MBIE Te Ara Paerangi - Future Pathways

A submission from the Centre for Neuroendocrinology, a University of Otago Research Centre (consisting of 10 research groups across 2 academic Departments): https://www.otago.ac.nz/neuroendocrinology/index.html

Prepared by:
Prof Dave Grattan (Director) and Prof Rebecca Campbell (Deputy Director), on behalf of approximately 60 research staff and postgraduate students

Executive summary

1. NGĀ WHAKAAROTAU RANGAHAU, RESEARCH PRIORITIES

- "Top down" prioritisation of research should not come at the expense of increased investment in fundamental, discovery-focused science.
- Untargeted support of excellent (internationally competitive) fundamental research should be a key priority
- Funding of "priority research" areas must be stable and long-term, to enable building and maintenance of teams of expert researchers.
    - Potentially, this is best achieved through establishment of institutes to focus on priority areas.
    - Empower the expert researchers within focused institutions to make key decisions on specific research to be undertaken within priority areas.
- Implement a career structure for scientists, allowing stability and development of expertise.
- Ensure a structure that fosters long-term development of scientists rather that short-term project-based funding.

2. TE TIRITI, MĀTAURANGA MĀORI ME NGĀ WAWATA O TE MĀORI TE TIRITI, MĀTAURANGA MĀORI AND MĀORI ASPIRATIONS.

- Increase Māori engagement with and within the science work force by improving the career structure for scientists, promoting science as an attractive career option with security and stability.

3. TE TUKU PŪTEA FUNDING

- Must move away from a formula for funding indirect costs of research that is based on salaries.
- An alternative model must be transparent and be based on the actual costs of the research
- Consider a differential scale for overheads (or base funding) that reflects the type of research being proposed.
- For competitive grant funding, move away from 2-staged grant applications and toward a full, peer-reviewed application without submission deadlines.
- Introduce a renewal process for successful research grants to establish a culture of continuity and stability.

4. NGĀ HINONGA INSTITUTIONS

- Research-institutions should be bulk funded (non-competitive) to enable building of experienced, long-term research teams. Sharing of facilities and resources should be encouraged to promote collaboration.
- Centralisation of large-scale equipment and facilities makes sense, and should be administered in a service model to enable research (as opposed to a financial model aiming to recover costs).

5. TE HUNGA MAHI RANGAHAU RESEARCH WORKFORCE

- Work-force considerations should be at the forefront of any design of research priorities.
- Ensure that access to "career development" funding is equitable and not limited by individual circumstance.
- Career development funding must include full salary support, and be long term (or feed into an acknowledged career pathway)
- Career development funding should be available across all career stages (not just "early career").
- Base grant funding should come with an expectation that a funded institution will provide long-term career structure for scientists

6. TE HANGANGA RANGAHAU RESEARCH INFRASTRUCTURE

- Reduce administrative redundancies and duplication of effort by having a common application process for all competitive funding.
- Maintain expert peer review as a part of any assessment system

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1. NGĀ WHAKAAROTAU RANGAHAU, RESEARCH PRIORITIES

KEY QUESTION 1: What principles could be used to determine the scope and focus of research Priorities?

KEY QUESTION 2:
A) What principles should guide a national research Priority-setting process?
B) How can this process best give effect to Te Tiriti?

KEY QUESTION 3: How should the strategy for each research Priority be set and how do we operationalise and implement them?

"Prioritisation" is a political construct, not a scientific one. It is intuitively attractive to "prioritise" research in areas of perceived need or public interest, but this needs to be balanced in terms of what historically has been shown to be more likely to be a successful strategy for scientific progress. In fact, most scientific advances have not come from "prioritised" work – but rather have come from untargeted fundamental science aimed at advancing knowledge (this is specifically examined in the context of health and medicines in **Spector** et al., 2018). The current response to the Covid-19 pandemic is a good example. Our ability to respond scientifically to this was supported not by priority investment in infectious disease, but rather by a broad range of scientific skills that were in place largely within the University system. We were fortunate that diagnostic tools such as genome sequencing could be developed because there were researchers using these tools for fundamental discovery research in areas quite unrelated to human disease (such as viral evolution, ecological screening, or methods to extract DNA from prehistoric samples). None of this research was predicted through prioritised research. "Priority" investment in infectious disease (introduced recently) is clearly too late to be of real impact in the present pandemic, and it is questionable as to whether it will have appropriate focus to address the next outbreaks of infectious disease. We need to ensure that any science system continues to invest heavily in untargeted fundamental research, to ensure that we have an appropriate personnel and skill base, and to provide the basic science discoveries that will enable us to deal with new challenges (indeed, perhaps the broad support of excellent fundamental research could be one key priority).

Currently, the Marsden Fund supports untargeted research, but the success rate is less than 10%. This is insufficient to sustain a healthy science community. Most other research funding in New Zealand is targeted to some extent, but predominantly competitively

distributed and often in very short-term contracts (less than 5 years). This model alone does not support a stable and productive science sector.

Given that some form of "priority setting" is inevitable, we need to consider how best to establish these priorities. Scientific research requires experts, who take years to build their expertise and reputation in their specific areas. The *impact* of their research is critically dependent on their expertise and credibility within a field. It is not possible for even an outstanding scientist to switch directions and move into another area (that might be a government priority), and still be able to have the same sort of scientific impact in that new area. One key principle, therefore, is that any funding of "priority" research areas must be long-term, because researchers/groups need stability to build up their expertise, credibility and critical mass in a new field. Perhaps prioritisation could be achieved at a broad level through institutional funding (see below). One way to support priority research areas would be through establishment and support of Research Institutes (equivalent to our existing CRIs) to lead research initiatives in prioritised areas. Provide long-term, stable funding to such institutes to build capacity in a particular area. This priority research should not be funded from a competitive pool of money, potentially taking away from other areas of priority or from fundamental research. Research institutions should be empowered to make decisions about how best they can contribute to priority research areas, given the personnel they have or are able to recruit, the equipment and facilities available, and the knowledge of what their international colleagues are doing. The experts should be given autonomy to decide what is the best way they can contribute to global research in this area. Perhaps one international example of this would be the Max Planck Institutes in Germany. There does need to be care taken not to "silo" funds within limited groups of researchers (a major issue behind the lack of discernable impact from the National Science Challenges), and ensure there are mechanisms for early/mid career people to bid into those funds. This could be through having additional fellowship schemes that are aligned to research priorities, and a career structure that fosters long-term development of scientists rather than short-term project-based funding.

Spector JM, Harrison RS, Fishman MC. Fundamental science behinds today's important medicines. *Science Translational Medicine 10*: eaaq1787, 2018

<u>Key Responses:</u>

- "Top down" prioritisation of research should not come at the expense of increased investment in fundamental, discovery-focused science.
- Untargeted support of excellent (internationally competitive) fundamental research should be a key priority
- Funding of "priority research" areas must be stable and long-term, to enable building and maintenance of teams of expert researchers.
    - Potentially, this is best achieved through establishment of institutes to focus on priority areas.
    - Empower the expert researchers within focused institutions to make key decisions on specific research to be undertaken within priority areas.

- Implement a career structure for scientists, allowing stability and development of expertise.
- Ensure a structure that fosters long-term development of scientists rather that short-term project-based funding.

2. TE TIRITI, MĀTAURANGA MĀORI ME NGĀ WAWATA O TE MĀORI TE TIRITI, MĀTAURANGA MĀORI AND MĀORI ASPIRATIONS.

KEY QUESTION 4: How would you like to be engaged?

KEY QUESTION 5: What are your thoughts on how to enable and protect mātauranga Māori in the research system?
KEY QUESTION 6: What are your thoughts on regionally based Māori knowledge hubs?

Engagement should be genuine and based on long-term relationships. At present, this is compromised by the uncertainty (low success rates) and short-term nature of funding. Forcing token linkages with Māori to support research and grant applications (for example by including this in assessment of scoring of research applications) promotes short-term relationships that may be disingenuous and likely also overburden established Māori researchers and consultation groups.

Mātauranga Māori should be Māori-led and self-determining. This would be best achieved by bringing more Māori researchers into the science work force. At present, science is not an attractive career path, nor one open to all individuals, as many positions are precarious with a lack of stability, short-term contracts, and requirement for mobility. It is challenging to convince talented Māori students and scholars to aim for a career in research when, for example, professional programmes offer more security. This could be addressed with targeted funding, but in fact, this is a systemic problem across NZ research. Providing more stable funding and a career path for all scientists would have wide ranging benefits. One clear benefit would be to increase the attractiveness of science as a career for Māori researchers. In this framework, additional, targeted funding might be initially appropriate to enhance engagement of Māori in research, but in the long-term, would hopefully become unnecessary. Regional Māori Research Hubs sound like a good idea, as an opportunity for researchers to make contact and initiate interactions with iwi at an appropriate time in a research project, and foster formation of long-term relationships.

<u>Key response:</u>

- Increase Māori engagement with and within the science work force by improving the career structure for scientists, promoting science as an attractive career option with security and stability.

3. TE TUKU PŪTEA FUNDING

KEY QUESTION 7: How should we determine what constitutes a core function and how should core functions be funded?

KEY QUESTION 8: Do you think a base grant funding model will improve stability and resilience for research organisations, and how should we go about designing and implementing such a funding model?

Before considering "core functions", we believe that first and foremost we need to consider our workforce as "core" to all scientific research (see section 5, below). Core functions will evolve with evolving research questions, and with the expertise of our research staff.

It does seem, however, that there might be certain "core functions" that could be better supported separately from a project-based funding system. It seems that much of this could be supported through funding of research institutes (each perhaps having some dedicated "core functions" that they make available to the rest of the community). As for "priority' funding above, a key to supporting "core function" would be stability, and investment to keep these functions up to date. For example, animal facilities are required for biomedical research, but cannot be closed down or markedly changed in size should project grant funding change over relatively short time frames. Such facilities need to run on a "service model", centrally funded as a service to the NZ Science system and affordable to all users, and not as a business model as a cost (or potentially profit) for a host institution to be passed onto a fluctuating and relatively-limited number of users.

It is essential to move away from a formula of indirect costs that is based on staff salaries. We are not opposed to full-cost funding, but the current formula for calculating "overheads" has had a catastrophic effect on our science workforce, discouraging employment of qualified researchers and incentivising the use of students as a primary workforce. The consequence has been a proliferation of PhD graduates with insufficient jobs for them to go to. A "one size fits all" formula is also likely too coarse a measure for biomedical research, as the overhead (infrastructure, equipment and facilities) on running animal and laboratory-based research would be much higher than, for example, public health research. The latter may be more people intense, and so with the present formula, this is accumulating significant overhead expenditure for the government that is not required or justified. In contrast, overhead on lab-based research is likely to be insufficient to reflect actual costs and is subject to manipulation by people moving work onto students.

Hence, a change is necessary. One option would be to retain overheads using a different formula, such as a percentage of the total cost of the grant (i.e. on top of the total awarded costs of the grant). This would be much more similar to systems used ("indirect costs" or "on costs") in most other international funding systems. It may be that "base funding" provides an opportunity to do this better. The devil will be in the detail – how would such base-funding be calculated? We think a key issue is one of transparency – it needs to be absolutely clear what functions are covered by base funding, and what are not. The actual full cost of those functions not covered must then be eligible for funding in the direct costs of the grant. There should not be artificial budget limits.

We advocate a move away from the concept of commercial "research contracts" and back to thinking of funding as "research grants". It is not possible to deliver "science" to "contract". Fund people and allow them to do the research they think will have the greatest impact.

Specific suggestions regarding competitive funding (not really addressed in the questions of the consultation document):

- Consider removing "Expression of Interest" phases of grant application. At present, many of our competitive funds start with an "expression of interest" phase, where a non-expert committee selects a subset of applications to go through for invitation to full applications. No committee will have appropriate expertise to assess across a wide range of topics, and so grants will be selected based on how well the idea is sold to a non-expert, rather than on the quality of the sciences and how it might advance a particular field. Such a system strongly favours "name recognition" and 'track record" over novel ideas, meaning early career researchers are significantly disadvantaged compared with established researchers. We need a system where all applications receive proper peer review. While this might appear to increase workload, more likely it would reduce submission rates – as researchers would need to put more investment into each submission. Perhaps any increases in workload could be balanced by removing application deadlines and allowing submission at any time (or at least having multiple submission deadlines per year), allowing more flexibility in workload. Ensure continuity in assessment panels, and allow researchers to revise and resubmit to respond to specific reviewer/panel comments (similar to the NIH system).
- Introduce a "renewal" process for research grants, encouraging an expectation of continuity and stability for research, based on acceptable progress. As done by the NIH, these could be assessed separately from the competitive pool of new applications, with an expectation of much higher success rate for renewals. Such a process would need to be balanced by ensuring there remained opportunities for new people to enter the funding pool. If there was more stability, researchers would be less inclined to submit multiple applications (a common strategy currently used to address the insecurity produced by low success rates in competitive funds). This would also improve career stability for researchers working on these long-term projects.

<u>Key responses:</u>

- Must move away from a formula for funding indirect costs of research that is based on salaries.
- An alternative model must be transparent and be based on the actual costs of the research
- Consider a differential scale for overheads (or base funding) that reflects the type of research being proposed.
- For competitive grant funding, move away from 2-staged grant applications and toward a full, peer-reviewed application without submission deadlines.
- Introduce a renewal process for successful research grants to establish a culture of continuity and stability.

4. NGĀ HINONGA INSTITUTIONS

KEY QUESTION 9: How do we design collaborative, adaptive and agile research institutions that will serve our current and future needs?

KEY QUESTION 10: How can institutions be designed to better support capability, skills and workforce development?

KEY QUESTION 11: How should we make decisions on large property and capital investments under a more coordinated approach?

KEY QUESTION 12: How do we design Te Tiriti enabled institutions?

KEY QUESTION 13: How do we better support knowledge exchange and impact generation? What should be the role of research institutions in transferring knowledge into operational environments and technologies?

This section of the document seems to refer to CRIs, and we function within a University setting, and so our perceptions may differ.

It would seem to us that institutions addressing priority research areas would be a normal part of a government strategy, just as they have institutions looking at economy, infrastructure, health, education. Such institutions should be predominantly bulk funded, with long-term secure funding to build research teams and build capabilities. There should be little need for researchers in those institutions to bid into competitive funding pools (which should be prioritised based on scientific excellence, rather than predetermined topic priorities). It is important to remove barriers to collaboration and cooperation, and one key way of doing that would be by providing stable, non-competitive long-term funding, so that groups feel comfortable in sharing their expertise. A critical feature of such institutions should be that they employ scientists in long-term, career positions. Large scale equipment and national-scale facilities could also be located in and administered by such institutions. As a country, we are smaller than most international cities, and so it clearly makes sense to use a centralised system to enable investment in high-end research facilities that would not be cost effective to replicate across multiple sites. Core-funded institutions should be encouraged to make their facilities available to researchers from other institutions, again operating on a service model rather than a full-cost recovery model (performance indicators should be amount of use of the equipment/facilities, rather than using a financial model based on income). This would encourage collaboration between groups based in the institution and others, such as other institutions or University researchers.

Universities could function on a different model, perhaps with lower-level base funding to support core functions and facilities, education funding (e.g. PBRF) to support base levels of research training and student research, and then access to competitive funding for larger scale endeavours. We would advocate that base funding was also sufficient to enable Universities to provide a career structure for non-teaching scientists aligned with academic research groups (see section 5, below). Alternatively, this important issue could be managed through renewable research contracts (as discussed above).

<u>Key response:</u>

- Research-institutions should be bulk funded (non-competitive) to enable building of experienced, long-term research teams. Sharing of facilities and resources should be encouraged to promote collaboration.
- Centralisation of large-scale equipment and facilities makes sense, and should be administered in a service model to enable research (as opposed to a financial model aiming to recover costs).

5. TE HUNGA MAHI RANGAHAU RESEARCH WORKFORCE

KEY QUESTION 14: How should we include workforce considerations in the design of research Priorities?

KEY QUESTION 15: What impact would a base grant have on the research workforce?

KEY QUESTION 16: How do we design new funding mechanisms that strongly focus on workforce outcomes?

In our view, this is the most important part of the review, because the biggest problem in our system is the lack of career structure for scientists – short term funding, fixed term contracts, lack of security. Providing job security and career structure for scientists would make science much more attractive to a wider parts of our community – potentially solving the issue of a lack of representation of certain groups within the science community. In particular, it would provide a pathway to solve the issues relating to a lack of Māori engagement in science (discussed above). If base grants to institutions included requirements to provide secure research positions, this might be a major step forward (for example, each academic appointment in science at a University could come with additional funding for a research assistant/technician/post doc; this would be hugely valuable to support research and provide additional career path for scientists supporting academic research).

A key problem in our current system is that much of the funding aimed at ECRs does not adequately fund salary (e.g. Marsden Fast Starts, HRC First Grants). This means that the successful researchers are dependent on institutional support that might not be equitably available, or on support from senior colleagues, which detracts from the pathway to independence, and again, may not be equitably available. Thus, a new system must contain fellowship support that is completely self-contained (salary plus consumables), or be negotiated with institutions that specific levels of support will be made available to successful fellows. A secondary problem is the gap in transition from a postdoctoral fellowship into a secure permanent position. We currently train many more people that can be accommodated in career positions, meaning we continuously lose highly skilled workers out of science or to more stable funding overseas. Thus, any fellowship system must be relatively long-term, and/or come with an acknowledged career pathway. It is a waste of resources to fund an individual for 3-5 years, but then not have a clear pathway to retain them in the system. Perhaps a model like the US K-99 should be considered (this funds ECRs for a period of mentored postdoctoral research, and then a second period of funding once they have received a tenured appointment – the period of guaranteed funding makes them attractive to be hired by Universities/Research Institutions). Other models, such as the "Junior Professorships" offered in Germany; NHMRC Career Fellowships in Australia, could also be considered.

We recommend removing "time limits" on eligibility for Fellowships, and ensure instead that they are offered based on an individual's opportunity to undertake independent research. This may be affected by family responsibilities, personal situations, experience in

other careers, or potentially their precarious employment status where they may have been working within someone else's group because this is the only funding that was available. They should still be eligible to compete for opportunities to develop an independent path (or perhaps, a leadership role) at any stage (i.e. whenever the time was right for that individual). While appropriate assessment of an individual's status (relative to their opportunity) might be harder than simply applying time limits, it is much more equitable and we are more likely to see scientists develop into research leaders at different stages of their personal journey, rather than being lost to the system because they do not conform to a specific "traditional" pathway.

We also believe the system should be looking to build strong teams, rather than always seeking "independent" researchers. This is perhaps a University-specific problem, but funding good people to build critical mass within established groups is likely to be a better strategy for completing impactful research than only appointing individuals with disparate research interests. Of course, this does need to be balanced by ensuring mechanisms to allow new people to enter the system, and new groups to form.

Key response:

- Work-force considerations should be at the forefront of any design of research priorities.
- Ensure that access to "career development" funding is equitable and not limited by individual circumstance.
- Career development funding must include full salary support, and be long term (or feed into an acknowledged career pathway)
- Career development funding should be available across all career stages (not just "early career").
- Base grant funding should come with an expectation that a funded institution will provide long-term career structure for scientists

6. TE HANGANGA RANGAHAU RESEARCH INFRASTRUCTURE

KEY QUESTION 17: How do we support sustainable, efficient and enabling investment in research infrastructure?

Currently, our system has too many different mechanisms each delivering too little funds, and there seems to be a large administrative cost with each fund. If base-funding was available to support research institutions and "priority" research areas (discussed above), it would seem practical to combine all competitive funding into a single pool, with a common format and application process, with excellence and scientific impact being the primary driving mechanism. This could be managed as a combination of competitive renewals and new applications. Such a system would reduce redundancies in administration of the assessment process, and reduce the workload on applicants by enabling them to focus on one specific application format. We believe international expert peer-review remains a critical part of any assessment of scientific excellence, as local "non-expert"committees are unlikely to be able have the breadth of expertise to cover all research areas equitably.

Investment in infrastructure could be controlled at the institutional level, but through a system that encouraged sharing and collaboration, rather than competition. One possibility would be to have a fund where institutions or groups of researchers could request support for large-scale infrastructure investment, and this could be assessed by a national level committee tasked with assessing value of the proposition (in terms of enhancing national research capabilities) and then the best way to implement the requested infrastructure to ensure equitable access to these resources (where to locate the infrastructure, and how to resource it).

Key response:

- Reduce administrative redundancies and duplication of effort by having a common application process for all competitive funding.
- Maintain expert peer review as a part of any assessment system