The Research Council of Norway

Physiology-related Disciplines

Panel 2

Evaluation
Division for Science

The Research Council of Norway

Physiology-related Disciplines – Panel 2

Anatomy, physiology, neurobiology, toxicology, pharmacology, embryology, nutritional physiology, pathology, basic odontological research, veterinary medicine, fish health, including corresponding translational research

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Preface from the Research Council of Norway

The Research Council of Norway (RCN) is given the task by the Ministry of Education and Research to perform subject-specific evaluations. According to the plan for these evaluations the RCN carried during 2010 and 2011 out a comprehensive evaluation of Norwegian research within biology, medicine and health in Norwegian universities, hospitals, relevant university colleges and relevant research institutes. Evaluations have previously been performed within these subjects/fields, in biology in 2000 and medicine and health in 2004.

Due to the large span in disciplines and the number of scientific groups involved in the evaluation, seven international panels of experts were established; each of them reviewed one of the following subfields:

Panel 1	Botany, Zoology and Ecology-related Disciplines
Panel 2	Physiology-related Disciplines
Panel 3	Molecular Biology
Panel 4a	Clinical Research – Selected Disciplines
Panel 4b	Clinical Research – Selected Disciplines
Panel 5	Public Health and Health-related Research
Panel 6	Psychology and Psychiatry

The Research Council of Norway would like to thank the panel for the comprehensive work the panel has performed.

Oslo, October 2011

Hilde Jerkø (sign.)
Director
Division for Science

Mari K. Nes (sign.)
Director
Division for Society and Health

Statement from the panel, with panel members signature

This is the report from Panel 2 in the Evaluation of Biology, Medicine and Health covering Physiology related disciplines.

The conclusion and recommendations in this report are based on self-evaluations and hearings with representatives from the units evaluated. The hearings took place in May 2011 in Oslo. The views expressed in this report are the consensus views of the panel members. The members of the panel are in collective agreement with the assessments, conclusions and recommendations presented. Panel member Barbara Cannon did not take part in the hearing nor the grading of one of the groups at The National Institute of Nutrition and Seafood Research (NIFES) as she had co-published with one of its researchers.

Panel Members:

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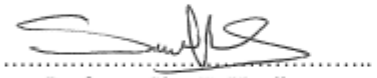

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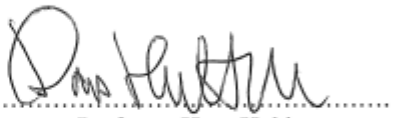

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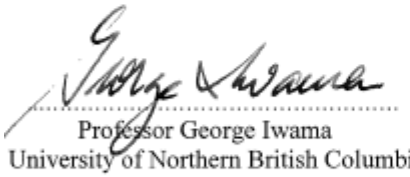

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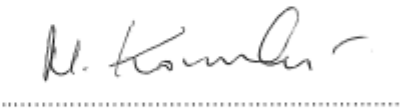

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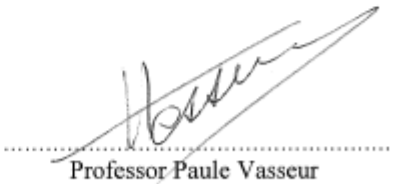

Professor Paule Vasseur
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France

Per Janson, The Swedish Research Council, acted as secretary for the panel.

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Executive summary with general conclusions

The main focus of the evaluation should be the scientific quality of Norwegian research in the field of Physiology-related disciplines within biology, medicine and health and psychology in Norwegian universities, university hospitals, relevant research institutes and relevant university colleges.

The panel has identified a number of very good and excellent research units. But, there are also substantial qualitative differences between the evaluated units. One striking feature is that less successful units are small and they would benefit from more strategic thinking.

The role of the research institutions in Norway outside universities was a major discussion among the panel members. In general, the scientific quality was lower in the research institutes compared to evaluated units based in universities. It is the view of the panel that the organization of the research institute sector and their relationships between each other and the universities is in need of clarification. However, the institutes seem to have different objectives than the universities and, therefore, judging the different units by the same criteria results in rather negative perspectives on the industry-oriented units.

Another major theme of the hearings and the discussions within the panel was the funding of basic research. It seems clear that the funding of basic research is inadequate, and more generous funding for fundamental research and larger plurality of funders would be highly beneficial to the research sector and to Norway.

- It is a general impression that the recommendations from the previous evaluation have been adequately addressed. However, in many units it is unclear what their main line of research is.
- The research landscape is fragmented; many units lack critical mass. There are cases where there have been mergers into larger units, but this has not changed the way research is carried out. Many researchers still continue as individuals.
- Much of the research being carried out is of high societal relevance. However, the emphasis lies too heavily in applied research. The funding for basic research is inadequate, and the lack of different large funders of basic research is a problem.
- Generally speaking, the quality of research based in universities is higher than that in governmental research institutes.
- Norway is one of the leaders in the world in fish science. A question worth investigating closer is to what extent redundancy exists in fish science in Norway.

General description of the field

Medicine

One notable feature of medical research in Norway was the clear commitment to socially useful goals. The dedicated units were highly focused on this project-driven science and were reasonably supported by internal funds. On the other hand, this strategy may have reduced their competitive advantage for Research Council and similar external funding. There were pockets of real excellence in blue-skies research, most notably the striking success of neuroscience groups with world-leading investigators. However, the overall impression was of a government-driven science base aimed at improving population health and well-being. Because the panel used RCN provided metric-based standards for publication impact and citations to make assessments, the conclusion was often that scientific outputs were not internationally competitive at an excellent level. Nonetheless other countries now striving to bring their hypothesis-driven research to a point where health and economic benefits can be realised, might be envious of Norway's success. In the future, it might be better to incorporate societal impact more quantitatively into the assessment criteria to give a true reflection of these strengths of the Norwegian research base.

Odontology

Dental faculties in Scandinavia were remarkably successful scientifically during the 70´s and 80´s and were responsible for a large volume of the dental scientific production worldwide. The contributions were highly appreciated and the articles were highly cited. However, during the last 15 years dental faculties in Scandinavia, including in Norway, have experienced increasing difficulties in recruiting academic staff for both basic and clinical science, as well as in obtaining research funds. To increase the scientific milieu, most dental faculties have now merged with medical faculties. There are a few exceptions, one being the dental faculty in Oslo. Whether or not the mergers have been beneficial is discussed among dental scientists, but it is highly likely that dental research in the long run has to be performed in a large biomedical context to be able to increase the basis for its recognition internationally and to be competitive in obtaining external grants. At many dental faculties in Europe, pure basic science has been downsized and the remaining parts have been organized close to the clinical science departments in order to focus on translational research. At the dental faculty in Oslo, a comparatively large basic science department is still alive which opens up interesting possibilities for establishing competitive dental translational research. However, the basic and clinical departments are physically separated and would gain a lot if organized into research groups working on a daily basis much more close to each other or preferably being integrated into solid units. In general, dental research has to be much more focused on a fewer number of projects and collaborations with other biomedical research groups in Norway and internationally need to be increased. It is crucial that dental science become more biomedically oriented in order to be able to obtain grants from highly competitive sources like RCN or EU.

Fish/food and aquaculture

Norway has played, and continues to play, a leading international role in the provision of safe and high quality food from the sea. This ranges from invertebrates to teleost fishes. In particular, Norway has led the world in the production of salmonid fish species through intensive aquaculture. Most of this production is Atlantic salmon, *Salmo salar*, but there is active development in the successful production of other high value species for the food market. Intensive aquaculture represents a relatively new practice, whereby we are farming what we traditionally hunted and gathered from the oceans, and freshwater bodies. It is where traditional agriculture was 80 years ago. Because of its novelty, research and development are key to the development of efficient, effective and safe processes in all facets of aquaculture. Norway has been one of the world's research leaders in this field. There have been substantial investments in research directly in all aspects of aquaculture as well as in fields that contribute indirectly to this field. An example of this latter point would be the knowledge generated in the basic sciences of immunology and vaccine production that laid strong foundations for solving health-related problems in fish and shellfish production. There will be an increasing importance placed on sustainable practices in aquaculture and on environmental quality on food safety and quality of aquaculture products. There will likely be more attention to renewable energy sources to power operations and the consideration of land-based facilities to minimize the potential impacts of aquaculture on the physical and biological environments. Also, more attention is being/has to be paid to environmental quality in order to ensure food safety with regards to human health.

Veterinary medicine

Veterinary research in Norway is anchored in the two main institutions: the National Veterinary Institute (NVI) and the Norwegian School of Veterinary Sciences (NVH). However, other research institutions contribute to this field, for example the Norwegian University of Life Sciences (UMB) which currently has strong ties with NVH. In the future, when the merger between NVH and UMB has been successfully completed, it is envisaged that the collaboration between the Departments and the different research groups will be even stronger for the benefit of Animal and Veterinary Science Research in Norway. Both at NVI and NVH the research has been focused on infections and host-pathogen interaction in mammals (prion and mycobacterial diseases, for example) and fish (virus, parasites, mycotoxins for example) and on various aspects of reproductive toxicology and immunology. The use of the Zebra Fish platform to study basic mechanisms should be emphasized. The animal welfare aspect is obviously important in the light of infectious diseases but might have played a more predominant role in, for example, various production diseases, which are a direct consequence of advanced production methods both in domestic animal production and fish aquaculture production. The organization of the groups at NVH might be difficult to maintain as the researchers come from several different departments but it seems as if the management is very dedicated to this structure and it will undoubtedly sustain even better research efforts and more interdisciplinary projects. The number of veterinary graduates doing research in their final year and the graduate students at both NVI and NVH guarantee satisfactory recruitment for staff in the future. In certain areas the infrastructure needs improvement and this cannot be delayed until the fusion between NVH and UMB. Veterinary research in Norway sustains both agriculture and aquaculture in Norway by directing research not only to areas pertinent and vital for these important businesses but at the same time to areas focusing on basic research findings.

Physiology

Physiological research in Norway has traditionally been very strong. It continues to be strong as documented by the outcome of the current evaluation. Several research groups are recognized as national and international leaders, with a prominent involvement in European collaboration within FP7. Scientific production is very good, with a significant proportion of researchers producing high quality publications annually.

Following the last evaluation the reviewed units addressed the lack of scientific leadership and fragmentation of the research. In most cases they responded by merging smaller research groups and strengthening the leadership structure, as well as developing and implementing strategic plans. This included identifying directions for development and allocating resources (financial and human) accordingly. The implemented changes encouraged a bottom-up process of formation of flexible and effective research groups.

Although the evaluated research groups have very good facilities, the lack of permanent technical staff makes it difficult to run at full capacity. Recruitment of PhD students does not seem to be a problem, but the lack of employment prospects for those graduates may become an issue in the near future.

The societal impact of biological/physiological research remains strong thanks to its prominent translational dimension and close link to relevant industries.

University-based and Institute sector-based research

In contrast to what is the case in many other Western countries, a very significant fraction of research and development in Norway occurs in "institutes" outside of the system of higher education (Universities) which are often focused on topics currently of importance for society. There are two aspects of this strategy that should be considered. Firstly, that research within universities may fail to retain the most adept researchers if funding is more difficult to achieve there, and in consequence those remaining may become too focused on teaching, to the detriment of quality, also of the teaching. Secondly, that research within institutes may not be exposed to the same stringent criteria of evaluation, as it would be if the researchers were applying in normal competition with their peers. There is a risk that this could negatively influence research quality, and there is also a threatening scenario, where institutes that become populated with young researchers at a time when the efforts of the institute are clearly formulated will, with time, develop an age profile (with a staff of a similar age) rather than a wide range of ages following with a constant renewal of staff. We also feel that it is stimulating for researchers to be continuously exposed to undergraduate and graduate students of new generations – and for students to be exposed to scientists involved in applied, as well as basic, research. Any tendency to make the teaching of new generations a task that could be escaped from by working in pure research institutes is probably in the long run negative for the development of science and society. Thus, to the extent that society realizes that it needs scientific endeavours in certain more applied areas, we consider it more adequate to earmark certain funds within granting agencies for these tasks and allow normal scientific competition decide who will obtain these funds. One possibility to solve these problems is also to let areas of applied research (on specific grants) be housed within the university system to facilitate mutual interaction (and possibly easier for individual researchers to shift between the organizations). We were presented by several examples where the leaders at the institute sector searched collaboration with universities, both for

strengthening specific projects and for arranging possibilities for PhD students to work partly in the institute sector. As a whole those arrangements seemed to be only partly successful, and there may be a strong need to rethink the formal relation between the institute sector and the university sector.

General recommendations

Overall, the current evaluation indicates that the recommendations from the previous evaluation were adequately addressed. It is, therefore, paramount to create conditions allowing the development of the positive trends indicated in the evaluation.

It is further recommended that incentives for more collaboration across basic and applied research units take place. For example, zoophysiology or human-health related research groups could team up more with groups addressing particular fish disease challenges. Also, there is room for better coordination and even closer contact between the fish pathology/microbiology groups where overlapping research should be avoided. This research area tends to appear slightly uncoordinated and the players should be encouraged to apply for a Centre of excellence.

As in most countries, and while acknowledging the exceptions, the quality of research based in universities is higher than that in governmental research institutes. At a higher level, the Norwegian government might consider the possibility of having all research to be university-based/centred.

A strong impression following the evaluation is that fundamental research in completely free areas is severely underfunded. Funding seems to be available if one is prepared to focus on an aspect of current (political) interest, but the fraction of funding dedicated to investigator-driven projects is clearly disproportionately small. In the long term, this policy can, and probably will, result in a regrettable absence of innovation.

Recommendations for future evaluations

The metrics used for the evaluation were a concern for the panel. The general bibliometric report that supplemented the self-evaluations was of limited information to the panel. If it is to be used it should be done, if possible, on the level 2 of the evaluated units. There were also researchers and publications that were mentioned in more than one evaluated unit. Many evaluated units were not used to benchmarking themselves, and the panel had to deal with variable output variables. Furthermore, the national system of level 1 and level 2 publications used in Norway caused some confusion. To summarize, the output variables, most notably publication records, need to be more uniform. It was also difficult for the panel to identify scientific collaborations, and which research projects that had principal investigators from the evaluated units.

The panel also noted that there was a lack of quantification of how industry, the society and the economy are affected by activities at the various research units. There is occasional mention in qualitative terms, but the quantification of this impact is not treated in a similar way as the traditional research metrics.

Description and evaluations of the institutes and research units

University of Bergen

Faculty of Mathematics and Natural Sciences – Department of Biology

Evaluation units
A. Developmental Biology
B. Fish Health

General comments
The Department of biology (BIO) was established on the 1st of January 2004 by the merger of the former Departments of Botany, Fisheries and Marine Biology, Microbiology, and Zoology. This merger was in response to the previous evaluation of biological research in Norway and the subsequent "Biofagplanen", as well as to national strategic processes. To strengthen scientific leadership, department heads were appointed on four-year contracts and given broad mandates. The Centre for Environmental and Resource Studies at the University of Bergen (UiB) joined BIO in 2006.

BIO has 51 tenured scientists (36 professors, 15 associate professors), and 55 administrative and technical staff, of which 47 are directly involved in research support. They employ 51 PhD students, 13 post docs, 18 adjunct professors and 23 researchers. BIO is organised in 16 research groups. Scientific output averages 165 publications per year (c.a. 3.2 per tenured staff member per year). The number of publications in the 10% top-ranking journals in biology and ecology has doubled in 2005-2009 compared to the previous five-year period. BIO has produced 16 *Science* and *Nature* papers within this period. Citation rate is excellent and on a sharp rise (5100 citations in 2009 alone).

BIO addresses two main strategic priorities of UiB: marine sciences and development-related research. Areas of priority are: evolutionary, ecological and developmental processes, encompassing research on all levels, from molecules to oceanography. They strive to contribute towards the understanding of the effects of major global change drivers (climate change, habitat loss, invasive species, pollution, resource exploitation) with particular focus on polar regions.

The very high proportion of the budget used for salaries is an issue. Also, it has become apparent during the meeting with BIO representatives that budgeting along with implementation of the ambitious strategic plans created some personal tensions within BIO. This needs to be quickly resolved, as it may undermine the scientific productivity.

Follow-up of previous evaluations
The previous evaluation of 2000 pointed to the lack of scientific leadership and fragmentation of the research. BIO has responded to this by merging four units, strengthening the leadership structure and developing a strategic plan for 2005-2010.

Establishment of research groups and separation of research goals from education goals were among other of BIO's responses to the previous RCN evaluation. Formation of research groups has become a bottom-up process, where scientists with similar research

interests, approaches or systems create flexible research units headed by a research group leader.

Overall, the current evaluation shows that the criticism and recommendations from the previous one were successfully addressed.

Developmental Biology

Description
The unit has a full-time staff of 7 people, three professor II positions, one post doc-position and six PhD students. It includes two research groups, The Marine Development Biology (MDB) and Vertebrate Evolution and Development (VED).

General comments
Financially, the unit has received substantial support from both the university and the department as well as external funding and since 2004 they have been involved in more than 50 national and international projects.

The unit aims to be a key player in marine developmental biology. The research activities are laboratory and field based, and aim to elucidate basic morphological characteristics and physiological processes and mechanisms.

Scientific quality
The unit has strong European collaboration through LIFECYCLE (An EU-project within FP7).

The Marine Developmental Biology (MDB) is clearly stronger than the Vertebrate Evolution and Development (VED) group, which is on decline due to long-term absences.

Some prominent researchers have left the MDB group, but the four primary researchers and their teams are doing well. They publish about 30–35 papers annually in excellent-to-good quality journals and in strong numbers. They are not confined to field-specific journals, but of broad disciplinary scope, such as *PNAS*, *Development* and *Journal of Experimental Biology* (recently also *Science*).

Zebrafish seems to be a future research model, though sequencing of cod genome may put it as an emerging marine teleost model.

Grade: Very good to Excellent

Societal impact
MDB activities have greatly contributed to building BIO position as the largest provider of aquaculture workforce in Norway. Osmoregulatory research (SOS) has resulted in the foundation of a company (Havbruksinstituttet). This holds promise for even stronger collaboration with industry in the future.

Recommendation
Maintain present trajectory studies.

Fish Health

Description
Fish Health is a small group consisting of just 4 permanent staff members with 2 technicians, 2 professor II positions and 7 PhD students. There are two research groups in the unit: the Fish Immunology Group (FIG) and the Fish Diseases Group (FDG).

General comments
The research in the two groups is complementary to each other and covers several aspects of immunology (cellular immunology, immune genes and comparative immunology) and all the major groups of fish pathogens (virus, bacteria, parasites). The main aim of FDG is characterisation of pathogens (virus, bacteria and parasites) associated with wild and farmed fish with the main emphasis on farmed fish. FIG and FDG activities fall within an exciting and fast-developing field, where basic and applied research can be easily combined.

The groups have very good facilities, though the lack of permanent technical staff makes it difficult to run to the full capacity. Flow cytometry has proved particularly useful.

Collaborative effort in genome sequencing projects and functional genomics are worth mentioning. Sequencing of the salmon lice genome in collaboration with the Max Planck Institute for Molecular Genetics (Berlin, Germany) and University of Victoria (Canada) has been very fruitful.

Scientific quality
There is a focus on aquaculture, fish digestion physiology and nutrition, mostly in comparative aspect. The unit has a high scientific production, and has published 78 articles in peer-reviewed journals in the evaluation period (5.2 publications per year per permanent position). They also capitalize on an earlier seminal work on marine viruses published in Nature (1989).

Grade: Very good to Excellent

Societal impact
Societal impact is strong thanks to a close link to the industry. Translational dimension is also strong. Diagnostic tools developed at FDG have been a key to the success of two commercial labs in Norway. There is also an on-going work on development of the vaccine against *Francisella piscicida* and salmon lice, which might bring commercial success.

Recommendation
Continue this positive trajectory.

University of Bergen

Faculty of Medicine and Dentistry – Department of Biomedicine

Evaluation units

A. Cardiovascular Research Group
B. Craniofacial Developmental Biology
C. Neuroscience Research Group

General comments

The Department of Biomedicine, the largest department in the Faculty of Medicine and Dentistry at the University of Bergen, is the result of a merger in 2004 between three pre-clinical departments (Anatomy and Cell Biology, Physiology and Biochemistry and Molecular Biology).

Among the long-ranging projects, the Department wishes to establish *one* Center of Excellence (the topic is still open) and an international PhD research school. Even though the latter initiative will not directly bring in resources it is part of an initiative to strengthen the Department on the global scene with later returns for international collaboration and recruitment. In addition it is expected that the PhD students in such an international school will help to foster new interactions and collaborations within the Department. The Department has reorganized their internal grouping which has improved the internal interaction in several groups. The recent hirings of several academic staff have been "open" to get the best applicants, but the final choice also been made with the perspective to strengthen the present research profile/grouping.

There are 25 professors, 12 associate professors, 5 part-time professors, 28 post docs, 14 researchers with a doctoral degree and 51 PhD students at the department.

The main funding source for the department is the RCN, making up for approx. two thirds of the total external funding. Other significant external funding sources are the Norwegian Cancer Society and The Western Norway Regional Health Authority (*Helse Vest*).

Follow-up of previous evaluations

Since the last evaluation there has been a merger and reorganisation and a move into a new building. The department went from 33 research groups down to 10 with the intent to create thematically common groups, with at least two scientists plus some technical support. This panel met 3 of these groups. Teaching was condensed to increase contiguous research time. Very active programmes encourage high level publication and international collaboration. An internal evaluation is also planned for 2011.

Cardiovascular Research Group

Description
The group has 5 full Professors (one 5% clinical) and 2 Associate Professors. It participates in the Locus for Circulatory Research. Grants from the RCN are mentioned but their value is not stated, and they have had industry funding within the period.

General comments
This is a relatively new grouping. Their general strength is in the microcirculatory area, with strong interests in interstitial fluid and connective tissue as well as inflammation. Their activity is not in the mainstream of cardiovascular science, since they look at a number of other organ systems. The recent younger recruit brings a more cardiac aspect, and it is encouraging that they are now collaborating in the developing area of cardio-oncology. The competence in animal physiology is a strong advantage.

Scientific quality
The Microcirculation group is very productive. They have excellent international collaborations, and have a number of high quality publications. In most cases their strong contribution is demonstrated by first or senior authorships, while a few, e.g. the *PNAS* paper, are more likely originated by collaborators.

Grade: Good to Very good

Societal impact
The general area clearly has social relevance. They aim to be translational, with links to industry, and we note the two projects being patented.

Recommendation
They are still not a large group, and there may be more opportunities for increasing critical mass (possibly with the tumour group). The cardiac recruit is excellent but may be somewhat isolated and further hiring in this area would be an advantage.

Craniofacial Developmental Biology

Description
This group which was established 1999 has two permanently employed scientists at the Professor level of which one has been on leave part time during the evaluation period for clinical training in orthodontics. One professor emerita is also active within the group. Six PhD students, one from Norway and five from foreign countries are the basis for the research activities. All of them have a background outside dentistry. Two PhD students graduated during the evaluation period. The research activities are focused in two main projects: 1) Interdisciplinary translational project aiming at understanding genetic changes leading to developmental disturbances in dentition with the goal to generate biological teeth and 2) Development of the mammalian head, especially craniofacial and oral structures.

General comments
It is of great value that dental scientists aim at studying basic science and to extend that goal also to translational studies. However, given the fact that the group is very small, the two research projects described in the self-evaluation are very ambitious and likely to be more relevant for a large research institute. The allocation of the research group for

craniofacial development biology to the large Department of Biomedicine seems also strategically well thought and it is apparent that the group by this has access to several advanced molecular techniques. It is, however, strange that the group seems not to collaborate with other groups at this department, there are no co-publications, nor any comments on such ongoing or planned collaborations in the self-evaluation. This is particularly surprising in light of the small size of the group. According to the self-evaluation, the group collaborates with several national and international colleagues but very few of them, if any, is co-author of any publications. It is also surprising, that there seems not to be any collaboration with the very productive group for craniofacial biology at the Institute of Oral Biology in Oslo.

Scientific quality
The group has published 15 papers in international journals during 2005-2010 which makes 2.5 papers per year. It is difficult to know how many senior scientists and PhD students that have been active during the evaluation period. Currently, 2 senior scientists and 6 PhD students are active. Even if some of the students have been recruited during the period, at least two have graduated, and in relation to these circumstances the scientific output is modest. One publication 2005 appeared in *Development* which is a prestigious journal (impact factor 7.7), but since then the papers have been published in journal with lower impacts (range 0.9 – 3.2) with a trend for decreasing average yearly impact factors (3.4/2005 to 1.7/2010).

Grade: Fair to Good

Societal impact
Tooth developmental disturbances are common and understanding molecular and cellular mechanisms are important for diagnosis and treatment. Results might also be of importance for tissue engineering of tooth tissues.

Recommendation
This group is rather small and seems to be isolated and would benefit from being part of an extended network with other groups in the developmental area. It could be either with groups working on developmental research in general or with the craniofacial group in Oslo or with other groups in the Nordic countries like Professor Irma Thesleff´s group in Helsinki which is one of the most prestigious groups internationally in craniofacial biology.

Neuroscience Research Group

Description
This group presently consists of 5 tenured scientists, each with an independent research laboratory within the following fields: Synaptic plasticity (including the molecular level), synaptic transmission and integration in retinal microcircuits, neuroinformatics and image analysis, pain physiology and electrophysiological studies of behaviour.

General comments
Even though the neuroscience group consists of 5 “separate” units the administration, most of the infrastructure and the economy is integrated and shared. The integration and collaboration can also be seen in co-publications giving evidence of an integration also at scientific level. As a whole the senior scientists have been successful in raising significant amount of external funding. The infrastructure within the group – or at core facilities with

full access by the group members – include very good imaging facilities (e.g. 7 T animal magnet, core facilities for molecular imaging and proteomics and multiphoton laser-scanning integrated with electrophysiological equipment).

Scientific quality
In the areas of synaptic plasticity (including the molecular level), synaptic transmission and integration in retinal microcircuits, the publication rate and quality is excellent, with several publications in top journals. The senior researcher in the group on electrophysiological studies of behaviour will soon retire, and the continuation of this field does not seem to have high priority in the Group. However, the remaining fields do have high priority and the technical resources and the infrastructure is in place to support a positive development. Although the group maintains several independent research projects the internal interaction seems to be excellent and to strengthen the group as a whole.

Grade: The present performance of the Group as whole is Good/Very good with some excellent components.

Societal impact
Significant part of the work is translational: this holds true both for the molecular aspects of synaptic plasticity with specific relations to cognitive functions and impaired memory during normal aging, as well as the pain research.

Recommendation
It seems that the group has clear vision on keeping a broad field of projects, but still integrated. They also have a clear vision on recruitment of PhD students and postdocs. In order to support this it is essential that vacant positions will be reappointed to support this vision.

University of Oslo

Faculty of Mathematics and Natural Sciences – Department of Molecular Biosciences

Evaluation unit

A. Physiology Programme

General comments

The Department of Molecular Biosciences was formed in 2004, and was a merger of the Department of Biochemistry and three sections from the Department of Biology: Microbiology, Cell biology, Genetics and Physiology. To foster interactions between the new faculty members and highlight areas of research four programmes were established: the Programme for genomics, gene regulation and gene function (Gene Programme); the Programme for proteomics, protein structure and function (Protein Programme); the Cell Biology Programme; and the Physiology Programme. The research programmes are organized along thematic research lines rather than traditional disciplines, with the possible exception of the Physiology Programme.

The Department has 19 tenured faculty members, 23 technicians; of the non-tenured research staff there is 35 PhD students. The largest research groups have more than 10 members, while the smallest one has less than 4 members. Retirements at the faculty level have not been replaced fully, and this presents a major challenge for the future.

About one third of the research budget comes from external sources, where grants from the Research Council of Norway (RCN) make up approx. 80 % of the external funding.

Follow-up of previous evaluations

Following the previous RCN bio-evaluation an internally driven reorganization at the Faculty of Mathematics and Natural Sciences led to the reorganzation into 2 departments: Department of Molecular Biosciences and Department of Biology, which the physiologists regard as uncomfortable. The reorganization was driven by the Faculty independent of the evaluation.

Physiology Programme

Description

Following an initiative from the Faculty of Mathematics and Natural Sciences, the Physiology Programme was created within the new Department of Molecular Biosciences. This seems still to be an uncomfortable arrangement because, in spite of the use of molecular tools and techniques, the groups have in general an integrative set of questions that they address, questions that often fit into a broader biological context. As such, something of the stimulation and motivation for the work is diminished.

The main focus of the Physiology Programme is on comparative physiology and neurobiology. The strategy behind much of the research is to approach basic physiological problems by utilizing biodiversity.

At the time of the report, there were four research groups at the Programme, constituting 4 full-time professors, 4 post docs, 9 PhD students and 2 technicians working part-time. The number of post docs and PhD students had increased by the time of the interview.

The Programme has been successful in obtaining external funding, particularly from the RCN, from which they have received a total of about 37 million NOK for the last 5 year-period.

General comments
The group leaders in the Physiology Programme seem supportive of one another. The belief seemed to be, and this can indeed be defended, that the senior professors in particular were sufficiently motivated not to need an artificial vision to be applied from above.

There have been severe cutbacks in tenured staff positions since the last evaluation, as a direct result of retirements, but the money was then withdrawn, probably through lack of interest in the area by those with a mandate at that time to allocate positions. One position has recently been reappointed, with excellent research support from the Faculty as well as from external sources.

Scientific quality
The programme is clearly appreciated by the RCN, as all group leaders are PIs on individual grants. Members of the programme have had EU support on a long-term basis. The programme has also attracted extra financial support from the Faculty of Mathematics and Natural Sciences in the form of a strategic research initiative aimed at emerging top-tier groups, BiFF (Biodiversity in Form and Function). One group in the programme also participates in the Faculty's emerging research initiative MURES together with colleagues at the School of Pharmacy. In addition, in an attempt to obtain further support, the programme will be jointly applying, together with members of the Medical faculty, for a Centre of Excellence in neurobiology; the neurobiology theme is not prominent in all groups but can be discerned to different degrees in all.

There has been a consistently good rate of publication from all members of the programme and many of the publications are in very good to excellent journals.

The topics of research are very diverse covering 1) neurobiology and respiratory physiology of vertebrates, 2) cellular electrophysiology and aquatic bioacoustics, 3) molecular muscle biology *in vivo*, and 4) a newly established field on neural processing and plasticity of cortical circuits in behaving animals. All of these groups are small, but all with publication in high impact journals with important results from all groups.

International collaborations are well-developed in some of the groups.

Grade: Very Good to Excellent

Societal impact
Immediate and more long-term societal impacts are evident in all the groups.

Recommendation

It is recommended that stronger interaction is encouraged between the Physiology programme and both the Department of Biology (at the Faculty of Mathematics and Natural Sciences) and the neuroscience colleagues in the Medical Faculty. It would probably not be inappropriate for institution leaders to consider whether better dynamics could be obtained if the Physiology programme within the Department of Molecular Biosciences and the Biology Department were to achieve a closer interaction.

University of Oslo

Faculty of Medicine – Institute of Basic Medical Sciences

Evaluation units
A. Neuroscience
B. Nutrition 1

General comments
Institute of Basic Medical Sciences (IMB) is one of three institutes of the Faculty of Medicine at University of Oslo (UiO). Seven Thematic Research Units have been defined at IMB: a) Cellular and molecular biology, b) Organ physiology, c) Immunobiology, d) Neuroscience, e) Behavioural research, f) Nutrition science, and g) Biostatistics, epidemiology and modelling of biological systems. These areas should also be seen as prioritized.

About half of the budget for research emanates from external funding. The RCN is a major funder, and they make up for about 60 % of the external funding. There are 47 professors, 10 associate professors, 32 researchers with a PhD, 39 post docs and 57 PhD students at the IMB. The gender balance is somewhat of a concern. About two thirds of the professors are men, but among the post docs and PhD students females are in a majority (about 70%).

Follow-up of previous evaluations
Key recommendations from the previous RCN evaluation for "Research in Biology and Relevant Areas of Biochemistry" (2000) have been followed up at IMB:
1) seven prioritized areas of research have been outlined to give a stronger focus on research strategies and research profiles. Neuroscience and Nutrition science are two of these areas.
2) the establishment of Centre of Excellence (CoE) in medicine has been supported at IMB since 2003.
3) regional research platforms have been established (i.e. Functional Genomics, the Norwegian Transgenic Animal Facility at IMB in collaboration with Rikshospitalet in 2005).

Neuroscience

Description
The present Neuroscience unit consists of 42 researchers (named in the self-evaluation report) including 14 professors (1 emeritus), 1 associate professor, 15 researchers and 13 post doc fellows. They are still organized in many independent research units, as described below, but with strong features of interdependence and collaboration.

General comments
The Neuroscience unit builds on the great tradition and achievement of early neuroscientists known as the "Oslo School of Neuroanatomy" and the more recent development of antibody techniques for the demonstration of neurotransmitter amino

acids in tissue sections, the development and plasticity of the neuromuscular junction, hippocampus and the discovery of the long-term potentiation (LTP).

1. Neural Systems and Graphics Computing Laboratory (NeSys). This unit is developing neuroinformatic tools for visualization and analysis of brain architecture (partly in relation to an international centre in Stockholm, KI), and is also housing a "small" animal imaging unit. Among the members of this unit are several senior scientists with duties other than original research. Nevertheless the unit's output is good.

2. Molecular Neuroscience. Lately this group has focused on the AQP4 and its role in the pathophysiology in epilepsy and ischemia. The output from this unit is strong during the assessment period, although the leader of the group recently got major administrative responsibilities.

3. Synaptic Neurochemistry Unit. Lately this group has focused on the transport systems (transporter proteins) of amino acid transmitters across membranes – including astrocytes which are able to release glutamate. The productivity has been high during the assessment period although the senior scientist formally retired at the beginning of this year. From the self-evaluation it seems that the contract for many of the members of the group is soon ending.

4. Neuropil Plasticity. Actually two groups focussing on transporter proteins for amino acid transmitters – here including the inhibitory transmitters glycine and GABA and on synapses and their capacity for structural and functional change (using cell cultures). One senior scientist has also contributed on the brain activity pattern (EEG, fMRI) during mental activity. The group is small by the production, but still fair and published in good journals.

5. Neural Development and Optical Recording (NDEVOR). The group is focusing on the development of the brain and spinal cord – including identified interneuron populations. They have high productivity in good journals. The senior scientist of this group is the Chairman of the Norwegian Centre for Stem Cell Research (opened 2009). This Centre's principal objective is to increase the pace of existing stem cell research in Norway, establish a platform for human pluripotent stem cell research, and facilitate the clinical use of stem cells, including in diseases of the nervous system.

6. Plasticity in Neurobiological Systems. Under this headline four different, independent laboratories covering sensory processing in the visual cortex (fair productivity with publication in very good journals), plasticity in the neuro-musular system (very small group, presently with modest productivity), axonal properties of the CNS white matter (very small group, not many publications, but published in relevant journals) and basic research – with a translational aim – on the Attention-Deficit/Hyperactivity Disorder (ADHD) (high productivity, including publications in journals with high impact factors). These 4 subgroups cover very different areas, and it would therefore appear to be counterproductive to suggest further reorganizations.

7. Neurochemistry. This group focuses on molecular signalling pathways in specific (neurotransmitter-specific) neuron populations. The group is small, but has maintained a good productivity with publications in relevant good journals.

8. Brain Signalling and Coding. The work here focuses on intrinsic neuronal mechanisms (ion channels) in hippocampus neurons which are of direct importance for signal transmission – and great relevance for neurons in other parts of the CNS. Although the group very much depends on foreign post docs it has been very active with several high impact publications.

Scientific quality
The number of units listed above may seem bewildering, but a number of initiatives secure an integration of the researchers and research programs across the units. Thus, five of the neuroscience research groups at IMB are members of the Centre for Molecular Biology and Neuroscience (CMBN) that was established in 2002 (as a RCN Centre of excellence). The Centre aims to take on a leading role in elucidating the role of DNA repair and genome maintenance mechanisms in preventing neurological disease and brain ageing. The research activity and infrastructure generated by the CMBN is poised to enhance the scientific environment at IMB and its surround. The Norwegian Centre for Stem Cell Research and Rikshospitalet (opened 2009 at IMB), with a leading input from the unit "5 Neural Development and Optical Recording". Other networks where the staff at the Neuroscience group as a whole plays a central role includes the nation-wide collaborating networks the Norwegian Brain Initiative: a Large-Scale Infrastructure for 21st Century Neuroscience (NORBRAIN), the Nansen Neuroscience Network (NNN, the first innovation organization in neuroscience research and industry in Norway, was founded at the initiative of the CMBN, the MI-Lab at NTNU, and neurologists / neuroscientists in Bergen, Oslo, Tromsø and Trondheim), the Norwegian Neuroscience Society (NNS) and the Norwegian Brain Council (Hjernerådet). The group is thus much more integrated than it appears from the list of "independent units". Nevertheless, several of the small have obvious problems to reach an optimal impact because of the group size. Also the age profile is a serious threat for the maintained impact of this large group of neuroscientists.

To summarize; as stated above in relation to the specific fields, even small groups with limited quantitative outputs indeed produce results of very good quality and publications in high impact journals. However, the fragmentation of fields of interest combined with the age profile certainly is a challenge to be considered when positions are opened in the future. The past excellence and remaining strength combined with the size certainly makes this combined group to the "neuroscience powerhouse" in Norway.

Grade: Ranges from Good to Very good with several excellent groups/features.

Societal impact
A strong neuroscience research initiative has an obvious 'societal impact' by itself, but among the many strong projects there are several which have a very clearly stated translational aim (obvious from the description above).

Recommendation
Despite the excellence and strength described above the many small groups ("fragmentation") and the generation shift needs attention both in upcoming major applications (national and international) and when positions are opened (refilled) in the future.

Nutrition 1

Description
The evaluation unit comprises 11 research groups, each led by a professor in permanent position. 7 of the 11 professors are male. In addition, there are 50 PhD students and postdoctoral fellows and 12-14 technical/administrative members. The groups vary markedly in size and research activity, including publication achievements.

General Comments
The unit has 3 prioritized research areas: 1) Antioxidants, DNA damage and nutrition-related cancer; 2) Obesity, cardiovascular disease and metabolic syndrome; and 3) Nutritional epidemiology and primary prevention.

Scientific quality
The research topics cover molecular biology, animal experiments, clinical trials and population studies concerning energy metabolism, cell signalling, vitamins, glycobiology, inflammation, oxidative stress and epidemiology in health and disease. Research is translational and multidisciplinary.

The overall production is of high quality. It relies also on some internationally-known scientists which are highly cited. Several scientists are involved in both basic and applied research, from genes to clinical trials. Members of the unit have the ability to raise funds and apply successfully to competitive funding. Three current projects are presented to reflect the integrated research within and outside the unit:

Perinatal nutrition: the objective is to demonstrate that optimized nutrition to premature infants will improve growth, cognitive and brain development and will reduce future metabolic disorders. Clinical trials among preterm infants are carried out in hospitals to investigate the impact of extra energy, protein, essential fatty acids and vitamine A, versus a normal diet. The output from the two leaders and the scientists involved in the project is quite high and in very good journals.

Antioxidants and inflammation: epidemiology has demonstrated benefits of antioxidants in diet and "antioxidants" is topic of research worldwide. The project will use *in vitro* and *in vivo* (animal) models for mechanistic studies. In humans it will focus on colorectal cancer patients to evaluate effects of optimal diet on genetic and functional disorders, and polymorphisms related to oxidative stress and inflammation. Valorisation of the results by the leader and the collaborators in their own field of research is high in very good journals during the assessment period. It would be fine that papers associating members of several groups inside the unit emerged from the project.

Proteins, amino acids and obesity: the project deals with mechanisms of obesity and a role of cysteine plasma levels in the regulation of energy and lipid metabolism. It is an innovative and challenging research project. The team has a good productivity and is publishing in journals with high impact factors.

A weakness recognized by the staff members is the separation in 11 research groups, each comprising a few members and often relying on a single permanent staff member. There are poor interactions between the groups so far, even if promotion of collaborations between the groups has been engaged recently. The high level of publication rate

(between 2 and 8 art/year for each member) and high impact of the scientific production in the field of nutrition and cancer explains the grade attributed.

Grade: Very good to Excellent

Societal impact
The unit activity deals with diet research, and research on agents for promoting healthy dietary habits in the population. Therefore the societal impact is important.
Indeed, nutrition affects public health problems and also obesity, an epidemic challenge globally. In addition, studies are oriented on prevention of common diseases like diabetes, cardiovascular diseases, cancer, cognitive decline, osteoporosis and inflammatory diseases.
Research is also engaged in developing countries (South Africa and India) and in studies regarding vulnerable groups (premature infants, old people, ethnic minorities, and cancer patients).

Recommendation
Maintaining high standard of publication: the future retirement of senior scientists internationally known may be a concern. Increasing interactions between research groups is necessary. Emphasizing development of basic research. Support demand of equipment for animal experiments.

Faculty of Medicine / Oslo University Hospital – Institute of Clinical Medicine / Division of Diagnostics and Intervention

Evaluation units
A. Pathology
B. Pharmacology

General comments
The merger of four hospitals (2 in 2005 and with another 2 on 2009) resulted in the Oslo University Hospital (OUH). The OUH is responsible for approximately 50 % of research in the health sector in Norway, and has nine clinical divisions, and The Division of Diagnostics and Intervention (DDI) is one of these.

In response to the previous evaluation, the Oslo University Hospital and University of Oslo are now working much more closely and liaised over their research strategies. They have also introduced the new roles of 'Head of Research' in the DDI and a Research Head in each of the 8 departments in the DDI. These individuals manage the research activities at the level 2, help with the development of a cohesive research strategy and ensure that all research in the DDI is done in groups with 'critical mass'. However, it was noted that these changes have yet to bring about an increase in total publications/year (which remained static between 2005 to 2010).

The Division of Diagnostics and Intervention (DDI) is a result of merging all disciplines of laboratory medicine including pathology, as well as radiology and intervention medicine into one administrative unit at the OUH in 2009. The unit currently employs about 2200 employees on 8 different departments.

The scientific staff consists of 295 employees, and is composed of professors in full or part-time positions amounting to about 20% of the research staff, 12% are researchers, 19% post docs, 26% PhD students and 19% technicians.

About one third (a somewhat larger share in 2010) of the funding of research comes from external sources. Around 17 % of the funding from external sources comes from the RCN.

Follow-up of previous evaluations
Before the merger into OUH, each of the hospitals had separate strategies to strengthen research in response to the previous evaluations. This has been followed up in OUH, which recently had a new research strategy approved by the Board.

The previous evaluations raised a lack of scientific leadership at all institutional levels (divisions, departments, research groups), and that the research had to be more focused. Actions to address these shortcomings have been taken by both institutions at all levels.

Pathology

Description
The current department was formed after a merger of four departments. It consists of 100 scientists (including 18 professors and 18 post docs). It is by far the largest pathology department in Norway.

General comments
In 2008 there was a strategic decision to focus its research activities into 3 main areas: *Immunology, Cancer Biology* and *Basic Cell Biology*. These receive internal research funding from the Oslo University Hospital and University of Oslo, as well as external grant support from such funding agencies as the South-Eastern Regional Health Authority, Norwegian Cancer Society and the Research Council of Norway.

Scientific quality
The panel noted some excellent quality publications – especially by scientists in the Immunology and Cancer Biology areas. However, it also noted that of the 902 papers published in peer-reviewed journals between 2005 and 2010, only 35% were senior-authored by members of the Pathology department.

The department needs to increase the number of good quality publications senior-authored by members of the department if it is to compete in all 3 of its main research areas at the national or international competitions levels.

Grade: Good to Excellent

The grading reflects the diversity of quality of publications in the department – some are in top, international journals and clearly of high impact while others appear in much lower impact journals.

Societal impact
The work done by scientists here in the fields of Immunology (i.e. their work on allergies as part of the Centre of Excellence in Immunology) and Cancer Research (e.g. designing novel and highly sensitive diagnostic tools for lymphoma – work being done as part of a

major, 7-centre collaboration) could have a major impact on the way such diseases are detected/treated.

Recommendation
The Department should encourage scientists doing less prominent/important work (e.g. outside the areas of strength in Immunology and Cancer Biology areas) to actively seek local collaborations with stronger track records in order to secure funding and generate good quality publications in the future.

Pharmacology

Description
The Department was formed in 2007 from the merger of 2 smaller departments, and a further merger with the Clinical Pharmacology Department at University of Oslo in 2010. This was done to achieve the 'critical mass' for research groups recommended after the previous evaluation.

Now it consists of 6 sections over 4 locations. Currently there are 6 full-time professors and assistant professors, 5 post docs, 15 PhD students and 4 part-time professors (20 %). But, 2 professors retired in 2009 and another 3 will retire in 2011-2012. So far they have only secured a commitment from the University of Oslo to fund 2 of them (one in cancer pharmacology and the other in cardiovascular pharmacology).

General comments
The research strategy has been to explore cellular signalling mechanisms, especially in cancer and heart disease. There are currently eight research groups in four locations, and this structure is under revision. The department has external funding for several PhD students, and have external funding for innovation projects.

Scientific quality
The Department has a research strategy to focus their research activities in 2 main areas: (i) cell signalling (in cancer and cardiovascular disease) and (ii) the factors controlling the variable responses of the body to certain drugs. Most of their publications are in specialised, national/EU journals rather than international ones. However, it emerged during the evaluation interview that some groups have conducted advanced translational/clinical work (e.g. testing drugs against new targets they have identified in heart failure – in collaboration with various, prominent industrial partners).

Grade: Good

Societal impact
The Department now has experience of working with industrial partners to take their findings in the lab into the clinic. This form of focussed, translational work could lead to new drugs for cardiovascular disease and/or cancer.

Recommendation
The Department needs to raise the quality of its publications. It is commended for its translational work on new drug targets and encouraged to patent its laboratory findings and seek good quality industrial collaborations, where possible.

University of Oslo

Faculty of Dentistry – Institute of Oral Biology

Evaluation units
A. Biofilm
B. Craniofacial Biology Research

General comments
Institute of Oral Biology is the smaller of the two institutes making up Faculty of Dentistry in Oslo and has 60 employees including 16 academic positions as Professor I, Professor II and Associate Professor, one postdoc and 16 PhD students. Out of the 10 Professor I only one is female. The Institute was established 1993 by a merge of three independent basic science departments for Physiology and Biochemistry, Anatomy and Microbiology, all within the Faculty of Dentistry. Since 1999, the Institute is located close to Rikshospitalet and the basic science department of the Faculty of Medicine, but far from the Institute for Clinical Dentistry. According to the web site for the Institute of Oral Biology, the researchers at this institute are organized in seven groups: a) anatomy, b) bacteriology, c) biofilm and signalling, d) developmental biology, e) epithelial cell biology, f) molecular genetics and g) pathology and forensic dentistry.

It is remarkable that so few postdocs are working at this institute, especially since it is a non-clinical institute.

The Institute encourages their researchers to publish in high impact factor journals but seems not to have any incentives, nor do they have a clear definition what they regard as high impact factor journals.

It is important to note that the research group in bacteriology has been highly rated in national competition for being recognized as a Center of Excellence, although the group was not eventually given this status.

Follow-up of previous evaluations
Based upon two previous evaluations which pointed out that the research activities were too diverse and did not keep up with the leading edge of research, the activities have now been organized into two main areas: a) *Biofilm* and b) *Craniofacial biology, diagnostics and treatment*. These two areas are now also part of the research focus for the Institute of Clinical Dentistry, together with two other focus fields in Biomaterials and Health promoting and preventive activities.

At the organizational level, the institute still seems to split into too many diverse research groups. This is a weak point and an issue that needs to be addressed not least since the institute points out in their self-evaluation that the scientific staff is critically low and that it has had large financial problems during the last five years resulting in a reduction of 3.8 positions as researchers.

Biofilm

Description
Research is concentrated into four research areas: 1) Bacteriology, 2) Biofilm and Signalling, 3) Periimplantitis and 4) Periodontology. The research groups have a dental clinician as a group leader. These four areas are different from the seven areas listed in the web site for the institute. It is not possible to understand how large the four groups are, but it seems as the last two groups are smaller than the first two.

General comments
Given that the entire Institute of Oral Biology has 16 academic positions and that it is not specified how many academics are actively working in the four groups, it seems still as the research focus is too diverse. It is stated in the self-evaluation that the bacteriology group focuses on taxonomy of oral biofilm in health and disease and that the biofilm and signalling group studies the molecular basis for bacterial communication and that the two other groups are investigating prevalence and risk indicators for periimplantitis and participating in a clinical randomized placebo controlled study, which clearly demonstrates the diversity. It is also apparent that the groups in periimplantitis and periodontology have no overall research aims. It is highly appreciated that the bacteriology group is having an active collaboration with a very well recognized bacteriology group at Forsyth Dental Institute in Boston, as well as with several national groups outside dentistry.

Scientific quality
The biofilm unit has published 92 papers 2005-10. 60 of these papers have been published by the bacteriology group (18 in dental journals), 24 (7 in dental journals) by the group for biofilm and signalling and 8 by the periodontology group. The number of publication by the bacteriology group is impressive although it is not clear how many scientists are active in this group. However, there are no publications in high impact factor journals (<3.5).

Grade: Fair to Good

Societal impact
The two major oral diseases – caries and periodontitis – are both infectious diseases caused by bacteria within the biofilm present on the surfaces of teeth. Although the incidence of both diseases had decreased during the last decades there are still groups of patients that suffer from these diseases and with increasing age it is also known that patients become more susceptible to caries. It has also now been realized that 10% of the population in most countries, including Norway, has periodontitis which does not respond to conventional hygiene programs and surgery. More than 700 species of bacteria are present in the dental biofilm and it is important to further study which bacteria are causing the diseases and how they interact when establishing the biofilm. Biofilm research is also important for many fields outside dentistry.

Recommendation
The research activities should be focused to two groups, one in bacteriology and the other in biofilm and signalling. It is also important that both groups try to deepen their research which should make it possible to publish some of their papers in high impact factor journals. The collaboration by the bacteriology group with the group at Forsyth Institute in Boston should be increased. The unit should recruit more post docs. To focus all

research at the Faculty of Dentistry, the research at Institute of Oral Biology should be redirected into more of translational research in the dental field.

Craniofacial Biology Research

Description
This group has nine permanent scientists (Professor I and Associate Professors) which are members in five different research groups: 1) oral cancer, 2) oral epithelial biology, 3) oral immunity, 4) wound healing and 5) tooth and salivary gland development. Of these members, two have dental background, two national science backgrounds and two medical backgrounds. It is highly appreciated that the group has members with different backgrounds which is not too common in dental research units. The unit has thereby extensive knowledge in several techniques used in biomedical research.

General comments
It is very apparent that the different research groups at this unit are too diverse and too small. There is no overall aim for the group and it seems as if the groups are working as separate groups with no interactions between them. Most of the staff is older than 50 years and some of them are close to retirement. Of the nine CVs included, two are clearly strong/very strong but the others are rather weak.

Scientific quality
During the evaluation period, the unit has published 53 papers which make 10 papers per year or one paper per permanent scientist. This is not satisfying and clearly less than expected. Of these 53 papers, 24 were published in dental journals but only two in the dental journal with highest impact factor (*J Dental Research*). Although several of the projects are scientifically interesting, there are no publications in journal with high impact factor; all are in journals with IF<3.5. The studies on miRNA in developing tooth germs are in the front line internationally.

Grade: Fair to Good

Societal impact
All the five research areas are potentially important for several parts of clinical dentistry but this unit has too few contacts with clinical dentistry.

Recommendation
It is important that this unit focuses on much fewer research areas and that a strategic plan is developed which include focus on an area where it possible to recruit scientists with well recognized CV. It is also important that close contacts with clinical dentistry is established making it possible to perform translational dental research. Focusing on fewer areas would also make it possible to perform research at the international front line with publications in high impact factor journals. Basic science groups in the dental field have to compete with similar groups at medical and natural science departments and to be competitive requires much more in the future than in the past. The unit should increase the number of post docs. The craniofacial biology program, if continued, should establish collaboration with the unit in Bergen for craniofacial biology to develop a national strategy in this field.

Faculty of Dentistry – Institute of Clinical Dentistry

Evaluation unit

A. Biomaterials, Tissue engineering and Regeneration

General comments

This institute was previously based upon 13 small departments but was reorganized 1999 in 8 departments and 3 sections, of which Biomaterials, tissue engineering and regeneration is one. At the institute, 43 scientists are employed permanently at the level of Professor I, Professor II and Associate Professor, two are post docs and 24 are PhD students. Among the professors there is a gender imbalance – 30 % females and 70 % males. For the associate professors it is the opposite. The institute has a programme for increasing the rates of female professors.

It is well recognized that the institute encourages the scientists to publish in high impact factor journals but it is important to define what is accepted as high impact and also to have administrative systems to follow this over the years. Since dental research has to compete with other biomedical fields it is also important to relate the achievements at the institute to other biomedical fields in Norway and to dental fields in Nordic countries, Europe and US. These analyses seem not to be prioritized at the Faculty level.

It is interesting to note, given the strategy in several other European countries that dental research needs to compete with other medical fields, that the institute has obtained a separate grant from the Research Council to support clinical dental research and another grant from the University of Oslo for PhD positions.

Follow-up of previous evaluations

Due to recommendations by previous evaluations, the research activities are since 2005 focused in four areas: 1) Biomaterial and tissue regeneration, 2) Health Promotion and Disease Prevention, 3) Biofilm (together with Oral biology) and 4) Craniofacial biology (also together with Oral biology). It is difficult to clearly see how this reorganization has affected the diversity at an organizational level. It is also not evident how the reorganization has affected the organization of the research groups and if more focused research areas have developed. Nor is it evident how it has affected the quality of the publications or the ability to attract external funding. The institute seems not to have any strategy how to allocate parts of the research budget based upon deliveries.

Biomaterials, Tissue engineering and Regeneration

Description

The research activities in this unit are organized in seven research groups working with nine different research areas: 1) loading, 2) epigenetics, 3) matrix biology, 4) surface, 5) homeostasis, 6) biomimicry, 7) stem cells, 8) endodontics and 9) scaffold. Four group leaders are professors; one is associate professor and two post docs. Among the project leaders one is female. It is difficult to understand how many are employed at this unit totally and divided in different categories. The unit has previously been evaluated and been regarded excellent. The unit has been able to obtain EU grant as co-ordinator and has also received grants from the RCN.

General comments
It is surprising to note that so many diverse research areas are listed in the self-evaluation. Although it has not been possible to obtain an overview of the total number of scientists, it gives the impression that also at this unit the diversity is remarkable. It is not apparent how the seven groups interact and make benefits of each other. On the other hand, this unit seems to be very focused on their research activities. The unit has extensive collaborations nationally and internationally both within and outside the dental field. This unit has a well thought strategy for training, mobility and career path and recruits PhD students and post docs internationally. The students make part of their projects at other laboratories abroad. This is facilitated by the fact that the units have many international collaborators. From the nine CVs incorporated in the self-evaluation it is apparent that three of the scientists are highly recognized – one has been cited more than 3,000 times and two approximately 1,000 times which is good in the dental field.

Scientific quality
During the evaluation period, the unit has published 71 papers according to their own list which, however, also includes some abstracts and some which are reported twice. On an average, the unit has published 13 papers per year which makes 2 papers per research group, which is not too impressive given the fact that not all are senior authorized by a member of the group. There is, however, some papers in scientific journals with rather high impact factor (4.5-5.5). Rather few papers are in dental journals but quite many in biomaterials journals.

Grade: Good

Societal impact
Research on the interactions between biomaterials and human body is of great importance not only in the dental field but also in medicine in general. The use of dental implants has improved the quality of life in millions of people.

Recommendation
Most of the studies are descriptive, which often is the case in the biomaterial area. If the unit decreases its research areas, it would open up possibilities to more mechanistic studies which would help them to get more deepened insight into the interactions between biomaterials and tissues/cells. That would also facilitate publications that are at the international edge as well as to be more competitive for grants in the biomedical field.

University of Tromsø

Faculty of Biosciences, Fisheries and Economics – Norwegian College of Fishery Science

Evaluation unit

A. Fish Health – Fish immunology and vaccinology

General comments

Norwegian College of Fishery Science (NCFS) was established in 1972 as a national multidisciplinary college within fishery sciences and educations, and organised as an umbrella organization between the universities of Bergen, Trondheim and Tromsø. In 1988 NCFS was re-established and organised as a faculty at the University of Tromsø. Research at the college is rooted in basic science and scientific traditions with translational science applications to marine recourses and innovation within fisheries, aquaculture and biotech industry.

Initially, the college was established to take national responsibility for education of Fisheries Candidates – a 5 year integrated master program that later was reorganised (2003) into a multidisciplinary bachelor and disciplinary master programs. NCFS also carried responsibilities for research and education within marine biology, fish biology, marine biotechnology, aquaculture and social economy at the University of Tromsø.

In 1989, NCFS together with the University of Bergen was assigned the national responsibility for education of Aqua Medicine Biologists (5-year integrated master program) licensed to practice veterinarian medicine on fish with particular emphasis to the aquaculture industry.

University of Tromsø merged with Tromsø University College in 2008, and subsequently there was a need to harmonise and profile education and research to establish the reorganised University of Tromsø. In this process, NCFS as a faculty was reorganised into three departments: Norwegian College of Fishery Science, Department of Arctic and Marine Biology and Tromsø University Business School comprising the Faculty of Biosciences, Fisheries and Economics. Biotechnology related research (bio-prospecting, fish immunology and vaccinology, and food science) together with resource biology and fishing harvest technology were organised under NCFS.

There are currently 49 permanent research positions at the College (16 professors, 11 associate professors and 22 research fellows). In addition there are 8 post docs, 33 PhD students and 11 engineers. The gender balance among the permanent positions, one fourth are women, is a concern. Among the professors and associate professors only 5 out of 22 are women.

The present organization of the faculty was established in late 2009. It is still in the process of the re-organization of research and education in accordance with the new organization plan. Therefore, the assessment is a bit premature.

It is unclear whether the college internally competes with the Department of Arctic and Marine Biology within university structure. Closer institutional connection within the university would perhaps help strengthen the standing.

Follow-up of previous evaluations
The response to the previous evaluation, which was critical of the lack of strategy in this group, was not responded to by conducting strategic planning. They reorganized and made some "strategic" investments. Some kind of SWOT analysis would have been appropriate.

Mentioning areas of opportunity, such as bio-fuels from algae, is not strategic planning. The mentioning of strengths and weaknesses are not those of the institute, relative to the environment, but it is a wish list of things they wish to improve.

Fish Health – Fish Immunology and Vaccinology

Description
In 2005-2010 the unit has contained only three full-time professors, from previously 6 positions. The unit has been organized as teams led by each of the professors and decisions have been made at the team level.

General comments
An overall goal of the research is contribute to maintaining a sustainable, environmentally safe and ethical acceptable aquaculture industry in Norway, and most of the projects are tailored to serve the national aquaculture industry.

The unit is small, though coherent, and considers itself an international leader in research on fish immunology and vaccine research. However, it is a small group, below 'critical mass'.

There is a delayed continuation of professor position due to general policy at the Faculty that all positions go back to the pool when becoming vacant. The unit was very successful in gaining external funding. In 2009, 66% of funding came from external grants.

There is a strong history of collaboration with international partners in Scotland, Canada, the United States, The Netherlands, India and China.

Scientific quality
The self-study is not satisfactory. There is much reported on abstracts of the various research projects. As other units have done, there ought to be a fair and full reporting of research activities and impact.

Volume of publications is relatively good, and the *quality* is satisfactory in the light of available resources and the fact that the period for PhD scholarships is reduced to three years. Of special interest is the research on the gene cluster coding interferons in salmon and pioneering study on dendritic cells in fish. The volume has increased from 15 publications in the whole 2005 to 26 for the 6 first months in 2010.

The publication output, on an individual basis and career output of the faculty are not large; 71 publications for 11 researchers over 10 years (between 2-4 publications per year/person). It appears that the high teaching demands of the college environment and

the primary orientation of the research to industry-based applied research compromises the capacity to conduct more basic research.

Specifically for the Fish Immunology and Vaccinology group, there appears to be 3 full time researchers/professors. It is stated that there is success in competitive funding from the RCN and the EU. They state that "critical mass" would be met with another engineer and two more professors who can share the teaching and research.

For the topics being investigated, there should be more publications in higher impact journals.

This is not a strong research group. Statements such as "The weakness is that teaching is still the main responsibility of the professors and that funding by RCN still favours applied rather than basic research." seem like excuses for performance.

National collaboration is good. International collaboration is all right for the EU but not strong for anything further. Some foreign researchers are present.

Grade: Good

Societal impact
Collaboration with the vaccine industry was established in the middle of 1980s, and presently there is a strong collaboration with the fish vaccine industry through projects in the research collaboration between India and Norway (RCN). They have unused potential for patenting (had 4 patents in the past).

Recommendation
The unit would benefit from hiring researchers specializing in adaptive immunity.

University of Tromsø

Faculty of Health Sciences – Institute of Medical Biology

Evaluation units

A. Medical Pharmacology and Toxicology Research Group
B. Vascular Biology Research Group
C. Cardiovascular Research Group
D. Tumour Biology Research Group

General comments

The Faculty of Health Sciences (FHS) was formed in 2009 after the merger of the Faculty of Medicine at the University of Tromsø and the Faculty of Health Sciences at the University College. The FHS is the largest faculty at the University of Tromsø and is organised in 7 Departments, one of which is the Department of Medical Biology.

In response to the previous RCN evaluation in 2000 (in which the department was criticized for insufficient scientific leadership and lack of strategic planning, and a fragmented research profile), some structural changes (e.g. the removal of small, isolated '1-man/woman' research units) and re-organisation of the department into research groups with a clear research focus – usually on some area of human disease were carried out. This resulted in the establishment of the current 11 research groups comprising 180 employees in total (including 22 full professors, 20 associate/associate II professors, 25 post docs, 36 PhD students and 44 technicians working in 11 research groups and 3 technology platforms; electron microscopy, bioimaging and proteomics). Members of academic staff are able to commit around 50% of their time to research activities and many are well known in their respective areas of research.

The department receives its annual budget from the FHS (approx. 33 M NOK in 2009) and allocates research funding to the various research groups based on group size, number/quality of scientific publications, PhD candidates, number of EU, RCN and industry-supported projects.

There is some concern in the department about replacements for academic staff. In less than 2 years, 5 members will retire and it was not clear from the hearing whether the department will be allowed to recruit replacement staff to work in the same area as the retirees. It appeared that this will depend on the research strategy and teaching requirements prevailing at that time.

Follow-up of previous evaluations

It would appear that only minor changes were initiated as a direct response to the previous evaluation but more significant changes have been introduced subsequently, including financial initiatives and attempts to focus on core areas of research.

Medical Pharmacology and Toxicology Research Group

Description
This group is composed of three research teams, covering a broad range of interests as indicated below. The academic staff consists of 3 professors, one 20 % associate professor, one associate professor, two 20 % associate professors and 1 researcher. The group has recently lost three academic positions, one full-time and two 20 % appointments, which has meant significantly increased teaching responsibilities for the remaining staff.

General comments
These scientists study the effects of drugs/toxins on the body and their current projects include: (i) experimental studies of the structure and function of transport proteins, (ii) molecular modelling of drug targets, and (iii) bioaerosol toxicology (exposure in the workplace, especially the seafood industry). They have competence to carry out their research on several levels (i.e. from basic molecular studies of mechanisms, to molecular modelling, to drug action in clinical studies), so their work has translational potential. The Molecular Modelling team seems to be the best funded of the 3 current groups, with external funding secured from various sources over the evaluation period.

Scientific quality
Productivity is quite high in this group – with, on average, 5 papers/staff member/year (albeit in mainly specialised rather than general journals). This is impressive given their reduction in staff numbers over the last few years, 3 academic positions (one full time and two part-time positions). As indicated above, the majority of articles have appeared in field-specific journals of moderate impact, although a few have been published in very good journals.

Grading: Good

Societal impact
It is likely to be high given their main focus on drug effects.

Recommendation
One or more of the 3 vacant academic posts in this group should be renewed (especially in Toxicology as this is currently missing in the group) – once a clear strategy is in place for how these appointments would help strengthen the existing strong molecular modelling group and provide extra support to build up the other two, less strong research groups (i.e. to help them to attract external funding etc). They also need to conceive of ways to redress the imbalance highlighted in the hearing between classical 'wet work' at the bench and '*in silico'* modelling studies. These need to be carried out in a co-ordinated and equal manner so as to maximise the efficacy of their novel modelling approach.

Vascular Biology Research Group

Description
This group consists of 2 full professors, 3 post docs, 4 PhD students, and 1 technician working in a tightly focussed group on the role of the scavenger endothelial cell in atherosclerosis, innate immunity and delivery of biopharmaceuticals.

General comments
They have not been able to recruit new PhD students in the group since 2007, so they need to attract departmental or external funding for this as a matter of some urgency. This should be seen as a priority by the Department, and joint efforts need to be made to fund at least some PhD student positions in all research groups that have nominal departmental approval.

Scientific quality
The 2 professors in this group have published 45 papers in 5 years (so 4-5 papers/group/ academic staff member) in mainly good, albeit specialised, journals. Many publications are senior-authored by members of groups with whom this group collaborates.

Grading: Good

Societal impact
Their work could lead to a number of new therapeutic approaches to the treatment of atherosclerosis and other conditions.

Recommendation
The group has high visibility in the field of scavenger endothelial cell biology, and is doing well on meagre resources so the number of academic posts should be increased and departmental funding for PhD students provided. They also need to increase their funding for basic research from the RCN and other sources and from industry for the more applied aspects of their research.

Cardiovascular Research Group

Description
There are 3 professors, and 2 associate professors at the unit.

General comments
This group works on cardiovascular physiology and pathophysiology, and is currently running 4 interrelated research projects: (i) The role of altered cardiac metabolism in the development of cardiac dysfunction during pathophysiological conditions such as obesity/diabetes and hypertrophy/heart failure, (ii) Ischemic damage and adaptation focusing on the mechanisms underlying myocardial damage during acute ischemia and reperfusion in healthy hearts as well as in diseased hearts, (iii) Studies of endothelium with special focus on mechanisms related to flow induced vasodilation, and (iv) Infrared thermography (i.e. the use of infrared thermography as a research tool in studies concerned with peripheral circulation in humans, including disease diagnosis, plastic surgery and efficacy monitoring of disease treatment). They fund much of their work via the regional health authority rather than RCN funding.

Scientific quality
This group has extensive international collaborations (e.g. in EU and NIH collaborations) so it is not surprising that its scientists (3 full professors and 2 associate professors) have collectively published 45 papers in peer reviewed journals in 2005-10 – which equates with approx. 2 papers/staff member/year. However, it is unclear what proportion of the studies were actually based in the group (i.e. on which they were senior author) rather than elsewhere. A significant number are in *American Journal of Physiology*, which we consider very good in the field. There was one article in *Journal of Biological Chemistry* and one in *Cell Metabolism* (very good to excellent and broader) but neither was senior-authored from Tromsø.

Grading: Good to Very good

Societal impact
The focus of several of the researchers on major human diseases will undoubtedly contribute new knowledge with potential applications.

Recommendation
There is still considerable disparity within the group with respect to scientific focus and there may be room for greater concentration.

Tumour Biology Research Group

Description
This group was established in 2009 and consists of 4 full professors and 2 associate professors.

General comments
They are focussed in 2 main areas: tumour matrix biology (i.e. via MMPs) and the possible use of lytic peptides as a new form of cancer treatment (in collaboration with the Company, Lytix Biopharma who are funding a clinical trial of one of these peptides). The projects are based on clinical observations and utilise tissue samples from patients, *in vitro* assays and various *in vivo* murine models (xenograft and syngeneic).

Scientific quality
The 6 members of academic staff in this group have published 30 papers in the 2005-10 (so that equates with just 1 paper/staff member/year. Furthermore, these are mainly in middle-ranking cancer journals (impact factor of 5 or less) and only 16 of the 30 (i.e. 50%) were senior-authored by members of the group, so half of their papers were submitted by other groups.

Grade: Fair to Good

Societal impact
Their work on lytic peptides could generate new therapies for cancer.

Recommendation
This group has yet to achieve critical mass in either of their research areas and should merge with the cancer group in this department, the *Molecular Cancer* Group.

Norwegian University of Science and Technology (NTNU)

Faculty of Natural Sciences and Technology – Department of Biology

Evaluation units
A. Environmental Toxicology
B Zoophysiology

General comments
The Department of Biology (IBI) was established in 2002 in response to the Norwegian Research Council's (RCN) bioscience evaluation in 2000, that recommended to merge fragmented research units. Since 2009, the Department of Biology (IBI) is organized in three sections:

- EEE Ecology, Ethology, Evolution (three research groups)
- PEB, Environmental Toxicology and Biotechnology (three research groups including Zoophysiology and Environmental Toxicology)
- MS, Marine Science (one research group)

IBI has 24 professors, 9 associated professors, 17 research scientists, 13 post docs, 26 technicians, 54 PhD students. The gender bias of the staff is highly skewed. Only 4 of the professors, 2 of the associated professors and 2 of the research scientists are women.

IBIs identified ecology, environmental toxicology, plant molecular biology and systems biology as directions for strategic development. Consequently, they allocated much of resources to the relevant sections, somewhat leaving behind the remaining others. This has been also reflected in allocation of new positions and replacements.

The structure of the department is imbalanced, with zoophysiology organizationally separated from ecology and evolutionary biology, as a result of the previous evaluation. However, according to the testimonies this does not pose a constraint on collaboration which is highly encouraged at NTNU.

On the other hand, the self-assessment identified a low degree of cooperation between research groups and within some groups as a weakness. Overall, there is still room for harmonizing both structure and collaboration.

Internal funding is relatively stable and predictable. This allows for coherent long-term planning within the sections and research groups. Around 40% of the research budget comes from external funding and for 2008 and 2009 grants from the RCN make up for two thirds of the external funding. Allocation of internal funding to research is based on the scientific production of each professor and associate professor (individual scientific publications over the last three years) and the number of graduated PhD and MSc students.

Follow-up of previous evaluations
The department has been reorganized and resources allocated according to the recommendations of previous evaluation.

Following the 2000 evaluation, research units were merged to ensure attaining the critical mass within the 3 newly established sections. Resources were allocated to strengthen the core research areas where IBI had an international leading position: environmental toxicology (ET), ecology (including ethology and evolution), and plant molecular- and systems biology.

Within physiology and toxicology, the last evaluation focused on the need for strengthening and expanding the research, while avoiding diversification. This has been followed up within the ET-group, with the replacement of one new professor. This has resulted in the formation of a strong, active and integrated research team.

Since the evaluation graded Dept. of Zoology as excellent, it has received disproportionally strong financial support in the establishment of the Centre of Conservation Biology. Zoophysiology would most likely still benefit from further merger and more focused research agenda.

Environmental Toxicology

Description
The unit consists of three permanent faculty positions: 2 professors and 1 associate professor, and in addition 2 researchers, 1 post doc-position, and 8 PhD students. Two technical positions are also affiliated with the research group.

General comments
Research activities span from genotoxicity, molecular and cellular toxicology and pollutant effects on fish, amphibians, free ranging marine mammals and birds, including Arctic species. They perform research aimed at understanding the functional and developmental alterations of wildlife caused by exposure to environmental stressors using the -omic technologies; using a combination of experimental exposure studies in controlled laboratory conditions and sampling of free-living animals in the field.

The group has broad national and international research collaborations. At the national level their main collaborators are SINTEF Fisheries and Aquaculture, Veterinary College Oslo, and Norwegian Polar Institute.

Scientific quality
The permanent scientific staff are recognized as international leaders and researchers in their respective disciplines (molecular and cellular toxicology and physiology, genotoxicology and cell biology, transfer of contaminants in food chains and physiological effects of pollutants).

The researchers have a high visibility at the international level, and are members of national (and international) governmental scientific boards and committees (such as Norwegian Scientific committee for food safety, UNEP-Stockholm Convention Working 41, Group on Climate Change and POPs, European Science Foundation Marine Pollution Working Group).

Grade: Very good/Excellent

Societal impact
The research has high impact and deals with environmental concerns regarding:

- Pollution anthropogenic activities and their impact on wildlife
- Climate changes
- Polar artic research

Recommendation
Maintain present trajectory. The review panel strongly support the need of renewal of equipment, formulated in the self-assessment. Also, in order to strengthen collaboration between and within research groups, institutional barriers should be examined.

Zoophysiology

Description
There are currently 5 researchers at the unit (3 professors, 1 associate professor and 1 research fellow). Only one of the full time positions during the period 2005-2010 has been held by a female. There have been incentives to increase the number of female researchers at the unit.

General comments
The research in zoophysiology is very diversified and fragmented with little overlap. Groups are well below critical mass, and there is no formal organization structure. The age structure is skewed, with most researchers above 55 or close to retirement.

Available infrastructure is good, with a large and modern animal housing facility. The unit is involved in an intense international collaboration.

Scientific quality
Zoophysiology enjoyed relatively high success rates in obtaining funding from the Norwegian Research Council. The research is diverse and fragmented, with a large variation in publication and citation records (between 1-19 publications/person in the 2005-2010 period). Some areas (most notably avian physiology) are internationally well recognized. Thus, the grading reflects a wide variation of research quality and output.

Grade: Fair/Good to Very good

Societal impact
Researchers are very successful in dissemination of their results to general public through popular media. The research on cold hardiness can potentially have applied character.

Recommendation
Perhaps the merger of evolutionary biology with zoophysiology should be considered to achieve critical mass. New positions should be advertised according to the strategic plan.

Norwegian University of Science and Technology (NTNU)

Faculty of Medicine / St. Olavs Hospital – Department of Circulation and Medical Imaging

Evaluation units

A. Exercise Training in Health and Disease
B. Extreme Environments and Health

General comments

This Department was established in 2002 in the reorganisation of the Faculty of Medicine, and was then evaluated by the RCN in the Clinical Medicine round in 2003. It has 3 main strategic research areas: medical technology (largely imaging), translation research and health surveys/biobanking.

Since 2003, it has made substantive changes in line with the various suggestions made by the panel after the hearing. It has also come up with a sensible, ambitious research strategy and the head of department showed vision and considerable leadership when outlining this in the hearing (2011). They have carefully considered, logical plans to exploit the wide range of skills available within the Department to do exciting translational studies (i.e. taking findings obtained in their 'wet', molecular/cellular experiments through to clinical trials with collaborators at St Olav's Hospital and other sites). The head of Department was able to cite clear examples of how they were already doing this (and publishing such studies) within the evaluation period. One example cited was their longitudinal studies in exercise/heart failure which remain in clinical trials.

The marked technology platform (the 'MI Lab family') is still strong – as it was back in 2003 – and still being improved and strengthened with new developments in their imaging techniques. The Cardiac Exercise Research Group has recently established the new 'K. G. Jebsen Centre for Exercise in Medicine' and are applying to the RCN for this to be made a Centre of Excellence. Both the RCN and Regional health authority (30%) contribute to the research budget of the Department but much of this funding is short-term. Their Centre of Excellence application forms part of their current strategy to move on from such short-term project funding in various groups in the Department to more substantive, 5-10 year grants.

Of the total research budget, around 60 % comes from external funding. For the last three years between 30 and 42% of the external funding come from project grants from the RCN.

At the Department there are in total 14 professors, 8 assistant professors, 23 post docs, 17 researchers with a doctoral degree, and 61 PhD students.

Follow-up of previous evaluations
The department has responded to the recommendations in the evaluation in 2003 and implemented strategic plans in the following ways:

- It has extended its strategic position as a resource centre of medical technology.
- It has taken several steps to support projects that use the HUNT population surveys and examples from its biobank.
- It has made investments to develop a research group of translational research on exercise in medicine.

Exercise Training in Health and Disease

Description
There are 5 professors at the unit, all of them being men. Currently, there are 20 PhD students and 7 post docs working within the unit.

The research of the unit is organised in two groups:
1. Cardiac Exercise Research
2. Exercise Physiology and Sport Sciences

General comments
This is a tightly focussed, relatively well funded Unit studying the beneficial effects of exercise training on the prevention, treatment and rehabilitation of patients with cardiac disease, metabolic syndrome and other conditions. They establish effective training programmes for such patients and also investigate the cellular mechanisms underlying how these exercise programmes work. There are 2 main research areas: Cardiac Exercise Research and Exercise Physiology and Sport Sciences. They were awarded high quality labs in the integrated University hospital development and currently receive research grants from a number of national and foreign funding bodies. This success has not been accompanied by increased (but rather by decreased) academic posts in the Unit which means that each tenured scientist has more admin work to do now and that they may not be able to keep their most gifted postdocs as there are no junior academic posts to offer them. They have a number of successful international collaborators.

Scientific quality
They are well known for their work and said that they have produced around 120 papers in the evaluation period – with members of their Unit being senior author on approximately 90% of these. They are aware that translational studies are a great strength in their research programme and intend to progress with this approach in a number of areas.

Grading: Very good

Societal impact
The research is likely to have a direct effect on the health of the nation – for example in the prevention, treatment and rehabilitation of patients with cardiac disease. It will be interesting to see which other diseases/conditions they will extend their focus to cover in future years (i.e. beyond cardiovascular conditions). They routinely receive coverage for their work on Norwegian TV so there is considerable public interest in their work.

Recommendation
It would be a good opportunity if they could secure funding for a Centre of Excellence and other forms of long-term funding. The faculty should support their work by perhaps funding one or more tenure track or full academic posts in the Unit.

Extreme Environments and Health

Description
This Unit was established in 1988 and works mainly on the possible adverse effects of diving on the body. A good and stable funding is described in the self-evaluation. The Head of the Unit has recently retired so they are advertising for a replacement. He is currently the only full-time Professor in the Unit (the rest of the staff are postdocs, researchers, techs, MD and PhD students). Given that situation, future plans to secure longer-term funding is important, but the path to this was less clear in their strategy.

General comments
The main working hypothesis emerging from this research unit is that endothelium dysfunction and damage is the main cause of the formation of bubbles and the serious decompression sickness. The unit has contributed a number of seminal publications in this field and demonstrated that high intensity aerobic exercise (before diving) protects against gas bubble production, and that this is related to the production of nitric oxide.

Scientific quality
They are well known for their work on decompression sickness as a "vascular" disease and have published several seminal papers in this field during the evaluation period. At the presentation they themselves presented it as a weakness that they had too few publications in top journals.

Grade: Good to Very good

Societal impact
This is important work given the role of divers in the offshore Norwegian Oil industry.

Recommendation
Secure 5-10 year research funding to secure a "generation shift" with the new leader.

Faculty of Medicine / St. Olavs Hospital – Department of Laboratory Medicine, Children's and Women's Health

Evaluation unit

A. Clinical Pharmacology and Toxicology

General comments

The Department of Laboratory Medicine, Children's and Women's Health (LBK) was formed in 2002 from several smaller units, as one of the five departments at the Faculty of Medicine. The most substantial change was the grouping together of the Departments of Children's and Women's Health with several laboratory units. LBK is now organized in four sections by medical disciplines: a) Paediatrics, b) Gynaecology/Obstetrics, c) Anatomy/Pathology/ Forensic Medicine, d) Laboratory Medicine plus a fifth section for technicians. The structure was created from 15 sections, after a previous evaluation recommended some consolidation.

This Department has a number of not very closely related sections, with a loose base around the themes of the title. The Head of Department had a good knowledge of the Level 2 section, and had clear ideas on how to improve their scientific collaboration and output. She is to be commended on her leadership skills.

The Department has little funding from the RCN, and the share of external funding of the research budget is about 35%. They report that external funding is problematic for some groups, but the funds available from the Local Health Authority have been a significant help.

The Department has 13 professors, 15 associate professors, 3 post docs and 13 PhD students.

Follow-up of previous evaluations

This Department has clearly taken note of the recommendations of the previous report and tried to group units in a more logical way. If the level 2 unit evaluated here has not formed a more coherent and collaborative group, this is more to do with the diverse interest of the individuals rather than any institutional failing.

Clinical Pharmacology and Toxicology

Description

The Clinical Pharmacology and Toxicology group at LBK consists of five tenured professors with 5-100% positions at the University. All members are also employed by St. Olav's University Hospital. It should be noted that all professors are male.

General comments

They have little interacting interests, and 5 distinct areas of investigation, and in a very broad sense the primary research topic is drug safety. They have joint positions, and a high teaching load, which reduced the time for research.

Scientific quality

There has been a steady output of papers from this unit, with some highlights, but the majority fell into the category of solid low-to-mid-range journals, not infrequently written

in Norwegian. Some international interest was indicated by invitations to several of the professors to speak abroad. This profile produced the grading indicated, with mostly national but some international relevance.

Grade: Fair

Societal impact
There were strong areas in which value to society was demonstrated, and one or more of the staff was in demand as governmental advisors.

Recommendation
Efforts by the Head of Department are unlikely to produce more than modest improvements in the collaborative nature of this section, since they have been together for some time and know well each other's interests. We do not recommend further efforts in this direction: it would be more productive to support the external collaborations of these investigators or a fresh input of staff.

Faculty of Medicine – Centre for the Biology of Memory / The Kavli Institute for Systems Neuroscience

Because of the small size of the insitute level 1 and 2 have been merged (also done in the self assessment).

Centre for the Biology of Memory (CBM)/The Kavli Institute for Systems Neuroscience

Description
The group presently consists of 3 senior scientists in permanent positions (professorships) and 2 additional senior scientists covering "new" areas within the common project
1: modern gene technology in analysing the function of specific neuronal element, and
2: statistical physics and information theory for understanding neural population coding.
It seems secured that the latter scientists will soon obtain permanent positions at the Faculty. In addition the group has around 20 post docs and 20 PhD students, 10-15 master students and 21 technical assistants. The gender balance among post docs and PhD students is approximately 60% (males) – 40% (females).

General comments
The leaders of this Centre were appointed as associate professors at NTNU in 1996 (at the Department of Psychology – later reallocated to the Faculty of Medicine to new laboratory premises). In 1999, the group leaders received their first major research grant, under the European Framework 5 (FW5). Already in 2002 the group (then with a number of prominent visiting research colleagues from Europe and the U.S.) was appointed a Research Council-founded Centre of Excellence (Centre for the Biology of Memory – CBM). This Centre is now (from 2007) a separate unit at the Medical Faculty – reporting directly to the Faculty leaders. In 2007 the CBM was appointed a Kavli Institute – this also gives significant economic support. The group was also boosted by the appointment of an additional leader (covering the anatomy of microcircuits). Several additional grants from EU and the European Research Council have been / are supporting the group. The Norwegian University of Science and Technology (NTNU) has steadily given very strong support to the institute.

Scientific quality
The Centre for the Biology of Memory (CBM) has developed into one of the world's leading arenas for experimental and theoretical studies of memory in brain networks. Since its inauguration in 2007, CBM has been able to provide some of the most ground-breaking insights so far into how spatial location and spatial memory are computed in the brain and, more generally, how the brain generates its own neural patterns. The most remarkable contribution was perhaps the discovery of grid cells in the entorhinal cortex (in 2005), which immediately pointed to the entorhinal cortex as a hub for the brain network that makes us find our way through the environment. The discovery led to a complete revision of established views of how the brain calculates position and how the results of these computations are used by memory networks in the hippocampus. The results will ultimately benefit the development of tools for diagnosis and treatment of Alzheimer's disease, which commonly begins in just the brain area that contains the grid cells.

The present publication record is indeed excellent with great international impact.

The risks perceived by the leaders are that the unit is critically dependent on all its senior members and that much of the basic funding is dependent on external time-limited grants.

Grade: This is undoubtedly Excellent.

Societal impact
In addition to the general importance of truly excellent neuroscience research, the present program is also addressing particular aspects of importance for understanding and diagnosing Alzheimer's disease.

Recommendation
The NTNU has clearly invested heavily in this Unit, and their confidence has been justified. Certain parts of the funding e.g. the Centre of Excellence award will soon be lost. Continuity of funding under this or another scheme will be necessary to prevent this unit relocating from Norway. We are confident that this is understood by the NTNU, RCN and Norwegian Government and will be addressed in good time.

Norwegian University of Life Sciences (UMB)

Department of Animal and Aquacultural Sciences

Evaluation units
A. Monogastric Nutrition and Product Quality
B. Ruminant Physiology and Nutrition

General comments
The Department of Animal and Aquacultural Sciences (IHA) was the outcome of a reorganization of four departments and is today a research driven institution covering most aspects of animal production. IHA is the only Animal Science institution in Norway although very closely related disciplines exist at other Norwegian institutions, like NVH and NVI. IHA is organized into 5 research groups of flexible structure, adjusted accordingly to the current scope of research projects. Two centres have emerged within IHA: namely the Centre for Integrative Genetics (CIGENE), formally established in 2003 and Aquacultural Protein Centre (APC), a Centre of Excellence established in 2002. APC is the only Center of Excellence in Norway focusing on aquaculture.

The Department's permanent scientific staff is 18 professors and 13 associate professors. Although not stated explicitly in the self-assessment, the strategy of IHA seems to be centred on development of methods of sustainable food production. IHA also employs 1.9 professor II (i.e., several persons with 10-20% positions), 2 post docs and 1 researcher with doctoral degree. IHA has more than one hundred research projects running and about 90 PhD students. As the staff is relatively old it will be a challenge to recruit new faculty members. Although positions are announced internationally it is difficult to recruit new people and many of the PhD students do not want to or can remain in the Department.

Research in animal science including fish, animal breeding and genetics, systems biology, ruminant physiology and nutrition, monogastric nutrition and product quality and animal welfare is performed at the Department.

The funding situation is fairly good with 1/3 basic, 1/3 public research funding and 1/3 from industry (KMB projects). The total external funding is increasing (total external funds are 58%). About 90% of the professors have RCN funds but there is obviously a considerable variation. The IHA is using bonus (funding) to stimulate attraction of external funding.

Concerning infrastructure there are several unique facilities: The Animal Production Experimental Centre at Norwegian University of Life Sciences (UMB) offers facilities to host applied research with dairy cows (including calves, heifers and bulls), dairy goats, sheep, pigs, poultry and fur animals. The Feed Technology Centre at UMB offers excellent possibilities for studying effects of feed technological treatments on production and health parameters in different species.

Research collaborations exist to a large extent with scientists in the Nordic Countries particularly in breeding and genetics and feeding and also with the Norwegian agro-industry. The KMB projects are commendable and it seems clear that the industry does not determine the research direction and any IPR belongs to IHA. The IHA appreciates the KMB, collaboration with the industry, paying 20% in the collaborative projects. Collectively the close relation to agro- and aqua industry is very good, leading to several products, improved feeding regimen and feed evaluation.

Follow-up of previous evaluations
There is no mention or reflection of the past evaluation.

Monogastric Nutrition and Product Quality

Description
The unit consists of 6 full professors, 6 associate professors, 2 research scientists, 3 post docs and 3 part time professors. Two of the full-time professors are female. Two full professors, 3 associate professors and 2 post docs are allocated to the Aquaculture Protein Centre (APC), a Norwegian centre of Excellence, established by the Research Council of Norway in 2002. This is hosted by UMB.

General comments
The group is working with nutrition and nutrition physiology of monogastric species (fish, pigs, poultry, fur animals, dogs, cats) and with product quality related to nutritional factors of both monogastric species and ruminants (pigs, beef, fish, poultry, sheep, goat, eggs and milk). This area of research is closely integrated with the Aquacultural Protein Centre (APC).

Infrastructurally there is a metabolism unit for pig and a fish nutrition laboratory: this is important for basic scientific studies on nutrition and it facilitates collaboration with APC.

Due to limited internal funding almost all research activities are dependent on external grants and this is a great dilemma as the free choice of research topics *de facto* is limited.

Scientific quality
Several research areas of the group are strong and well recognized: new feed resources, contents of bioactive compounds, effects and development of new feed technology processes, nutritional bioavailabilities and animal physiology and health. In addition, the group has a strong focus on the nutritional, sensory and technological quality of animal. The group is leading internationally in many of the fields but it is difficult to discriminate between the activities carried out by this unit and APC.

In the evaluation period scientific productivity of senior staff members varied between 3-40 publications, with the majority publishing more than 3 papers a year.

Grade: Good

Societal impact
The research carried out at the unit can result in development of feed ingredients and feed processing technologies promoting animal production and reduction of negative

environmental impact. However, the excessive load of time consuming, purely industrial work may limit or delay scientific output.

Recommendation
The monogastric unit performs research at a good international level with publications in internationally and nationally recognized journals. They have a strong tie with the Norwegian industry and their research is of relevance both to national and international research development. Their contribution to research in developing countries is commendable and essential in the view of the increasing importance of monogastric nutrition in those countries. They should also endeavour to achieve more basic funding as the level of external funding may lead to an intended external decision over projects and delays in publication time.

Ruminant Physiology and Nutrition

Description
The group consists of 3 full professors, 1 part-time professor (20%), 4 associate professors, 1 senior researcher, 1 post doc and 11 PhD students. All professors and associate professors are men, many of them approaching the retirement age. The number of PhD students is sufficient but there is no employment possibilities following PhD education.

General comments
The research group is focusing the attention on ruminant physiology including horses and feed evaluation. They have access to excellent animal experimental facilities (rumen metabolism, coecal cannulation in horses) and laboratories for feed evaluation.

The group incorporates an advanced metabolism unit with highly qualified technical staff facilitating basic research of international standard. Researchers at the metabolism unit have been the main architects of the new Nordic feed evaluation system for cattle (NorFor). This is a very successful system, but does not bring extra revenues to the department. Among the senior staff, a very high proportion has support from the RCN.

The unit has very good collaborations with industry.

Scientific quality
The group plays an important international role in digestive physiology in ruminants and has a national leading role in basic physiology and in horse digestive physiology and in feed evaluation. The ability to attract external funding is relatively high (about 60%), but it may also be a problem for the future.

The group has published around 100 publications over the evaluation period. This might be considered satisfactory. However, many of the publications are not in peer reviewed journals and some of them are non-refereed abstracts. In fact, some of the results have been published in low impact and narrow-field journals. Research on ungulate population ecology/grazing are of good quality and published in well recognized ecology/general journals. The research on extensive production systems (reindeer/sheep) on rangeland pastures is worth mentioning, as it is unique to Norway and published in good quality journals.

Grade: Fair to Good

Societal impact
The societal impact is significant as they have participated in developing products and feeding regimes. Also, their attempt to reduce greenhouse gasses through alternative feeding regime will be important for the future. Development of the Nordic feed evaluation system for cattle (NorFor) is also worth mentioning.

Recommendation
The ruminant physiology group has good facilities, a solid base for performing research and reasonable external funding. They still have to make more efforts to publish more in international peer reviewed journals with high impact factor. Post-PhD career planning and recruitment should be developed.

Norwegian School of Veterinary Science

Evaluation units

A. Fish Health
B. Environmental and Reproduction Toxicology
C. Pathology/immunology
D. Microbiology

General comments

The Norwegian School of Veterinary Science (NVH) is the only veterinary educational institution in Norway. The main campus is located in Oslo and in addition there is a research unit in Tromsø (Section for Artic Veterinary Medicine) and a section for small ruminant research in Sandnes (Section for Small Ruminant Research).

NVH consists of 4 Departments: Department of Basic Sciences and Aquatic Medicine (BasAM) , Department of Food Safety and Infection Biology (MatInf), Department of Production Animal Clinical Sciences (ProdMed) and Department of Companion Animal Clinical Sciences. Each Department is led by a Head of Department who is responsible for both teaching and research.

The education is highly intertwined with research and contributes to the concept of research-based teaching and evidence-based veterinary medicine. In addition NVH has two master programmes which started up in 2004; Food Safety and Aquatic Medicine. Due to lack of qualified, Norwegian applicants, NVH has not admitted new students to these master programmes over the last two years.

This is a large research unit in veterinary medicine and in spite of their teaching mandate their researchers are broad in their scope and extensive in their collaborations. There are a total of 131 full-time researchers with a doctoral degree at the NHV, and about 35 % are professors. There are 117 PhD students, and the number post doc positions (currently 11) are probably too low, as these are a valuable resource for the research groups. Also, many PhD students report that there is a career "gap" after the time they finish their PhD. About 20 % of the professors are female, whilst the proportion of female associate professors was 55 % and female PhD students was 73 %.

The funding of the research is to a large degree external, over 60 %, and grants from the RCN make up more than half of the external funding. However, the degree of EU funding is too low and more post docs should be solicited.

The pro-rector is heading an advisory Committee for Research and Ethics which has about 7.5 million NOK (2.5% of the budget) to stimulate research. This funding can be used strategically for various activities (funding of projects, starting grants for women in research, PhD students and ethical matters) and this internal funding is very competitive.

The strategic research plan for 2006 – 2009 prioritized the following core areas:

- Aquatic medicine
- Infectious diseases (Infections with economic impact, zoonotic diseases, prion diseases)
- Preventive medicine and animal welfare
- Genetics
- Patho-toxicology and disease mechanisms

It is, however, unclear exactly how the core areas are selected and how the thematic groups, research groups and the departments interplay. It is commendable however that the management has made attempt to select areas based on strength and relevance.

In the Strategic research plan for the period 2010 – 2012 NVH will be

- A leading international institution in fish medicine
- To continue to have a high international profile in the following areas:
    - Food safety
    - Animal health and welfare
    - Disease etiologies and mechanisms of diseases
    - Preventive medicine

Follow-up of previous evaluations

NVH has responded well to the recommendations of the last evaluation. They've invested in appropriate leader positions and developed their own Strategic Plans. They are investing increasing percentages of resources to encourage multidisciplinary research areas. They will merge with the Norwegian University of Life Sciences in 2014. The main reasons for the merger are to strengthen and establish more robust research climates in the fields of bioproduction, animal food chain, food security and food safety, preventive medicine and animal welfare. Together with the university at Ås, NVH will form a fully integrated new university.

Fish Health

Description

There are 6 professors, 5 associate professors, 5 researchers and 5 post docs at the unit. Among the professors 5 are men.

The unit has been funded from external sources such as the RCN, EU, countries outside the EU and industry. One reason behind this relatively large external funding is that the unit is one of the subsections of the Aquaculture Protein Centre, a Norwegian Centre of Excellence.

General comments

The themes of this group are: host-pathogen interactions; nutrition and health; and using the Zebrafish model to explore basic mechanisms. There are 5 sub-groups in the first theme, with the other 2 having one each. The Zebrafish groups sticks out as odd. It is a research platform and not a research area. They are actually doing work in some marginal areas such as micro-gravity with space applications, but also conducting research in developmental biology and cryopreservation of gametes. It is strongly recommended that this powerful tool to be made available to all research themes in NVH.

In the period 2005-2010 a total of 30 PhD students affiliated to NVH and having a topic of their dissertation related to fish health, finished their studies. The recruitment situation for PhD students is generally good, with a high number of well qualified applicants for each position. All PhD students spend some time (a few weeks to more than half a year) at co-operating institutions abroad or at other national research institutions during their project period.

Regarding infrastructure the aquarium facilities at NVH is not satisfactory but this is compensated by working with other groups in Norway having better facilities (Nofima e.g.)

Scientific quality
The Fish Health Group is the largest group in the School, and is well-published. Their collaborations are international, and the topics they are connected to and active in are at the forefront of the field (Host-pathogen interaction, Nutrition and health and Model organism-zebrafish).

The self-study, however, is limiting in not revealing more detail of certain areas such as fish welfare research (e.g. pain). This group is connected to strong genomics groups internationally.

Grade: Good

Societal impact
Fundamental studies of fish health is crucial for the Norwegian aquaculture industry and being central in many important scientific findings make the societal impact significant.

Recommendation
They should continuously strive to receive funding from the RCN, get more post doc positions and the Zebra Fish platform is encouraged to share their powerful tools with others.

Environmental and Reproduction Toxicology

Description
There are 4 professors, 1 part-time professor, 2 associate professors and 3 post docs at the unit.

General comments
The research activities at the unit focus on 4 themes:

- Reproductive physiology
- Reproduction, production and welfare
- Environmental chemistry and toxicology
- Translational and comparative medicine

It is an interesting multidisciplinary group that address the gaps in these areas. This is noteworthy for the country.

Scientific quality
The publications in the self-evaluation (about 200) are not all directly related to or originate from scientists engaged in this group nor are they published in refereed journals.

Generally their unit is strong on the toxicology effect on reproduction and the neuroendocrinology of fish.

The Boar-taint project seems to have produced interesting and commercializable results.

Grade: Good

Societal impact
The taint project is important, so is the semen preservation area and their findings in neuroendocrinology and environmental toxicology will have implications for human reproduction.

Recommendation
More post doc and maybe a more narrow focus.

One consideration might be to imagine breaking down these units and pushing this toward true multi- and inter-disciplinarity. Think of a reward system that would encourage exploration within and between the disciplines. The present form is trans- and multi-disciplinarity.

The cooperation between three departments will strengthen the whole College.

Pathology/immunology

Description
The unit is organized in four groups, which all work to identify research topics and sources of funding, either in cooperation or separately. There are 7 professors, 1 associate professor and 1 post doc at the unit. The gender ratio among the researchers is even.

General comments
The overall profile of the unit is to focus on immunological and pathophysiological investigations of infectious and degenerative diseases in domestic animals.

1) Studies of prion disease.
This has been a collaborative activity between three groups of the unit since 1996: absolutely in the main stream with early diagnoses and infections orally. In 2010, a new formal research network called PAN, as an acronym for (Prion-Aging-Neurodegeneration), was launched in order to improve the probability for getting more funding as prion-neurodegeneration has high priority.

2) Immunobiological studies, focusing on natural killer (NK) cells in infections.
Building on the last decade's emerging understanding of innate immunity, the NK cell group has performed the initial characterisation of NK cells in cattle and other ruminants, and currently study their role in infections. Central findings include the crucial involvement of NK cells and *Neospora* and *Mycobacteria* infections.

Scientific quality
The scientists are very active in publications as well as in organising meetings. Quantitatively it is difficult to assess the scientific quality as some of the publications are not refereed and as some are certainly outside the area which leads to the question: are all publications relevant for the field?

Their collaboration nationally is impressive and internationally as well even in a centre of excellence.

The Immunology Pathology Group is doing some interesting work in a limited number of projects such as prion research and NK cell work.

Grade: Good

Societal impact
The prion group is very important for eradicating e.g. scrapie and understand the transmission from animals to man. The NK group is instrumental in combatting Mycobacterial diseases.

It is commendable that the group has been able to cooperate with private firms.

Recommendation
The unit must try harder to get external funding for their PAN network as prion disease is of great importance not only for animal welfare but also for food safety and human health.

Microbiology

Description
The Microbiology Unit includes 19 different researchers: 8 professors, 8 associate professors, and three post docs. Seven of the full professors are male, whilst the other positions have approximately an even gender ratio.

The unit has been defined as those researchers who actively do research on topics in Microbiology, but excluding those whose major focus is on fish microbiology (they are included in the Fish health unit). The area of prion research is included in the pathology/ immunology evaluation unit. Researchers working with infection medicine from the internal medicine/clinical angle are not included in the unit.

General comments
Microbiology research at NVH is divided into bacteriology, parasitology, and virology, with different interactions between the researches working within these fields and also with interactions with other research groups that do not have microbiology as their main topic, but may nevertheless be affiliated (e.g. immunology, pathology, etc.). An extensive proportion of microbiology research at NVH is directed towards fish health and fish diseases. The researchers represent 2 of the 4 Departments.

Epidemiology:
The epidemiological studies have been a major focus within the Microbiology Unit. The epidemiology of zoonotic diseases is one of the main areas of research interest at the

EpiCentre, and the collaboration includes work with several African Universities from where several PhD students are recruited and educated in a sandwich programme.

Laboratory-based research:
As zoonoses of relevance to public health has been a prioritised area at NVH, foodborne and waterborne pathogens are of particular research interest (Centre for Food Safety). The research is mainly focused on the specific virulence factors of selected pathogens as *Bacillus cereus* and Shigatoxinproducing *E. coli*.

Scientific quality
The research topics are wide-ranging, from Arctic veterinary medicine to the investigation of domestic food safety. Bacteria and parasites are their specialty. There is a high profile parasitology group, specializing in *Cryptosporidium* and *Giardia*. They are developing a vaccine against *Anaplasma phagocytophilium*. The unit is doing very well in food microbiology and in epidemiology.

The Microbiology unit is an active research unit (264 publications), with an average of about 2 publications per researcher per year during the evaluation period. Not all of them are in refereed journals and some seem to fall outside the research topics of the unit.

Grade: Good

Societal impact
Food safety area and by providing information regarding health or management decisions or for specific situations, and may provide innovation in specific approaches in some sectors. For example, many of the studies of zoonoses have been of societal importance in an African context.

The research is also important for reindeer farming.

They have played central roles in the investigations of several public incidents recently (e.g. *E. coli* outbreak in 2006).

Recommendation
The research performed in the EpiCenter and Center for Food Safety has a high international standard and is well recognized in many East African Countries from where PhD students are recruited. This is commendable but it may also make future recruitment of staff to NVH difficult and certainly make it difficult to include PhD students in teaching. A certain balance should be maintained.

Oslo University College

Faculty of Health Sciences

Evaluation unit

A. Group of Pharmacology and Environmental Sciences

General comments

Oslo University College (OUC) was established in 1994 when thirteen local University Colleges were merged. The Faculty of Health Sciences is one of seven faculties at OUC and offers the widest selection of vocational studies in the country, with seven bachelor studies and two master degree programmes.

The OUC wants to become a University specializing in vocational studies and profession-related research, which will require an increase in both the quality and quantity of Research and Development (R&D). Therefore, OUC, including the Faculty of Health Sciences, has developed a strategy plan for R&D for this period.

The faculty has an R&D Board consisting of the R&D coordinator, the four research leaders and a representative for the PhD students. This board is responsible for strategy planning and internal financing (in combination with external evaluation). The leader of the board is the R&D coordinator who reports directly to the Dean. There is thus a direct link between research and the management of the Faculty and this is a good idea. However the meeting frequency in the board is too low. The majority of the staff (75 %) has no formal research education. The College has essentially no external funding but deploys a fraction of its own budget to research activities and provides financial incentives for publications in international peer-reviewed journals in the form of research funding.

The Faculty of Health Sciences has four strategic research areas, which reflect the units evaluated on level 2:

- Aging and Health,
- Rehabilitation and Habilitation,
- Male Reproductive Health,
- Pharmacology and Environmental Sciences**.**

The Faculty of Health Sciences has mainly permanent staff members, who are employed and paid for by the Faculty itself. There are 3 full-time professors and 18 associate professors (of which two are part-time), and 2 part-time professors (20 %) at the Faculty. About 75 % of the academic staff are assistant professors and lecturers with no formal research education. They are mainly involved in the education of students, but are also in some instances collaborators on research projects.

The Faculty of Health Sciences distributes 60 % of its internal R&D funding into the strategic (core) areas, with the aim of creating a solid basis for research and further development. It is not clear whether they have to apply and which criteria are used for giving this money. The external funding is very low (1.6%).

They will establish their own PhD programme in "Health and Social Participation" that will most likely be in operation from 2012. Offering a PhD programme that covers all of the areas of research could potentially simplify the recruitment of PhD students to the Faculty.

Follow-up of previous evaluations
Oslo University College did not participate in the previous evaluations.

Group of Pharmacology and Environmental Sciences

Description
The unit consists of 5 researchers (associate professors), of whom 3 are women. In addition, the group includes 1 PhD student and 3 Master's students.

General Comments
Specific activities include studies on the treatment and underlying causes of

- diabetes (insulin resistance in muscles)
- epilepsy
- chronic elevated levels of cholesterol
- new antimicrobials, including antibiotics and preservatives
- the impact of water quality and ambient particulate

They intend to perform research in many areas and that is not possible. In other words, there are too few scientists for too many areas and the representatives acknowledged this.

They will apply for a PhD student to work on an interdisciplinary project looking at possible links between gut microbial populations, glucose metabolism and metabolic biomarkers for type 2-diabetes. This is a very interesting area but the question is whether they have adequate competence in this field. Both the doctoral fellow and group members have industrial ties e.g. two producers of pharmaceuticals, namely Photocure® (Oslo) and Drug Discovery Laboratory® (Oslo).

A widespread international collaboration exists and this is considered to be essential for the progression in the group.

Scientific quality
The work is relevant and important in the context of modern life style diseases, in particular diabetes. Several publications are published in journals with high impact factor. Among the best articles are the ones in water quality and in epilepsy treatment.

In view of the obvious difficulties faced by the staff, the publication record is fairly good, with publications at a decent rate in field-specific international journals, many as indicated with former mentors or in collaborations with industrial/biotech partners. Among the best articles are the ones in water quality and in epilepsy treatment.

Grade: Fair to Good

Societal impact
The members of staff were clearly and admirably committed to achieving the best possible learning experiences for their students. This was also forwarded to motivate the

large number of diverse research projects within the division, as it should guarantee involved and up-to-date teaching. This dedication clearly indicates that the societal impact of the division is high.

Recommendation
In view of the lack of external funding, it would nonetheless seem advisable to pool the limited resources and perhaps focus sequentially on the different topics so as to obtain better rewards.

In the absence of significantly improved funding, it is difficult to see that achieving university status would alone serve to benefit the efforts of the staff to enhance their research achievements. The panel felt that a goal to merge with a major university may, in spite of understandable reservations, provide a more dynamic future.

Diakonhjemmet Hospital

Evaluation unit

A. Center for Psychopharmacology

General comments

Diakonhjemmet Hospital (founded 1893) is a private non-commercial hospital that supports certain areas of scientific research, including rheumatology, rheumatic surgery and psychopharmacology, with strong links to the University of Oslo.

The hospital spent 4 % of its total budget on research in 2009. More than half of these resources were financed internally.

Follow-up of previous evaluations

Since the structure was only established in 2000, a follow-up to the previous evaluation was not required in this case.

Center for Psychopharmacology

Description

Center for Psychopharmacology (CFP) is unique in Norway as the only hospital unit with principal focus on psychopharmacology. Within the unit there are three sub-units: a) Laboratory activities (pharmacogenetic and drug analyses), b) Clinical activities (consulting of out-patients and health care professionals, including education etc.), and c) Research activities.

The research sub-unit is led by a part-time (40%) researcher, who is also affiliated as a professor in pharmacology at the School of Pharmacy, University of Oslo. The academic staff within the research sub-unit comprises four physicians and seven pharmacists. Five out of these hold a PhD degree and 5 are PhD students.

General comments

Their principal activity is analysis of patient samples, and in 2009 they have performed ~150,000 analyses. They run courses and give consultations also. The research activity mainly involves clinical data to identify genetic and environmental factors which determine exposure of psychotropic drugs and active metabolites.

Scientific quality

The 30 papers presented show evidence of some excellent work, with novel observations on the effect of polymorphisms of metabolic enzymes on the serum concentrations of psychoactive agents. However, their output and international profile is not yet sufficient to place them above the category of Fair. They have expanded their activity beyond the psychoactive drug area and seem more interested in metabolism and pharmacokinetics in general, casting doubt on the name of their Center. Their collaborations with the Karolinska Institutet are very good, and they have the potential to improve their grading by further international collaborations.

Grade: Fair

Societal impact
Their work has clear impact in the area of personalised medicine, as evidenced by the adoption of their finding on CYP2C19*17 into routine screens, and their use of precious patient samples is exemplary.

Recommendation
They should retain the link to the Karolinska Institutet, which gives them both credibility and a competitive edge for investigation of new polymorphisms, and expand their collaborators. To protect against threats from the changing strategy of the Health Services, they might align more closely with the University.

Institute of Marine Research (IMR)

Evaluation units

A. Animal Welfare
B. Health
C. Marine Environmental Quality
D. Reproduction and Growth
E. Early Life Stages

General comments

The Institute of Marine Research (IMR) is a national governmental research institute, and has since 1989 been an independent institution under the Ministry of Fisheries and Coastal Affairs. Currently it is organized in a matrix consisting of 18 thematic research groups and 10 ecosystem programs.

The headquarters of IMR are located in Bergen. Important activities are carried out at departments in Tromsø (North), Flødevigen (South), at the research stations in Matre and Austevoll (near Bergen), at smaller field stations in the fjords, as well as on board the research vessels, which are at sea for a total of 1600 days a year, and on board hired fishing vessels. The Austevoll research station (1978) is a world-leading centre for intensive culture techniques for Atlantic halibut, cod, hake, and ballan wrasse. Matre Research Station (1971) is the centre for developing salmon farming and large scale highly controlled experimental studies. Flødevigen (1882) focused on coastal zone research, and in Bergen the research facilities include biological laboratories specialized to support research on fish diseases and salmon lice, major laboratories for molecular biology and chemistry.

There are currently 18 research groups (one is on hold from 2011) at the Institute. The staff includes 184 research scientists (163 with PhD), 22 other researchers (comprising post docs), 167 RD technicians, 60 technicians, 87 administrative, 20 PhD students. The share of external funding of total research funding is about 50 %. Of the external funding about 10 % comes from the RCN.

The main objectives of the Institute are to provide knowledge and science based advice to the governing authorities for rich and clean seas and coastal areas, and to ensure long-term sustainable fisheries and aquaculture with minimum negative impact on the ecosystem.

Specific research objectives are:

- to understand the dynamics of and provide management advice for the oceans and Norwegian coastal areas according to an ecosystem perspective
- to identify and implement improvements and if possible reductions in traditional single species and climate monitoring
- to achieve and implement new technology, and to develop/improve mathematical modelling based on better understanding of the ecosystem functioning.

From the 1970s the external (competitive) funding has steadily increased. In the decade 2000 – 2010 funding from external sources amounts to 45 – 51 % per year.

Concerning publications, IMR considers one international publication per scientist per year as being satisfactory considering that IMR also have to give advice, and there is much effort going into that. However, still 80 percent of the publications are done by 20 percent of the staff. The publications have since 2000 increased in quantity and quality.

IMR realizes that the expectations from the government concerning its research is that they are able to provide good advice based on the research but IMR accepts that cooperation with universities is important. It may be argued that merging with a university might strengthen research and then advice as this cannot be separated.

It is the opinion by the panel that they should be able to have done a more convincing presentation as it may be difficult to see their real overall activities.

Follow-up of previous evaluations
In the previous evaluation performed in 2000 the thematic programs were rated from fair to very good, based on scientific achievements and productivity. In 2001, the evaluation of the institute itself was generally very positive, with recognition for being well run and maintaining a reasonably high international standard. During recent years, they have followed the advice of being more management and environmentally oriented with respect to their aquaculture-related activity.

From the 2001 evaluation, IMR is in a long-term process of evaluating its monitoring strategy related to stock assessment and integration of environmental data towards an ecosystem approach.

IMR's strategy plan for the period 2006-2011 supported the strategy of the Ministry of Fisheries and Coastal affairs. IMR is now developing a strategy integrating the Earth's climate changes in view of securing sustainable marine food production, partly through a better understanding and assessment of the dynamics of the oceans and coastal areas.

Animal Welfare

Description
The group consists of 13 people, 3 scientists with professor competence, 1 with associate professor competence, 2 scientists, 2 post docs, 3 PhD candidates, and 2 research technicians.

General comments
Research fields covered by the unit are fish welfare, behaviour and physiology, mostly focused on coping ability and welfare of farmed fish under various farming conditions.

The unit has access to the best fish aquaculture research stations world-wide, and offers exquisite experimental opportunities for life-cycle studies on fish species like Atlantic salmon, rainbow trout, Atlantic cod, Atlantic halibut, Atlantic herring and mackerel species. It also takes advantage of laboratories facilities for molecular studies and genomics, histology, endocrinology and protein work and x-ray equipment.

The group has a wide competence, ranging from basic fish physiology, nutrition, and behaviour, zootechnology, aquaculture, physiological modelling, and fish farming environment surveillance technology, video image analysis, hydroacoustics, database and web, programming, statistical analysis.

Scientific quality
The unit has produced about a hundred papers during the evaluation period. The senior scientists have participated in 12-14 peer reviewed papers each in the reporting period (2005-2010), except one that has participated in 53. The young scientists have published 7-17 papers each, and in general of high quality.

Rate: Good

Societal impact
The results have been presented for and used by decision makers in the food safety area and the societal impact is thus considered to be important.

Recommendation
The unit is addressing important areas. They have in depths knowledge of fish farming and have developed excellent facilities to do experiments on sea at the same time as they have high credibility in the industry. Their rate of publication is in the main stream.

"Animal welfare in aquaculture" is a research area to increase (if it is not yet a priority) in order to fulfil ethical and environmental requirements; the fact that it is in line with concerns of authorities and consumers regarding environmental effects of aquaculture is an opportunity. It is recommended that this areas is devoted even more attention.

Health

Description
The group consists of 9 scientists (3 with professor competence, 2 with associate professor competence and 4 with assistant professor qualification). The group also includes one professor (from the University of Bergen) in a 20% position. A total of 3 technicians are allocated to the group.

General comments
The group has the responsibility for addressing diseases and other pathogen related health issues in fish and other marine species including virology, microbiology, parasitology, immunology, pharmacology, immunology and welfare. In the description it seems a little unclear as to which extent the research projects are innovate or merely are dictated projects.

The research collaboration is not that well described and the training of PhD students may not be a central issue.

Recruitment of students, lack of external funding and limited interdisciplinary interaction seem to be significant weaknesses where no real solution has been presented.

Scientific quality
One of the main issues stated in the annual assignment letter is spread of infection from aquaculture to wild fish and *vice versa*.

The group also delivers research activities in the fields of fish immunology, pharmacology and welfare.

There are many areas for few scientists but the ecological aspects for diseases seem to be unique.

The real unique part of Health-IMR: Health and diseases of fish from a shellfish point of view. The group has an ecological approach to diseases and can place them in context of the knowledge of the marine environment. In this area the unit has international reputation and a considerable number of important publications in high ranking journals.

Rate: Good

Societal impact
As the results of their research can be used to estimate the risk of disease transmission in aquaculture the societal impact – from industry to decision makers – is important.

Recommendation
As there are many actors in Norwegian Institutions concerned with aquatic health, IMR researchers in the Health group should establish stronger links to other groups. External funding must be increased and further attempts to recruit people should be solicited.

Marine Environmental Quality

Description
The group consists of 1 senior scientist with professor competence, 3 senior scientists with associate professor competence and 1 research scientist. The group also includes 1 professor in a 20% position and 1 recruit scientist currently on a PhD program. A total of 7 technicians are allocated to the group.

General comments
The research group deals with issues related to presence and biological effects of contaminants in the marine environment. The group has been organized to ensure good academic qualifications for methodological developments within disciplines related to chemistry, biochemistry and ecotoxicology. The unit also monitors geographical trends and time trends with regard to chemical contamination and radioactivity in different sea areas. They perform studies to assess the biological effects of accidental oil spills, and the effects of oil contamination on fish and shellfish, and the effects of produced water discharges from petroleum industry on fish.

Scientific quality
The 5 full time scientists have published a total of 28 peer-reviewed publications, on average approximately 1 publication per person and year. Group members were first authors for 40% of the publications. The publication in international peer-reviewed journals is fair, but with a potential for improvement. The unit has good contacts with colleagues from other countries/institutions, and represents a continuous evaluation of methods applied and results achieved.

Rate: Fair to Good

Societal impact
They have a focus on the offshore oil and gas industry. They are studying effects of oil contamination on fish and shellfish and heavily involved when there are accidents. Thus the societal impact is considered very important.

Recommendation
The scientific advising is obviously very important for marine biology in Norway but the leaders should nevertheless redefine the time spent between research and advising. They should maintain the equilibrium between basic and applied research. Recruitment of new scientists is essential to keep attractiveness and high competence; therefore, leaders have to take care that it does not suffer from reduction of external funding.

Reproduction and Growth

Description
The group currently consists of 10 research scientists (8 with PhD). Additionally the group has 3 post docs (two men, one woman) and 2 PhD students. A total of 7 research technicians are allocated to the group.

General comments
The group addresses issues related to reproductive biology and life-cycle research in farmed fish and fish species important for Norwegian fisheries. This also includes aspects of welfare in farmed fish, in particular related to skeletal deformities. Their research is well organized and they have recently recruited 4 new members. In addition, they train an acceptable number of PhD students and have been able to obtain post doc funding.

Scientific quality
The unit for reproduction and growth in fisheries conduct basic research particularly in the life cycle studies where molecular studies are used and they are leading in their field nationally and internationally.

The unit has been successful in being partners in EU-projects and in the period 2005-2010 members of the group are co-authors on 118 refereed scientific papers, i.e. on average 12 papers per permanent researcher in the group (2.2 papers per scientist per year) including the area of genomic sequencing (cod genome project) in highly cited journals (*Endocrinology*, *Journal of Experimental Biology*). Most of their work is applied but it will also have impact on the wider scientific society.

Rate: Good

Societal impact
Several new techniques very useful for the aqua farming industry have been developed e.g. the developments of photoperiod techniques to control puberty and spawning in farmed fish, which now are used widely in salmon and cod farms. This and several other inventions are important for society.

Recommendation
The future external funding situation seems to be difficult but it is recommended to maintain the group's strong scientific focus as this undoubtedly will be convincing for the granting authorities. They should consider including fish life cycle studies among activities.

Early Life Stages

In the evaluation period the group consisted of 8 people, 4 scientists with professor competence, 2 with associate professor competence, 1 scientist, and 1 PhD.

Will be inactive due to small number of scientists and will consequently not be assessed. The group members are transferred to other groups.

National Institute of Nutrition and Seafood Research (NIFES)

Evaluation units

A. Aquaculture Nutrition
B. Seafood Safety
C. Seafood and Health
D. Surveillance

General comments

The National Institute of Nutrition and Seafood Research (NIFES) was established in 1947 as the Fisheries laboratory's department for vitamin investigations to analyse vitamins in fishery products. Through various transformations it was established as a separate research institute under the Ministry of Fisheries and Coastal Affairs in 2003 and renamed as NIFES. Research is spanning the whole seafood chain from fish nutrition to intervention studies in humans.

NIFES has a leading position internationally on fish nutrition, feed toxicology (in fish) and chemical methodology, through research, monitoring program on contaminants and nutrients in seafood and toxicology research programs relating to contaminants in fish feed and to mammalian toxicology.

Restructuration is going on with the surveillance unit merged with seafood safety.

NIFES has an obligation on publication and dissemination of results to the scientific community and the general public. Communication is an important means to realise the institute's strategy, and a communication unit is dedicated to this task: popularize scientific results published in international peer-reviewed journals (the goal is two first authorships per year for all scientists). Transparency and impartiality are essential; therefore NIFES has limited collaboration with industry. Yet, collaboration is quite operational within platforms for an open research.

The institute has 40 scientists with PhD degrees (13 senior research scientists, 27 research scientists), of which 19 are women. In addition there are 6 scientists at NIFES who are adjunct professors (Professor II, 20% positions) and one researcher at NIFES is an adjunct lecturer (20% position) at the University of Bergen. These seven scientists are responsible for the University of Bergen's BSc and MSc courses on various aspects of nutrition: fish nutrition, food chemistry, food toxicology, seafood microbiology, and several courses in human nutrition for the department of biomedicine and the institute of medicine.

Half the research budget is made up from external funding (competitive grants from RCN, the EU and Norwegian Food Safety). Among the external grants, half comes from the RCN.

Large projects (Strategic Institute Projects) involve interdisciplinary research activity and collaboration among researchers in the Aquaculture Nutrition, Seafood Safety and

Seafood and Health research programs, in addition to national and international partners. International collaboration is encouraged, if not required. At the national level, collaborations are operational between NIFES and Nofima on some areas, while they are competing in other fields.

Follow-up of previous evaluations
Reorganization was carried out according to the former evaluation. NIFES was recommended to strengthen its expertise in the research area of seafood safety, while decreasing its role in commercial analyses. A dedicated research group on seafood safety was therefore established in 2003 to reinforce this field. The Institute have also in response to the last evaluation developed developing commercialization capabilities.

Aquaculture Nutrition

Description
The unit has 13 research scientists (5 seniors and 8 junior scientists (2 of these have "young outstanding scientist" grants from the RCN)). The size of the group has increased recent years. Most of the researchers are women, among the senior researchers 4 are female, and among the junior 5 are female. Furthermore, the research program has four PhD students (two male and two female) and 5 MSc students.

Some research activity is internally funded, but the researchers are expected to raise external funding to cover research costs as well as their own salary. Consequently, the financial resources situation varies from year to year.

General comments
The general areas of research include: sustainability of feed ingredients; fish welfare; climate change effects on salmonid nutrition; and supporting the culture of new species.

Research activity is organized in projects with defined aims, deliverables and milestones. It is decided at the institution level NIFES's editorial responsibility of the international peer-reviewed scientific journal *Aquaculture Nutrition*.

Scientific quality
They published 213 papers and chapters in the last five years (2005-2010), which averages about 2 articles per researcher and year. This unit has a prominent position in the field of fish nutrition. The publications are mainly in *Aquaculture* and *Aquaculture Nutrition*, Aquaculture Sciences, but also in journals of high impact or of the highest impact factor for the field. The unit hosts the peer-reviewed journal *Aquaculture Nutrition*.

Grade: Very good

Societal impact
The topics studied (especially sustainable aquaculture and climate effects, and now basic mechanisms of the metabolism) are highly relevant and interest policy-makers, the industry and the general public.

Recommendation
Maintain high level of activity and production

Seafood Safety

Description
The unit consist of 8 senior researchers (two with professor competence), and 5 are male. In addition, there are 3 PhD students and two master students who are part of the group. Approximately 84% of the funding comes from competitive grants such as the RCN.

General comments
The Seafood Safety group covers a vast area concerning potential risks associated with contaminants in seafood:
1. the production chain from animal feed to the final food product and transfer of undesirable substances from fish and to consumers
2. basis for scientific risk assessments to provide consumers with dietary advice on fish consumption through EU's maximum permitted limits related to food safety (EFSA, FAO/WHO)

There is good synergy with the nutrition group in being able to conduct research but also monitor toxicants in nutrition ingredients and feeds. This group has been involved across extreme levels of biological organization, from contributing to the sequencing of the cod genome, to the aquaculture industry level.

Scientific quality
The unit has produced 112 publications from 2005 to present (108 peer-reviewed papers and 4 book chapters), which averages 2.5 articles per researcher and year. The publications are mainly in *Aquaculture*, *Aquaculture Nutrition*, and *Aquaculture Research*, but also in some high impact factor journals.

Grade: Very good

Societal impact
The societal impact is evident, considering the research areas covered by the group. They also serve an important advisory role in matters of seafood safety, to government.

Recommendation
Maintain high level of activity and production

Seafood and Health

Description
The unit has expanded the last five years, and consists of 3 senior researchers with professor competence, 8 junior researchers, including 4 post docs. 2 of the 3 seniors and half of the junior researchers are men. In addition there are 6 PhD students and 7 master students.

The external funding accounts for around 60 per cent of the total budget.

General comments
The Seafood and health group supports the aims of the Ministry of Fisheries and Coastal Affairs and other governmental authorities to document the health effects of seafood and components from fish and other seafood. Their research concentrates on human conditions, including bone health; obesity; diabetes; mental health; and cardiovascular

diseases. These all have some tie to seafood and nutrition, even mental health. Their main resource challenge is claimed to be the inability to obtain funds for randomized controlled intervention trials with seafood.

This is a new group (< 10 years) and is still developing. Good collaborative partners such as Harvard, NIH, Laval, CDC Beijing.

Scientific quality
The unit has 95 publications from 2005-present, which gives an average of about 1.5 articles per year. The publications are mainly in the aquaculture and in high impact journals.

Grade: Very good

Societal impact
The social impact of the Seafood and Health Research program is very high.

Recommendation
Maintain high level of activity and production

Surveillance

Description
The scientific staff of the program consists of three senior researchers with professor competence and 5 younger scientists with PhD. All the senior researchers are men, and 3 of the 5 younger scientists are men.

General comments
The surveillance program has been giving scientific advice to the government, food authorities or other stakeholders. However, the group should not exist as a separate unit by now. The burden of monitoring and reporting has hindered further publication performance. There is a wide range of surveillance from wild to farmed organisms. One is the monitoring of shellfish. An obvious thing is the lack of any obvious contact with the NRC Canada Centre for Marine Toxins, Halifax. There appears to be good collaboration with EU groups.

Scientific quality
The unit has 80 publications from 2005 to present, which averages a little less than 2 articles per researcher and year. The publications are mainly in journals of the Aquaculture Sciences, but also in higher impact journals.

Grade: Good to Very good

Societal impact
The societal impact is very high. While not explicitly stated, there is a large societal impact through risk assessment and mitigation. The breadth of subject matters covered and the roles that range from research to surveillance is impressive.

Recommendation
Increase contact and collaboration with American and Canadian Research Institute dealing with the same objectives.

National Institute of Occupational Health

Evaluation unit
A. Toxicology

General comments
This institute was established in 1947 and advises the Ministry of Labour (on the work environment and occupational health) and Labour Inspectorate and Petroleum Safety Authority. In 2006 it launched a new research strategy and reorganised itself into 6 Departments. The Institute currently has 100 internally funded employees consisting of 19 senior researcher scientists, 8 researchers, 2 PhD students and 71 technicians/admin staff. There are also 24 externally funded personnel, including PhD students and postdoctoral fellows.

The Director General for Research (DGR) and the head of the Toxicology section were present at the hearing and explained that approx. 50% of the basic funding for this Institute is used for research including pilot studies and infrastructure, with the RCN and Norwegian Cancer Society providing external funding for their research. Most (80%) of their research is applied and the DGR presented data showing that the number of papers produced per scientist compared favourably with that in other public Institutes in 2009. The Institute staff have considerable freedom to suggest and get institutional support for curiosity-driven research in accordance with the research strategy, although they are told in the yearly Royal proposition and a letter from the Ministry which areas the Ministry would like them to develop or strengthen their expertise in (which sometimes means doing research in a new area). However, the institute has freedom and understanding from the Ministry to work in other areas as long as they are relevant to Norwegian work life in general.

Follow-up of previous evaluations
In 2006 the Institute launched a new research strategy and reorganised itself into 6 Departments, although it was not clear whether this was the direct result of a previous evaluation. They have stated that exploration of further synergies between groups would be desirable.

Toxicology

Description
The section of Toxicology is in the department of Chemical and Biological Working Environment and consists of 4 scientists, 1 clinician, 1 post doc, 6 PhD students and 4 technicians/admin staff. However, 20% of the time of 2 permanent staff members is spent on teaching at the University of Oslo/Norwegian University of Science and Technology and a considerable portion of the time of 2 of scientists is spent on regulatory toxicology work for the Ministry and the Labour Inspectorate.

General comments
One strength in the department is a Lung Cancer biobank which consists of 500 cases and 1000 controls (including frozen blood samples and/or DNA, and match pair lung cancer tissue/normal tissue and DNA/RNA). This has been a valuable resource for the Section

and has led to a number of interesting publications in the evaluation period on lung cancer susceptibility.

In their self-assessment, they state that their current projects are aimed at: 1) understanding the mechanisms of lung cancer and the factors that influences lung cancer outcome, 2) genetic susceptibility, and 3) molecular biomarkers of exposure to polycyclic aromatic hydrocarbons (PAHs).

However, little was said in the hearing about their on-going studies in these areas. Indeed, it was surprising to hear that their collection of new lung samples for the biobank had been terminated in 2010 and that scientists were now focussed on new research strategy involving studies on RCN-funded project on the possible toxic effects of nanotechnology and other aspects of environmental epigenetics. It remains to be seen whether they can compete on an international stage with the many other groups already working in this area.

Scientific quality
The Section has published 45 peer reviewed articles in 2005-10 and most of the ones on which they are 1st or senior author are in journals with an impact factor of 3-5. The data in their lung biobank has been used in a number of international collaborations and more prominent papers have been written by their collaborators (citing them as co-authors) in journals with a high impact factor (e.g. *Journal of the National Cancer Institute* and *Cancer Research*). However, the Section has yet to senior author papers in such journals.

Grading: Fair to Good

Societal impact
The societal impact is high as their research (both within the Institute and as part of various large lung cancer consortia) has led to some interesting insights into the etiology of lung cancer. It remains to be seen whether their future work in new possible environmental nanotoxins generates data of equal significance.

Recommendation
We suggest that they focus on ways to strengthen/extend their leading international position in lung cancer susceptibility – for example, by increasing their gene/environment studies to identify the molecular basis underpinning their epidemiological findings in this area. It is good to develop new areas of interest like the nanotoxin work but this needs to be done in parallel with their molecular lung cancer studies – not replace them (as the teams are new to these areas and have yet to build up leading positions in them). Similarly, plans for moving into epigenetic studies have potential but do not yet have a clear trajectory.

Norwegian Institute of Public Health

Evaluation units

A. Environmental Medicine
B. Forensic Toxicology

General comments

The National Institute of Public Health (NIPH) is a major national research agency with a staff of about 1000 employees and an annual budget of nearly 1 billion NOK. Established in its current form in 2002, the institute was formed from merging the National Health Survey, the Norwegian Medical Birth Registry in Bergen, a pharmaceutical statistical unit, the Register for Pregnancy Disruption, and the Cause of Death Registry.

The institute has a leading national position in epidemiology of infectious disease. They are responsible for nation-wide data gathering, and health crisis responses. Research activities support the public health institute for disease prevention and health promotion. NIPH is unique in contributing to national research networks, health surveillance, and advice to health authorities to focus on topics of public health.

The institute comprises 1 administrative and 5 scientific divisions: Environmental medicine, Epidemiology, Forensic toxicology and drug abuse, Infection disease control, and Mental health.

NIPH conducts research on a wide range of fields and issues and has a multidisciplinary research staff. Research activities are organized differently in each division. There are a total of 183 full-time researchers (78 of those have the qualifications of a professor) that have a PhD at the Institute. There are 76 full-time, and 6 part-time PhD students, of which a large majority are funded from external grants.

The external funding of the total research budget is on average 14%. The share of funding from the RCN of the external funding is however quite high, between 32 and 45% the last three years. The advantage of the governmental support of institutes like this is the ability to plan and execute long-term, longitudinal studies.

Follow-up of previous evaluations

The Research Council of Norway evaluated the Institute in 2000 (Environmental Medicine) and 2004 (Epidemiology) and rated them as excellent. Recommendations from this evaluation together with legislation changes of 2002 were integrated into research strategy and guided re-structuring of the Institute, completed as of Jan. 1, 2011. One advantage of the federal support of Institutes like this is the ability to plan and execute long-term, longitudinal studies. Still, however, there are many small units in the Institute, which was pointed out in a previous evaluation. Also, there appears to be a lack of in-depth research strategy, notably for picking up topics of studies, and a clear vision of their execution.

Environmental Medicine

Description
The unit comprises 90 employees (35 researchers equivalent to 17 full time and 10 PhD students) within 6 departments: Air pollution and noise, Analytical Chemistry, Chemical Toxicology, Environmental immunology, Food safety and nutrition, and Water hygiene. Women are in majority (70%) in scientific positions.

General comments
This division is specialized in environmental risk factors related to human health. Health risk assessments and advice are provided nationally and internationally within different fields, such as water, nutrients and food contaminants, chemicals in consumer products, allergy, outdoor and indoor air pollution, pollution (including engineered particles but they do not seem to address nanoparticles) and radiation.

Research on major public health issues (for example dementia, neurological diseases, rheumatology, ageing) is not that prominent. However, it is clearly impossible to carry out all important studies in one institution.

Scientific quality
The unit has six on-going RCN projects, and the Norwegian Mother and Child cohort study is the only longitudinal project presented.

Studies based on Cohorts and biobanks etc. are a huge strength and resource. There are strong collaborations internationally which make excellent use of the cohort studies. There are expected publications in a number of areas.

17 full time researchers have published about 40 papers per year, which amounts to nearly 2 per year per scientist. There is a large variation in the number of publications produced per scientist, which can partly be explained by different burdens of duty functions, as well as type of research (e.g. epidemiology versus experimental studies).

Grade: Good to Very good

Societal impact
There is a very high importance for society in the long term studies. The research activities serve as an important basis for the health evaluations and consultations for central and local health-, environment- and food authorities. Many of the division projects have a basic research orientation. Research and knowledge generation in areas of particular relevance to Norway have to be given priority, for instance fields related to outdoor and indoor air pollution, health effects of noise, food safety and nutrition, water hygiene, chemical safety and exposure analysis.

Recommendation
Strategically, the unit should focus on longitudinal studies. They should also develop epigenetic interests both in house and with international collaborations. Exposomics is a very interesting new concept and will be the future strategic direction. The panel see a great potential in this area.

Forensic Toxicology

Description
The Division for Forensic Toxicology and Drug Abuse was previously a separate institute, the National Institute of Forensic Toxicology, from 1969 to 2002. From 2003 the institute was re-organized as a division of the Norwegian Institute of Public Health (NIPH). There are 14 researchers who hold a PhD, corresponding to 6 fulltime equivalents. Among these 4 are men and 10 are women.

The unit includes 6 departments: Clinical Pharmacological Analysis, Drug Abuse Research, Drug Analysis, Toxicological Analysis, Department of Analytical Method Development and Department of Toxicological and Pharmacological Assessment. The Department of Drug Abuse Research is solely dedicated to research, while the other five are responsible for forensic toxicological analysis of biological samples from police, forensic pathologists, prisons, companies conducting workplace assessments, primary health services and in special cases from hospitals. These five departments spend a majority of their time and resources on routine work, analysing and interpreting the results. In addition, they provide the police, courts and others with expert witness statements, but they also do research on the development of new bio-analytical methods and on clinical pharmacological and toxicological issues.

General comments
This is a small and mainly service-oriented unit. Approximately 15% of the total annual budget of the Division is allocated for research supporting routine functions. This research is mainly financed through the institute's core funding. The scope of research at the unit is very narrow. It is unclear why it is carried out in the institution, which should be mostly dedicated to longitudinal, epidemiological studies. There is no direct link with the other evaluated units. Studies on drugs and driving safety are important, but their international visibility should be more prominent. The report provided little evidence of linking them to international collaboration, except for Denmark.

Scientific quality
The scientific productivity and quality is good. The 14 scientists have in total 92 publications which is an average of 1.3 publications per scientist per year. There are some important methodological advances in drug detection taken up at an international level. They are doing ground-breaking work that will change the traffic laws, regarding the detection of drugs, in addition to alcohol. Their main issue is the volume of routine work they do. The resource allocation to research is also limited.

Grade: Good

Societal impact
There is a clear impact on society through laws on driving. Methods of drug detection in saliva can be potentially very useful and significant.

Recommendation
Strategically, the unit should expand vision and collaboration base for projects. They could improve scientific awareness of their area, and expand collaborations.

Norwegian Veterinary Institute

Evaluation units

A. Infections in Fish
B. Biotoxins
C. Mycobacterial Diseases (model for chronic intracellular infections)

General comments

The Norwegian Veterinary Institute (NVI), founded in 1891, is today a nationwide biomedical contingency- and research institution dedicated to the fields of animal health, fish health, animal welfare, food and feed safety. It is owned by the Ministry of Agriculture and Food and the Ministry of Fisheries and Coastal Affairs.

The public assignment of the institution is to give research-based advice to the Norwegian Food Safety Authority (NFSA) and other governing authorities in the food-production chain in order to promote health and welfare of animals and fish, to ensure food safety, and contribute to sustainable bio-production.

NVI is the main producer of health surveillance and risk assessments and other research-based advice related to animal- and fish health and welfare, and is an important contributor of knowledge and competence in food safety issues. NVI is appointed by NFSA to be the national reference laboratory for animal and fish diseases and for several agents of importance for food safety.

The public assignment requires a broad competence and knowledge base; challenge to combine "width" and "point" in research. The research at NVI is mostly applied with some strategic basic research when relevant. In acute contingency situations research may be down prioritized.

The institute (347 employees in 2009) is organized with the head quarter and central laboratory located in Oslo (240 employees) and with 5 regional laboratories located in respectively Sandnes, Bergen, Trondheim, Harstad and Tromsø (altogether 107 employees). There are 11 senior research scientists and 80 researchers with a doctoral degree at the institute.

Follow-up of previous evaluations

They have responded to criticisms of the past reviews. They state that 24 remedial actions were taken and a 5 year strategic plan was implemented in 2010.

Infections in Fish

Description
The fish infection group is a relatively large group with 41 researchers, with a gender ratio close to 50:50.

Sections involved in research relating to infections in fish are:
- Fish health (bacteriology and pathology)
- Virology
- Parasitology
- Mycology
- Epidemiology
- Immunology
- Applied measures to control infections
- Regional laboratory in Bergen

A new organisation structure was implemented from 2011. The main reasons for this reorganisation were to obtain better use of competence and capacity for optimal fulfilment of NVIs public assignment, to facilitate building relevant and robust research groups across scientific disciplines, thematic fields and departments and to strengthen fish health research in particular. Each scientific discipline at NVI was organized in one section respectively (Sections for Virology, Parasitology, Mycology, Pathology, Bacteriology, Epidemiology and Immunology). All these Sections, the regional laboratory in Bergen and the SMS section in Trondheim are today involved in fish health research.

General comments
International collaborations: e.g. the Atlantic Veterinary College, Prince Edward Island, Canada, several leading labs in the UK and the National Veterinary Institute in DK. Disease control through research, diagnostics, surveillance and management practices seem to be the priority. The main research areas are virulence, pathogenesis, host response, diagnostic methods, identifying natural reservoirs of disease agents, dissemination and spread of infection, determination of disease risk factors and epidemiological tracing. The wide span in activity and multidisciplinary competence are strengths of the unit.

Scientific quality
Their publication record (118 for five years with 41 researchers (0.58) is relatively low. Quantitatively there is some margin of improvement, and progress was perceptible during the last two years. Qualitatively, the scientific production is good and results are published in high impact journals in the fields of Parasitology, Virology, Fish Immunology, and more generally in Genomics.

Grade: Fair to Good

Societal relevance
Research activities are of great importance to control fish disease that will be profitable to industrial fish production. The activities will contribute to sustain production and control infections in wild populations (salmon) through vaccination strategies in salmonid aquaculture.

Recommendation
Take advantage of the competence of the unit in pathology and epidemiology, that are genuine veterinary disciplines, to obtain competitive funding. Try to maintain equilibrium between basic and applied research, despite vulnerability of the small research groups and difficulties to develop long-term basic research.

Biotoxins

Description
The biotoxins group (focus on mycotoxins and algal toxins), has been increasingly important for the NVI in the last 20 years. The unit has a national leading position in the field for multidisciplinary research and detection of toxin-producing fungi in feed and food. There are about 13 researchers in the unit, and the gender ratio is close to 50:50.

General comments
The research on biotoxins has been conducted in the sections for Mycology, Chemistry and Toxicology. The two latter were merged in 2011. The Head of Section has been responsible for the research within each section. Research on mycotoxins and the toxin producing fungi has been a priority research area at NVI for many years.

The scientists involved in biotoxin research are involved in a wide network of national and international research collaboration and the international collaboration is quite extensive (USA, UK, France, NL, Germany, southern Africa, Japan, and New Zealand). As national priorities arise, the Institute plays a vital role in responding to the needs of society and government. Thus, the activities of this unit span research and public service.

Scientific quality
There are about 13 researchers. Scientific results are published in peer-reviewed international journals of good impact; the scientific production reflected by number of publications (1.3/year/researcher) is satisfactory, but still perfectible. Clinical relevant papers of interest for practitioning veterinarians may be published in Norwegian journals in addition to or instead of the international journals. The aims of such papers are to inform clinical veterinarians.

Grade: Good

Societal relevance
Research themes are relevant and deal mainly with toxins related to the Norwegian situation and that may affect shellfish production. Penicillium and trichotecenes, also responsible for problems worldwide, have been extensively studied. The unit within the Institute, has a good communication strategy to inform industry, authorities and other stakeholders, radio or TV, websites of NVI (www.vetinst.no) or for popular science (www.forskning.no).

Recommendation
Improve international position and relationships. There appears to be no contact with Canada's National Research Council Certified Marine Toxins Program, they are one of the world leaders in the production and distribution of shellfish toxin reference standards.

Mycobacterial Diseases

Description
The mycobacterial group is an old group in the Institute. It concentrates on human and animal mycobacterial infections. The 9 researchers are mostly (8) women.

General comments
Mycobacteria are excellent models for chronic intracellular infections and it gives a good understanding of pathogenesis of more general character of relevance to other bacterial diseases.

They have recruited a full time basic researcher to bolster fundamental research. The unit has extensive international collaboration particularly within EU and also African countries. National collaboration with other Norwegian institutes, particularly the Norwegian School of Veterinary Science is also important.

Scientific quality
Only a few scientists (including the PhD students and their director of research) are publishing in the unit. Their own production is good and quite valuable, with 2 to 3 articles/each/per year in peer-reviewed journals of good impact. Yet, the global production of the unit (23 for five years with 7 researchers and 2 PhD) is rather low due to a part of the staff that is not publishing. This weakness is perceived by the unit that is trying to remediate this.

Grade: Fair to Good

Societal relevance
Although mycobacterial disease is not a new field of research, human and animal infections are still a concern not only in developing countries, in Africa, but also in developed countries where recrudescence of paratuberculosis infections should be prevented. The mechanistic studies of the unit on infection routes between animals, humans and the environment, and immune responses to chronic infections are important for human health. Models can be extended to other bacterial diseases.

Recommendation
Increase the global scientific production of the unit, by motivating the senior scientists not yet publishing. Reinforce close collaborations with the Academic field at the national level, especially the Norwegian School of Veterinary Science and international network of collaborations.

Maintain communication with the sector of practising veterinarians.

Norwegian Institute of Food, Fisheries and Aquaculture Research (Nofima)

Evaluation units

A. Feed and Nutrition
B. Fish Health
C. Production Biology in Aquaculture

General comments

Nofima is a research institute and was established in 2008 as a result of a merger of four research institutes in food, fishery and aquaculture. The group's head office is located in Tromsø in northern Norway, while the research divisions are located in six places: Ås, Stavanger, Bergen, Sunndalsøra, Averøy and Tromsø. There is on-going organisational development in 2010.

Total staff in the institute is 490, where 444 persons are targeted by the evaluations in panel 2 and 3. Of relevance for panels 2 and 3 are 51 senior research scientists (equivalent to someone qualified for employment as a professor), 66 researchers with a doctoral degree, 17 post docs and 39 PhD students.

It is a business oriented research group focusing on research and development for the aquaculture, fisheries and food industry in Norway. The research is dedicated to be applied, although they encourage flexibility. Nofima wants to maintain a balance among three vital parts of research: basic strategic research, competitive research and industrial sponsored contracts. Their strategic goal is: *Increased value creation and innovation in the food, fisheries and aquaculture industry.* Every four years they revise their research strategies.

There are four business divisions at Nofima: Nofima Marine, Nofima Food, Nofima Ingredient and Nofima Market. The scientists are organised in departments within each business division, but all research activities are organised as projects. Resources are coordinated and allocated by the department director/head as part of the business unit management team. Most projects are multidisciplinary in nature and utilise resources across departments and business units, but report through the project leader to her/his department director/head, where coordination is done together with other department heads in Nofima.

The following strategic projects were established across the business units in Nofima

- Oil/lipid quality: Product quality and health
- Quality improvement and environmental benefits within the Norwegian wild fish sector
- Increased robustness through optimised mineral nutrition in Atlantic salmon
- Salmon louse – impact of feed raw materials

Department directors/heads have economic and strategic responsibility for development of their department and report on performance indicators to the business area director. Harmonisation across Nofima is coordinated by two research directors (marine and food),

responsible for the principal research strategies for the organisation.

Nofima has an average around 200 publications per year, and has been quite constant the last 5 years. About 25% of the publications are in collaboration with international partners. The number of publications per researcher has been between 0.74 – 0.93.

The largest share of funding for research comes from industrial sponsored grants (about half of the budget), about one fourth comes from basic strategic research and the last fourth comes from competitive research.

Of major infrastructure 6 semi full-scale plant facilities and 4 full scale aquaculture research facilities are worth mentioning. After the merger, investments in scientific equipment have been strongly reduced.

The number of projects a researcher participates in has doubled since 2005, which is a consequence of financial strains.

Follow-up of previous evaluations
Follow-up of Nofima since the last evaluation is cumbersome due to the conglomerate nature of the organization. So the self-evaluations include that of Matforsk (now Nofima Mat) and Akvaforsk (now Nofima Marin).

Feed and Nutrition

Description
The unit employs 26 research scientists, and at present four of them are engaged in the Aquaculture Protein Centre, which is a Centre of Excellence financed by the RCN.

General comments
There are five main areas of research within the unit: Basic nutritional requirements and physiology, Feed ingredients, Feed formulation and processing, Feeding and growth, Sustainability aspects and new research tools.

The main objective is to develop knowledge needed by the aquaculture value chain in the field of feed and nutrition according to requirements in the aquaculture organism and consumer demand for good, safe and healthy food. The research profile reflects to a large extent the needs of the industry.

Scientific quality
The scientific publication rate per full-time researcher is 1.4 papers, which fulfills the standard set by the Institute and is satisfactory considering that about 1/3 of the activity is in industry related research. While papers mostly published in Aquaculture related journals, articles in journal of high impact for the discipline have been recorded.

Grade: Good

Societal impact
The impact on industry is important. The research activities aim at a high scientific standard, combining basic research and applied research quite important for development of the aquaculture industry.

Improved knowledge in nutrition has economic (cost reduction), and health effects, producing a more stable and high quality of the end product.

Recommendation
To maintain tight collaborations with Universities (University of Bergen for instance) in order to keep competence.

To publish in high impact journals should be useful for favouring funding for basic research in nutrition areas, ingredient and feed processing.

Fish Health

Description
The unit employs 8 researchers that have a PhD, three of these are senior scientists and two are post doc. Five PhD students are involved in the research activities.

General comments
The main objective of the research is to contribute to increased sustainability and value creation in the aquaculture industry by minimizing losses due to diseases and deformities. It focuses on how infectious agents (bacteria, viruses and parasites) and production parameters influence on fish immune response, health and robustness. A large proportion of the projects focus on health and immunity in farmed cod.

Scientific quality
The scientific publication rate per full-time researcher is 0.8 papers. The publication rate may be considered as below the Nofima standards (of 1 article/full researcher/year), but this is compensated by the fact that the impact of some journals is rather high.

Grade: Fair to Good

Societal impact
Activities impact industry: a number of projects are designed in collaboration with the industry to meet their demands and this was often successful; examples are development of vaccines against vibriosis in cod, guidelines for best practices minimizing risk of disease transmission in intensive farming, how to avoid deformities in salmon fingerlings, vaccination strategies etc.

Recommendation
Maintaining level of collaboration with universities and industry.

Production Biology in Aquaculture

Description
There are 20 research scientists at the unit and of those 17 have a PhD and 2 are post docs. Currently, there is no PhD student in the unit and recruitment of qualified personnel is a challenge.

General comments
Research activities are normally organised as projects with one project leader, apart from two programmes: a) The Norwegian cod breeding programme and b) The national competence centre of capture based aquaculture. In these programmes there is programme leader employed at the unit, but it involves researchers from other departments at Nofima.

Nofima runs several large infrastructures for aquaculture research. These facilities are specially designed for production and experimental work on aquatic organisms, mainly fish, but also crustaceans and other shellfish. The main objective of the research is to increase the creation of economic value in the aquaculture and fishery industry, with regard to ethical considerations and sustainability. The research activities focus on how environmental conditions affect production performance and animal welfare.

Scientific quality
The average scientific publishing rate of the staff is one article per year, but the number of publications is not equally distributed among the staff (researchers involved in applied research are said less prone to publish). Most papers are published in Aquaculture related journals, but journals of higher impact are also selected.

Grade: Fair

Societal impact
Research activities are designed in collaboration with industry to support the development of new industrial activities. As an example, during the evaluation period, the department contributed to achieving 7 patents within different themes as fish tank technology, genetic markers, and fish feed formulation improvements.

Recommendation
To increase collaboration with universities and the number of PhD students is necessary for future recruitment of new and qualified staff.

To favor the publication of papers dealing with basic research in order to maintain ability to conduct good applied research in future.

To encourage the researchers involved in applied research to publish. Their involvement as coauthors of papers dealing with basic research (when justified) would be a mean to recognize their merits.

SINTEF Fisheries and Aquaculture

Evaluation unit

A. Marine Aquaculture

General comments

SINTEF Fisheries and Aquaculture AS was established as an independent research institute in 1999, based on research activities in different parts of the SINTEF Group for the fishing and aquaculture sectors. The institute is located together with NTNU marine science group at SINTEF Sealab at Brattøra in Trondheim.

SINTEF Sealab contains offices, seawater laboratories, process hotel for processing marine raw materials and analytical laboratories. In 2009 SINTEF opened a full-scale research centre for floating aquaculture technology, AquaCulture Engineering or ACE in Bjugn Municipality on the Coast of Central Norway. The Centre will combine science, technology and aquaculture practice for developing new solutions for the aquaculture industry that secure fish welfare, future operations and environmental challenges.

The research activity of the institute is divided in four research departments (Marine Resource Technology, Fishery technology, Aquaculture technology and Processing technology) and one consulting department (International projects and consulting).

The staff of the institute has increased from about 25 employees in 1999 until a total of 112 in 2009, and 40 of the total number of employees have a doctoral degree. The institute has 17 researchers with a doctoral degree (or equivalent) that are involved in biological research (in the text it is said that here are 18 researchers, but in the summarising table only 17 names are mentioned). Almost half of these are women.

External funding make up for half of the total funding of research. Project grants from the RCN are a small proportion of the external funding, about 15%. The largest source of external funding is industry and commerce contracts (43%).

Preparation of the self-study is not good. There are inconsistencies in numbers, between tables and paragraphs. Different and inconsistent fonts looks like a cut and paste from different sources.

Follow-up of previous evaluations

There is no mention or reflection of the past evaluation. There is no indication of a systematic strategic planning process.

Marine Aquaculture

Description
The unit has four researchers that have a PhD degree, three of them are women.

General comments
The research group is relatively small and the research has focused on feed cultivation and fish larvae culture.

There is no reporting of finances by Marine Aquaculture.

Scientific quality
The publication rate is low. There are 19 publications from four researchers over the last five years, which gives 1.2 art/year/researcher, i.e. rather satisfactory. Yet, journal quality is low overall, with exceptions coming from several years back. Four researchers do not generally hold first or anchor author positions. The reason given is the lack of basic research funding, but this is up to the initiative of the researchers.

Cooperation and collaborations seem to be entirely Norwegian.

Grade: Fair

Societal impact
The societal impact is important, considering the objectives of the institute combine science, technology and aquaculture practice for new solutions in the aquaculture industry that secure fish welfare, future operations and environmental challenges.

The research activity is developed in close collaboration with universities, especially NTNU, therefore the unit participates to the practical education of MSc and PhD students registered at this university.

Recommendation
Encourage faculty/researchers to access basic research through collaborations and competitive grant funding from the RCN. The self-evaluation might have been better, may not be doing justice to the institute.

SINTEF Technology and Society

Evaluation unit

A. Preventive Health Research

General comments

SINTEF Technology and Society (TS) is one of six research divisions in the SINTEF Group and merged with SINTEF Health (Health Services Research, Medical Technology, Global Health and Welfare, and Preventive Health Research) on 1st January 2009. The division has a total of 280 employees. Another re-organization took place in 2011 when three of four former Health departments (Health Services Research, Global Health and Welfare, and Preventive Health Research) merged into one department.

The health departments at SINTEF TS are highly dependent on external funding (90% of the budget) for the projects. EU Framework Programme 7 has over the last 5 years become an increasingly important source for funding.

There are a total of 99 employees in the 4 Health Research Departments, and among the research staff there are 37 senior scientists holding a doctoral degree, 3 post docs and 12 PhD students. The total gender distribution among research staff is approximately 50/50.

Follow-up of previous evaluations

The evaluation in 2001 stressed that there was a need to strengthen the research profile and for a reorganization that put more emphasis on research. The division has also been re-organized as described above, and there is a strategic process in place to strengthen the research profile.

Preventive Health Research

Description

The unit has 12 researchers (6 with a PhD degree, and 4 of them are senior researchers). The research activity is organized in three research groups: Work Physiology, Epidemiology and Innovation and Health Technology. In addition two PhD students are carrying out their work at the department.

General comments

The research activity comprises classical research seeking new knowledge within selected areas of human physiology, epidemiology and industrial design. A considerable part of the research activity is technology research for the purpose of developing new and better products, procedures and services.

The Department of Preventive Health Research has been subject to reorganization (merging of the two departments Work Physiology and Epidemiology) after the last evaluation and has recently been incorporated into a larger unit, the Department of Health Research. The group currently under evaluation is small and appears very disparate in the research fields that are represented, covering both thermal physiology and epidemiology. They use their individual expertise to compete for and to attract projects e.g. within epidemiology where they can apply similar methodologies to a variety of projects.

Their economic situation, with very low basic funding, seems to be constantly precarious, which must be extremely challenging. That a very high proportion of the funding is external, either industrial, through applied contract-based funding or through competitive grants, places them in a difficult situation and the industrial sector does not always encourage publication. As a consequence, the volume of publications is limited and these are found in field-specific journals, of fair to very good quality.

Scientific quality
While the scientific grade of fair reflects the combined quality and quantity of the scientific output during the period under evaluation, the total applied productivity is seen as having high relevance.

At an international level, the group members participate in a number of relevant conferences annually and are used as ad hoc reviewers for relevant journals. They educate a limited number of PhD students, funded through RCN grants and these are registered at the Norwegian University of Science and Technology.

Grade: Fair

Societal impact
The work of the group, both the epidemiology and the thermal physiology, has a high societal relevance and there would seem to be a potential for expansion of the latter toward an ageing population and within the area of physiological sensor technology. Their extensive experience in the development of survival suites provides excellent material for coverage of innovation projects in the media. This should be further encouraged.

Recommendation
The individual researchers are likely to be able to publish more papers in highly respected journals. If greater internationally relevant scientific quality is required, then relevant resources must be made available to the group in a more stable manner. However, if the generation of socially useful outputs is the goal, then they are performing well.

Appendix A. Mandate

Evaluation of research in biology, medicine and health in Norway 2010 – 2011

Mandate for the evaluation

The Research Council of Norway (RCN) is given the task by the Ministry of Education and Research to perform subject-specific evaluations. The Division for Science has decided to evaluate research activities in biology, medicine and health and psychology in Norwegian universities, university hospitals, relevant research institutes and relevant university colleges.

Evaluations have previously been performed within these subjects/fields, in biology in 2000 and medicine and health in 2003.

1. The objective of the evaluation

The main focus of the evaluation should be the scientific quality of Norwegian research within biology, medicine and health and psychology in Norwegian universities, university hospitals, relevant research institutes and relevant university colleges.

The evaluation will reinforce the role of the RCN as advisor to the Norwegian Government and relevant ministries. The evaluation will give knowledge, advice and recommendations on biological, medical and health related research and give the institutions as well as the RCN and relevant ministries a better basis for determining future priorities within and between fields of research.

Specifically, the evaluation will:

- provide a critical review of the strengths and weaknesses of the above fields, both nationally and at the level of individual research groups and academic departments. The scientific quality of the research will be reviewed in an international context.
- assess to what degree the previous evaluations have been used by the institutions in their strategic planning
- discuss to what degree the research units perform research in accordance with the strategy of their institution
- identify the research units which have achieved a high international level in their research, or have the potential to reach such a level
- identify areas of research that need to be strengthened in order to ensure that Norway in the future possesses necessary competence in areas of national importance. A key aspect is to enable the RCN to assess the situation regarding recruitment within the scientific fields
- discuss to what extent the research meets the demand for interdisciplinary research and future societal challenges

2. Organization and methods

International evaluation panels will be appointed for the following fields:

- Botany-, zoology- and ecology- related disciplines
- Physiology related disciplines including corresponding translational research
- Molecular biology, including corresponding translational research
- Clinical research, including corresponding translational research (two panels)
- Public health and health-related research
- Psychology and Psychiatry

Self-assessments including information about the organization and resources, as well as future plans, will be provided by the research units. In addition the panels will be provided with bibliometric analysis. Representatives from the involved units will be invited to meet the panels for presentations and discussions.

Each of the evaluation panels will write a report with evaluations of the different research units as well as specific recommendations. These reports will be sent to the research units for factual control. In order to provide general recommendations at a national level for research within these fields, Joint Committees will be established comprising members from each of the different evaluation panels/research areas.

Specific criteria for inclusion and exclusion – see attachment.

3. Tasks of the evaluation panels

The panels are requested to

- Evaluate research activities with respect to scientific quality, national and international collaboration. Scientific quality should be the main focus
- Evaluate how the research is organized and managed.
- Submit a report with specific recommendations for the future development of research within biology/medicine/health/psychology in Norway, including means of improvement when required.

Aspects to be assessed in the panel reports:

3.1 National level

- Strengths and weaknesses
- Research cooperation nationally and internationally
- Recruitment and mobility
- General resource situation regarding funding and infrastructure
- Cooperation with other sectors of society (e.g. industry)

3.2 Institutional level

To be defined as the institution as such, or as a university department, or a research institute.

Depending on the size of the institution level 3.2. and level 3.3. may be merged. In case of two levels, level 3.2 focus on organisation and strategy, level 3.3. on research quality and production.

- Organisation, research leadership and strategy
  - Including follow up of recommendations given in previous evaluation/s
- Resource situation
  - Funding, staffing, infrastructure and the balance between resources and research activities
- Scientific quality
  - Including the description of a publication strategy
- Training, mobility and career path
  - Recruitment and policies for recruitment
  - Policy for mobility and career path
  - Policy for gender and age balance in academic positions
- Research collaboration
  - Collaboration and networking activities at national and international level including interdisciplinary and multidisciplinary research activities, as well as translational research (from basic to applied research or vice-versa)

3.3 Research units

- Organisation, research leadership and strategy
  - Including resource situation (staff and funding) and research infrastructure
- Research activities
  - Scientific quality and production
- Training, mobility and career path
  - Recruitment and policies for recruitment
  - Policy for mobility and career path
  - Gender and age balance in academic positions
- Research collaboration
  - Collaboration and networking activities at national and international level including interdisciplinary and multidisciplinary research activities, as well as translational research (from basic to applied research or vice-versa)

4. Time schedule

Panel meetings will take place in Oslo March-June 2011
Deadline for submitting draft panel reports August 2011
Deadline for submitting final reports October 2011
Deadline for joint reports November 2011

5. Miscellaneous

Other important aspects of Norwegian biological, medical and health related research that ought to be given consideration.

Attachment

Delimitation and organisation

The panels are asked to base their evaluation on self-assessments from the research units, factual information, bibliometric analysis and hearing meetings.

Starting point for the present evaluation will be the research performed at the institutions in question. The university departments and several institutes in the institute sector are too large to be evaluated as one single research unit. In order to give an overview of the research the evaluation will be carried out as follows:

Departments at the universities and university colleges and institutes in the institute sector (named institution)

1. The institution – level 1 – describes its organisation and research strategy in a written document as well as factual information including funding, number of permanent and preliminary positions etc.
2. The level below the institutions (section, group, program etc.) is the unit that will be evaluated and which prepare the self-assessment for the research – level 2.

In some institutions the level 2 units might be placed in different panels. If so the institute structure and strategy will present their activities to all relevant panels. Large evaluations units within level 2 belonging to different panels may split in different evaluation units or will be evaluated in a panel covering the main content of their research.

The units to be evaluated at level 2 need to be units already established. However it is important that the evaluation units to be evaluated have a certain minimum size. If the research performed within two or more evaluation units belong together thematically, it may be an advantage to prepare a joint self-assessment making it clear that the self-assessment describes the research in two or more groups. Level 2 units with minor scientific activities and production, are to be described on level 1, the general description of the institute.

Research at the university hospitals

The research performed in the university hospitals is often part in integrated research units between the university and the hospital. It will normally neither be practical, nor natural to separate the self-assessment from these units. It is preferable that these integrated units give a joint self-assessment and a joint oral presentation at the hearing meetings. The universities are asked to take the main responsibility for the self-assessment when the research unit is led by a researcher who has his/her main position at the university. The same is asked from the university hospital when the research unit is led by a researcher who has his/her main position at the hospital.

Appendix B. Criteria for grading

Excellent	Research at the international front position: undertaking original research of international interest, publishing in internationally leading journals. High productivity.
Very good	Research with high degree of originality, but nonetheless falls short of the highest standards of excellence. A publication profile with a high degree of publications in internationally leading journals. High productivity and very relevant to international research within its sub-field.
Good	Research at a good international level with publications in internationally and nationally recognized journals. Research of relevance both to national and international research development.
Fair	Research that only partly meets good international standard, international publication profile is modest. Mainly national publications. Limited contribution to research
Weak	Research of insufficient quality and the publication profile is meagre: few international publications. No original research and little relevance to national problems.

In some cases, a grading of "X/Y" or "X to Y" has been given. "X/Y" means that the grade is in between X and Y. "X to Y" means that the grading of different groups within the evaluated unit ranges from X to Y.

Appendix C. Letter to institutions

Se vedlagte adresseliste

Vår saksbehandler/tlf.
Berit Nygaard, +47 22037174

Vår ref.
201002437
Deres ref.

Oslo,
21. juni 2010

Fagevaluering av biologi, medisin og helsefag, inklusive psykologi

- **invitasjon til informasjonsmøte og**
- **invitasjon til å plassere forskningsenhetene i evalueringspaneler**

Det vises til tidligere informasjon om fagevalueringen i brev av 25.2.2010, samt våre nettsider om evalueringen; www.forskningsradet.no/biomedhelseevaluering

Informasjonsmøte
Vi inviterer til informasjonsmøte på Gardermoen, Radisson Blu Airport Hotel
tirsdag 24. august kl 10.30 – 15.00
Informasjonsmøtet er primært for representanter for ledelsen ved involverte fakulteter og institutter i UoH-sektoren og instituttsektoren.

Hensikten med møtet er å informere om evalueringen med fokus på organiseringen, mandatet for evalueringspanelene, egenvurderingene og faktainformasjon, tidsplan med mer. Program for møtet og lenke til påmelding legges på www.forskningsradet.no/biomedhelseevaluering i løpet av uke 26. ***Påmeldingsfrist er mandag 16. august***, og det er mulig å melde seg på allerede nå https://web.questback.com/norgesforskningsrd/kyl3fa8ebo/ . På våre nettsider vil vi i uke 32 legge utkast til faktaark og mal for egenvurdering. Kommentarer til disse dokumentene kan gis på informasjonsmøtet.

Dialog og tilbakemelding
Vi inviterer med dette institusjon/institutt til å plassere sine evalueringsenheter i de ulike panelene, se definisjon i vedlegg 3, Avgrensning og organisering. For å være sikre på at vi har etablert hensiktsmessige paneler og at vi får en noenlunde jevn fordeling av evalueringsenheter i panelene, ber vi om en tilbakemelding fra alle institusjoner/institutter

med forslag til plassering av evalueringsenhetene for den enkelte institusjon/institutt så snart som mulig og senest ***fredag 27. august.*** Tilbakemelding til evalbiohelse@forskningsradet.no. Ta gjerne kontakt underveis ved behov.

Vi ber også om å få oppgitt en kontaktperson ved hver institusjon/institutt. Det vil blant annet være behov for dialog i etterkant av fristen slik at sammenlignbare forskningsfelt ved de forskjellige institusjonene, så langt mulig, plasseres i samme panel.

Panelinndeling
Det planlegges en inndeling i syv paneler (se vedlegg 4). Panelinndelingen er basert på Norsk inndeling av vitenskapsdisipliner (vedtatt av Universitets- og høgskolerådet i 1994) for klassifisering av forskning. I arbeidet med å rekruttere eksperter til fagpanelene er følgende kriterier lagt til grunn:

- Det enkelte panel skal dekke disiplinene innenfor panelet
- Det tilstrebes å finne eksperter med bred kompetanse som kan dekke flere områder
- Det vurderes om det er mulig å få med ett medlem i hvert panel som deltok i forrige evaluering for å bidra til kontinuitet
- Det tilstrebes at hvert panel har minst 40 % av begge kjønn
- Det tilstrebes en viss spredning i alder blant medlemmene

Det er lagt strenge habilitetsregler til grunn ved utnevning av panelmedlemmene.

Mandat for evalueringen
Mandatet for evalueringen følger vedlagt, vedlegg 3.

Utvidet tidsramme
Det har tidligere vært gitt tentativ tidsramme for evalueringen. Tidsrammen har nå blitt noe utvidet. Dette medfører at høringsmøtene blir forskjøvet til perioden 20. mars -10. juni, kun ukene uten helligdager. Den utvidede tidsrammen gir noe mer tid til dialog med miljøene og arbeidet med egenvurderingen, samt bedre tid til ferdigstillelse av rapportene. Evalueringen vil være avsluttet i løpet av 2011. Se tidsplanen i vedlegg 5.

Avgrensning og organisering
Hovedfokuset i evalueringen skal være vitenskapelig kvalitet i forskningen. Evalueringen er på gruppenivå, ikke enkeltforskernivå. Evalueringen vil bli gjennomført av fagfeller i paneler sammensatt av meritterte utenlandske forskere (”peer review”) og alt materialet i evalueringen skal være på engelsk.

Evalueringen omfatter mange ulike institusjoner og antallet forskere er stort. Forskningsrådet har satt en grense for minstestørrelse for institusjon/institutt som inviteres til å delta i evalueringen. Det angitte antallet vitenskapelig ansatte gjelder innenfor hvert fagområde, dvs. innenfor biologi eller medisin og helsefag. Noen forskergrupper/forskere har deltatt i nylig gjennomførte fagevalueringer, disse skal ikke evalueres på nytt.

Kontaktpersoner i Forskningsrådet
Spørsmål i tilknytning til evalueringen kan rettes til:
- Prosjektleder Berit Nygaard, telefon 22037174, bn@forskningsradet.no – (ferie 5.7. – 9.8)
- Prosessleder Malena Bakkevold, telefon 95750533, post@malena.no – (ferie 5.7 – 16.8)

Hvert av panelene har en egen fagrådgiver, se vedlegg 4 med oversikten over panelene.

Parallelle evalueringer som berører flere av forskningsmiljøene
Formålet med fagevalueringer er å foreta en kritisk gjennomgang av forskningen med hensyn til kvalitet relatert til internasjonalt nivå, styrker og svakheter, rammebetingelser for forskningen og rekrutteringssituasjonen. I tillegg innhentes råd om hva som skal til for å styrke forskningen og hvilke prioriteringer som peker seg ut. De to første evalueringene nevnt nedenfor evaluerer spesielle satsinger i Forskningsrådets regi og overlapper bare delvis med fagevalueringen.

Evaluering av FUGE
Det er en pågående evaluering av FUGE (funksjonell genomforskning) for å se på merverdien av programmet, og bla å få innspill til det videre arbeidet med satsing på bioteknologi.

Midveisevaluering av SFF-II
Formålet med evalueringen er å bedømme de vitenskapelige resultatene sentrene har oppnådd og å gi en vurdering av planene sentrene har utarbeidet for forskningen i siste 5-årsperiode.
Evalueringen finner sted i 2010 – 2011.

Midtveisevaluering av SFI
Evalueringen skal vurdere de forskningsresultater som er oppnådd og om virksomheten i senteret underbygger senterets mål. Evalueringen skal videre gi en vurdering av planene for virksomheten i den mulige siste 3-årsperioden. Evalueringen gjennomføres høsten 2010.

Evaluering av idrettsvitenskap (sports sciences)
Parallelt med fagevalueringen vil det bli gjennomført en felles nordisk evaluering av idrettsvitenskap 2010-2011. Evalueringen blir administrativt ledet av Finlands Akademi. Forskningsrådet ønsker at relevante norske miljøer skal delta i denne evalueringen, og vi vil sende ut separat informasjon om dette. Finlands Akademi avholder et informasjonsseminar om evalueringen 17. august, kl 12.00 – 15.30 i Helsinki.

Evaluering av deler av instituttsektoren
Fiskeri- og kystdepartementet (FKD) og Landbruks- og matdepartementet (LMD) har initiert evalueringer av deler av sin instituttsektor – se vedlegg 1

Med vennlig hilsen
Norges forskningsråd

Hilde Jerkø (sign.)
Avdelingsdirektør
Divisjon for vitenskap

Mari Nes (sign.)
Avdelingsdirektør
Divisjon for vitenskap

Vedlegg 1

Institusjonene som omfattes av fagevalueringen

Universitetene
Alle instituttene ved de medisinske fakultetene omfattes av evalueringen. Når det gjelder biologi og psykologi (bortsett fra ved UiB og UiT) vil evalueringen omfatte institutter og naturvitenskapelige museer som er deler av naturvitenskapelige og samfunnsvitenskapelige fakulteter.

Helseforetakene
Alle helseforetakene med universitetsfunksjon omfattes av evalueringen. I tillegg kommer Diakonhjemmet. For integrerte forskergrupper mellom universitetsinstitutter og helseforetak se vedlegg 2 Avgrensing og organisering. Når det gjelder øvrige helseforetak ber vi om at de regionale helseforetakene vurderer om det er andre helseforetak som faller innenfor rammene for evalueringen. Vi vil gjerne ha en dialog om disse med de regionale helseforetakene.

Instituttsektoren
For instituttsektoren generelt kan det ved enkelte institutter være at nivå 1 og nivå 2 er sammenfallende – se vedlegg 2 Avgrensning og organisering.

Forskningsrådet er kjent med at Fiskeri- og kystdepartementet (FKD) parallelt med fagevalueringen vil evaluere Havforskningsinstituttet. Havforskningsinstituttet ønsker å være en del av fagevalueringen og FKD ønsker å benytte seg av det innsamlede materialet som delinnspill til sin evaluering og i tillegg benytte panelets delrapport om instituttet fra fagevalueringen.

Landbruks- og matdepartementet (LMD) har bedt Forskningsrådet om å evaluere bla Bioforsk, Norsk institutt for skog og landskap og Veterinærinstituttet i løpet av 2010. Rapporten for denne evalueringen skal være ferdig 1. desember 2010 for å kunne være en del av grunnlaget for en ny melding til Stortinget om landbruks- og matpolitikken. Disse tre instituttene inviteres også til å delta i fagevalueringen av biologi, medisin og helsefag. Som vi skrev i vårt brev i februar er skillet mellom grunnleggende og anvendt forskning nå mindre fremtredende og det er økt samarbeid på tvers av forskningsart både innenfor biologiske fag og medisin og helsefag. Det er derfor ønskelig å evaluere hele forskningsfeltet innenfor de ulike fagområdene og institusjonene samtidig. Forskningsrådet ser det som viktig at også instituttsektoren deltar i denne brede fagevalueringen. Vi regner med at det materialet som ferdigstilles til evaluering av vitenskapelig kvalitet i LMD's evaluering vil kunne være et viktig grunnlag for materialet til fagevalueringen.

Høyskolene
Som i instituttsektoren kan det være at ved enkelte høyskoler er nivå 1 og nivå 2 sammenfallende.

Vedlegg 2

Avgrensning og organisering

Panelene skal basere sin evaluering på egenvurdering fra forskningsmiljøene, faktainformasjon, bibliometrisk analyse og møter med forskningsmiljøene.

Evalueringen vil ta utgangspunkt i instituttene og den forskningen som foregår der. Universitetsinstituttene og flere institutter i instituttsektoren er imidlertid for store og sammensatte enheter til at instituttet kan være evalueringsenheten. For at evalueringen skal gi oversikt over forskningen i *faget* gjennomføres evalueringen etter følgende modell:

Institutter i UoH-sektoren og instituttsektoren

1. Instituttet beskriver organisering og strategi for forskningen ved instituttet og gir faktainformasjon (finansiering, antall ansatte og stipendiater med mer) (nivå 1)
2. Nivået under instituttet (instituttgruppe, avdeling m.m.) *er den enheten som evalueres* og disse lager egenvurdering for forskningen (nivå 2)

Nivå 2 har ulike benevnelser ved de forskjellige institusjonene (instituttgrupper, seksjon, avdeling, forskergruppe, tematiske program m.m.). Ved enkelte institutter vil det være slik at enheter på nivå 2 hører hjemme i forskjellige paneler. I de tilfellene vil instituttbeskrivelsen følge til alle panelene. Robuste/store undergrupper på nivået under nivå 2 som *kan* høre hjemme i forskjellige paneler, plasseres der hvor hovedtyngden av forskningen hører hjemme (mestprinsippet).

Enhetene som skal evalueres på nivå 2 skal være etablerte enheter, ikke konstruerte grupper for denne evalueringen. Det er viktig at enhetene ikke er for små. Dersom instituttene ser at forskningen i forskergrupper/evalueringsenheter tematisk hører sammen, kan det være en fordel at disse forskergruppene lager en samlet egenvurdering hvor det framgår at det er en fremstilling av forskningen i flere grupper. Evalueringsenheter/forskergrupper på nivå 2 som har liten vitenskapelig aktivitet og produksjon, beskrives i instituttets (nivå 1) generelle omtale i egenvurderingen.

Minstestørrelse på institusjon/institutt som inviteres til å delta i evalueringen er:

UoH-sektoren, inklusive helseforetak med universitetsklinikkfunksjon
1) Minst 5 vitenskapelig ansatte (professor I, førsteamanuensis I) innenfor hvert fagområde (biologi, medisin og helsefag) eller
2) Minst 5 fast ansatte forskere/klinikere med doktorgradskompetanse som har 40 % eller mer av sin stilling definert som forskning

Andre helseforetak
Minst 5 fast ansatte forskere/klinikere med doktorgradskompetanse som har 40 % eller mer av sin stilling definert som forskning

Instituttsektoren
Minst 5 fast ansatte forskere med doktorgradskompetanse som har 40 % eller mer av sin stilling definert som forskning innenfor hvert fagområde (biologi, medisin og helsefag).

Forskning ved universitetssykehusene
Ved universitetssykehusene er det i svært stor grad integrerte forskergrupper/enheter mellom universitetsinstituttene og helseforetaket. Det vil normalt verken være hensiktsmessig eller naturlig å skille egenvurderingen og presentasjonen av disse enhetene. Det er ønskelig at integrerte enheter mellom universitet og helseforetak gir en felles egenvurdering og en felles presentasjon.
Vi ber om at universitetet tar hovedansvar for egenvurdering og eventuell presentasjon når forskergruppen/enheten ledes av en som har hovedstilling ved universitetet, mens helseforetaket tar hovedansvar for egenvurdering og eventuell presentasjonen når enheten ledes av en som har hovedstilling eller hele stillingen ved helseforetaket.

Kriterier for eksklusjon

- Nylig evaluert i annen fagevaluering (eks sosiologi, økonomi, farmasi, kjemi, fysikk, geofag)
- Idrettsmedisinske fag – tas ikke med i denne evalueringen fordi en felles nordisk evaluering av idrettsvitenskap (sports sciences) vil bli gjennomført i 2010-2011.
- Sosialfaglig forskning (barnevern, sosialtjenester) inkluderes ikke i evalueringen.

Appendix D. Time schedule for the hearing meetings

Time schedule – Panel 2
Hearing meetings in Oslo, Hotel Bristol, 02.05.2011 – 06.05.2011

Monday 2 May 2011:

Time	Institution/department	Unit
0830 – 0900	Panel Meeting	
	University of Oslo (UiO), Faculty of Mathematics and Natural Sciences	
0900 – 1000	Department of Molecular Biosciences	1. Physiology Programme
1000 – 1025	Break/Panel Meeting	
	University of Oslo (UiO), Faculty of Medicine / Oslo University Hospital	
1025 – 1150	Institute of Clinical Medicine / Division of Diagnostics and intervention	1. Pathology 2. Pharmacology
1150 – 1215	Panel Meeting	
1215 – 1315	Lunch	
1315 – 1440	Norwegian Institute of Food, Fisheries and Aquaculture Research (Nofima)	1. Feed and Nutrition 2. Fish Health 3. Production Biology in Aquaculture
1440 – 1505	Break/Panel Meeting	
	University of Bergen (UiB), Faculty of Mathematics and Natural Sciences	
1505 – 1605	Department of Biology	1. Developmental Biology 2. Fish Health
1605 – 1625	Break/Panel Meeting	
1625 – 1735	Institute of Marine Research (IMR)	1. Animal Welfare 2. Health 3. Marine Environmental Quality 4. Reproduction and Growth 5. Early Life Stages
1735 – 1800	Panel Meeting	

Tuesday 3 May 2011:

Time	Institution/department	Unit
0830 – 0900	Panel Meeting	
0900 – 1025	The National Institute of Public Health	1. Environmental Medicine 2. Forensic Toxicology
1025 – 1050	Break/Panel Meeting	
	Norwegian University of Science and Technology (NTNU), Faculty of Natural Sciences and Technology	
1050 – 1150	Department of Biology	1. Environmental Toxicology *2.* Zoophysiology
1150 – 1210	Panel Meeting	
1210 – 1310	Lunch	
	University of Tromsø (UiT), Faculty of Biosciences, Fisheries and Economics	
1310 – 1355	Norwegian College of Fishery Science	1. Fish Health – Fish immunology and vaccinology
1355 – 1415	Break/Panel Meeting	
1415 – 1500	SINTEF Fisheries and Aquaculture	1. Marine Aquaculture
1500 – 1520	Break/Panel Meeting	
1520 – 1605	SINTEF Technology and Society	1. Preventive Health Research
1605 – 1625	Break/Panel Meeting	
	Norwegian University of Science and Technology (NTNU), Faculty of Medicine / St. Olavs Hospital	
1625 – 1725	Department of Circulation and Medical Imaging	1. Exercise Training in Health and Disease 2. Extreme Environments and Health
1725 – 1800	Panel Meeting	

Wednesday 4 May 2011:

Time	Institution/department	Unit
0830 – 0900	Panel Meeting	
	University of Oslo (UiO), Faculty of Dentistry	
0900 – 1000	Institute of Oral Biology	1. Biofilm 2. Craniofacial Biology Research
1000 – 1015	Break/Panel Meeting	
1015 – 1100	Institute of Clinical Dentistry	1. Biomaterials, Tissue Engineering and Regeneration
1100 – 1115	Break/Panel Meeting	
	Norwegian University of Science and Technology (NTNU), Faculty of Medicine / St. Olavs Hospital	
1115– 1200	Department of Laboratory Medicine, Children's and Women's Health	1. Clinical Pharmacology and Toxicology
1200 – 1215	Panel Meeting	
1215 – 1315	Lunch	
1315 – 1400	Diakonhjemmet Hospital	1. Center for Psychopharmacology
1400 – 1415	Break/Panel Meeting	
	University of Oslo (UiO), Faculty of Medicine	
1415 – 1610	Institute of Basic Medical Sciences	1. Neuroscience 2. Nutrition 1
1610 – 1635	Break/Panel Meeting	
	Norwegian University of Science and Technology (NTNU), Faculty of Medicine	
1635 – 1745	Centre for the Biology of Memory (CBM) / The Kavli Institute for Systems Neuroscience	1. CBM / The Kavli Institute for Systems Neuroscience
1745 – 1805	Panel Meeting	

Thursday 5 May 2011:

Time	Institution/department	Unit
0830 – 0900	Panel Meeting	
0900 – 1025	National Veterinary Institute	1. Infections in fish 2. "Biotoxins" 3. Mycobacterial Diseases
1025 – 1050	Break/Panel Meeting	
	Norwegian University of Life Sciences (UMB)	
1050 – 1150	Department of Animal and Aquacultural Sciences	1. Monogastric Nutrition and Product Quality 2. Ruminant Physiology and Nutrition
1150 – 1210	Panel Meeting	
1210 – 1310	Lunch	
1310 – 1435	Norwegian School of Veterinary Science	1. Fish health 2. Environmental and Reproduction Toxicology 3. Pathology/immunology 4. Microbiology
1435 – 1500	Break/Panel Meeting	
	University of Tromsø (UiT), Faculty of Health Sciences	
1500 – 1610	Institute of Medical Biology	1. Pharmacology and Toxicology 2. Vascular Biology 3. Cardiovascular Research Group 4. Tumor Biology
1610 – 1630	Break/Panel Meeting	
	University of Bergen (UiB), Faculty of Medicine and Dentistry	
1630 – 1740	Department of Biomedicine	1. Cardiovascular Research Group 2. Craniofacial Developmental Biology 3. Neuroscience Research Group
1740 – 1800	Panel Meeting	

Friday 6 May 2011:

Time	Institution/department	Unit
0830 – 0900	Panel Meeting	
0900 – 0945	Oslo University College, Faculty of Health Sciences	1. Group of Pharmacology and Environmental Science
0945 – 1000	Break/Panel Meeting	
1000 – 1045	The National Institute of Occupational Health	1. Toxicology
1045 – 1100	Break/Panel Meeting	
1100 – 1210	National Institute of Nutrition and Seafood Research (NIFES)	1. Aquaculture Nutrition 2. Seafood Safety 3. Seafood and Health 4. Surveillance
1210 – 1230	Panel Meeting	
1230 – 1330	Lunch	
1330 – 1600	Panel Meeting	

Appendix E. Overview of all panels

Panel 1 **Botany, Zoology and Ecology-related Disciplines**: Evolutionary biology, ethology, marine biology, limnology, plant physiology, systematics and agricultural sciences

Panel 2 **Physiology-related Disciplines** (human and zoophysiology), including corresponding translational research: Anatomy, physiology, neurobiology, toxicology, pharmacology, embryology, nutritional physiology, pathology, basic odontological research, veterinary medicine, fish health

Panel 3 **Molecular Biology**, including corresponding translational research: Microbiology, immunology, cell biology, biochemistry, molecular biology, genetics, genomics, biotechnology including breeding and bioinformatics

Panel 4a **Clinical Research**, including corresponding translational research: All surgery, anaesthesiology, oncology, physical medicine and rehabilitation, gynaecology, paediatrics, dermatology and venereology, ophthalmology, otolaryngology and all clinical odontology

Panel 4b **Clinical Research**, including corresponding translational research: All internal medicine (cardiology, nephrology/urology, gastroenterology, endocrinology, haematology, infectious diseases, respiratory tract diseases, geriatric medicine), neurology, rheumatology, radiology and medical imaging and other clinical medical disciplines

Panel 5 **Public Health and Health-related Research**: Public health, community dentistry and community nutrition. Epidemiology and medical statistics. Health services research, preventive medicine, nursing research, physiotherapy, occupational medicine, behavioural research and ethics, other health-related research

Panel 6 **Psychology and Psychiatry**: Clinical psychology, social-, community- and workplace psychology, organizational psychology, personality psychology, developmental psychology, cognitive psychology, biological psychology and forensic psychology. Psychiatry, including geriatric psychiatry, child and adolescent psychiatry, biological psychiatry, and forensic psychiatry. Behaviour research

Appendix F. List of the panel members

Members of Panel 2

Professor Ulf Lerner, Umeå University, Sweden (leader of the panel)
Professor Barbara Cannon, Stockholm University, Sweden
Professor Torben Greve, University of Copenhagen, Denmark
Professor Sian E. Harding, Imperial College London, UK
Professor Hans Hultborn, University of Copenhagen, Denmark
Professor George Iwama, University of Northern British Columbia, Canada
Professor Marek Konarzewski, University of Bialystok, Poland
Professor Claire Lewis, University of Sheffield, UK
Professor Paule Vasseur, Université Paul Verlaine - Metz, CNRS, France

Secretary: Senior Analyst Per Janson, Swedish Research Council

Appendix G. CVs for the panel members

Name:	**Ulf H.Lerner**

Degree(s):	1. DDS 2. PhD

Research field(s):	1. Regulation of differentiation and activity of osteoclasts and osteoblasts by systemic factors, inflammation and malignant tumours. 2. Clinical studies of bone metabolism and fractures in primary and secondary osteoporosis 3. Regulation of osteotropic cytokines by resident fibroblastic cells in periodontium

Present position:	Professor Oral Cell Biology at Department of Odontology, Umeå University, Umeå, Sweden and at Center for Bone and Arthritis Research, Institute of Medicine at Sahlgrenska Academy, University of Gothenburg, Gothenburg, Sweden

Name:	**Barbara Cannon**

Degree(s):	1. B.Sc. biochemistry, London, 1967 2. Ph.D. physiology, Stockholm, 1971

Research field(s):	1. Integrative and cell physiology studies related to energy balance, with particular emphasis on brown adipose tissue. 2. Sympathetic nervous system control of metabolism.

Present position:	Professor of Physiology, Stockholm University

Name:	**Torben Greve**

Degree(s):	1. 1970: Doctor of Veterinary Medine (DVM) 2. 1981: Doctor of Veterinary Science (DVSc)

Research field(s):	1. Veterinary Reproduction and Obstetrics 2. Large Animal Embryo –and Biotechnology

Present position:	Professor of Animal Reproduction, Faculty of Life Sciences, University of Copenhagen, Denmark.

Name:	**Sian E. Harding**

Degree(s):	1. B.Sc. 2. Ph.D.

Research field(s):	1. Cardiac pharmacology 2. Gene and cell therapy

Present position:	Professor of Cardiac Pharmacology, Imperial College London

Name:	**Hans Hultborn**

Degree(s):	1. Med. Kand. 2. Med. Dr, docent (from Gothenburg University; 1972)

Research field(s):	1.”Motor control” – in reduced animal preparations and in intact human subjects – with special focus on spinal reflexes and spinal motor programs (e.g. locomotion) 2. Intrinsic properties of neurones (motoneurones) and their control by transmitters – with particular focus on “persistent inward currents” (and plateau potentials). Dean, Faculty of Health Sciences; Uni Copenhagen *1996-2002* President of the Scandinavian Physiological Society *1988-1994* President of the Federation of European Physiological Societies *2003 -2007*

Present position:	Professor in Neurophysiology, University of Copenhagen

Name:	**Marek Konarzewski**

Degree(s):	1. MSc: 1985. University of Warsaw, Branch in Białystok 2. PhD: 1990. Institute of Ecology, Polish Academy of Sciences 3. Habilitation Thesis: 1995, Institute of Ecology, Polish Academy of Sciences

Research field(s):	1. Evolutionary ecology 2. Eco-physiology 3. Quantitative genetics of vertebrates

Present position:	1. Professor at the Mammal Research Institute, Polish Academy of Sciences 2. Professor at the Institute of Biology, University of Bialystok, Poland

Name:	**George K. Iwama**

Degree(s):	1. Bachelor of Science, Zoology, 1975, University of British Columbia 2. Masters of Science, Zoology, 1977, University of British Columbia 3. Doctor of Philosophy, Zoology, 1986, University of British Columbia

Research field(s):	1. Fish Physiology Acid-base regulation, osmoregulation, ionic regulation, fish health and immunology, acute and chronic stress response, aquaculture

Present position:	President and Vice-Chancellor Professor University of Northern British Columbia, Prince George, Canada

Name:	**Claire Lewis**

Degree(s):	1. BSc Hons in Zoology, University of Reading 2. DPhil in Neuroendocrine Cell Biology, University of Oxford 3. DSc, University of Oxford

Research field(s):	1. Tumour Inflammation & Angiogenesis 2. Gene Therapy 3. Innate Immunity

Present position:	Professor of Molecular & Cellular Pathology, University of Sheffield Medical School, UK

Name:	**Paule Vasseur**

Degree(s):	1. Chemist (Diploma University of Lille, France. 1968) 2. PhD Toxicology, University of Lille, France. 1970 3. Professor of Universities in Toxicology. Paris. Competitive examination 1981.

Research field(s):	1. Toxicology 2. Environmental Toxicology, Ecotoxicology 3. Occupational Health 4. Environmental Health

Present position:	Professor of Toxicology. CNRS UMR 7146. University Paul Verlaine-Metz, France

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