)	40.35	21.05	19.30	1.75	17.54
Research staff (n=243)	23.46	11.11	24.69	12.76	27.98

#### 10. Biosecurity training includes a test of competence

	Always and often	Sometimes	Rarely and never	N/A	Don't know
All responses (n=346)	19.36	9.83	21.97	24.86	23.99
Senior staff (n=188)	25.00	13.83	22.34	13.83	25.00
Junior staff (n=112)	29.46	11.61	25.89	5.36	27.68
Technical staff (n=57)	40.35	21.05	19.30	1.75	17.54
Research staff (n=243)	23.46	11.11	24.69	12.76	27.98

#### 11. Standard operating procedures have been developed (in your facility)

	Strongly agree and agree	Disagree and strongly disagree	N/A	Don't know
All responses (n=300)	75.00	15.33	4.33	5.33
Senior staff (n=187)	74.87	13.37	5.88	5.88
Junior staff (n=111)	74.77	18.92	1.80	4.50
Technical staff (n=57)	87.72	7.02	0.00	5.26
Research staff (n=241)	71.78	17.43	5.39	5.39

### III. Laboratory Biosafety and Biosecurity

#### 12. Staff are trained to work according to the standard operating procedures

	Strongly agree and agree	Disagree and strongly disagree	N/A	Don't know
All responses (n=301)	66.45	18.60	6.64	8.31
Senior staff (n=188)	66.49	17.02	9.57	6.91
Junior staff (n=111)	65.77	21.62	1.80	10.81
Technical staff (n=56)	78.57	12.50	0.00	8.93
Research staff (n=243)	63.37	20.16	8.23	8.23

#### 13. Staff are regularly tested to ensure competence in the standard operating procedures

	Strongly agree and agree	Disagree and strongly disagree	N/A	Don't know
All responses (n=304)	29.93	48.36	8.55	13.16
Senior staff (n=190)	30.00	50.00	11.58	8.42
Junior staff (n=112)	29.46	45.54	3.57	21.43
Technical staff (n=57)	54.39	36.84	1.75	7.02
Research staff (n=284)	20.77	44.01	8.80	12.68

#### 14. Legislation/regulations exist to address hazardous waste disposal

	Strongly agree and agree	Disagree and strongly disagree	N/A	Don't know
All responses (n=302)	87.75	4.64	1.66	5.96
Senior staff (n=185)	88.65	4.32	2.70	4.32
Junior staff (n=112)	85.71	5.36	0.00	8.93
Technical staff (n=57)	92.98	3.51	0.00	3.51
Research staff (n=284)	73.94	4.23	1.76	5.63

#### 15. Legislation/regulations regarding hazardous waste disposal are followed

	Always and often	Sometimes	Rarely and never	N/A	Don't know
All responses (n=301)	74.42	9.30	3.65	2.99	9.63
Senior staff (n=188)	76.06	6.91	3.72	4.26	9.04
Junior staff (n=111)	71.17	13.51	3.60	0.90	10.81
Technical staff (n=57)	78.95	10.53	3.51	0.00	7.02
Research staff (n=242)	73.14	9.09	3.72	3.72	10.33

### III. Laboratory Biosafety and Biosecurity

#### 16. Occupational health surveillance mechanisms exist and are followed (at institutional level)

	Strongly agree and agree	Disagree and strongly disagree	N/A	Don't know
All responses (n=303)	61.39	21.78	2.97	13.86
Senior staff (n=189)	66.14	21.16	2.65	10.05
Junior staff (n=112)	52.68	23.21	3.57	20.54
Technical staff (n=57)	71.93	19.30	0.00	8.77
Research staff (n=284)	50.35	19.37	3.17	13.03

#### 17. Occupational health reporting mechanisms effective at institutional level

	Always and often	Sometimes	Rarely and never	N/A	Don't know
All responses (n=299)	44.15	20.74	12.37	1.34	21.40
Senior staff (n=188)	43.62	23.40	13.30	2.13	17.55
Junior staff (n=109)	44.04	16.51	11.01	0.00	28.44
Technical staff (n=55)	54.55	25.45	9.09	0.00	10.91
Research staff (n=242)	41.32	19.83	13.22	1.65	23.97

#### 18. Staff are required to report laboratory accidents and incidents

	Strongly agree and agree	Disagree and strongly disagree	N/A	Don't know
All responses (n=302)	89.07	3.97	4.97	1.99
Senior staff (n=189)	89.95	4.76	2.65	2.65
Junior staff (n=111)	87.39	2.70	0.90	9.01
Technical staff (n=56)	96.43	0.00	0.00	3.57
Research staff (n=284)	75.00	4.23	2.11	4.58

#### 19. A record of research projects exists and is maintained at institutional level

	Strongly agree and agree	Disagree and strongly disagree	N/A	Don't know
All responses (n=302)	68.54	12.58	2.32	16.56
Senior staff (n=188)	65.43	13.30	3.19	18.09
Junior staff (n=112)	73.21	11.61	0.89	14.29
Technical staff (n=57)	73.68	5.26	3.51	17.54
Research staff (n=284)	57.39	12.32	1.76	14.08

### III. Laboratory Biosafety and Biosecurity

#### 20. A record of hazardous biological materials exists and is maintained at institutional level

	Strongly agree and agree	Disagree and strongly disagree	N/A	Don't know
All responses (n=302)	51.99	16.89	5.96	25.17
Senior staff (n=213)	44.13	15.02	7.51	22.07
Junior staff (n=135)	45.93	14.07	0.74	21.48
Technical staff (n=64)	60.94	9.38	1.56	17.19
Research staff (n=284)	41.20	15.85	5.63	22.89

#### 21. Hazardous biological material is safely and securely stored

	Always and often	Sometimes	Rarely and never	N/A	Don't know
All responses (n=305)	68.20	9.51	2.95	7.21	12.13
Senior staff (n=190)	69.47	7.89	2.63	9.47	10.53
Junior staff (n=113)	66.37	12.39	3.54	2.65	15.04
Technical staff (n=57)	71.93	14.04	3.51	3.51	7.02
Research staff (n=246)	67.48	8.54	2.85	7.72	13.41

#### 22. Mechanisms exist for staff to report unlawful or irregular conduct (i.e. whistle-blowing mechanisms exist)

	Strongly agree and agree	Disagree and strongly disagree	N/A	Don't know
All responses (n=302)	64.24	15.89	0.99	18.87
Senior staff (n=213)	62.91	11.27	0.94	13.62
Junior staff (n=135)	43.70	17.78	0.74	20.00
Technical staff (n=64)	65.63	14.06	0.00	7.81
Research staff (n=284)	53.17	13.73	1.06	17.96

#### 23. Measures exist to protect staff who report unlawful or irregular conduct from occupational detriment

	Strongly agree and agree	Disagree and strongly disagree	N/A	Don't know
All responses (n=298)	37.25	21.48	0.34	40.94
Senior staff (n=213)	33.80	17.37	1.41	35.21
Junior staff (n=135)	28.15	20.00	0.74	34.07
Technical staff (n=64)	40.63	18.75	0.00	29.69
Research staff (n=284)	29.58	18.31	1.41	35.92



