



## Statement – National RNA science and technology priorities

A national roundtable to identify Australia's RNA science and technology priorities was held on Thursday, 29 July 2021, hosted by the Australian Academy of Science and the Australia and New Zealand RNA Production Consortium.

The group, comprised of experts in RNA biology and biotechnology from academia and industry, discussed how Australia can play a leading role in the global ecosystem of RNA science and harness the opportunities for Australian industry to develop RNA-based products and services for global markets. The group concluded that a national mission is required to ensure Australia can fulfil this leading global role.

RNA, or ribonucleic acid, exists in various forms that play a central role in the function of genes and the regulation of gene expression. RNA controls development in plants and animals, influencing areas as diverse as crop yields in agriculture, and brain function in humans. There has long been considerable potential for RNA based products. However, the success of RNA based technology in the rapid development of safe and effective vaccines for COVID-19 has drawn sustained public interest in the technology. It has also triggered public and private investment to establish capabilities from fundamental scientific research through to clinical and commercial onshore mRNA manufacturing.

With the first commercially approved mRNA-based vaccines there is considerable potential for developing more advanced uses of RNA therapies and technologies, including the treatment of disorders such as arthritis, cancer and malaria and producing environmentally friendly biopesticides. Further, developing products that can accurately detect pathogenic RNA will be essential for biosecurity in Australia and globally.

Considering the uniquely Australian problems that stand to be solved by RNA science, including sensing new biosecurity threats, and supporting climate change adaptation in agriculture, the group determined a list of research priorities by balancing Australia's strengths against emerging global trends. These research priorities are as follows:

- RNA vaccines, including vaccines for people with autoimmune disorders
- RNA therapeutics
- RNA sensing tools
- The role of RNA in plant and animal development
- The role of RNA in brain function and disorders
- RNA chemistry
- Stability and advanced manufacturing of RNA therapeutics
- RNA delivery technologies.



The agreed recommendations from the roundtable are to advance opportunities towards:

- a national mission for the whole RNA science and technology pipeline in Australia, driven by strategic investment and prioritisation across funding schemes
  - the national mission should provide sustainable, long-term funding for projects from fundamental research to translation
- a local mixed RNA manufacturing ecosystem, including pilot facilities to enable new Australian products to be translated, production of pre-clinical trial components and GMP sovereign manufacturing capability to support clinical trials
- the formalisation of cross-disciplinary coordination to:
  - develop a roadmap for a national RNA science and technology mission
  - holistically nurture the entire research to translation pipeline
  - connect the research community to each other and industry
- the facilitation of commercialisation and establishment of a self-sustaining RNA biotech industry through new and existing mechanisms, including incentivising the capture of new intellectual property, the R&D tax incentive and proposed patent box initiative
- schemes to build capacity in entrepreneurial and translation expertise, including facilitating greater mobility between research and industry.

Australia has an opportunity to create an innovative RNA research and development 'ecosystem' and become a global player in this disruptive industry, creating and manufacturing high-value RNA-based products here, and exporting them to the world.

The Australian Academy of Science will produce a full report of the roundtable for policymakers and science funders in the coming weeks.

### What is RNA science?

RNA is one of the three major biological macromolecules essential for all known forms of life, along with DNA and proteins. For decades RNA has been viewed as the intermediate between gene and protein. It is now evident that many RNAs are not translated into proteins, but rather act to control the complex processes of differentiation and development. These RNAs are also subject to modification, particularly in the brain, which connects hardwired genetic information to environmental parameters.

Pfizer/BioNtech and Moderna mRNA vaccines have been successfully used against COVID-19 and can be potentially reformulated rapidly to counter new strains of viruses. They have also been shown to have the potential to inoculate against many diseases such as autoimmune disorders, RSV, influenza and malaria. Applications of mRNA and other forms of RNA, such as siRNA, miRNA, gRNA and dsRNA have potential beyond vaccines, including the treatment of neurodegenerative and neuropsychiatric disorders, cancer, and RNA-based biopesticides in agriculture.



Australia is well placed with many world-leading experts in RNA science, biomaterials and biotechnology located within our universities and research institutes. Australia is also developing the capability to manufacture RNA on an industrial scale for products, including mRNA vaccines.

Through the adoption of policies and strategic investments, opportunities exist to develop sovereign capability in RNA science and technology from knowledge creation to translation and manufacturing.

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