Animal Medicines Australia
ABN 76 116 848 344 | ACN 116 848 344
18 National Circuit
Barton ACT 2600, Australia
P: +61 2 6257 9022
animalmedicinesaustralia.org.au

9 April 2021

Critical Technologies Coordination Office
The Department of the Prime Minister and Cabinet
PO Box 6500
Canberra ACT 2600

By email only: ContactCTPCO@pmc.gov.au

Dear Sir/Madam,

Re: Submission to Critical Technologies Discussion Paper: Agriculture

Thank you for the opportunity to provide a submission to the Critical Technologies Discussion Paper (the discussion paper). We welcome the opportunity to assist the government in identifying current and emerging critical technologies that are key to the prosperity of Australia's agricultural sector.

Animal Medicines Australia (AMA) is the peak industry association representing Australia's animal health sector. Our members are the local divisions of global innovators, manufacturers, formulators and registrants that supply essential veterinary medicines and animal health products that are critical to supporting Australia's $28 billion dollar livestock industry and the $13 billion pet industry.

AMA notes that, in its current format, the discussion paper is focussed on cropping, with little reference to livestock production. The scope of the project should be expanded to include critical technologies that will assist farmers and veterinarians in protecting and promoting the health of Australia's livestock.

We look forward to continuing engagement on this important topic. If we can provide additional information at this time, please do not hesitate to contact me.

Yours Sincerely,

(unsigned for electronic submission)

Dr Charmian Bennett
Director of Science and Policy

SUBMISSION TO THE

Critical Technologies Discussion Paper: Agriculture

9 April 2021

Animal Medicines Australia

Introduction

Animal Medicines Australia (AMA) is the peak body representing the leading animal health companies in Australia. AMA member companies are the innovators, manufacturers, formulators and registrants of a broad range of veterinary medicine products that prevent, control and cure disease across the companion animal, livestock and equine sectors.

Improved animal health is integral to sustainable food production, with the health of animals inextricably linked to the health and wellbeing of people and the environment. Innovation in animal health reduces the threat of disease to both animals and people through improved disease resistance, improved disease prevention strategies, earlier and more specific diagnosis, and accurate and effective treatment. Supporting innovation in animal health supports sustainable production systems, greater food safety and security, and improved animal welfare with fewer animals lost to preventable disease.

Healthy animals promote greater food and fibre production with fewer resources. To meet the demands of the world's growing population, predicted to increase to 9.8 billion by 2050, global food production must increase by more than 70 per cent, presenting an unprecedented challenge in the face of global environmental change, as well as consumption and trade volatilities. Australia's ability to deliver on reliable, safe and sustainable production and trade of animals and animal-derived commodities is dependent on the successful adoption of new technologies.

Bringing an innovative new animal health product to market is a very long and costly process, taking (on average) five to 15 years and costing more than US$100 million.[1] Regulatory processes therefore need to support timely, appropriate, risk- and science-based evaluation of new technological developments. Policy settings should establish clear pathways to support technology and innovation adoption.

As outlined in AMA's submission to the *Draft Report of the Independent Review of the Agvet Chemicals Regulatory System* (the Draft Report)[2], technological advancements in agriculture must be fostered across broad areas – this could include the use of drones, genetics, remote sensing, management systems, information technology, data mining and many others. Attempts to pick "winners" in future technologies must be discouraged, as it is difficult, if not impossible, to envisage exactly which technologies will provide the most benefit to Australian farming in the future.

In progressing an innovation agenda, there will be areas where governments can reduce hurdles and roadblocks. This will include how industry, stakeholders and governments interface, and recognition of intellectual property and other incentives that will assist development and implementation. This could, in turn, boost the potential value of Australian-developed technologies in international economies. Some elements of an Innovation Agenda could include:

- eliminating barriers;
- seamless systems;
- incentivising development;
- facilitating collaboration;
- inviting regulatory innovation;
- championing science and risk-based approaches;

[1] Hunter, Shryock and Cox (2011). *Overview of the animal health drug development and registration process: An industry perspective*. Future Medicinal Chemistry, 3(7): 881-6.

[2] AMA Submission to the Draft report of the Independent Review of the Agvet Chemicals Regulatory Framework

- ensuring unencumbered trade of animals and animal commodities;
- supporting public health and animal welfare; and
- meeting the Social License challenge.

In Summary:

AMA is pleased to provide the following comments to the *Critical Technologies Discussion Paper: Agriculture* (the discussion paper).

AMA supports the government's commitment to identifying current and emerging critical technologies that are key to the prosperity of Australia's agricultural sector. In its current format, however, the discussion paper appears to overlook the significant contribution made by the animal health and livestock sectors in Australia's agricultural productivity. The scope of the project should be expanded to include critical technologies that will assist farmers and veterinarians in protecting and promoting the health of Australia's livestock.

Scope of the discussion paper

In its current format, the discussion paper is focussed on cropping, with little mention of livestock production. In particular, the examples provided to illustrate the eight proposed priorities refer almost exclusively to innovations that would assist crop production, with no examples relating to livestock production included in the discussion paper. The scope of the project should be expanded to include critical technologies that will assist farmers and veterinarians in protecting and promoting the health of Australia's livestock. Further consultation with key stakeholders in the livestock production sector will ensure the Critical Technologies Policy Coordination Office (CTPCO) is cognisant of the challenges facing Australian farmers in their aspiration to improve the health and productivity of Australia's livestock production sector.

Animal medicines support up to 15 per cent of livestock production output[3], contributing $2.7 billion in added value to Australia's agricultural sector. However most of Australia's livestock populations are stagnant or in decline. Australia's sheep flock has declined from 170.3 million in 1990 to just 65.8 million in 2019. The national beef herd has varied between 23-28 million, with female slaughter rates increasing due to drought-related destocking. Dairy cattle numbers peaked in the late 1950s and 1960s at around 5 million head, with a current herd of slightly more than 3 million head. Yet over the same period, there have been significant increases in animal productivity through breeding, husbandry, management and judicious use of veterinary medicines. Innovative solutions are required to address the challenges of maintaining Australia's high quality livestock herds and agricultural reputation in the future during extreme climatic conditions and competitive international markets.

Maintaining the health and welfare of livestock is critically important for productive, ethical and sustainable livestock industries. Scientific advances and emerging technologies in animal health, from artificial intelligence to stem cell therapy and new generations of vaccines, will continue to provide opportunities to predict, prevent, diagnose and treat animal illness more quickly, accurately and safely, thereby improving animal welfare, protecting livelihoods and rural communities, and increasing the efficiency and sustainability of agricultural production.

Digital technology, big data and the internet of things

The discussion paper makes eight proposals regarding critical technologies, some of which would be reliant on the agricultural industry's ability to access and harness "big data" in future. The big data revolution is a critical technology in and of itself.

As computers and mobile applications become more widespread, powerful and interconnected, the ability for the agricultural industries to collect and analyse large amounts of data is increasing. This provides many opportunities to develop new insights into animal health and welfare through better monitoring of individual animals, and the detection, control and treatment of livestock diseases, as well as the interconnections with human health and the environment embodied in a One Health approach.

Government investment in the big data revolution would greatly assist the livestock industries in contributing to the National Farmers Federation's (NFF's) vision of agriculture exceeding $100 billion in farm gate output by 2030,[4] and meeting the challenge of feeding an increasing global population

[3] AMA Economic contribution of animal health products to Australia's livestock industries
[4] 2030 Roadmap - National Farmers' Federation (nff.org.au)

without contributing to deforestation, by managing existing farming land more sustainably and improving the health and welfare of livestock in Australia.

Increasingly, "smart" technologies are being utilised to improve the diagnosis, treatment and management of disease in both people and animals. As outlined by Animal Health Australia in their report *Megatrends, opportunities and challenges facing Australian livestock industries*, these technologies and the ability for the animal production industry to analyse and share big data are key to future strategies for disease surveillance (remote sensing), diagnostics (robotics/artificial intelligence) and emergency disease management (risk-mapping for preparedness, response, eradication and proof of disease absence).[5]

AgriFutures have similarly identified the Internet of Things as a key transformative technology for agriculture – limited only in scope by the imagination of innovators.[6] Communication technologies with reliable spatial data coverage are critical to the successful development and expansion of these key technologies and on-farm adoption. [7]

Various digital technologies, including mobile apps, have been developed to support disease monitoring, generate early warning alerts and improve the response of farmers, health workers and veterinarians to disease outbreaks and threats. Digital technology offers opportunities for veterinary medicine to become more efficient and precise, enabling an individual-level of veterinary care even in large groups of animals. Greater adoption and utility of these technologies could be facilitated by the use of e-labels that contain smart content on animal medicine products, a concept being discussed at both a national and global level.

Wearable technologies are playing an increasing role in disease prevention and enable farmers and veterinarians to treat herds at an individual level on a scale that was previously not possible. Tracking devices such as ear tags and biosensors can offer real-time data on an animal's health, behaviour, movement and feeding and watering habits – alerting farmers to the early warning signs of ill health or disease outbreaks.

Technological advances in surveillance methods, including cameras, microphones and sensors can produce accurate, continuous data regarding animal health and wellbeing, productivity and performance. These innovations allow for earlier diagnosis and targeted treatments, leading to improved animal health and reduced costs – for example, detecting early signs of disease based on the volume and frequency of feed consumption or using thermal cameras to detect the first elevated temperature amongst a herd of animals.

As highlighted in the discussion paper, biological sensors would provide an invaluable tool for detection of biological materials, with a role in countering both biosecurity and national security threats. Further consideration of how this technology could be applied more broadly to local biosecurity management, disease outbreak and spread would be valuable.

Software systems that can capture the increasing wealth of data provided by these digital technologies and predict disease or health challenges before they occur are critical for improving the productivity and welfare of livestock production in Australia. Through approaches like machine learning technologies and artificial intelligence-driven algorithms, tools can be developed that are

[5] Megatrends, Opportunities and Challenges Facing Australian Livestock Industries – Animal Health Australia
[6] Rural Industry Futures: Megatrends impacting Australian agriculture over the coming twenty years (agrifutures.com.au)
[7] decadal-plan-agricultural-sciences-final-draft-nov16.pdf

capable of analysing continuous on-farm data, predicting likely health threats and facilitating effective preventative actions.

For example, in 2006, an outbreak of Rift Valley fever in East Africa was predicted two months before the first cases began to emerge, enabling early warnings and actions.[8] Paired with existing data spanning 60 years, contemporary satellite rainfall and vegetation data identified a correlation between the *El Niño* weather pattern and disease outbreaks. Utilising historical and contemporary climatic data could be invaluable for predicting and preparing for disease outbreaks in both humans and livestock, and greatly assist in minimising the spread of infectious and zoonotic diseases. AMA notes the inclusion of CubeSat space-based sensors in the eight priorities outlined in the discussion paper. Further exploration by the CTPCO regarding the applicability of this technology in monitoring disease outbreak and spread would be valuable. Similarly, further consideration by the CTPCO regarding the application of global positioning systems for livestock health management would be valuable.

Significant barriers to the widespread development and adoption of digital technologies and integration of digital technologies into routine animal health care and production include a lack of certainty and clarity regarding regulatory requirements, responsibilities and confidentiality. For data-driven solutions to reach their full potential, it is crucial that regulators ensure adequate and effective data protection for all stakeholders, without stifling the potential of digital solutions. Limited connectivity in many parts of rural Australia is a major barrier to digital advancements. Improving access to telecommunications and internet in rural areas is vital to facilitate the uptake of digital innovations.

Critical innovations in animal health

Antibiotics are a cornerstone of modern medicine and public health protection against infectious diseases – there are no alternatives to treating life-threatening bacterial infections. Antimicrobial resistance (AMR) is recognised globally as a significant threat to both human and animal health. The animal health sector envisages a future where the effectiveness of veterinary antibiotics as a therapeutic tool is maintained and these important medicines are used responsibly to protect and treat animals. Equally important, however, is the increasing challenge of addressing antimicrobial resistance in human health, and protecting and improving food safety and security.

As part of a global commitment to address these interconnected challenges, AMA and its member companies have committed to five principles and practical actions, including to invest in development of new products that reduce reliance on antibiotics.[9] This includes company investment of 6 - 9 % of annual turnover in the development of new products, diagnostics, genetics and life-cycle management of existing products. Globally, this is expected to equate to an annual investment by animal health companies of around US$1.8 to 2.7 billion for prevention and treatment options for livestock and companion animals.

New compounds that offer a novel way to target bacteria without using antibiotics are among the most valuable potential innovations in animal and human health care. The animal health sector has prioritised the research and development of alternative technologies, such as bacteriophages, antimicrobial peptides, ambient cold plasmas, nanotechnology and immunotherapies.

[8] https://earthobservatory.nasa.gov/images/37025/predicting-rift-valley-fever
[9] AB-Commitment-Australia.pdf (animalmedicinesaustralia.org.au)

Other innovations can reduce the need to use antibiotics by preventing disease occurrence. Vaccines are one of the most reliable and effective ways to prevent animal diseases. The global movement of people, animals and food reduces geographical barriers to disease, while a changing climate can allow disease vectors to thrive in new areas. The role of vaccines in preventing previously deadly and costly livestock diseases, improve animal health and wellbeing, increase agricultural productivity and reduce reliance on antimicrobials highlights the importance of integrated approaches to agricultural innovation.

Warming temperatures due to climate change are also resulting in parasite species being able to thrive in new regions, increasing the urgency to discover new parasiticides and other effective methods of parasite control to improve animal and human health through the control of zoonotic and other vector-borne diseases, increase productivity, reduce environmental impacts and manage parasiticide resistance.

AMA supports the inclusion of computational chemistry and bio-composites as priority technologies in the discussion paper. These technologies have considerable potential for increased adoption in veterinary medicine discovery and further consideration by the CTPCO of their application in the animal health sector is welcomed. AMA notes, however, that other innovative pathways for animal health product discovery and development should not be excluded from the CTPCO's list of technology priorities.

Gene editing technologies

AMA supports the inclusion of gene technologies in the list of proposed priorities in the discussion paper. By allowing for small and precise heritable changes to the genome of animals, gene editing technologies can replicate naturally occurring changes in the process of genetic variation and take advantage of naturally occurring mutations. This process has already been successfully utilised to improve livestock production and animal health and welfare, for example, by breeding virus-resistant pigs and polled cattle.[10]

To date, interactions between AMA members and Australia's Gene Technology Regulator have primarily concerned animal vaccines. However, gene technologies and genetic modification are becoming increasingly important tools in veterinary medicine, just as they are in human medicine. In the future, innovative new veterinary medicines developed using gene technologies may be registered for use in Australia, such as antisera, vector vaccines, antivirals, immunoglobulins and monoclonal antibodies.

AMA has recently provided comments on the Consultation Regulation Impact Statement and Explanatory Paper on modernising and future-proofing the National Gene Technology Scheme[11]. The science of gene technology is advancing rapidly, and it is critical that the regulatory system is able to respond to scientific advances in a timely manner. A 'future-proofed' scheme must have the flexibility to accommodate new technologies as-and-when they are discovered and enable them to be available quickly. This is facilitated most effectively, efficiently and appropriately through a science-based, risk-proportionate regulatory approach that is focused on the product or outcome.

[10] Megatrends, Opportunities and Challenges Facing Australian Livestock Industries – Animal Health Australia
[11] AMA submission on National Gene Technology Scheme

Conclusion

AMA commends the government in their commitment to identifying current and emerging critical technologies that are key to the prosperity and productivity of Australia's agricultural sector under increasingly challenging production, consumption and trade conditions. The scope of the project, however, should be expanded to include critical technologies that will assist farmers and veterinarians in protecting and promoting the health of Australia's livestock.

Meeting the demands of a growing global population under increasingly challenging conditions will require local, national and global action. Australia's ability to deliver on quality, safety, sustainability, reliability and efficiency of trade in animals and animal-derived commodities, while achieving the NFF's goal of exceeding $100 billion in farm gate output by 2030, will be greatly strengthened with the successful adoption and implementation of new technologies.