

# Australian Medical Research and Innovation Five Year Strategy

*A National Reproductive Health Strategy for Maximising the General Health of the Australian Population.*

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**The Society of Reproductive Biology (SRB)** is one of Australia's oldest and most successful research Societies. Its members have a remarkable history of success in providing practical benefits from their innovative research. Examples include the development by our members of virtually all the modern forms of assisted reproductive technology, major advances in contraceptive medicine, and the development of stem cell science leading to the burgeoning field of Regenerative medicine. As well as these profound contributions to health, the research performed by our members is widely extended to: ensure our farmers are the world leaders in reproductive efficiency, herd quality and genetic improvement; contribute to developing the necessary technology for combating the scourge of invasive vertebrate species; and to help our conservationists with tools for species preservation.

The practical success of our members attests to the benefits from ensuring that a rigorous approach to understanding biological principles that underlie health and disease is in place to guide translation and clinical interventions. We are of the view that this can be best and most economically achieved when research support is provided on the basis of rigorous and entirely independent peer review for research excellence. Experience shows that attempts to "pick winners" on any other basis has a poor record of outcomes and is often counterproductive. The NHMRC has over many decades developed rigorous and equitable approaches to assessing, administering and supervising medical research funding and it is SRB's view that this structure should be used for supervising expenditure by the MRFF.

## **The Problem**

While not wishing to specifically address issues of disease burden, we make the general and obvious point that the overwhelming risk to the nation's health and economic strength is the ever-growing burden of chronic diseases. As Reproductive biologists we consider it important to emphasise the extraordinary discoveries of the last decade (many of which have been made by our members) that demonstrate that the reproductive health of parents is the major contributor to the whole-of-life disease risks for their children, and even their grandchildren. Thus, an individual may become predisposed to the serious chronic diseases of adulthood as a consequence of the conditions of her/his conception and during development while in the uterus. This includes major impacts on the incidence and severity of obesity; metabolic diseases, including diabetes; cardiovascular disease; mental health and cancer. We argue that current health and medical structures inadequately recognise this risk and do not provide mechanisms to prevent or mitigate the outcomes.

This gap in the system arises from:

- I. an under-appreciation by health policy makers of the major contribution that reproductive health plays in determining whole-of-life health outcomes;
- II. an incomplete mechanistic understanding of the causative pathways involved; and
- III. the intellectual unpreparedness of the health professions to deal with non-communicable disease processes that fall outside of the conventionally understood range of causalities.

Pouring increasing resources into the hospital and health systems will have only incremental impact on outcomes until there is an adequate understanding of causality at a biological level. This new understanding will allow for the rational development of prevention, mitigation and treatment options.

## **Consequences**

The outcome of this gap is

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- a. a large and growing burden of chronic diseases within the community;
- b. poor treatment options and outcomes for this disease burden because of the unrecognised fundamental causes;
- c. the prospect that the burden will continue to grow as the conditions are propagated across generations; and
- d. an expensive and less efficient health system due to misallocation of resources.

The history of science and technology shows that useful innovation is born of the rational application of new knowledge to important unmet needs. The current crisis in the burden of chronic diseases stems not from inadequate efforts to treat it but from an inadequate knowledge base of its fundamental causes. The increasing demand on our best and brightest to plug the holes in the health system created by chronic diseases wastes our human, emotional, economic and intellectual resources. Unleashing these lost resources will create a more efficient and productive society, and reduce the stocks of human suffering within our community.

## Strategy

The community's frustration at the inexorably rising tide of chronic diseases and its resistance to conventional medical approaches are clear signs that new knowledge and new approaches are required. Sustainable progress can only be achieved in an environment of patient, stable and secure long-term investment in research of the underlying mechanisms. This in turn will inform the most prudent and cost-effective strategies for prevention, mitigation and treatment. We propose that there is an urgent requirement for a National Strategy for Reproductive Health, the benefits of which will be felt across each individual's lifespan, and across future generations.

For too long the measure of success for reproductive health has simply been the birth of a reasonably healthy baby. This standard must be reset so that every couple wishing to do so can conceive a healthy baby that has the maximum chance of a productive life free from constant or recurring pain or anguish. To achieve this, the underlying molecular and cellular basis of how the conditions of one's conception and development can lead to a non-communicable chronic disease burden must be identified and understood. This new understanding will provide new pathways for preventing and treating the range of most serious chronic diseases.

This strategy will focus on the investigation of:

1. The normal and pathological processes of gamete and embryo formation and development, with particular emphasis on the still rising tide of infertility and limitations to the success of assisted reproductive technologies;
2. The basis for severe maternal diseases, such as polycystic ovary syndrome and preeclampsia, and their impacts on fertility and fetal health, and improved options for fertility preservation in diseases such as cancer;
3. The impacts of the range of environmental conditions, including maternal and paternal disease, on gamete, embryo and fetal well-being;
4. The molecular basis for the cellular memory encoded within the gamete, embryo and fetus of the conditions of conception and development that so powerfully impacts on the homeostatic settings that govern health outcomes for life; and
5. Redesign of medical and health curricula to provide adequate intellectual training for considering the treatment of non-communicable chronic diseases.

The success of this strategy will require the commitment of many expert teams. These teams will have different shapes, sizes and composition; there is no magic formula to research success other than excellence. The increasingly common calls for the focus to be primarily on teams dedicated to specific translational outcomes are misguided. Such teams will have a place but are only one component of the complex recipe for success. Success will come from coordinating the activities and goals of the already many excellent teams present within Australia. We are looking for synergies from these interactions with the recognition of the benefits that arise from sharing diverse sources of wisdom to solve complex problems.

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## Priorities

The key to achieving these strategic aims is to bring the best minds to the problem. We propose a three tiered set of priorities to achieve this.

1. The creation of a National Reproductive Health Consortium. This would bring together the leading research groups, clinical investigators and practitioners, service providers and key commercial and philanthropic partners. The consortium would have independent governing and advisory boards and would identify leadership and participants for research nodes that contribute to each of the 5 strategic goals identified above. The consortium would receive establishment and ongoing support for its structural requirements from the MRFF.
2. The Consortium would have a role in identifying critical weaknesses in the research base required to meet the strategic goals and make recommendation to MRFF for support of these. Support would be provided by a quantum of earmarked funds being allocated to NHMRC funding platforms for competitive application. For instance, to ensure that adequate research project funding is directed to these strategic aims, the current NHMRC project grant scheme would have a specific quantum of new funds allocated from the MRFF for use for to fund highly recommended projects within the scope of the strategic aims. Allocation of MRFF funds for these projects would use similar mechanisms as the joint assessment of cancer grants by the NHMRC and Cancer Council.
3. If the Consortium recognises that there is a clear gap in expertise in certain aspects of the strategic goals then these could be closed by attracting the best researches to these questions by the creation of specific Fellowships of 5 years duration (renewable). Fellowships would be appointed in a transparent and competitive manner by specific MRFF allocations through the NHMRC Fellowship program. In allocating Fellowships it will be recognised that research in seemingly disparate areas can and will inform the strategic goals of reproductive health. Thus, it would be a mistake for funding to be overly goal or outcomes focussed. The preference should be towards research that is most likely to produce profoundly significant new knowledge. This approach can be taken with confidence that such new knowledge will provide the best investment towards innovation and practical outcomes.

It is essential that grant funding reflect the true cost of research. The current salary support packages associated with many grant schemes do not meet the minimum award salaries and conditions under which chief investigators are compelled to employ staff. Currently, our country's most talented and successful researchers are being actively penalised for their success, in that they must spend precious time and effort finding top-up funding to allow them to meet the statutory requirements for employing staff. The reality is that there are simply not adequate alternative sources of funds to meet these needs, meaning that the small proportion of excellent projects that do get funding under current systems struggle to meet their objectives and full potential. These are circumstances that would never operate in a successful business. The current model of under-funding successful grants reduces the efficiency of the Nation's research spend.

## Outcomes

This strategy will take a generation to fully mature. The current time lines of 5-year Strategies and 2-year priorities will not foster buy-in by the highest quality researchers. Short-term commitment is most likely to attract opportunists lacking the required long-term commitment to see these complex issues through to their end. A stable long-term commitment to this strategy will result in the necessary cohesive and co-ordinated approach to the problem.

A consistent and patient approach to this task will lead to a marked reduction in the new incidence of chronic disease due to rational preventative interventions, much improved medicines and treatment strategies for those who slip through the preventive net, a resulting marked reduction in the strain on our health care systems, and improved efficiency of our nation due to reduced losses in individual productivity.