THE FACULTY OF MEDICINE & DENTISTRY
UNIVERSITY OF ALBERTA

RESEARCH ASSESSMENT EXERCISE
FINAL REPORT

Submitted to Dean Philip N. Baker
By the RAE External Review Committee
April 20th, 2010

FACULTY OF MEDICINE & DENTISTRY
UNIVERSITY OF ALBERTA

MESSAGE FROM THE DEAN

Dear Colleagues,

Re: Research Assessment Exercise (RAE)

In order to guide our Faculty's efforts to attain the highest possible standards of research excellence, we decided to put the Faculty of Medicine & Dentistry through what is arguably the most rigorous Research Assessment Exercise that any institution within North America has been through.

I am extremely grateful to our distinguished External Review Panel for the resulting Report – which will help guide our decision-making and strategy for the months and years to come.

Whilst it is gratifying that the majority of research being conducted within the Faculty is of a standard that is nationally recognized, and that a significant proportion of the research attains international excellence, the Report clearly states that we have the potential to do even better in several key areas.

We feel that it is important to share the assessment of our Faculty, and the detailed recommendations of the External Review Panel, with our partners and key stakeholders. This Report has not been edited, save for the inclusion of initial responses to the detailed recommendations, from the Faculty Research Committee and the School Research Leads. We anticipate further detailed and continuing dialogue consequent upon the advice that we have now received.

Dr. Marek Michalak, Vice-Dean (Research), and I share the view of the External Review Panel – that the Faculty is in an excellent position to reach greater levels of excellence, and we look forward to working with you to ensure that these levels are attained.

With best wishes,

Yours sincerely,

Dr. Philip N. Baker, FRCOG FMedSci, (FRCSC)
Dean,
Faculty of Medicine & Dentistry
Professor of Obstetrics & Gynecology

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EXECUTIVE SUMMARY

This External Review Committee was invited to review the University of Alberta, Faculty of Medicine & Dentistry research enterprise to identify research excellence and to provide recommendations that would enhance the Faculty's mission and vision. The Committee reviewed the research programs of 8 newly founded Faculty Schools and 2 Research Institutes: the Alberta Diabetes Institute (ADI) and the Mazankowski Alberta Heart Institute (MAHI). Detailed commentary and recommendations are outlined in the full report. Key recommendations are as follows:

1. The FoMD is in an excellent position to reach greater levels of excellence; a special opportunity to fulfill UofA's vision of being in the world's top 20 public universities in 2020.
2. FoMD has overall research excellence highlighted across several schools and one Institute. These areas of strength are:
    a. Membrane proteins and structural biology
    b. Motor control and rehabilitation
    c. Transplantation
    d. Diabetes (including obesity)
    e. Virology

    Areas with strong potential but that require decisions around directions and strategic use of resources are:
    a. Cardiovascular biology
    b. Cancer
    c. Neuroscience
    d. Women and children's health
    e. Epidemiology and health outcomes research

    In both groupings, steps are needed to take advantage of strengths and to improve deficiencies.
3. The bold implementation of 8 schools and the focus on 2 Institutes in FoMD will require careful and astute leadership to take advantage of a new setting for research in the next decade. To preserve existing strengths and meet the challenge of new initiatives, special attention is required in SMSM, SCLS, ADI, and the MAHI.
4. The changing environment from AHFMR to AI-HS requires a clear plan in order to retain and recruit faculty and to preserve a high level of morale.
5. The University of Alberta needs to safeguard FoMD during a transition period if personnel support from AI-HS diminishes.
6. The AHS is a dramatic change in health care administration and the 4 pillars of research must be recognized as a critical component in AHS leading to new opportunities on a provincial level.
7. A relentless and uncompromising culture of seeking the highest level of leadership for key positions in the FoMD will bring long term elevation in stature.
8. During the transition period of multiple changes in the academic and clinical environment, and also in the context of fiscal constraint, special priority may need to be given to key research areas in order to preserve quality.
9. Although the reputation of FoMD is high, there is a need to grow and cultivate 'stars' at an international level who are recognized by prestigious international awards (e.g., Lasker, Gairdner)
10. The RAE Committee believes that FoMD can achieve higher stature at quality levels 3 and 4 (see full report for definitions) if these major recommendations, along with many of the subset recommendations, are successfully implemented.

A. INTRODUCTORY REMARKS

Background Information – Process for the RAE

This External Review Committee was invited to review the University of Alberta (UofA), Faculty of Medicine & Dentistry (FoMD) research enterprise and to provide recommendations that would enhance the Faculty's mission and vision. The External Review Committee feels it a privilege to be asked to undertake this important exercise, and acknowledges the 'forward-thinking/progressive' efforts of the Faculty to undertake such an initiative. The Committee appreciated the way in which the site visit was organized - we were able to meet with senior representatives from the University of Alberta, the Government of Alberta, and from Alberta Health Services, and these interactions were extremely useful in helping the committee understand issues affecting research in the Faculty. Thus, recommendations outlined in this report are founded on each of the reviewer's experiences and expertise in science and research, as well as their objective view of the landscape and of the research programs in the Faculty as presented in the RAE materials. We have noted the goal of the University of Alberta to become one of the world's top 20 public universities by 2020. The report is intended to provide potential solutions to issues and topics identified, and to identify areas of research excellence within the Faculty - with the aim to enhance the Faculty's research mission and to meet the University of Alberta's goal of international excellence.

The External Review Committee, chaired by Dr John Dirks, President & Scientific Director of The Gairdner Foundation and Professor Emeritus of Medicine, University of Toronto, and consisted also of Dr Mona Nemer, Professor of Biochemistry and Vice-President Research, University of Ottawa; Dr Donald Podoloff, Professor of Nuclear Medicine & Diagnostic Imaging, University of Texas M.D. Anderson Cancer Centre; Dr Philip Sherman, Professor of Paediatrics, Microbiology & Dentistry, University of Toronto; Dr Colin Sibley, Professor of Child Health and Physiology and Director of Tommy's Maternal and Fetal Health Research Centre, University of Manchester; and Dr Gary Westbrook, Professor of Neurology and Co-Director of the Vollum Institute, Oregon Health and Science University. Dr Ron Dyck, Assistant Deputy Minister, Research Division, Alberta Ministry of Advanced Education and Technology attended the site-visit as an invited observer; his insights helped the committee to understand the research landscape in Alberta.

The Faculty requested that the Committee review the research programs of 8 newly founded Schools (consisting of established Departments, Divisions, etc) and 2 Research Institutes: the Alberta Diabetes Institute (ADI) and the Mazankowski Alberta Heart Institute (MAHI). Documentation supporting selected areas of research excellence (funding, publication records, overview of programs, etc) was provided by each School/Institute and a site-visit occurred from March 17th – 19th 2010. At the site-visit, the Committee met with School Leads, School Research Leads, Institute Directors, key scientists of varying levels of seniority, representative trainees, and others.

The Faculty requested that the Committee exercise their knowledge, judgment, and expertise to reach a collective view on the quality and potential of the research put forth by each School and the 2 Institutes. In this report, the Committee provides a brief assessment of the research, a ranking of the quality of research judged to reach the levels described below, and a series of recommendations. The assessment for each School focused on quality of research outputs (research excellence/international

impact, papers published, funding received, etc.), the research environment, research infrastructure, and future plans and potential.

	Levels of Research Quality
4	**Quality that is world-leading in terms of originality, significance and rigor**
3	**Quality that is internationally excellent in terms of originality, significance and rigor but which nonetheless falls short of the highest standards of excellence**
2	**Quality that is recognized internationally in terms of originality, significance and rigor**
1	**Quality that is recognized nationally in terms of originality, significance and rigor**
0	**Quality that falls below the standard of nationally recognized work or work which does not meet the published definition of research for the purposes of this assessment**

The six-member Committee provided a breadth of clinical and discovery research expertise and provides a high-level view of the research in each School/Institute with more detailed assessment in some areas. Recommendations provided are a result of full consensus across the six-member panel.

During the site visit, the Committee met with senior representatives from academia, government, and health to understand the context of biomedical research in Alberta. The Committee heard presentations from and/or had discussions with:

- Dr Carl Amrhein, Provost and Vice-President Academic, University of Alberta
- Dr Lorne Babiuk, Vice-President Research, University of Alberta
- Dr Stephen Duckett, President and CEO, Alberta Health Services
- Minister Gene Zwozdesky, Ministry of Alberta Health and Wellness
- Dr Annette Trimbee, Deputy Minister, Ministry of Advanced Education and Technology
- Mr Rob Seidel, Chairman of the Board, *Alberta Innovates – Health Solutions*

In addition to meeting with Schools and their Leads and researchers, the Committee also had the opportunity to meet with a group of junior and mid-career investigators; a large group of trainees (Master's students, PhD candidates, PDF's, etc) representing each School/Institute; and a small group of senior, established Faculty members.

The Committee very much appreciates all of the efforts that went into creating such a comprehensive site-visit that allowed for an understanding of the research environment in the Faculty and facilitated the assessment and recommendation process.

Generation of the RAE Final Report

This Final Report is the product of input from all members of the External Review Committee. Assessments, observations, and recommendations are the result of consensus agreement from all panel members. The Final Report was generated under the guidance of the Chair of the External Review Committee, Dr John Dirks. Information was collated from all Committee members, and the first draft of the full report went out to the Committee for review and edits on Thursday, April 1st, 2010. Following feedback, edits and agreement by all Committee members on the content and recommendations in the report, the final draft report was reviewed with Dean Baker (April 16, 2010)

to ensure that the terms of reference for the review had been met, and to clarify and ensure accuracy of several issues on behalf of the Committee. The RAE Final Report was submitted to Dean Baker on April 20th, 2010.

B. CURRENT STATE OF FACULTY'S RESEARCH ENVIRONMENT

Overview

The Committee notes the tremendous growth and progress in the Faculty of Medicine & Dentistry over the last 10 years. As outlined in a briefing presentation given by Dean Baker, the Faculty is currently rated 4th in Canada in terms of research output (grants received) and impact (quality of publications). University of Toronto's medical research program is rated 1st and the medical research programs of University of Alberta, McGill University (rated 2nd), and UBC (rated 3rd) clustered tightly together, suggesting that with focused effort, the U of A Faculty of Medicine & Dentistry could move up in these national ratings.

The Faculty has a long-standing track record of international recognition and excellence in many areas of discovery and clinical sciences. These include research in the areas of structural biology, protein function and cell biology, diabetes, cardiovascular disease and imaging. For over 4 decades, substantial funding from the Medical Research Council of Canada (MRC; now CIHR) has been awarded to the discovery research departments (biochemistry, cell biology, physiology, pharmacology) - and these departments are still major recipients of Tri-Council funding in the Faculty. More recently, CIHR has supported research across all four health research pillars (outlined below), enabling the Faculty to develop strengths in health outcomes research (e.g., cardiovascular disease, nephrology), investigator-driven clinical trials, and evidence-based medicine.

- Pillar 1: Biomedical Research
- Pillar 2: Applied Clinical Research
- Pillar 3: Health Systems and Services Research
- Pillar 4: Social cultural, environmental factors that affect the health of populations.

The Alberta Heritage Foundation for Medical Research (AHFMR) has been instrumental in building research excellence and capacity in health and medical sciences in the Faculty, supporting both basic and clinical sciences. Along with CIHR, AHFMR is a major source of salary and operating awards in the Faculty. This advantage has, at the same time, created significant challenges for the Faculty. When salary renewal awards are not successful, it places significant financial pressure on the Faculty and the University to retain positions and individuals. The situation of having so many 'soft-funded' academic positions has become a crisis for the Faculty and in particular since the recent changes in AHFMR. The Committee learned that very significant forward financial commitments for investigator salary awards reduced the flexibility of the Heritage Foundation to deliver on the original vision of attracting and retaining outstanding scientists in Alberta. As of 2008, AHFMR restructured into 'Alberta Innovates – Health Solutions' (AI-HS), an entity that still manages the Heritage Endowment and reports to the Ministry of Advanced Education and Technology. AI-HS is currently developing a new strategy for funding biomedical health research in Alberta. The uncertainty of this transition was a serious issue voiced by all Schools/Institutes during their meetings with the Committee. Many investigators are uncertain about their security. Uncertainty impacts recruitment. There is urgent need for a plan to continue funding of successful scientists during the transition period.

The Faculty currently has 650 academic members that are reviewed annually through the Faculty Evaluation Committee (FEC). Two hundred and twenty nine (229) are assistant professors, 199 are associate professors and 222 are full professors. Many clinical appointments are affiliated with the Faculty, helping to fulfill its teaching and research mission. These members are not formally evaluated through FEC.

Over the last 5 years the Faculty has experienced annual growth in research revenues, from $144,495,957 in 2004/2005 to $189,535,211 in 2008/2009 fiscal years. To understand revenue growth in relation to growth in numbers of Faculty members would require more information (e.g. annual revenues per academic FTE). The Faculty also manages an endowment portfolio with a current market value of about $99M, yielding an annual spending allocation of just over $4M. The majority of available funds are assigned towards endowed chairs - the Faculty is currently recruiting into about 12 such positions. The Faculty holds 9 Tier I Canada Research Chairs and 12 Tier II Canada Research Chairs that span the Schools.

CIHR funding across the Faculty has increased somewhat over the last 5 years, from $30,784,483 in 2004/2005 to $36,280,964 in 2008/2009 fiscal years. As outlined in a presentation by Dr Baker, the Faculty has recently experienced a decrease in their CIHR success rates relative to national success rates. This applies to both 'new' and 'renewal' applications. This issue requires urgent attention – and the University and Faculty are taking this trend very seriously. We understand that an intramural grant review process and a mentoring system are being implemented in the Faculty.

In term of prestigious awards for research, 2 members of the Faculty are elected Fellows of the Royal Society, London UK (Drs Michael James and Brian Sykes) and 19 members of the Faculty are elected Fellows of the Royal Society, Canada. Further, 10 Faculty members are elected Fellows of the Canadian Academy of Health Sciences. Since year 2000, 8 Faculty members have been appointed to the Order of Canada (3 such individuals have now retired from the Faculty). A future goal of the Faculty should be to ensure several members are strong candidates for major international awards like Nobel, Lasker and Gairdner.

The growth on campus in terms of facilities and infrastructure is impressive: the new Health Research Innovation Buildings (both East and West) are operational and house substantial up-to-date equipment purchased through many successful CFI/ASRIP grants (outlined in the next paragraph). The Alberta Mazankowski Heart Institute opened recently and the new Edmonton Clinic buildings are under construction. The North Edmonton Clinic building will house out-patient clinics and most of the health sciences faculties and is near completion. This will create new opportunities for ambulatory research.

Over the last 12 years, the Faculty has been successful in securing large-scale infrastructure awards from both the federal and provincial governments e.g., through CFI and ASRIP. Research space, equipment, and facilities across the Faculty are notable, and build around initiatives in cardiovascular disease, diabetes, gastrointestinal disease, immunology, transplantation and transcriptomics, physiology and movement, virology, prion disease and protein folding, proteomics, metabolomics, computation, *in vivo* imaging, and more.

In terms of trainees, the Faculty currently has 534 graduate students comprised of near equal numbers of MSc and PhD students. The graduate training programs have not been reformulated in the context of the new School structure. Separate graduate training programs exist in the following Departments/Centre:

- Biochemistry
- Biomedical Engineering
- Cell Biology
- Medical Microbiology & Immunology
- Medicine
- Centre for Neuroscience
- Oncology
- Pharmacology
- Physiology
- Psychiatry
- Surgery
- Medical Sciences Graduate Program – administrative structure for smaller graduate programs including:
    - Anesthesiology & Pain Medicine
    - Dentistry
    - Laboratory Medicine & Pathology
    - Obstetrics & Gynecology
    - Ophthalmology
    - Pediatrics
    - Radiology & Diagnostic Imaging

The Committee met with about 20 trainees (including post-doctoral fellows) - 2 from each School and Institute reviewed. All of the trainees shared positive comments and excitement about their training experiences. However, an area of concern was the lack of access to Core Facilities across the Faculty. It was also noted that the Faculty's animal facilities (HSLAS) often impeded research for reasons such as exceptionally long wait times for ordering/breeding animals and for protocol approvals. Such concerns with HSLAS were also raised by several School Leads. The students felt the need for organized 'Faculty run' facilities for various standard experimental methods and also as a training ground for learning methodologies and equipment handling. While the Faculty houses significant infrastructure (e.g., CFI/ASRIP-funded equipment described above), central management and access to facilities in the Faculty is an issue.

During the site visit, the Committee heard a presentation from Dr Eric Archambault, founder and CEO of 'Science-Metrix' - a company in Montreal that specializes in provision of bibliometric data for evaluative purposes. On behalf of the Faculty, Science-Metrix analyzed a collection of manuscripts from each School/Institute to provide relative impact factors (RIFs). This was useful information for the Committee as it enhanced assessing publication data across the different areas of research (the RIF accounts for variations in citation patterns across different disciplines).

Science-Metrix also compared the Faculty's scientific output (manuscripts) and impact as a whole, with other select and similar Universities world-wide. Over 2003-2008, the Faculty published a total

of 6,573 manuscripts (e.g., in the Scopus data base); 16% of those papers were published in the top 10% of journals and 15% of those papers are in the top 10% of papers cited. Although close, the Faculty fell behind the medical schools of UBC, McGill, and University of Toronto in those two domains. This is partly a function of more publications coming from those larger centres [e.g., 2003-2008 total publication numbers in Scopus data base for UBC, McGill and University of Toronto were 9,937, 12,293, and 28,707, respectively], but also reflects slightly lower quality.

Further, the journals that the Faculty publishes in with the greatest impact (corrected to account for different citation patters across disciplines) are in the journal sub-fields of: rehabilitation, general and internal medicine, gastroenterology, urology and nephrology, arthritis and rheumatology, respiratory system, obstetrics and gynecology, cardiovascular system, anesthesiology and orthopedics (data from 2003-2008). These are the 'top 10' of a much longer list, so other fields have similar impact. Note that these journal sub-fields do not necessarily relate directly to research themes identified in the Faculty. For instance, 'cardiovascular research' in the Faculty is published in a variety of journal sub-types: cardiovascular, biochemistry, physiology, etc. Further analyses of the Science-Metrix data are required, and the Faculty is undertaking this exercise. The Committee also appreciates the various limitations of bibliometric analyses, however such indices do give a sense of 'trending' or direction in terms of quantity, quality and impact. It is advisable that the Faculty performs such analyses every 3 to 5 years, particularly now that a 'benchmark' has been established.

Key Factors Affecting the Faculty

There are several major changes in the environment that impact the Faculty's research enterprise. These include: new administration and organizational structuring in the medical school; re-focusing and changes in government funding programs, including the transformation of AHFMR into Alberta Innovates – Health Solutions; and new leadership and structuring of the provincial health care delivery system, Alberta Health Systems (AHS)

Under new Faculty administration, Departments, Division, and research units (institutes) were organized under 8 new School structures. The School membership elected their School Lead and School Research Lead. During the site visit, the Committee met with School Leads and School Research Leads and developed an understanding of the opportunities, as well as the challenges, inherent in this new structure, and these are commented on later in this document.

As noted above, the Committee also met with key individuals representing the sectors/institutions involved in the changing research environment in Alberta. During a Welcoming and Briefing Dinner held on March 17th, Dr Carl Amrhein, Dr Stephen Duckett, Dr Annette Trimbee and Minister Zwozdesky all expressed their interest and excitement about the Faculty's research assessment exercise. As well, they each described the current goals, challenges, and initiatives within their respective organizations. Dr Amrhein outlined the fiscal constraints faced by the University as well as the University's full support of the Faculty's research assessment exercise and the need to understand where the areas of research excellence lie. He emphasized University of Albert's goal of achieving the highest quality. Minister Zwozdesky and Dr Duckett each described the priorities for healthcare in Alberta, which include optimizing personal and community health and improving healthcare delivery systems. As well, the restructuring of health into a pan-Alberta system was outlined. A research agenda in the health system appears to be emerging. However, research

priorities and the allocation of specific resources to academic health research are issues that are currently unclear.

On March 19th, the Committee also engaged in a conference call with Mr Rob Seidel, Board Chairman for AI-HS. This conversation was very important as concerns about the restructuring of AHFMR were voiced by all Faculty Schools and Institutes. The University VP Research Office, and the Deans and Vice Deans of Medicine at both medical schools (UoA, UoC) have been working closely with Mr Seidel and AI-HS, to develop a transition plan for existing AHFMR salary awardees. Mr Seidel indicated that the new AI-HS will:

- Continue to fund research in Alberta at the same level as AHFMR had done in the past – there will not be reductions to the operating budget for research
- Fund initiatives that align with the 'Alberta Health Research and Innovation Strategy' that is currently being developed by the Alberta Ministry of Advanced Education & Technology. AET is also working with AHS and AHW to create this strategy.
- Honor its new legal obligation to ensure its funding activity is consistent with government policies, procedures, and priorities
- Seek leveraged spending with industry – this will be a new element to research funding in Alberta
- Continue to fund discovery science: to quote Mr Seidel: *"We are not out of the business of basic research"*.

Other emerging initiatives that involve and affect the Faculty are the 'Alberta Academic Health Sciences Network (AAHSN)' proposal and the 'Campus Alberta' initiative.

The AAHSN proposal outlines a provincially integrated approach to biomedical and health research, clinical care and health education. The vision as outlined in the presentation from Dean Baker is to be a leading Centre promoting integrated health education, research and healthcare for Albertans, and making Alberta an international leader in all three. To achieve the vision, AHS, the two Alberta medical universities, and government are exploring development of an AAHSN framework. The goal is to facilitate delivery of common missions in select areas of research, training and delivery of quality care.

'Campus Alberta' is an effort to establish coordinated Alberta-wide networks across the Universities in areas of research and educational strength and capacity. The protégé initiative is 'Campus Alberta Neuroscience' which involves bringing together under one organizational umbrella strengths in neuroscience research and education across Alberta's 3 universities. The partnership benefits from a common strategic vision allowing establishment of priorities and a provincial scope for efforts in neurological and mental health research and education.

Both of these initiatives are in their infancy, but speak to a new culture of partnership across the UoA and UoC medical faculties, that will undoubtedly have positive results in terms of impact and opportunities.

C. OVERARCHING COMMENTS AND RECOMMENDATIONS

Following meetings with key opinion leaders and School and Institute faculty members, the Committee puts forward the following comments and recommendations. Assessments and recommendations for each of the 8 Schools and the 2 Institutes are described in the next section.

Research Excellence in the Faculty

1. There are many outstanding investigators and research groups spread across discovery and clinical departments and themes. It is essential to preserve these areas of capacity and excellence, as they represent the 'high profile' of the University of Alberta and the FoMD across Canada and the world. Such areas include, but are not limited to:
    a. **Membrane proteins and structural biology**
    Drs Michael James and Brian Sykes have led the way with solving structures and protein interactions using crystallographic and NMR techniques. The Department has also been conscious to develop mid-career researchers in this area (Drs Mark Glover, Howard Young, Joanne Lemieux, Andrew MacMillan, Richard Fahlman, Leo Spyracopoulos). The researchers have individual interests in 'structure-function' research and several are directed towards drug design and diagnostics. The Faculty could consider harnessing their expertise and efforts in protein chemistry and structural biology toward a focused program in drug and diagnostic development. This could even be focused in areas that reflect other research excellence in the Faculty (e.g., virology, cancer).
    b. **Motor control and rehabilitation**
    The research teams of Drs Richard Stein and Vivian Mushahwar, and others, have built an international reputation for the Faculty in the field of motor control and rehabilitation, with applications to spinal cord injuries, cerebral palsy and other diseases. It will be important to sustain research capacity in this relatively small but important area of excellence.
    c. **Transplantation**
    Research excellence in clinical and discovery transplantation sciences span across the Schools and Institutes and the Alberta Transplant Applied Genomics Centre. Edmonton is also the largest clinical transplantation site in Western Canada and many clinical trials are performed at this centre. The transplantation research teams in the Faculty would benefit from an operational structure such as an 'Institute of Transplantation Sciences' within the School of Clinical and Laboratory Sciences, to consolidate and focus their efforts. The transplantation theme also fits well with the virology theme: viral disease is a major cause of liver failure and so liver transplantation (e.g., HCV), and is a major complication of immunosuppressive therapy.
    d. **Diabetes (including obesity)**
    The Alberta Diabetes Institute represents a unified effort to investigate diabetes across the 4 Pillars. The Institute has been very successful in securing resources in the past, and the recent addition of new investment, investigators, and programs (e.g., clinical trial unit, islet biobank) should position the ADI to make greater impact. More recently and under the direction of the interim director, Dr Peter Light, the 'research culture' in

ADI has improved significantly. It is critical that the ADI secure a permanent director with strong leadership experience.

e. Virology

Past research in virology in the Faculty has reached international acclaim. Significant new investment in the area (to be announced) will help to build the group and ensure ongoing progress and success. It is important that 'virology' develop a focused set of priorities, a strong group of mid-career investigators as well as increased level of trainees.

2. Other areas have substantial strengths and pockets of capacity, but could have greater impact with strategic development. These include:

a. Cardiovascular biology

Across the Faculty, there are excellent academics in the cardiovascular field in both basic and clinical research, including clinical trials. This and the MAHI represent an opportunity to develop a coherent cardiovascular research team in the Faculty - and every step should be taken to integrate cardiovascular scientists from across all the Schools, (e.g., SMSM, SIM) and to consolidate this theme under the umbrella of MAHI. Research plans and priorities need to be established, as well as a rejuvenated 'research culture' in MAHI (e.g. seminar series).

b. Cancer studies

Cancer research in the Faculty is excellent in the imaging and cancer genomics areas, but is in need of higher profile and potentially consolidation under the umbrella of an Institute, as suggested by the team. Research in cancer biology represents an opportunity at the U of A and at a provincial level as a 'Campus Alberta' entity.

c. Neuroscience

Research in neuroscience spans several Schools and there are many excellent basic science and clinical researchers in the Faculty. The theme requires enhanced organization and profile – this is addressed further in the next section.

d. Women and Children's Health

The Committee recognizes the provincial investment in the area of 'women and children's health' and is impressed by the infrastructure and resources that have emerged in Edmonton (e.g., Women and Children's Health Research Institute (WCHRI), Lois Hole Hospital for Women). Women and children's health are a global and national priority - this area has potential for the Faculty and for the province, and is an excellent focus for a 'Campus Alberta' program.

e. Epidemiology and health outcomes research

Epidemiology and heath outcomes research is essential to an academic health centre. The Faculty has pockets of excellence in this area (e.g., School of Internal Medicine, Epicore Centre). Resources in this area need to be examined across the Faculty and stronger networks established with focused priorities.

Faculty Research Committee (FRC) Comments:

FRC recognizes the international impact that our basic and clinical researchers have made in the above areas of research excellence as identified by the External Review Committee and supports these selections. As the External Review Committee also highlights in this report, in vivo imaging is another

area of substantial research strength and capacity that has placed the Faculty on the international stage and that supports 'cancer' and other research themes. FRC recommends that the research area of in vivo imaging be added to 'Group 1' above.

General Comments Regarding Research Programs

1. The Committee recommends that the Faculty provide governance and management to centralized core facilities that house critical instrumentation and provide services to funded scientists. It is recognized that facilities/equipment may be located in various buildings and may reside in Schools (e.g. SMSM), Institutes or Centres, but overall consolidation and governance needs to be provided by the Faculty to achieve easier overall use. Core facilities need to be advertised to faculty members and should also provide training opportunities for graduate students (trainees). This will increase research efficiencies, contribute to research excellence, and stimulate interdisciplinary experiences.
2. The Faculty must continue to focus on excellence in all four pillars of the research enterprise. Opportunities in Pillars 2, 3, and 4 research require far more integration between the Faculty, its members, and Alberta Health Services. Establishment of an 'Alberta Academic Health Sciences Network' would significantly facilitate such efforts.
3. Neuroscience is an area of research strength and capacity that spans several Schools – e.g., Department of Psychiatry, Neurochemical Research Unit, Centre for Neurosciences, Division of Neurology, and other units. Collectively, there are commendable and large numbers of publications in this field at the UofA. However 'neurosciences' does not come across to the Committee as a visible and highly developed theme in the Faculty. The research efforts of these units would benefit from a unified approach, potentially under the direction of a highly respected and established leader in neurosciences. The formation of 'Campus Alberta Neurosciences' may also assist with focusing FoMD research in neurosciences.
4. The faculty appears to have research gaps in areas that are important (essential) to a medical Faculty and that would improve overall strengths of other programs. The faculty should examine the value of filling identified research theme gaps, including in the areas of: developmental biology, genetics/genomics, bacterial pathogenesis and cancer biology.
5. The Faculty should examine the merits of identifying Aboriginal people's health issues as an over-arching research priority - perhaps as a 'Campus Alberta' or Western Canadian initiative would be appropriate. Aboriginal health involves all clinical and community disciplines.

Faculty Research Committee (FRC) Comments:

The FRC agrees that strength in 'neurosciences' spans our Schools and that greater organization and profile is needed to achieve full potential in this area. Further, the areas of Aboriginal health, woman and children's health, and cancer biology would benefit by engaging in research and educational activities with University of Calgary and University of Lethbridge as 'Campus Alberta' initiatives. Our Faculty must take the lead in activating these efforts.

Faculty Operations and the New School Structure

1. The Committee can identify other medical faculties worldwide engaged in new organizational arrangements that create opportunities for collaboration across clinical and basic research units. Many such changes are directed at recognizing that the 'new' field of molecular biology has made new research arrangements logical and productive – in fact, necessary. The

Committee believes that they were not commissioned to either critique the Faculty's new School structure or suggest that it be changed.

2. It is important to define more clearly the roles and responsibilities of School Leads and the School Research Leads. In future, a novel academic search process would be advantageous. This will require making critical resources available to the School Leads.
3. Overall, movement from a Department/Division structure to a School/Department/Division based organizational model in the Faculty should be viewed by faculty members as an opportunity rather than an impediment.
4. The new School structure was beneficial to some Schools, but identified as a challenge/threat by others. Smaller Schools appear to be adapting better to the Schools organization, and it would also appear that some Schools are organized in a more suitable and logical manner than others. Thus, there may be a need for some adjustments in due course. Although the reorganization into Schools has immediate administrative advantages, it will fail unless it provides added value in terms of research and graduate training and supportive infrastructure to research groups and principal investigators. Leadership and appropriate incentives are absolutely essential to the success of this organizational structure. In some cases, there appears to be continued uncertainty as to the roles and responsibilities of School Leads, Research Leads, and Department Chairs. This problem appears to be most acute in the School of Molecular and Systems Medicine and needs to be addressed.
5. Clear and transparent methods used to assign priorities (focus), choose leaders, and rationalize limited resources (space, targeted funding, core facilities) should be implemented.
6. The Faculty should guide the Schools in the implementation of successful communication plans among School leads, departments, divisions, institutes and research units.
7. The new School structure should be evaluated by the Faculty in 3-5 years time, and altered, if necessary (e.g., changes in School membership).
8. The Faculty should asses developing a clear strategic plan regarding current and future infrastructure development in the Faculty that will support current and future research programs.

Faculty Research Committee (FRC) Comments:

The FRC appreciates the External Review Committees' comments regarding the Faculty's new School structure and acknowledges the need to develop better 'terms of reference' for the School and School Research Leads, especially as it relates to the roles of Department Chairs. Further, the evaluation criteria used in Faculty Evaluation Committee (FEC) must take into account the work of School and Research Leads.

Personnel and Funding

1. The restructuring of AHFRM into AI-HS is an opportunity to refresh, rebuild, and refocus biomedical and health research funding in Alberta. Discussions with Mr Seidel were encouraging. However, the preliminary plans and priorities of the new AI-HS do not appear to be ***explicit*** in the need for discovery research – the very area that has brought distinction to the University of Alberta and produced many discoveries that have, or are in the process of, translation into clinical practice. Successful biomedical research with translation to clinical medicine is a pyramid with a broad and deep base in discovery; discovery-related research cannot be lost in the new system without producing long-term damage to the biomedical research capability at the U of A and the future health of the province's citizens. The path

from the base of this pyramid is unpredictable, circuitous, and sometimes long. For example, the discovery science that led to the "Edmonton Protocol" for islet cell transplantation stretches back decades and was not initially directed at diabetes. An essential feature of the growth of biomedical research at the U of A has been the resources and financial stability created by provincial funds; in particular, the former Heritage Foundation. For example, in the School for Molecular Systems Medicine, all of the most highly recognized senior and junior investigators receive salary support from the Heritage Foundation (now AI-HS). It is vital that university and government leaders move quickly to reassure the biomedical research community that there remains a sense of financial stability and research opportunity in Alberta. Otherwise, the U of A will not be able to retain outstanding scientists or recruit new outstanding ones. The impact of even a short period of indecision could decimate areas of excellence that took years, even decades, to establish.

2. Long-term financial security of high-quality tenure appointed faculty is a priority for both retention and future recruitment of the best and the brightest minds. A faculty-wide academic alternate relation plan (AARP) could be used to enhance protected time for clinician investigators and clinician scientists. Alternate strategies and fall-back positions must also be planned for.
3. Several of the junior faculty and trainees reported that seminar programs had been reduced due to lack of continued funding from the Heritage Foundation. We think this is regrettable. Outside speakers and in-house "work in progress" seminars (e.g. as is ongoing in the ADI) are critical to the research culture and esprit, and must be preserved. These can be organized on a research group theme, or School basis, as they also serve to increase the visibility of the U of A to the outside world. As an example, the MAHI would benefit '2-fold' by a formal lecture series consisting of internal as well as international guests: it would assist with integration of the research teams and would also give an international presence to the institute.
4. With the plateau in AI-HS funding (endowment revenue) and the increase in demands/competition for CIHR funding (and thus lower national success rates), the Faculty needs to fully explore other mechanisms and agencies to secure extramural research funding for investigator-initiated grants

Core Facilities

1. Although infrastructure at the U of A is superb, there is an apparent lack of integration of core facilities in Institutes, Schools, and Centres. This was expressed by trainees as well as School Leads. The Faculty should undertake a review of all core facilities, with the intent to maximize efficiencies and user access for all faculty members and to provide oversight and integration, where appropriate. The School of Molecular Systems and Medicine may be a place to locate major elements of core facilities and technologies.
2. Ineffective delivery of Laboratory Animal services (via HSLAS) was highlighted by both trainees and faculty as an impediment to research. A strategy must be implemented to enhance efficiencies, while maintaining the highest of standards.

Faculty Research Committee (FRC) Comments:

As outlined by the External Review Committee, centralized management of select core facilities will benefit the Faculty by increasing efficiencies and by fostering interdisciplinary and training experiences; the FRC fully supports the recommendation that Faculty provide governance and

management of centralized core facilities that house critical instrumentation and provide services to our scientists. A Faculty task force was recently assembled to address core facilities, and this timely recommendation will be relayed to that committee.

Faculty Training Programs

1. As previously described, the Committee met with about 20 trainees (Master's students, PhD candidates, PDF's) from across the Faculty. These interactions were positive and the group was (eventually) eager to share their research and trainee experiences with the Committee. The group was broadly very happy with the training they are receiving at the U of A however some trainees expressed their sense of isolation from their peers. They also noted the relative isolation of training in Alberta. Accordingly, faculty support for a Visiting Professorship program should be implemented. The availability of intramural support for trainee Travel Awards would also be helpful in this regard.
2. A review of the structuring of the Faculty's graduate programs is suggested. Graduate programs are encouraged to restructure in ways that increase cross-fertilization and training. In some cases, these may follow the new School organization. One example is the School of Molecular Systems Medicine where a joint program across the School is likely to provide advantages in terms of recruitment from outside Alberta, flexibility of student programs, and some economy of scale in courses. Joint graduate programs (as well as shared Core Facilities, see above) will facilitate a natural process of collaboration and integration between departments, centres, Institutes, and Schools. These broader models have the potential to enhance collaborations, promote inter-disciplinary research, and enhance the biomedical research training experience.

Faculty Research Committee (FRC) Comments:

The FRC notes that achieving and sustaining 'research excellence' also relies on the Faculty's ability to attract the best trainees worldwide. Our new School structure provides a mechanism to create new and innovative interdisciplinary training programs that could greatly assist with student recruitment. FRC agrees with these recommendations.

Institutes

1. An issue regarding 'Institutes' for the Faculty and for the health sciences campus in Edmonton is the lack of hospital-based research institutes (HBRI) which are successful in many Canadian academic centres. We define institutes as having a research director, a separate governing or advisory board, and separate fundraising ability. Although focused in various areas, HBRI are able to choose and direct their research themes, but their choices and resources also have beneficial effects for many other areas. Edmonton does not have any true HBRIs: ADI is university based and the MAHI has largely a clinical focus. The lack of true HBRI on the Edmonton health sciences campus likely means that substantial philanthropic funding and support from the community for health research is missed as donor gifts are often related to diseases affecting the donor's families and friends. The Faculty and the hospital-based researchers need to consider how to develop health research institutes or 'HBRI-like' institutes within the complexities of AHS. It could be a major source of operating funds, core funding and development, and recruitment and retention of researcher excellence, especially

in attracting mid-career level researchers. As described above it would also aid development of Pillars 2, 3 and 4 research.

2. Several Schools and presenters suggested the development of new "centres" or "institutes", particularly in cancer and transplantation. We agree that these are areas that might benefit from efforts to coordinate and facilitate research activities. We believe the Faculty should assess this further.

Faculty Research Committee (FRC) Comments:

The model of HBRI's has been very successful at other large centres (e.g. Toronto and Montreal). The FRC agrees that the Faculty and AHS must develop mechanisms to better imbed research in the clinical environment. Creation of a health outcomes research institute that focuses on Pillars II, III and IV research is a mechanism to achieve this. Further, FRC agrees that our 'transplantation' and 'cancer' themes each require a research structure under which investigators can consolidate their efforts. The details of such would be unique to the needs of each group and requires further evaluation.

Leadership and Recruitment

1. The Committee recommends that the Faculty ensure that strong leadership is established in key research units. High quality institutes need highly successful and respected research leaders who can build a complement of cutting edge investigators for the institute. There are several areas of vulnerability, including ADI (currently with an interim director) and the MAHI (currently with 3 directors). The Schools also require strong leadership, with clear accountability, responsibilities and resources. The Faculty should ensure that it has a culture of selecting leadership at the highest levels.

Faculty Research Committee (FRC) Comments:

FRC recognizes that strong leadership in areas of research excellence, focussing also on strategic development of cutting edge mid-career investigators is critical for our success. A permanent director for ADI is being recruited. FRC agrees with the recommendation that the MAHI requires leadership by one director and recommends that this individual be a world-leading clinician scientist. Other associate directors may be required in MAHI (e.g., clinical, scientific director). With MAHI's unique clinical environment and substantial research infrastructure (e.g. ABACUS) there is true potential to place Edmonton as one of the top 5 in the world in the cardiovascular field, provided we can consolidate our cardiovascular research under the MAHI umbrella – as recommended by the External Committee.

Relationship with Key Stakeholder: Alberta Health Services

1. Alberta Health Services (AHS) does not seem to regard research as a priority, or at least the current focus appears to be short-term. Given the interrelatedness of top-quality care and clinical research, this approach will have both short and long-term adverse impacts on the optimal care of patients in Alberta, and in the development of more effective treatment options. It is known and accepted that patients enrolled in research studies have better outcomes. The relationships of clinical care and research are complex in an academic medical centre, and require careful consideration by groups, including all stakeholders to prevent unintended consequences on health delivery. The Alberta Academic Health Sciences Network initiative may help to facilitate research and improve care in the Alberta setting. AHS should

have a role in funding the research enterprise in Alberta. The planned recruitment of a senior VP research by AHS should help to develop the relationships necessary to pursue a combined Faculty and AHS research mission. The Committee strongly recommends that the senior VP research report directly to President/CEO of AHS to emphasize the importance of research in the healthcare system in Alberta, and to facilitate its implementation. The senior VP research in AHS needs to be a prominent spokesperson for health research in Alberta and within the Faculty.

D. COMMENTS AND RECOMMENDATIONS FOR SCHOOLS, ADI, and the MAHI

1. School of Cancer, Engineering and Imaging Sciences

Quality Rating:

Overall: 2 - Quality that is recognized internationally in terms of originality, significance and rigor

Imaging research: approaching 3 - Quality that is internationally excellent in terms of originality, significance and rigor

Within SCEIS, there are 83 academic and clinical faculty members with a >10% commitment to research. Of these, 7 are in BME, 10 in RDI and 66 in Oncology. The total Full Time Equivalent (FTE)-equivalent research commitment of this group is 30.9. The School has chosen the following themes as their areas of research excellence: Engineering-Regenerative Medicine; Genome Stability; Medical Imaging; and Novel Therapeutics, Biomarkers, and Clinical Translation.

The SCEIS is one of the strongest Schools reviewed. The three components of the school are well matched and should provide excellent scientific collaborations and synergies, as the relationships develop. The School describes plans to create a Cancer Research Institute which would aid in integrating surgical, clinical, and imaging units with the goal to enhance research focus, clarity and progress towards research development and commercialization. The Molecular Imaging core within the Imaging Science Division is world class with outstanding faculty and staff. There is a very strong radiochemistry/instrumentation program. The compounds in the pipeline will especially aid in the diagnosis and therapy of cancer and other diseases in this era of molecular medicine. The School's leader is an internationally recognized figure in his field

The Biomedical Engineering group (formerly a department), although representing less that 10% of the research FTEs within the SCEIS, has the potential to synergize with the work of this School in cancer imaging as well as with imaging activities in other departments/divisions such as Medicine and Neurology. The group contributes to two of the four School-chosen areas of research excellence: Medical imaging and Engineering/Regenerative Medicine. The former involves the traditional area of medical physics whereas the latter includes e.g. Dr. Burrell's work in wound healing and Dr. Gorassini's work in recovery from spinal cord injuries. As it relates to BME, most of the papers cited under 'Recent Achievements' in the RAE document are in specialty journals with modest impact factors and citations rates have also been modest. There is a history of interaction with faculty members in tissue engineering, particularly the commercialization of the silver product for wound healing (Anticoat). The BME group has seen a significant increase in funding over the past 4 years and

has been the leader in terms of establishing the Biomedical Engineering Research and Results Initiative (BERRI) to promote commercialization. The RAE document did not contain sufficient information to assess what appear to be superb infrastructural elements including the NINT, Allen MRI Research Center and the Institute for Reconstructive Sciences in Medicine.

The School feels that the 'number one investment for tomorrow' is in the area of Genome Stability and creation of a cancer Institute would help to unite that research theme.

Recommendations

1. The creation of an Institute may aid in focusing efforts, team building and seeking corporate support for redefining structure of Cancer research in the Province.
2. The School would benefit by making choices about which cancers to focus research on, or by becoming part of a larger provincial or national consortium in cancer research.
3. Despite the emphasis on Genomic Stability, the reviewers did not perceive that cancer biology, a major growth area in science, came through as a high profile U of A theme. The Faculty and the province would benefit by focused additional efforts in this area. This should include integration with other researchers across the Faculty working in the cancer field.
4. The BME group is an important asset to several research themes in the Faculty, however, the overall visibility of the group is somewhat difficult to evaluate because of the diversity of themes and discrepancies within the group. The goal of integrating the 60 academic BME faculty at the U of A appears challenging given the diversity of topics under study and the distribution across the campus. A more focused approach that builds on the substantial research infrastructure and existing strengths in the FoMD may be more effective in establishing national and international recognition for BME at U of A.
5. The BME group could be important to the integration of imaging facilities across the Faculty
6. The BERRI initiative could be useful in bringing engineering expertise to faculty members in FoMD, particularly in the areas of imaging and medical devices.

School's Comments:

We appreciate the positive comments about imaging research and note the opportunity to strengthen collaborations across campus, particularly through BME and PET programs. We wish to highlight our strengths in clinical trials, question comments concerning cancer biology research, but are grateful for the unequivocal support for an Institute of Cancer Research that will strengthen and facilitate cancer biology and genomics research across Campus and enhance areas of lesser strengths such as stem cell research.

2. School of Clinical and Laboratory Sciences

Quality Rating:

Overall: 3 - Quality that is recognized internationally in terms of originality, significance and rigor - especially for virology and transplantation

There are 75 Faculty affiliated with the two departments, but many additional UA Faculty are involved in SCLS's activities because of the nature of the School's research, its Institute/Centre activities, and its commitments to the Faculty and to the University of Alberta Hospital. The

Department of MMI has 16 full-time faculty members (half are funded externally) with two retirements anticipated in the next year. The department also has six clinical and 19 academic cross-appointed faculty members. The Department of Laboratory Medicine and Pathology is a large department comprising 55 faculty in seven Divisions (Anatomical Pathology, Analytical & Environmental Toxicology, Hematology, Medical Biochemistry, Medical Microbiology, Molecular Pathology and Medical Laboratory Science). The department also has 52 clinical Faculty mostly working at other diagnostic laboratories in Edmonton, and four academic cross-appointed Faculty.

The School has chosen the following themes as their areas of research excellence: Analytical and Environmental Toxicology; Immunology and Transplantation; Molecular Pathology and Biological Preservation; and Virology and Infectious Diseases.

The School is home to members that have made significant research achievements: Dr Tyrrell made major contributions to the development of an oral antiviral agent for HBV (Lamivudine), and along with colleagues at the U of A (Drs Mercer and Kneteman) he developed the first non-primate animal model for HCV. The goal of successfully developing a Hepatitis C vaccine in 10 years would be a colossal achievement. Dr Halloran (Director of the Alberta Transplant Applied Genomics Centre) was the first to describe antibody mediated transplant rejection and more recently his team is determining the molecular phenotypes of disease and injury events in transplanted tissue. Of note: Dr Halloran is the founding and current editor in chief of the *American Journal of Transplantation* - this situation is unique in Canada. The School is rich with infrastructure; its challenges are recruiting faculty due to the current funding environment.

Recommendations

1. Under the new School structure, 2 Departments (MMI and Lab Med Pathol), 2 Institutes (that are now amalgamating into a single Institute), and the Alberta Transplant Applied Genomics Centre (ATAGC) have been brought together. There appears great potential for new collaborations and synergies among these units, however the School requires more work to become a coherent research entity. To assist with that, research teams should be developed in the School (and across the Schools) that have a structure to their operation. There is a need for transplantation to be more at home in the new entity. Refer to other sections of this document that recommend establishment of am “Institute of Transplantation Sciences” in this School.
2. The School of Clinical Laboratory Sciences has delivered past work in virology that is internationally excellent. However, prospectively, there are some concerns in terms of the continued output and capacity in light of the many productive members who are either near retirement or in administratively heavy roles in the School. Plans are in place for new major recruits in relation to several recent and substantial awards (to be announced), which should recapture research momentum.
3. The development of a ‘Virology Institute’ would be an important step forward. A detailed strategic research plan needs to be developed for the Institute. As part of the strategic plan, there needs to be ongoing planning aimed at ensuring recruitment of a critical mass of high quality scientists. Steps also need to be taken to ensure ongoing sustainability of the Institute is achieved.

4. Transplantation pathology and molecular phenotyping are strengths within the School. The potential privatization of pathology across AHS is a threat to this and to other programs that rely on clinical material for academic research. Inseparability of clinical service and academic research in pathology needs to be maintained.
5. Although trainees are registered in other Faculties and Departments and are part of the School, there is still an apparent lack of trainees in the School. Efforts need to be implemented to address this.

School's Comments:

We thank the review committee for their thoughtful recommendations. We've taken note of the need to build collaborations within the SCLS, to pursue strategic new recruitments, and the need to develop detailed research plans for the new Li Ka Shing Institute of Virology. Our leadership has also started to explore how we might facilitate future development of an Institute of Transplantation in the Faculty.

3. School of Community-Based Medicine

Quality Rating:

Overall: 1 - Quality that is recognized nationally in terms of originality, significance and rigor

The School of Community-Based Medicine (SCoBM) has chosen the following themes as their areas of research excellence: Emergency Health Care Research; Medical Education Research; Mental Health and Translational Neuroscience; Occupational and Environmental Health, Injury and Rehabilitation; Primary Care-Community-Based Health Services and Health Systems Research

This School brings together the Division of Community and Occupational Medicine, Department of Emergency Medicine, Department of Family Medicine, Division of Geriatric Medicine, Division of Physical Medicine & Rehabilitation, Department of Psychiatry. The panel recognizes and applauds the efforts made to bring these fairly disparate groups together. However, there are some weaknesses. Total staff numbers are 75 and they have only had a total of around $19M in grant moneys received over the last 5 years. Furthermore the income appears to have slowly declined year on year. Out of the 32 selected publications 18 had a RIF less than 1 and 14 of these were since 2005; these figures were heavily biased by the 1/8 in both Primary Care and Medical Education that had a RIF greater than 1 and were published since 2005. 11 PhD students are currently enrolled, which seems low.

Recommendations

1. The Emergency Health Care Research, Mental health and Translational Neuroscience and Occupational and Environmental Health, Injury and Rehabilitation Medicine themes are possible areas for future focus. Neither Primary Care nor Medical Education Research should be pursued as independent themes – they have too weak a current base.
2. The contribution of Drs Cherry and Rowe across the School is notable and there is a case for re-casting the themes around these two investigators – perhaps in an Emergency Health Care and Community, Occupational Medicine and Rehabilitation Research Themes. Strong Psychiatry/Mental Health would be advantageous to any faculty of Medicine but development

of this theme at the U of A will not be helped by recruitment of a laboratory scientist in 'addictions' who could be isolated in the set-up of the current group.

3. In March 2006 the School of Public Health (SPH) was created separate from the Faculty of Medicine & Dentistry and we understand an independent SPH is crucial for accreditation. The SPH, as a stand alone University School has requirements for capacity and resources in biostatistics, epidemiology, policy making, community research and more. The Committee anticipates excellent and synergistic interactions between the SCoBM and the SPH.
4. Aboriginal health is a Canadian and world problem. An integrated Alberta, indeed Western Canadian, research initiative in this area should be considered.

School's Comments:

We appreciate the Committee's comments and will continue to build on noted strengths in Emergency, Occupational, Rehabilitation, and Mental Health/Neuroscience research and to contribute to faculty-wide programs (e.g. education, Aboriginal health, geriatrics). Our established resources would support an endowed chair in addictions, and we suggest that 'primary care' and 'health services' research provide unique opportunities while also addressing provincial health goals.

4. School of Dentistry

Quality Rating:

Overall: 0 - Quality that falls below the standard of nationally recognized work or work which does not meet the published definition of research for the purposes of this assessment

The School has chosen the following themes as their areas of research excellence: Dental Hygiene Research and Community and Public Health Orthodontics.

As outlined in the report, the School of Dentistry (SoD) has undergone substantial change in the past 15 years that has severely affected the research program. The School of Dentistry has 21 FTE - only 4 are classified as discovery scientists, defined by SoD as more than 20% time devoted to research. That percentage is well below what is necessary to have a high quality research program. The other faculty list either 0-10% or 11-20% effort for research. This low degree of effort makes it extremely difficult to generate a research program that has significant national and international prominence. Both the written report and the oral presentation provided raise major concerns about being able to protect sufficient professional time of faculty members in the SoD for pursuing high quality research activities. Clinical teaching responsibilities cannot be used as a justification that limits the research enterprise. The lack of critical mass in research is reflected in the relatively low level of external funding and low visibility of the School. For example, no members of the School have salary awards. Several faculty members have published a number of papers, but the impact of this work is generally low as measured by citations. Many of the papers are directed at practicing dentists – a worthy objective but below the expectation for an academic unit.

The current research focus includes orthodontics and community/public health. The School plans to overcome the lack of research manpower by the addition of several Chairs and additional faculty in clinical and discovery science areas. The appointment of Dr Major as head of the School in 2010 allows these recruitments to proceed. However, the report provided by the school did not provide a

focused plan for how these recruitments would establish a high-visibility research program. There is also a question whether outstanding scientists could be recruited to the School. The School's research efforts are not well integrated with areas of strength in other Schools in the FoMD, although there is interaction with Biomedical Engineering. The School does have a number of trainees in orthodontics, but many are in the MSc program, which primarily represents specialty training for clinical dentists. Thus students in the graduate program appear to have little interaction with graduate programs in other schools and the research output and impact of trainees is below expectations.

We understand the School has been provided resources to recruit 14 new positions: 7 clinicians (each proposed to have roughly 30% of time available for research), 2 endowed research chairs, and 5 foundational scientists.

Recommendations

1. The Committee learned both from the Faculty and from government that the School of Dentistry is a priority; a professional Dental school must be maintained for the province and the School is a successful program in terms of its clinical and educational mandate. These missions must continue to be nurtured. As well, the research mission of the School must be brought to a higher level of achievement.
2. The current level of research expertise, time commitment, and impact is low. Thus, the recruitment of additional clinicians to free current faculty for research is unlikely to produce the intended result, i.e. research of higher quality and impact. This conundrum is compounded by the low number of qualified academic dentists in North America and the many open academic positions across N America (>450) - thus, the probability of recruiting these rare individuals to the U of A is very low.
3. The 14 new positions in the School provide a special opportunity to link with other Schools. The positions in discovery science research that have been allocated to the SoD should be targeted to areas that would create centres of excellence in oral biology/health in the context of research strengths and priorities in the FoMD. In ***all*** cases, the research recruitments should be joint with another Department or School to ensure that high-quality faculty is recruited, and that the recruitments strengthen the overall research environment in the FoMD. Given the current research environment in the SoD, we do not believe that it will be possible to recruit the "best and brightest" if the positions are isolated in the SoD. It might be most efficient to recruit a group of investigators (e.g. 5) in a focused area to create a new centre of excellence. One such area could be developmental biology. Pain is another such area. Other topics that could enhance current areas of excellence in the FoMD include bone biology, tissue engineering, and cancer biology. It is expected that graduate students in these programs would likely come from other Departments and other Schools.
4. The School should establish a committee consisting of the School's Leads, the Vice-Dean Research, other critical representation (Dean; other School Leads,) and 2 external advisors whom are internationally recognized researchers in the dentistry field. The leadership and advice of this committee would aid in the strategic development of a focus of research excellence in an area of dental research that synergizes with other Faculty priorities and strengths.
5. Research space for new discovery science appointments should not be isolated from FoMD faculty with similar areas of interest. The relocation of dentistry's clinical and research space

in 2012 provides an opportunity to rationally group and integrate laboratories according to research themes.

6. Two chairs have been allocated to the School, one for Geriatric Dentistry and one in Clinical Dentistry. There also are research efforts in pediatric community health and tobacco cessation. We urge that appointments and activities of this type be tightly integrated with FoMD clinical research faculty in aging/geriatrics and community health, respectively, in order to maximize their value to the School and the FoMD and to enhance the potential for clinical research. We strongly encourage 'cross-appointments' of the two new chairs to facilitate such interactions.
7. For clinician investigators and clinician scientists, a minimum of 50% of professional time (and likely more than 75% for young investigators) protected for research endeavors must be vigorously enforced.
8. The SoD requires access to emerging Faculty-wide initiatives to develop an array of relevant core services and research supports, including a rigorous intramural grant review program.
9. There should be an increase in the number of endowed research chairs available to support meritorious faculty in the School.
10. Reorganizing the delivery of current graduate student training would enhance interdisciplinary research initiatives. For instance, the SoD could work in conjunction with the new training initiative proposed by the School of Molecular & Systems Medicine.

School's Comments:

The need to maintain an outstanding professional School of Dentistry in the province was acknowledged in the report. The School of Dentistry accepts the report recommendations and will strategically target recruitments that will not only fulfill our research mandate, but also link to the research strengths and priorities of the Faculty.

5. School of Human Development

Quality Rating:

Overall: 1 - Quality that is recognized nationally in terms of originality, significance and rigor

The School of Human Development (SHD) has chosen the following themes as their areas of research excellence: Child Health; Developmental and Neurosciences; Preconception, Pregnancy, Birth and Early Beginnings; and Women's Health.

SHD consists of 243 clinical and academic members from the three U of A departments, and connects with another 140 WCHRI members from other departments and faculties across campus. The Department of Paediatrics includes 17 pediatric specialty divisions ranging from general pediatrics to critical care, and is currently comprised of 118 academic faculty and 33 clinical members. The Department of Medical Genetics totals 14 academic and 1 clinical member. The Obstetrics and Gynaecology Department consists of 58 clinical members and 19 academic faculty.

The SHD is a grouping bringing together pediatrics, medical genetics and obstetrics and gynaecology. Although such a grouping has precedence in many institutions worldwide it needs to be recognized that obstetrics and gynecology research does not always have much overlap with that in pediatrics

unless there is also good neonatology research (which does not appear to be the case here). Overall grant funding to the School over the last 5 years is at best not changing. The selected papers were generally in journals with a RIF over 1 but a significant number (13) were more than 5 years old. There are 50 PhD students – low in comparison to the number of staff and the panel applauds the plans to double this number.

Recommendations

1. The Committee recognizes the provincial investment given to the important area of 'women and children's health. In this School, researchers in these areas are recognized nationally for their work, and a smaller number of investigators are of international stature. There are a large number of pediatricians in the school and include three CRC Tier 1 and three Tier 2 Chairs. However, the foci of good quality seem to be swamped by the volume of lower quality. We applaud the steps taken to reduce the number of research inactive paediatricians from the grouping and this needs to continue with further focusing into a smaller number of research areas.
2. Obstetrics and gynaecology research is, like pediatrics, ranked at a national level. However, Dr Davidge is an internationally recognized star and the recruitment of Drs Baker and Kenny strengthens this focus of quality in pregnancy research. As described by the School Leads, the recruitment of two further positions is planned for this area (obstetrics/gynaecology). Whilst there is some logic in recruitment to gynaecological oncology (fit to School of Cancer and Imaging), there is no logic to appointing to 'women's health research' as was suggested by the School team.
3. Medical genetics is a much smaller and lower profile research grouping and was somewhat hidden in the documentation. This is an area which needs to be developed for the Faculty.
4. The panel was unconvinced that the four research themes were a logical division or provide the best platform for future development. We suggest that it might be simpler to have a Women's Health group and a Child Health group. This would then fit well with the overarching Women and Children's Health Research Institute (WCHRI).
5. WCHRI undoubtedly represents an opportunity to build research excellence, with its funding and core facilities. However, it needs to develop a clear mission and detailed strategic plan: we recommend the leadership learn from the way that the Alberta Diabetes Institute has developed such a plan.
6. Developing a 'Campus Alberta' initiative in women and children's health should be evaluated, as this is an overarching theme of importance to the province, and indeed a national priority for Canada on the global landscape.

School's Comments:

We appreciate the Committee's insightful comments as we continue to establish more accurate job descriptions for our large clinical departments. To further develop Medical Genetics, we will explore initiatives in developmental biology. Building on WCHRI's current excellence, focused strategic plans will be developed to also promote a 'Campus Alberta in Women and Children's Health' to improve health through research.

6. School of Internal Medicine

Quality Rating:

Overall: 3 - Quality that is internationally excellent in terms of originality, significance and rigor

The School of Internal Medicine (SIM) in the Faculty of Medicine and Dentistry at the University of Alberta has identified four broad research themes as research priority areas for the future, including: 1) infection, inflammation, and immunity; 2) vascular medicine; 3) metabolism, nutrition, and obesity; and 4) health services and health outcomes. A large percentage of faculty time (53.4 of 181 FTE's) equally divided among senior, middle level, and junior faculty is devoted to the research enterprise. This is a mature and high profile school that is well known in Canada and abroad.

Both the written submission and oral presentation clearly describe this grouping as a large and research intensive School in the Faculty. Senior members are high profile individuals with national and international stature in their fields of investigation that span areas of research excellence identified by the Committee (e.g., cardiovascular biology, transplantation, diabetes, epidemiology and health outcomes). Mentorship and counseling appear to be in place and working effectively to support the career development of more junior faculty. A strong complement of clinician scientists is present in this School. The four research pillars are recognized and relevant to the research priorities of the School. A strong new Chair to lead the Divisions of Internal Medicine has been appointed and will prove to be a strong asset for the School of Internal Medicine and the Faculty at-large.

Recommendations

1. The School needs to develop clear research priorities within each of the four broad themes identified to date, so as to be able to develop future research in the School strategically, rather than simply on an opportunistic basis e.g., need for clinical expediency and load.
2. The SIM needs to provide leadership and research direction for health epidemiology and outcomes, health policy, and health economy initiatives arising through Alberta Health Services. As the largest clinical department/School, SIM should work at enhancing the interface with AHS and at building healthcare systems and health outcomes research activities in the Faculty.
3. The SIM needs to be poised to take advantage of initiatives arising with the emergence of Alberta Innovates – Health Solutions, and with 'Campus Alberta'.
4. The SIM already has an intramural grant review program and could assist with the Faculty's initiative to establish such a process, Faculty-wide. The School could also take a leadership role in the development of an array of relevant core services and research supports to enhance research across the Faculty.
5. Although the School is home to many endowed chairs, greater emphasis on creating targeted endowed chairs needs to be implemented. These can support existing meritorious faculty.
6. To enhance interdisciplinary research initiatives, the merits of reorganizing the current graduate student program should be considered. For example, a program in conjunction with School of Molecular & Systems Medicine initiative could be evaluated.

7. The School should periodically reassess the nature of its current structural organization and consider developing research divisions or units (e.g., institutes) that are thematic in nature. This may help to support development of targeted research areas/themes.
8. As an established Department (e.g., that is now a School) the School must make certain that future recruitments (additions and replacements) are done with utmost care so as to insure further progress to highest academic standings.

School's Comments:
The SIM was pleased with the review, and agrees that many of the recommendations will further strengthen us. Hence, the SIM agrees to take a leadership role in developing focused and thematic research plans that will also drive targeted recruitment. The SIM agrees to integrate our already strong outcomes/epidemiology research through the new Health Outcomes Institute. We would be pleased to lead the development of a Faculty-wide mentorship program. We agree with the comments regarding the MAHI (see below, under MAHI section).

7. School of Molecular and Systems Medicine

Quality Rating:

Overall: 3 - Quality that is internationally excellent in terms of originality, significance and rigor

The rating reflects the overall research quality of the School but the committee recognizes that within the School research groups such as structural biology and membrane proteins are of very high international quality.

The School has chosen the following themes as their areas of research excellence: Cardiovascular Research; Cell Signaling; Cellular and Systems Neuroscience; Diabetes and Metabolism; Macromolecular Trafficking and Organelle Biogenesis; Membrane Proteins in Disease; RNA Biology; and Structure and Dynamics of Biological Macromolecules.

At present there are 83 full-time professors and numerous adjunct Faculty. The SMSM is an extremely strong overall program that has produced many internationally known scientists including eleven members of the Royal Society of Canada, 2 members of the Royal Society (London), 4 current and former Howard Hughes Medical Institute (HHMI) international scholars and 30 faculty members who receive salary support from the former Heritage Foundation. By any measure, the top scholars in these departments have distinguished themselves nationally and internationally as is nicely documented in the well-written RAE report. The faculty also has very high quality discovery scientists at junior levels. The School has a superb infrastructure with excellent core facilities in many areas including NMR, molecular imaging, crystallography, and proteomics.

However, the new School is also a complex organization that includes the Departments of Biochemistry, Cell Biology, Pharmacology and Physiology as well as two Centers (Neuroscience and Prions and Protein Folding Diseases). The SMSM has 83 core faculty members who have produced 1081 publications in the past 5 years. Unlike some of the other Schools, the SMSM is not organized around a research theme but rather a confluence of the discovery science departments. This makes it virtually impossible to devise a simple plan to "integrate" the School around a few research themes.

As a result, the priorities listed in the RAE are quite general, and the 8 themes reflect the areas of greatest current activity and strength. It is also apparent that the some of the 8 themes are strongly represented in other schools, e.g. cardiovascular science in the Mazankowski Heart Institute and diabetes in the ADI. Likewise, activity in neuroscience is scattered among many different schools.

It was clear to the RAE review team that there is resistance to the new School organization, both from some Department Chairs as well as from individual faculty members. There is a serious risk that a negative ethos could impede further advances in SMSM. The School structure for MSMS currently has no resources or administrative support; thus, its very existence depends on the preexisting Departments.

Recommendations

1. Research by faculty in the SMSM has provided both tremendous benefit to the U of A in terms of visibility in Canada and abroad, and also produces an economic benefit through the technology and new knowledge created by discovery research activity. This excellence is threatened by the uncertainty concerning the new Alberta Innovates-Health Solutions reorganization. It is imperative that discovery research be well supported or the U of A will quickly lose its top scientists to other institutions. Erosion of this sort starts from the top.
2. The general mood in the new School poses a more immediate threat to the research excellence within SMSM than, perhaps, any of the other schools. It is critical that the Dean, Department Chairs, and School leads work together to resolve their differences and agree on a plan that moves the research agenda forward in a manner that preserves the existing excellence, but also provides much-needed scientific expertise to groups with more translational goals. Leadership is key to this effort. SMSM did accept that current molecular science and its methods make it quite possible to be in another department than their current one. These are the seeds for lateral thinking that will make SMSM an even more vigorous entity for the next decade.
3. One mechanism by which the Departments could begin to work together is by combining the graduate programs, which has value in terms of broadening the education of existing students and the increased visibility of a strong joint program in recruitment of students from Canada and abroad. The success of the Max Planck Research Schools might serve as a model for such a program. For instance, the School should investigate combining graduate programs with the School of Internal Medicine.
4. Efforts to work together and with the Faculty on core facilities provide another focus around which the Departments could build on common interests, while also maintaining the autonomy of strong established research groups.
5. Neuroscience at U of A has a relatively low profile nationally and internationally, in part because it is spread across multiple academic units and lacks sufficient expertise in important areas such as molecular and developmental neuroscience. ‘Neuroscience’ would benefit from strong leadership to integrate efforts in developmental neuroscience, systems neuroscience (motor control), clinical neurosciences as well as the cellular and molecular activities in the SMSM. Upcoming retirements in several departments should allow reshaping of the neuroscience agenda at U of A. Although many institutions have chosen neuroscience as a priority, this effort could be shaped to the existing strengths of research at U of A in order to create a group with national and international impact.

6. The SMSM has had limited translational approaches. Although these cannot be forced, efforts should be made to integrate SMSM faculty with some of the thematic strengths of the FoMD in e.g. diabetes and metabolism and cardiovascular science. There are multiple ways this can be done including location of laboratories, joint seminars, pilot research awards, etc.
7. There is potential for SMSM to work with School of Cancer and School of Human Development to develop greater strength in cancer biology and genetics/genomics, respectively.
8. The School's cardiovascular scientists represent strength and they need to be integrated with the MAHI such that the Faculty can attain its full potential in cardiovascular research. This in turn will assist in making the MAHI a successful research enterprise.
9. The SMSM should have a goal to be more successful in international awards.
10. The RAE committee believes SMSM is a foundation stone for the new school systems. The Faculty leadership should consider providing some incentive resources to SMSM (to be administered by the School Lead) to help with scientific and academic integration.
11. SMSM has a large number of retirements occurring over the next several years, and it will be imperative for the School's leadership to maintain the research track record and recruit creative and highly competitive early/mid-career researchers into these positions: recruiting for the future is key.

School's Comments:

We agree with the External Review Committee recommendations, but concur that limited resources from Faculty and uncertainties with AI:HS may restrict adoption of recommended strategic initiatives, including recruitment and retention of excellence. Integration within SMSM and with other entities within the Faculty, including graduate programs, core facilities, neurosciences and cardiovascular themes, as well as initiating translational initiatives and improving communication of successes like international awards will propel us forward.

8. School of Surgery, Anesthesiology and Critical Care Medicine

Quality Rating:

Overall: 1 - Quality that is recognized nationally in terms of originality, significance and rigor

Vision, Transplantation, Reconstructive Sciences: 3 - Quality that is internationally excellent in terms of originality, significance and rigor

The School of Surgery & Anesthesiology and Critical Care Medicine, consists of the Division of Anatomy, the Department of Anesthesiology & Pain Medicine, the Division of Critical Care Medicine, the Institute for Reconstructive Sciences in Medicine, the Department of Ophthalmology, the Department of Surgery and the Surgical Medical Research Institute.

The School of Surgery, Anaesthesiology, and Critical Care Medicine in the Faculty of Medicine and Dentistry at the University of Alberta has identified research priorities as transplantation, vision science, tissue engineering, metabolic, immune and cognitive responses to injury and disease. Clinical duties and responsibilities are viewed by leaders in the School as a major impediment to undertaking

significant research. Surgeons from the University of Alberta are internationally recognized for developing the Edmonton protocol for islet cell transplantation and nationally recognized for developing high quality solid organ transplant programs. The number of graduate trainees, post-doctoral fellows, and number of faculty focused on research endeavors are all relatively small.

Recommendations

1. The School should focus on prioritizing finite resources on research areas of excellence. Vision science and transplantation were identified in the School's oral presentation. A surgical scientists training program could be an asset.
2. Developing physical space devoted to a unified vision science research program could enhance research collaborations and research output. The Faculty may wish to consider a long-term plan for vision research (or special senses), as this is an area of strength.
3. The School, indeed the Faculty requires consolidation of its trans-disciplinary research initiatives in Transplantation. The Committee recommends an organizational entity to consolidate the Faculty's research efforts in transplantation. The shape of this new organizational entity will require further assessment by the Faculty, but the Committee suggests that an 'Institute of Transplantation Sciences' within the School of Clinical and Laboratory Sciences is appropriate given that the research strengths in transplantation span the Faculty. The new entity will require a much focused and well managed research program, as currently the research programs of its potential members are captured under the aims of other Institutes, Centres and Schools. It will be important that the new Institute facilitate strengthening and synergy of transplantation across the Faculty as opposed to diluting other programs where transplantation researchers are also central [e.g., ADI (islet transplantation); ATAGC (transplantation pathology and diagnostics); Institute of Virology (transplant and infectious diseases); MAHI (cardiac transplantation)].
4. The School should assist with promotion of the islet cell transplantation program by establishing relevant faculty cross-appointments and developing greater intellectual participation with the rapidly expanding islet cell biology program in ADI.
5. Establishment of an AARP, and focusing the protected time for research for the staff with suitable training and commitment to excellence, would greatly benefit the research efforts of this School. If an AARP does not materialize for this group, plans need to be developed to ensure sufficient protected 'research time' for clinician investigators and clinician scientists.
6. As with other Schools, the School of Surgery, Anaesthesiology, and Critical Care Medicine should assist in Faculty-wide initiatives that will develop an array of relevant core services and research supports, including a rigorous intramural grant review program.
7. The School should actively increase the number of endowed research chairs – in targeted areas – to also support meritorious faculty.
8. To enhance interdisciplinary research initiatives, the School should consider reorganizing its graduate student programs. For instance, the School could work in conjunction with a School of Molecular & Systems Medicine new graduate program initiative.

School's Comments:

Our School supports the recommendation of supporting vision science and transplantation as areas of excellence by developing unified space for the former, and by developing an Institute of Transplantation. We feel transplantation would be best developed in a fashion resembling the

Alberta Diabetes Institute with its placement either in the School of Surgery or in no specific school, but rather as a Faculty institute.

9. Alberta Diabetes Institute

Quality Rating:

Overall: 3 - Quality that is internationally excellent in terms of originality, significance and rigor

The Alberta Diabetes Institute (ADI) in the Faculty of Medicine and Dentistry at the University of Alberta has identified four research themes, including islet cell signaling and biology, immunology and transplantation, clinical research and public health, and obesity/nutrition and metabolism. A mission to lead the world in the prevention, treatment, and cure for diabetes was clearly enunciated. The importance of considering research related to Aboriginal persons was highlighted. A well attended weekly seminar program has been implemented to build communication among 48 current Institute members and their trainees (more than 160). The plan for using funding to nurture the next generation of researchers is the right strategic decision and provides a plan which could be used in other Institutes and Schools across the Faculty. Physical space is available to house the laboratories of 17 PI's in a single building. The same building is used to house dry research laboratories for pillars 3 and 4 researchers, with clinical research space under development.

Total grant funding of the group looks good though one would have hoped to see evidence of a year on year increase over the last 5 years. 26/32 selected publications had a RIF greater than 5 and were published since 2005; the ADI's own commissioned analysis of their output ranks them as a leading diabetes research group in Canada; international comparisons would have been helpful.

The written and oral presentations provided evidence of an Institute that is working well and provides research output that is greater than the sum of individual parts. The "get on with it" approach should be modeled by other Institutes and Schools in the Faculty. The interim director is judged to be providing strong and effective leadership. The planned hiring of a prominent research scientist and several others (to be announced) will strengthen the islet cell biology program, and is applauded. A convincing mentorship program for trainees, junior faculty, and mid level researchers is in place. The proposal to bring international recognized, Edmonton-based obesity researchers into the Institute is logical, compelling, and highly likely to increase research outputs. The importance of undertaking research that is relevant to populations of vulnerability, including First Nations, is considered to be strength. Active participation in community outreach is also noted as providing a valuable contribution, which is deserving of appropriate recognition by leaders in the Faculty. This approach could be modeled for use across all the Schools in the Faculty, in the support of a local Knowledge Translation initiative.

The Institute has very good interim leadership but needs to recruit a permanent Director at the earliest time.

Recommendations

1. The ADI should be actively engaged in discussions regarding the merits of a unified transplant program in the Faculty.

2. Cross-pillar research initiatives and communication strategies should be modeled for use across Schools in the Faculty.
3. Aboriginal people's health research initiatives should be mirrored across Schools in the Faculty.
4. The merits of core facilities considered as a Faculty, rather than Institute, resource should be considered.
5. ADI leadership need to keep engaged with the Faculty as a whole to ensure that the research community stays interactive – and not "siloed" by the physical isolation provided by a separate research building.
6. Long-term retention of leaders and highly capable faculty recruited to the Institute needs to be ensured, and a permanent high stature director needs to be appointed.
7. The merits of extending the training program in diabetes to a cross-Canada initiative, in collaboration with other centres of excellence, should be considered.
8. The decision to focus recruitment on islet biology is sensible – especially in the light of the recruitment that has been made. Altogether the ADI seems to be in good hands and to have a foundation which can lead to a truly world class research centre in diabetes.
9. Establishing research in genetics is essential to ADI.
10. Enhanced focus on obesity research as suggested by the ADI research team is sensible and recommended.

Institute's Comments:
The ADI agrees with the RAE report's recommendations and are happy with the general outcome. We do recognize that we still have some way to go reach our overarching mission, but believe we have adopted the right training, mentorship and recruitment strategies. This sentiment seems to be strongly echoed by the RAE report's findings.

10. Mazankowski Alberta Heart Institute

Quality Rating

Overall: 2 - Quality that is recognized internationally in terms of originality, significance and rigor

Potential to be: 3 - Quality that is internationally excellent in terms of originality, significance and rigor. The Institute has remarkable new facilities for clinical and research into CV disease.

The Mazankowski Alberta Heart Institute (MAHI) has chosen the following themes as their areas of research excellence: Congenital Heart; Coronary Syndromes and Atherosclerosis; and Heart Failure and Transplant. There are 112 investigators affiliated with the Institute, the majority are members of the Faculty of Medicine & Dentistry. About half of the members are located in MAHI building. The MAHI is currently working at integrating the four Pillars of health research that are represented by its membership. The MAHI has a substantial clinical service mandate and this may be an opportunity to build on 'outcomes' research, in light of access to large amounts of clinical data. The Institute has many partnerships e.g., the Canadian VIGOUR Centre (Virtual Coordinating Centre for Global Collaborative Cardiovascular Research) that runs global collaborative cardiovascular research and the TORCH CIHR provincial training program. Both VIGOUR and TORCH are directed by Dr Paul Armstrong. Areas of research strength include the focus on 'early care' (ST elevation; non-ST

elevation, acute heart failure, sudden death and stroke), cardiac energy metabolism, and cardiac transplantation. Edmonton is Canada's largest heart transplant program. The Cardiovascular Research Centre directed by Dr Jason Dyck, is associated with MAHI and represents strength (research and infrastructure) as does ABACUS, which is a clinical research unit within MAHI. ABACUS houses a 64 slice CT scanner – there is only one other in Canada. MAHI intends to build a nucleus of coronary disease research around this infrastructure and expertise. The MAHI is a partnership between the University of Alberta and Alberta Health Services although the governance structure does not appear to reflect that. The Scientific Director, Dr Lopaschuk, reports to 2 separate Boards (one 'UofA', and another 'AHS').

Recommendations

1. With its infrastructure, resources and access to a remarkable patient base, the MAHI represents and excellent opportunity to create a quality research program in cardiovascular research for the faculty. Currently, the research program of the MAHI lacks clear focus and objectives aimed at meeting the Institute's vision. As outlined by Dr Lopaschuk, the MAHI is working at integrating the research programs represented by its membership that span all four pillars of health research. Every step should be taken to integrate cardiovascular researchers from across the Faculty under the research arm of the MAHI, particularly those researchers from SMSM and SIM
2. There is a critical need to review MAHI's governance model and appoint an overall director (the MAHI currently has 3 directors) of international standing to successfully integrate the vision of the MAHI. The Committee notes the substantial amount of funding and commitment that have gone in to building the MAHI, and to quote a member of the Committee – "the MAZ cannot and must not fail". The MAHI would benefit from a Scientific Advisory Board to assist with setting research priorities.
3. The MAHI requires unification of its affiliated members and there needs to be a solid reason/benefit for membership to the Institute. The Institute should develop a high quality lecture/seminar series and also promote integration and cross-fertilization among its trainees.
4. The governance structure of the MAHI needs re-examination and creation of a functional/accountable governance model that includes a single Board with representation by all stake-holders. MAHI has the opportunity to be world leading in outcomes research given its strong clinical mandate.
5. There is a large amount of un-occupied/unfinished space in the MAHI building and the Committee suggests that much of the space be used to develop basic wet laboratory space. It is a lost opportunity to not have discovery scientists included in the building. This space should include cardiovascular researchers in the SMSM (or cross-appointed with SMSM).

Institute's Comments:

We appreciate the panel's comments: the report concludes that there are excellent academics in the cardiovascular field and steps should be taken to integrate cardiovascular researchers from across the faculty under the research arm of the MAHI. Implementing this recommendation is critical to achieve the full research potential of the MAHI, and to more strongly identify cardiovascular research at the University of Alberta with the Institute.

E. CLOSING COMMENTS

As reviewed, the 'health and research' landscape in Alberta is changing at all levels. This represents many challenges to the Faculty, but also opportunities. The Committee feels that by implementing recommendations outlined in this report – and in particular, focusing on areas of research excellence – the Faculty will enhance their provincial, national and international success and impact. The reputation of research in FoMD at the UofA is in aggregate impressive, and represents a high caliber over past decades. There is every reason to believe that U of Alberta and the FoMD has the vision and energy to emerge from these changes as an even more prestigious institution.

The Committee is grateful for the opportunity to be a part of this very important exercise and acknowledges the many areas of quality research across the Faculty. We respectfully submit this report.

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F. LIST OF ABBREVIATIONS

AAHSN	Alberta Academic Health Science Network
ADI	Alberta Diabetes Institute
AET	Advanced Education & Technology
AHFMR	Alberta Heritage Foundation for Medical Research
AHS	Alberta Health Services
AI-HS	Alberta Innovates – Health Solutions
ASRIP	Alberta Science & Research Investments Program
CRC	Canada Research Chair
CFI	Canada Foundation for Innovation
CIHR	Canadian Institutes of Health Research
FoMD	Faculty of Medicine & Dentistry
MAHI	Mazankowski Alberta Heart Institute
RAE	Research Assessment Exercise
SCEIS	School of Cancer, Engineering & Imaging Sciences
SCLS	School of Clinical & Laboratory Sciences
SCoBM	School of Community-based Medicine
SHD	School of Human Development
SIM	School of Internal Medicine
SMSM	School of Molecular & Systems Medicine
SoD	School of Dentistry
SSurg	School of Surgery, Anesthesiology & Critical Care Medicine
UofA	University of Alberta