

**QANU Research Review  
Veterinary Sciences UU 2012**

**December 2012**



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## Foreword

This report follows the Standard Evaluation Protocol 2009-2015 for Public Research Organisations (SEP) that was developed by VSNU, KNAW and NWO. The purpose of this report is to present a reliable picture of the research activities submitted for this review and to give feedback on the research management and quality assurance.

The review committee was supported by QANU (Quality Assurance Netherlands Universities). QANU aims to ensure compliance with the SEP in all aspects and to produce independent assessment reports with peer review committees of international experts in the academic fields involved.

QANU wishes to thank the chairperson and members of the review committee for their participation in this assessment and for the dedication with which they carried out this task. We also thank the staff of the units under review for their carefully prepared documentation and for their co-operation during the assessment.

Quality Assurance Netherlands Universities

Sietze Looijenga  
Acting Director

Peter van Lieshout  
Chairman of the Board

## **Preface**

This report describes the independent external quality assessment of the research in Veterinary Sciences at Utrecht University (UU). The assessment covers the period 2006-2011 and was conducted according to the Standard Evaluation Protocol 2009-2015 for Public Research Organisations (SEP).

The quality assessment was carried out by a review committee consisting of one chair and six members with expertise in the relevant areas.

As chair of the Committee, I greatly appreciate the commitment, the expertise and the excellent cooperation of my colleagues. The Committee wants to thank all persons involved in the thorough preparation and support of the review.

Joost Ruitenber  
Chairman of the Committee

## 1. The review committee and the review procedures

### Scope of the assessment

The Review Committee was asked to perform an assessment of the research in Veterinary Sciences at Utrecht University (UU). This assessment covers the research in the period 2006-2011. The previous external research assessment was published in 2006, covering the period 2000-2004, and a 'mid-term' review was carried out in 2009, by largely the same committee as in this 2012 review.

The Executive Board of Utrecht University described the task of the Committee as follows:

*"The review committee is kindly asked to assess against international standards the quality, productivity, relevance and viability of the Institute of Veterinary Research, its research and graduate programme, in the period 2006 up to and including 2011, on the basis of the Standard Evaluation Protocol (SEP and taking into account the additional information provided in this document. At the programme level, the judgement should be cats in both qualitative and quantitative terms. For the quantitative assessment the five-point scale as specified in the SEP should be used. At the institute level a judgement in qualitative terms will do."*

### Composition of the Committee

The composition of the Committee was as follows:

- Prof. dr. E.J. Ruitenbergh (DVM), Vrije Universiteit Amsterdam, chairman
- Prof. dr. C. Belzung, Université François-Rabelais, Tours
- Prof. dr. H. Niemann (DVM), Institut für Nutztiergenetik (ING), Neustadt-Mariensee
- Prof. dr. T.J. Rosol, Ohio State University, Columbus
- Prof. dr. R.E. Peterson, University of Wisconsin, Madison
- Prof. dr. S.W. Reid (DVM), Royal Veterinary College, London
- Prof. dr. H.J. Thiel (DVM), Justus-Liebig-Universität Giessen.

A profile of the Committee members is included in Appendix A.

Roel Bennink of the Bureau of QANU (Quality Assurance Netherlands Universities) was appointed secretary to the Committee.

### Independence

All members of the Committee signed a statement of independence to safeguard that they would assess the quality of the Institute and research programmes in an unbiased and independent way. Any existing personal or professional relationships between Committee members and programmes under review were reported and discussed in the committee meeting. The Committee concluded that there were no unacceptable relations or dependencies and that there was no specific risk in terms of bias or undue influence.

### Data provided to the Committee

The Committee has received detailed documentation consisting of the following parts:

1. Self-evaluation report of the unit under review, including all the information required by the Standard Evaluation Protocol (SEP), with appendices.
2. Copies of three key publications per research programme.
3. Results of the bibliometric study on the Faculty of Veterinary Medicine of Utrecht University 2001-2011, Center for Science and Technology Studies (CWTS), Leiden University.
4. Overview of international collaborations (at the request of the Committee).

### **Procedures followed by the Committee**

The Committee proceeded according to the Standard Evaluation Protocol 2009-2015 (SEP). Prior to the Committee meeting, each programme was assigned to two reviewers, who independently formulated a preliminary assessment. The final assessments are based on the documentation provided by the Institute, the key publications and the interviews with the management and with the leaders of the programmes. The interviews took place on 10 to 12 June 2012 (see the schedule in Appendix C) in Utrecht.

Preceding the interviews, the Committee was briefed by QANU about research assessment according to SEP, and the Committee discussed the preliminary assessments. For each programme a number of comments and questions were decided upon. The Committee also agreed upon procedural matters and aspects of the assessment. After the interviews the Committee discussed the scores and comments. The texts for the committee report were finalised through email exchanges. The final version was presented to the faculty for factual corrections and comments. The comments were discussed in the Committee. The final report was published after formal acceptance by the Board of Utrecht University.

The Committee used the rating system of the Standard Evaluation Protocol 2009-2015 (SEP). The meaning of the scores is described in Appendix B.

# Part 1: Review of the institute

## Institute of Veterinary Research, Utrecht University

### 1. The institute

The Faculty of Veterinary Medicine (FVM) at Utrecht University (UU) is the only place in the Netherlands where veterinarians are trained. All research at the Faculty is performed under the auspices of the Institute of Veterinary Research (IVR).

The IVR research mission is to provide the scientific foundation for innovation and debate that benefits veterinary education, veterinary practice, related public health, and the economy. The overall aim of the IVR is to discover the biological principles of animal health and disease and their impact on public health. This knowledge should provide a solid basis for novel strategies that benefit veterinary practice, human health, and the economy. This ambition requires multidisciplinary expertise over the entire spectrum from molecule to population. Strong relationships with public stakeholders contribute to translation and application of scientific progress in the community.

Since 2006, the Institute's research takes place in six research programmes:

1. Biology of Reproductive Cells (BRC)
2. Tissue Repair (TR)
3. Emotion and Cognition (E&C)
4. Risk Assessment of Toxic and Immunomodulatory Agents (RATIA)
5. Strategic Infection Biology (SIB)
6. Advances in Veterinary Medicine (AVM).

Common objectives of these IVR programmes are:

- to advance veterinary sciences and related public health through discovery of the biological principles of animal health, animal disease and related biomedicine with the goal to develop novel prevention and intervention strategies (the 'One Health' concept)
- to serve society by creating a challenging environment with cutting-edge multi-disciplinary expertise and research facilities that is attractive for a variety of stakeholders
- to offer a broad spectrum of training for MSc and PhD students in collaboration with the Utrecht University Graduate School of Life Sciences.

The IVR is managed by the Director of Research (Vice dean for Research), who reports to the Dean and is supported by a Deputy Director and the IVR Office. Research in each of the six research programmes of the IVR is coordinated by a programme coordinator, who chairs a programme committee. Together, the programme coordinators form the IVR Strategic Advisory Board. This Strategic Advisory Board and the IVR management discuss strategic aspects of research management and research performance at the faculty and university level.

The FVM allocates an annual, task-related direct funding budget to 26 departmental research groups for their contribution to the IVR research programmes. A research group consists of one or more chairs and the research personnel associated with these chairs.

## 2. Quality and academic reputation

The FVM is the only academic veterinary institution in the Netherlands. More applied veterinary contract research and veterinary governmental tasks are carried out at partner institutes, notably the Central Veterinary Institute (CVI) of Wageningen University & Research Centre (WUR), and the Animal Health Service (GD) in Deventer.

At the local level, the FVM is situated directly adjacent to the Science and Medical faculties (including the University Medical Center (UMC Utrecht) and the Rudolf Magnus Institute of Neuroscience (RMI) and the Hubrecht Institute of the Royal Netherlands Academy of Arts and Sciences. These institutions host research expertise and facilities in the fields of human medicine, chemistry, physics, biology, and pharmaceutical sciences.

The Utrecht University Board has identified thematic research priority fields in this setting. These Research Focus Areas function as ‘Centers of Excellence’ in which the faculties of Veterinary Medicine, Medicine and Science participate. The University Board and the FVM endorse the Research Focus Areas by providing financial incentives to stimulate interfaculty multidisciplinary collaborations and joint research facilities.

Established UU Research Focus Areas in which IVR programmes are embedded include:

- ‘Infection and Immunity’
- ‘Epidemiology’
- ‘Growth and Differentiation’
- ‘Neuroscience & Cognition’.

The structural collaboration at the university level has resulted in the appointment of top scientists from the other institutions as strategic professor at FVM: profs. W. Derth (2008); L. Vanderschuren (2010); R. Ketting (2010); N. Geijsen (2010). Strategic chairs have non-tenured appointments that are renewable after 5 years, depending on accomplished targets.

The self-evaluation report lists the strategic research alliances of the IVR with partners in the human and veterinary field.

Many staff members of the IVR have been invited as members of national and international scientific committees, journal editorial boards, professional boards and committees, governmental advisory boards, and as key-note speakers at international conferences. Particularly noteworthy academic honours are the three prestigious international research prizes (the European Lung Foundation Award (2007); the John Goldsmith Award (2007); and the Dr. A.H. Heineken Prize for Environmental Sciences (2008) and a Honorary Doctorate from the Catholic University of Leuven, Belgium, awarded to Prof. Bert Brunekreef (IRAS). Prof. Martin van der Berg (IRAS) received an honorary doctorate from the University of Umea for his research on dioxin like compounds (2006). Prof. Johanna Fink-Gremmels (PB) was appointed as corresponding member of the Royal Academy of Veterinary Sciences in Madrid.

The results of the CWTS bibliometric analysis at the institute level show:

1. a continuous increase in MNCS (mean normalized citation scores) from 1.29 for the period 2001-2004 up to 1.59 for the period 2008-2011, indicating a rise in impact of the publications to far above world average,

2. a continuous rise in  $PP_{top10\%}$  values during the same period from 14% to 18%, indicating that the proportion of publications in the top-10% of most cited papers in the field ( $PP_{top10\%}$ ) exceeds the expected 10% by a factor 1.8, and
3. an ongoing increase in MNJS (mean normalized journal scores) from 1.26 to 1.44, indicating more frequent publications in high(er) impact journals in the field.

Research profiling of the total of IVR publications according to ISI field demonstrates a main focus (38% of total output) and strong performance in fields of *Veterinary Sciences* (MNCS=1.68) and *Agriculture, Dairy and Animal Sciences* (MNCS=1.49), but also a similarly high impact in a variety of biomedical domains. This is particularly apparent in the fields of *Public health, Toxicology, Microbiology and Reproductive biology* (MNCS=1.5-2.0).

### **Assessment/remarks**

The review committee was pleased to share the Institute's ideas for the future and to look back at the research performance. The future looks bright: the FVM has more coherence on the campus, through the links with the Faculty of Medicine and the University Medical Center, the Department of Pharmacological Sciences of the Faculty of Science, the Hubrecht Laboratory and the Rudolf Magnus Institute. This is reflected in the plans for the future. In the mid-term review three years ago a number of suggestions were made, which were mostly followed up (see Appendix).

In the current review, the committee has looked at the whole six-year period 2006-2011, including the improvements of the last three years.

The committee saw progress in the programmes, in terms of the quality and quantity of the publications. Some programmes are clearly world-leading, and all are at least internationally visible with significant contributions to the field, both in the veterinary domain and in the international biomedical arena. The recruitment of personnel, the acquisition of projects and the funding from EU and Industry are taken into account in the programme assessments.

The committee was able to get a good overview and carefully based the SEP scores on the position of FVM in the world. The scores for Quality and Productivity reflect the well-balanced publication strategy of the Faculty, covering both the leading veterinary journals and the biomedical journals.

The committee received updated information about international relationships. These data were taken into account by the committee. The impression is that the breadth of the research activities at FVM is an attractive characteristic for international students.

The quantitative analysis of the output and impact, by means of bibliometrics, is an interesting subject. The committee gave specific attention to the question whether the contributions from the FVM and the Medical Faculty in collaborative efforts affected the calculations. It may be necessary to discuss on a national level the proper way of counting joint publications.

For further assessment of the research quality and academic reputation, we refer to the programme assessments in the next section of this report.

### **3. Resources**

The total number of scientific staff (including PhD students) that is actively involved in IVR research ranges between 420 and 470 in the review period, which corresponds to approximately 230-260 fte (full-time equivalents). The research staff at IVR gradually increased by

approximately 10% in the period 2006-2011 to reach a plateau of approximately 260 fte in 2011. At the programme level, considerable changes in the number of research staff occurred ranging from a drop of 40% (BRC) mainly due to a lack of influx of new PhD students, to an increase of 50% (RATIA) largely due to absorption of external research groups and an increase in the number of PhD students.

Direct funding of IVR decreased from 14.8 M€ in 2006 to 13.4 M€ in 2011. This decrease in university budget was well compensated by an increase in extramural research funds and in contract research, resulting in an overall 18% increase in budget for the period 2006-2011. On average approximately 50% of the total available research budget was acquired from external sources. Total funding at the programme level increased from 22.4 M€ in 2006 to 28.8 M€ in 2011 largely due to successful acquisition of external research funds.

As from 2011, the past performance of the programme in terms of the earning capacity (research funds) and the number of successful PhD graduations are taken into account in the allocation of the research budget.

IVR facilitates access to cutting-edge technology by sponsoring central FVM research facilities and promoting access to facilities of the faculties of Medicine and Science, the Hubrecht Laboratory of the Royal Netherlands Academy of Arts and Sciences, and at the partner institutions (RIVM, CVI) and/or other consortium partners in Utrecht Life Sciences. This implies that IVR staff can utilize virtually all required research facilities. IVR core facilities include the Center for Cell Imaging, the Lipidomics facility, the FACS unit, and the Dutch Molecular Pathology Center.

The FVM is in an ongoing process to renew its buildings. A new central laboratory facility was opened in September 2006. The department of Farm Animal Health has moved in 2009 to a new building with experimental facilities for studies in poultry, pigs, and ruminants. The departments of Equine Sciences and Companion animals moved to their new facilities as well. The Androclus building with its lecture halls, library, teaching centre, faculty offices, restaurant and a number of preclinical research laboratories has been renovated in 2008. The pre- and paraclinical departments (Biochemistry, Cell Biology, Infection & Immunity and Pathology) are scheduled to move to a new research tower by 2016. The realization of the new infrastructure is expected to further strengthen scientific innovation at the interface between disciplines and to create a challenging and attractive scientific environment for young potentials.

The Central Experimental Animal Facility of Utrecht University (GDL) - an essential facility for research of the IVR - is also housed at the premises of the FVM. Apart from housing and care of experimental animals, the GDL offers biotechnical and other support, e.g. through facilities such as infection and SPF units, fully equipped surgical rooms, radionuclides lab, and cryo-preservation infrastructure. The GDL will also move to a new facility, nearby the new FVM research tower.

In addition to the facilities mentioned above, staff and students have access to E-journals, databases, search engines, and a full text repository provided by the nearby University Library (UBU).

### **Assessment/remarks**

The committee noted that the Dean is aware of the importance of proper access to shared research facilities and is looking for solutions to increase the transparency of the procedures, also to reduce waiting time and financial issues.

There was some discussion about the IP-system. The university support for securing intellectual property rights is generally regarded as adequate, though sometimes time-consuming.

In line with the growing diversity in society, the Faculty should also encourage the diversity in the background of its personnel, in terms of gender, nationality, and culture.

The Faculty has an important role on the national level regarding 'Reduction', 'Refinement' and 'Replacement' of animal experiments (known as the 3R's). As long as these experiments are necessary, efforts must be made to make the procedures transparent and to express a clear policy on this issue.

#### **4. Productivity**

IVR staff produced over 3,000 scientific publications in the period 2006-2011. The number of publications in peer-reviewed scientific journals considerably increased from around 420 in 2006-2008 to approximately 500 in 2010/2011. This strong increase was accompanied by a decline in the number of publications in 'other journals'. IVR staff contributed to nearly 200 books and book chapters. The trend to prefer to publish in peer-reviewed scientific journals may be explained by the more stringent IVR publication and research assessment policy in the period 2006-2011 which may have increased quality awareness.

#### **Assessment/remarks**

The Committee applauds the new policy to properly differentiate between the bibliographic benchmarking of biomedical and veterinary research. This policy specifies targets per domain for each group. The overall productivity and the monitoring activities are excellent and exemplary.

#### **5. Societal relevance**

The primary aim of the IVR is to advance veterinary sciences with the goal to provide a solid scientific basis for innovation and debate that benefits veterinary education, veterinary practice, related public health, and the economy. All IVR programs are designed to cover one or more of these aspects. IVR actively initiates and invests in the establishment of strategic alliances with partner institutes, government, and industry to ensure strong interaction with all stakeholders. The IVR stimulates public-private partnership and transfer of academic knowledge to veterinary practice and industry. At a different level, IVR strongly supports the representation of IVR experts in several governmental and institutional bodies and in the media to ensure contribution of the latest scientific facts and views to the societal debate. In addition, IVR experts co-organize post-graduate training courses for veterinarians to ensure that the latest knowledge and views find their way to the veterinary practice.

The societal relevance policy of IVR includes the initiation and support of:

- thematic research programmes on topics with societal relevance
- strategic alliances with public health institutions
- public-private partnerships
- representation of IVR staff in advisory bodies and organizations at all levels
- development of clinical guidelines
- post-graduate training courses
- organization of public events (media, schools, public days).

Examples of current societal issues affected by IVR research include: zoonotic infections (Q-fever, Toxoplasma), MRSA, regulations concerning the use of antibiotics in veterinary medicine,

OIE protocols, gene technology law, food safety, environmental and occupational health, and animal welfare.

IVR knowledge and expertise are also disseminated through professional papers and products (e.g. patents), publications aimed at the general public, and media appearances. There is a growing interest in FVM activities with the general public, related to societal problems such as emerging infections (Q-fever epidemic, Schmallenberg virus, Influenza) and the emerging resistance to antibiotics.

A total of twelve patents were filed in the period 2006-2011. The IVR valorization training for scientific staff has led to a gradual increase in the number of Invention Disclosures meetings with TTO-experts and valorization officers from the Utrecht Holdings. Current licensing deals include contracts with industry (MSD-AH, Merial, Pfizer-AH) and approximately 10 SMEs.

IVR staff are represented in governmental advisory boards (e.g. National Health Council, Council for Animal Affairs, Committee for Genetic Modification, KNAW Biosecurity board) and international agencies (WHO, OIE). The collaboration with industrial partners (e.g. ALTANT, Castellum projects) indicates that IVR research is increasingly recognized by industry. IVR actively engages in seeking new public/private partnership alliances both at the programme, institute and university level. The dean of FVM is member of the national 'regiegroep' of the top sector Life Sciences & Health (LS&H) for the ministry of Economic Affairs, Agriculture and Innovation, while others have been actively involved in setting the strategic research agenda's for the various road maps and programs for the top sectors LS&H and Agro-Food, respectively.

### **Assessment/remarks**

The IVR research aims at scientific excellence, but is also relevant for a variety of stakeholders including policy makers in human and veterinary health, ecosystems, and wildlife. Interactions with public stakeholders including animal rights organisations, companion and livestock owners are well incorporated into the research policy. Research supporting the development of clinical guidelines is directly relevant for the veterinary profession. The Committee applauds the stated goal to provide a solid scientific basis for innovation and debate that benefits veterinary education, veterinary practice, related public health, and the economy. This should safeguard a good balance between the interests of various stakeholders, based on long-term sustainability views.

The Committee also applauds the installation of a dedicated chair in Evidence-based Veterinary Medicine, to support translational medicine and link clinical questions and research, and in particular to promote the development of clinical guidelines.

### **6. Strategy for the future**

The IVR regards the consolidation of the departmental discipline-oriented research programmes into a limited number of multidisciplinary programmes of societal relevance in 2006 as highly successful when judged from the impact of the research output and the substantial increase in extramural funding. The strong embedding of some of the programmes in the University Research Focus Areas has strengthened the bond between animal and public health and increased quality and visibility. Moreover, the strategic alliances with partner institutions (RIVM, CVI, GD, Hubrecht Institute) -including the appointment of strategic chairs- have increased access to stakeholders and have resulted in successful public-private partnerships.

Yet, based on the analysis of results at the program level and changing societal demands, the IVR feels that some adaptations in policy may be required to remain successful in the future.

Animal health and disease are of major importance for modern society. Animals are relevant as source of food and for human well-being and economic prosperity, but also pose major risks to public health. The tight connection between the veterinary and human world is a major problem for society and asks for better integration of human and animal research, often referred to as the One Health approach. Most thematic IVR programs are in an ideal position to accommodate this need as they already successfully operate in the larger Life Sciences Research Focus Areas.

An additional development is the need for universities to make choices in their research themes to remain internationally competitive and to excel at certain areas. Utrecht University and the University Medical Center Utrecht are in the process of redefining their research mission and intend to focus their future top-research and valorization potential on Regenerative Medicine, Cancer, and Public Health (One Health).

Based on these two developments, IVR will adjust its research programmes to optimally benefit from the societal and local resetting of the research agenda.

The most obvious strategy is to go along with the outside developments and redefine its six research programs into three major programs of which two are directly linked to the Utrecht Life Sciences research profiles Public Health (One Health), Regenerative Medicine & Stem Cells, and Cancer and one is dedicated to explicit veterinary research. The latter program is essential to safeguard the veterinary mission and expertise in areas that are not covered by the interfaculty programmes.

Central topics in this restructured AVM programme may include Animal Welfare and Behaviour (E&C), Animal Reproduction and Genetics (including BRC), Animal Food and Metabolism, Oncology and Imaging, Comparative Medicine, and other key elements in veterinary training and practice.

The RATIA and SIB programmes will be cornerstones of the interfaculty Public Health (One Health) programme, while the TR programme will flourish best in the programmes ‘Regenerative Medicine & Stem Cells’ and ‘Cancer’.

Utrecht Life Sciences (ULS)		
<b>One Health</b>	<b>Regenerative Medicine&amp;, Stem Cells, Cancer</b>	<b>Specialist Veterinary Medicine</b>
<b>SIB &amp; RATIA</b>	<b>TR</b>	<b>AVM including Animal Welfare &amp; Behaviour (E&amp;C), Animal Reproduction &amp; Genetics (incl. BRC), Animal Food &amp; Metabolism, Oncology &amp; Imaging Comparative Medicine, a.o.</b>

In the view of IVR, all three new programmes address major societal needs, have excellent quality and have large valorization potential. The input of veterinary expertise into the Life Sciences programmes can be expected to strongly boost the international competitiveness and valorization potential of these programmes and bring outside expertise into the veterinary field. This development also enables major investments in state-of-the-art technology at the Utrecht Campus which is needed to keep up with international developments, to recruit world class scientists, to successfully start publicprivate partnerships, and to initiate strategic alliances.

In the view of IVR, a major challenge may be to safeguard the veterinary identity in the ULS programmes. However, based on the past performance and experience with the current embedding of IVR programmes in the larger university Research Focus Areas setting, the IVR is confident that this endeavour will advance and benefit Veterinary Sciences, and serve the societal stakeholders.

### **Assessment/remarks**

In the view of the Committee, the future looks bright for most of the programmes, but some of them will be affected by the reorganisation and will not be in the One Health, Regenerative Medicine or Cancer themes of the University, but in the specialist veterinary research. Some programmes are anxiously looking forward to their future.

The committee is aware of the fact that the new arrangement will clearly require an effort. It will be a challenge to properly balance the relevance of all the activities, but it is clear that the specialist veterinary research (AVM) is a unique building block. A collaborative effort to preserve veterinary medicine in the interest of teaching and research training is needed. It is clear that the Dean shares this point of view.

It also became clear that all faculty must be involved in the decision making processes, and that the opportunities for such consultations are present. Although the structure of groups, departments and interactions, is highly relevant for a coherent programme, there should also be some freedom for researchers to do creative and innovative research on the spot.

### **7. PhD training and supervision**

PhD students can only start their study after approval of the PhD project description by IVR. Only projects that fit the thematic programme are approved. All PhD students are under the supervision of a professor. Due to the position of the IVR programs in the university setting and the alliances with partner institutions, PhD students have access to state-of-the-art research and training facilities. Through their scientific networks the research programs also provide access to leading-edge national and international science groups.

PhD students are stimulated to present research results at international scientific meetings and publish in high-ranking scientific journals to build a strong own track record and scientific network. The PhD thesis typically consists of several publications in high-ranking peer-reviewed journals.

All PhD students are member of the Graduate School of Life Sciences (GS-LS) of the faculties of Medicine, Science, and Veterinary Medicine of Utrecht University. All PhD students sign the Training and Supervision Agreement (TSA) of GS-LS. The TSA specifies and serves to safeguard the quality of the training and supervision of PhD student and imposes a 'go-no go' decision within the first year of the PhD track. The GS-LS offers a series of PhD programs and theoretical courses that are associated with the UU Research Focus Areas. The PhD students from the IVR participate in the relevant PhD programme.

In addition to the thematic courses, both the GS-LS as well as the IVR offer a wide range of general courses to help attain the core professional skills necessary to function effectively as a (academic) scientist or future employee in a public or private setting.

The formal duration of a typical (type I) PhD track is 4 years. During this period, PhD students are employed by the FVM. DVM residents who combine their clinical training with a PhD study

are considered by GS-LS as regular PhD students with a proportionally prolonged PhD programme, as specified in the TSA.

In the period 2006-2011 the IVR delivered an average of 40 PhD theses each year. Of these PhD theses approximately 80% was prepared at FVM-UU, while 20% was produced at partner institutes under supervision of a FVM professor. The PhD students who performed their research at FVM, the majority graduates in the fifth year which is to be expected.

### **Assessment/remarks**

The committee regarded the poster presentations and the interesting discussions with the PhD students about the results of their research as a valuable element in the review. The PhD students were well aware of the procedures for monitoring their progress and for their supervision. It might be appropriate to add a broader perspective to the monitoring and supervision by involving faculty from outside the programme or department, in a PhD advisory committee.<sup>1</sup>

Another suggestion regarding the PhD students is the possibility to pay more attention to their career development, by having regular career discussions and by showing that the PhD students are members of the family and that the Faculty cares for their future.

Since the Faculty is responsible for the future of the veterinary training in the Netherlands, it is important for the Faculty to take full advantage of the opportunities that the Utrecht campus will offer for collaborative efforts with such areas as pharmacology and chemistry.

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<sup>1</sup> The Faculty reports that the Graduate School of Life Sciences has decided to appoint a monitoring committee for each PhD student with the task to monitor the PhD track alongside the promoter and copromoter. It has also been decided that each of the three participating faculties will appoint three confidants (*vertrouwenpersonen*) especially for the PhD students.

## Part 2: Assessments per programme

The committee assessed the following programmes of the Faculty of Veterinary Medicine at Utrecht University:

		Quality	Productivity	Relevance	Viability
IVR 1	Biology of Reproductive Cells	4	5	5	4
IVR 2	Tissue Repair	4	5	5	4
IVR 3	Emotion and Cognition	4	4	5	4
IVR 4	Risk Assessment of Toxic and Immunomodulatory Agents	5	5	5	5
IVR 5	Strategic Infection Biology	5	5	5	5
IVR 6	Advances in Veterinary Medicine	4	5	5	4

The detailed assessment per programme follows in the next section of this report.

**Programme IVR 1:                   Biology of Reproductive Cells (BRC)**

Programme coordinator:   Prof. dr. Willem Stoorvogel  
Research staff 2011:       3.9 tenured, 12.2 total fte

Assessments:                   Quality:           Very good (4)  
                                  Productivity:    Excellent (5)  
                                  Relevance:       Excellent (5)  
                                  Viability:        Very good (4)

*Short description*

The programme aims to provide answers to problems affecting or arising from reproduction in domestic animal species and man (One health) by improving understanding of the mechanisms involved in gamete development, fertilization and embryogenesis, and by improving gamete/embryo storage. Embryonic cells are used to study the phenomenon of cellular pluripotency and to investigate how these cells can be made to maintain pluripotency. The main objective is to improve technologies for assisted reproduction by understanding the molecular, cellular and physiological mechanisms that are critical to key steps in (assisted) reproduction: (1) gamete development, maturation and preservation, (2) gamete interaction and fertilization, (3) embryo development, storage and implantation

*Quality*

BRC covers a very interesting and innovative field of research with potentially strong links into both veterinary and human medicine. The researchers of BRC have taken the recommendations of the mid-term review into consideration in the design of the programme.

Members of the BRC programme regularly publish in the leading journals of the field of reproductive biology. This has gained them a very high international visibility in the scientific community and participation in international meetings and invitations to oral presentations at important conferences. This excellent scientific performance has been achieved despite a significant loss of scientific expertise as three world leading scientists who retired during the six years period, could not be adequately replaced. Future research plans will also include epigenetic aspects and implantation. To achieve these, important collaboration with researchers within Utrecht University (UU) and outside UU have been established. The proposed research programme for the next years is targeted and promising to yield novel results and thus high quality scientific papers.

*Productivity*

Members of the BRC programme have been extremely productive scientists with an extraordinary high output of peer reviewed papers and other publications. This has been achieved in spite of the significant loss of expertise caused by the non-replacement of leading researchers that retired during the 6-years period. BRC researchers have maintained their very high level of scientific quality and productivity, which is particularly to be commended. The part time employment (0.2) of Prof. A. Dinnyés has been successful and obviously yielded successful applications to the EU.

*Relevance*

A viable research programme on animal reproduction is absolutely critical for a future-oriented veterinary science research and teaching programme. It has numerous implications for veterinary science and human medicine. The BRC research programme is well positioned in this regard. It is

highly relevant to tackle important bottlenecks of animal reproduction and to develop novel cell-based therapies.

#### *Viability*

The evaluation panel strongly recommends to maintain this group and to support it in its future standing. The work that is to be conducted in BRC has strong implications for other research programmes of UU, such as Tissue Repair and RATIA. BRC researchers are encouraged to use these opportunities and exploit the collaborative assets with these programmes. The tentative restructuring into three major research programmes (One Health, Regenerative Medicine, AVM) should take into account that BRC is critical for basic and applied Veterinary Research and should make every effort to keep it viable under the new umbrella by providing a clear focus and sufficient resources.

**Programme IVR 2: Tissue Repair (TR)**  
Programme coordinator: Prof. dr. Jan Rothuizen  
Research staff 2011: 10.8 tenured, 37.4 total fte

Assessments: Quality: Very good (4)  
Productivity: Excellent (5)  
Relevance: Excellent (5)  
Viability: Very good (4)

#### *Short description*

This programme investigates the pathophysiology of tissue dysfunction and potential mechanisms for repair. The strategic goal is to develop new methods for stimulating regeneration and tumour prevention by delivery of essential cells, signals and/or biomaterials, and to devise preventive strategies for degenerative diseases. The programme exploits expertise on molecular genetics and genomics, proteomics, lipidomics, cell biology as well as molecular pathology to find new signals and routes for novel stem cell based therapies for failing organs.

The programme has three interrelated research lines:

1. *Musculoskeletal system* (this line studies the articular cartilage and the intervertebral disc in mice, dogs and horses. Integrated studies in animals and man are performed in close collaboration with UMC Utrecht)
2. *Liver* (this line studies angiogenesis as a component of the regenerative process in zebrafish, mice and dogs. Results of high-throughput screening in stem cell lines are further analysed in the translational line mouse-dog-man)
3. *Endocrine and genetic oncology* (this line studies the interaction of carcinoma and sarcoma stem cells with the microenvironment, using genetic canine tumour models).

#### *Quality*

The Tissue Repair programme began in 2006 and was formed by combining several pre-existing research groups. Currently TR consists of three main research lines: 1. Musculoskeletal system; 2. Liver; 3. Endocrine and Genetic Oncology with the opportunity for significant interactions and collaborations. The overall quality of the program is Very Good. This is based on the quality of the faculty and their research accomplishments, quality of the PhD graduate students and their research productivity, international recognition of the respective programmes, and facilities. The quality of research publications is excellent and has significantly increased (mean impact factor of 2.1 in 2006 to 4.3 in 2011). The publications range from basic science to applied veterinary investigations. The investigations on molecular pathogenesis and treatment of liver disease and endocrine diseases are particularly strong. The researchers have international prominence in all three areas. The interactions with the Faculty of Veterinary Medicine (FVM), the Dutch Molecular Pathology Centre, and Utrecht Life Sciences (ULS) are an important strength of the TR programme. The interactions and collaborations that have developed increase the quality and impact of the research. This should continue and receive encouragement and support from the FVM administration. Collaboration with the pathobiology department (under Professor Groene) has improved dramatically and this should continue to be fostered by the FVM. There are important synergies between the mechanisms of disease that are discovered in the TR programme and the applied pathology in the Groene group. Interactions between the three research lines should be enhanced. The Musculoskeletal system would particularly benefit from increased interactions with the Liver and Endocrine groups. The Musculoskeletal and Endocrine groups have a high degree of translation and impact for veterinary medicine. In the future, the

Liver group should strive to translate their impressive basic findings to veterinary patients in clinical trials. The research in the TR programme should not be limited to stem cell research. Tissue Repair is a broad topic and there is need for research in molecular pathophysiology, tissue structure, microenvironment, 3-dimensional reconstruction, and applied clinical research. Interactions with bioengineering programmes in the ULS may be potentially useful collaborations to develop, especially for the Musculoskeletal research line.

#### *Productivity*

Productivity of the TR programme is Excellent. The number of research publications is impressive (412 from 2006-2011). Many of the research publications are not specifically related to tissue regeneration or stem cells. This is not interpreted as a weakness, but as a strength. The publication of research manuscripts in high-quality biomedical journals has increased and publications in less impactful journals or book chapters have decreased. The productivity of PhD theses is very high with a total of 34 in five years for 10.8 Fte faculty. Productivity is strong and impactful in molecular biology, basic research and translational research.

Earning capacity has risen significantly from 20% in 2006 to 45% in 2010. External funding was 30% in 2011. Funding has been attained from national, EU and industry sources. This indicates that the research has relevance and impact for both basic and applied science. Public private partnerships should be emphasized in the future. This is potentially a good source of funding for applied and clinical studies.

#### *Relevance*

Societal relevance of the TR programme is excellent. There is deep strength in both the basic and molecular aspects of disease and clinical applications in human and veterinary medicine. TR supports both the One Medicine and Cancer and Regenerative Medicine themes of the ULS. Mouse and large companion animal models are used effectively for studies on pathogenesis and therapy. TR should continue to identify and investigate spontaneous or genetic diseases of companion animals that have relevance to humans. It is important that the medical community is educated about and accepts the role of companion animal disease in the One Medicine concept.

There should be increased emphasis on protection of intellectual property and identifying commercial opportunities for scientific discoveries, especially for veterinary medical markets. Clinical trials in companion animals should be increased. Spontaneous diseases of animals can be used to help predict the safety and efficacy of new human and animal therapeutics and devices. Spontaneous and genetic companion animal diseases can be selected to investigate novel forms of gene therapy, viral anticancer therapy, immunotherapy, and nanotechnology.

#### *Viability*

The viability and vision of the Tissue Repair programme is Very Good. All three research areas have the critical mass and expertise to have significant future impact. The pending retirement of Professor Rothuizen represents an important opportunity for the programme. The strength of all three research areas should be considered. It might be feasible to recruit a professor with expertise in gene or stem cell-based therapy that could enhance the entire programme. The areas of research focus for the three areas should be continually reassessed and balanced with faculty expertise. It is important that the disease mechanisms investigated have relevance for both veterinary and human medicine. It is critical that the TR programme builds acceptance by the ULS that investigations on diseases of companion animals have relevance for human disease. This is best demonstrated by collaborations with shared publications and funding, attraction of industry funding, and translation of research in animals to humans.

## **Conclusion**

The Committee advises that the TR programme continues to receive support for faculty, staff, and facilities. They are very successful, interact well with the ULS, and have the potential to increase their regional, national, and international impact. Tissue regeneration and repair is an important theme for a university with emphasis in biomedical research. Mouse models of disease and spontaneous diseases of companion animals play a central role in translational research. It is essential for the TR programme to form a cohesive and interactive unit even though the research areas may follow different diseases, species, or organ systems. There is much to gain from synergy between the three research areas. Spontaneous diseases in companion animals represent a unique resource to model and test new genetic and stem cell therapies that will be slow to progress to human clinical trials due to safety concerns. Companion animals could be a critical link to promote medical and industry interest in novel cell-based therapies. Faculty expertise should be enhanced in areas of mechanisms of disease and cell-based therapy using genetic modifications or stem cells. Collaborations must remain strong with other areas of the FVM (such as pathobiology and clinical medicine sections), the ULS, and chemical and biomedical engineering faculties. A clinical trials office and programme in the FVM should be a resource for the TR programme to translate scientific findings to the veterinary medical profession and serve as proof of principle for new therapies for human diseases. Public-private industry partnerships are a potential source for additional funding and growth.

**Programme IVR 3: Emotion and Cognition (E&C)**

Programme coordinator: Prof. dr. Frauke Ohl  
Research staff 2011: 3.8 tenured, 13.6 total fte

Assessments:                      Quality:            Very good (4)  
    Productivity:      Very good (4)  
    Relevance:        Excellent (5)  
    Viability:         Very good (4)

*Short description*

This programme on animal welfare research strives to define, identify and understand the neural basis of emotional states and cognitive abilities that are crucial for an animal's capacity to cope with environmental states, changes, and challenges. The study of the factors that influence the cognitive-emotional capacity of animals aims to be relevant for veterinary practice but also for translational biomedical research (animal models for neurobehavioural dysfunctions). Sophisticated behavioural and neurophysiological test systems are developed and used to analyze the relevant processes in different animal species. Imaging techniques are used to investigate pre- and perinatal development.

*Quality*

EC covers a very interesting and innovative field of research, oriented toward improvement of animal welfare, and involving both behavioural and neurobiological approaches. The programme is very coherent and directed toward well identified scientific goals. It must be noted that the programme started in May 2008, but the assessment period starts in 2006. This must be taken into account when considering the performance of the programme. It seems a very attractive, dynamic, relevant and well managed programme. It would be beneficial for the programme if additional resources could be secured, e.g. by applying for an international programme at the European level. The research is very relevant to veterinary sciences, as the models can be applied to welfare of farm and companion animals.

The researchers of EC have taken the recommendations of the mid-term review into consideration in the design of the programme. Recently, a new professor has been appointed, with high international visibility in the scientific community, as he is editor of a Journal in the field and has high-impact publications. His presence also enabled new collaborations with the Rudolf Magnus Institute for Neuroscience, as this researcher has a position in both academic institutions.

*Productivity*

Members of the EC programme are productive scientists with a high output of peer reviewed papers and other publications, particularly in the two last years. In the last years, they were able to publish in top 10% journal of the field and the medium impact of the publications of these years has much increased when compared to the production before 2008. This indicates that structuring this group as an independent research programme enabled them to considerably improve their productivity to a high international level. The strategy of the group is to publish in Neuroscience journals, which is important for their visibility. A drawback of this strategy is that this field is not very open to research on species other than model species such as rodents, primates, etc., which may affect the ranking of their papers within the Neuroscience field. Certainly, it would be much easier for them to publish in top journals in the Veterinary field, but this would make them less visible. This programme is very attractive for PhD students.

### *Relevance*

This research programme has a very high societal relevance, as findings from this programme can have applications both in the veterinary field, particularly in the aspect of animal welfare, and in the medical field, specifically in research relevant for some stress-related diseases such as anxiety and mood disorders. The societal relevance is also illustrated by the participation of members of the programme in the organisation of societal events such as the 3R-Symposium and their contribution to Guidelines in several organisations with high societal relevance. The team leaders should be careful in maintaining the right balance between public activities and communication on the one hand, and fundamental research on the other.

### *Viability*

The size of the group remains small, and should absolutely not decrease, but rather increase. Therefore, this group should absolutely be supported. As the One Health programme does not include research on neurological or psychiatric diseases, the EC research programme will rather be oriented toward Specialist Veterinary Medicine. It is important to secure funding in this condition.

### **Conclusion**

This group has an important impact in the field of Animal Welfare. It started recently, but its productivity and visibility have much increased in the two last years. It should absolutely be supported, and it is very important that its size does not decrease, but rather increase.

**Programme IVR 4: Risk Assessment of Toxic and Immunomodulatory Agents (RATIA)**

Programme coordinator: Prof. dr. Martin van den Berg  
Research staff 2011: 15.6 tenured, 89.0 total fte

Assessments:                      Quality:            Excellent (5)  
    Productivity:      Excellent (5)  
    Relevance:        Excellent (5)  
    Viability:         Excellent (5)

*Short description*

This programme aims to continuously improve the scientific basis for the assessment of risks (to human, animal and ecosystem health) of exposure to harmful agents through the food chain and vaccination, in the environment and in occupational settings.

The programme is organized in four research lines:

*a. Exposure Assessment & Control*

- Identification and characterization of physical, biological and chemical factors in the environment relevant for human, animal and ecosystem health.
- Quantification of routes of exposure in the general, occupational and domestic environments.

*b. Mechanism of Action & Dose-Response Assessment*

- Studies of availability, dose and mechanism of action of food and health products, pharmaceuticals, biotoxins and environmental contaminants in relation to their potential to induce adverse immune, neural and endocrine effects.
- Development of novel in vitro methods to reduce the number of animals tested and develops prediction methods for the in vivo situation.

*c. Environment & Host Response Modulation*

- Studies on immune modulation in relation to chronic immune - mediated diseases (e.g. allergies and autoimmune diseases).
- Studies of the immunological mechanisms of agents such as microbial components (including vaccines), probiotics, adjuvants, chemicals, pharmaceuticals and aeroallergens.

*d. Environmental Epidemiology*

- Studies on the relationships between exposure to biological (e.g. bacterial toxins and allergens), physical and chemical agents and health effects in human populations in the general environment, domestic and occupational settings.
- Studies with a special focus on veterinary public health issues resulting from interactions between animals and humans, their resulting exposures and possible adverse health effects.

*Quality*

For 2006-2011, RATIA was evaluated to be a world leading research programme by whatever measure was used to judge its performance (number of publications, mean normalized citation score, mean normalized journal score, earning capacity, or number of PhD theses). The impact of RATIA publications was 60-70% above the world average. The portion of publications in the top 10% of the most highly cited papers in the world was twice that expected. In essentially all areas (public health, environmental and occupational health, toxicology, environmental sciences, immunology, respiratory system, allergy, food science and technology, veterinary sciences, and

environmental engineering) RATIA publications were “high impact” and mean normalized citation scores were above world averages. Regardless of whether publications involved international, national, or no collaboration, all were “high impact”. Thus, output and scientific impact of RATIA research were spectacular.

RATIA is led by four distinguished professors Brunekreef, Van den Berg, Heederik and Van Eden. Each has an international reputation. In 2006-2011, some were recipients of honorary doctorates and, with other RATIA staff, amassed 14 honours. The most prestigious was an Academy Professorship for Brunekreef. Annually RATIA faculty delivered more than 60 invited lectures, edited 17 journals, and held 18 editorial board memberships. Accordingly, the world leading research program of RATIA is associated with outstanding tenured faculty.

### *Productivity<sup>2</sup>*

The number of RATIA publications per year in peer reviewed journals increased steadily from 2006 to 2011, resulting in over 900 publications for the period. Both cumulative numbers of publications and cumulative extramural research funding for this period were the highest of all IVR research programmes. RATIA was also heavily involved in training new PhDs. About 45-60 students/year participated in the PhD programme in 2006-2011 and a total of 62 PhD theses were completed in the six years. It is concluded that the RATIA research and graduate programme productivity based on numbers of publications in peer reviewed journals, extramural research funding, and number of PhD students trained in 2006-2011 was superb.

### *Relevance*

RATIA research fits in the “top sector” research fields identified by the Dutch government and meets Dutch society needs for risk assessments of physical, chemical and biological exposures. Studies on long-term effects in humans of traffic related air pollution were completed by RATIA investigators and will provide input into the development of EU policies for clean air in 2013. RATIA toxicologists completed the WHO re-evaluation of human toxic equivalency factors for dioxin-like compounds and these values are now used worldwide in predicting the risk of exposure to dioxin and related compounds in humans. In the area of veterinary public health, RATIA scientists initiated studies on various zoonoses. Risks to worker health in CAFO’s<sup>3</sup>, in the animal feed industry, and to veterinarians were investigated as were allergies to domestic, lab and farm animals. RATIA also initiated new research on alternative in vitro models to reduce the use of animals in testing with a 1 million Euro grant awarded to the veterinary pharmacology and toxicology division of IRAS. These examples illustrate the societal relevance of RATIA research.

Looking to the future, there is a societal need for research on the microbiome and exposome which RATIA scientists are poised to lead. There will be a societal need for alternative models to reduce animal use in research and RATIA scientists are leading such efforts. Other societal

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<sup>2</sup> The committee wanted to make sure that the bibliometric analysis or the publication scores of the group were not unduly influenced by the fact that the programme operates in two faculties. The group pointed out that the citation analysis is entirely independent from where the researchers are employed, because the citations are counted per publication and the outcome is benchmarked against the ISI field of publication and the impact factors of the journals in that field. The group has high citation scores in about ten different ISI fields, both in the medical and in other areas.

The number of publications per full-time equivalent of research input is also not affected by the group’s situation in two faculties, because all personnel in the research institute IRAS are employed by the FVM. Publications of the IRAS researchers may also be counted in the output of the Faculty of Medicine, but this does not affect the figures of the IVM review.

<sup>3</sup> CAFO = Concentrated Animal Feeding Operation

research opportunities that fit well with RATIA expertise are studies on adverse effects of pharmaceuticals, chemoprevention with naturally occurring and new synthetic compounds, allergies, immune diseases, and antibiotic resistance. Finally, incorporating RATIA into One Health will continue to make its research relevant to Dutch society by discovering new vaccines, optimizing antimicrobial use, and developing early warning systems to improve human and animal health.

### *Viability*

Strengths of RATIA were that its research areas, veterinary public health, toxicology, veterinary pharmacology, immunology and epidemiology, were able to obtain significant research funding in public health. Its principal investigators had distinguished research and graduate training track records and all four research lines contributed significantly to RATIA. Participation of most of IRAS in RATIA provided access to biomedical research facilities at the university and adjacent hospitals. There was a strong emphasis on problem solving in RATIA related to environmental and public health policies. This is illustrated by RATIA research being linked to WHO and IARC, and IRAS being a WHO Collaborating Center for Environmental Health Risk Assessment. There was also collaboration by RATIA on EU projects with RATIA faculty being principal investigators. In 2006-2011, RATIA's total external research funding contributed 38% to the total external research funds generated by Veterinary School faculty.

Research priorities of the One Health programme fit exceptionally well in RATIA. The opportunity for RATIA to merge with SIB and become part of One Health is an outstanding future direction. It will lead to greater interaction between RATIA and SIB and raise quality, productivity, societal relevance, and vitality of the research. Locating veterinary public health and environmental epidemiology in the same building will have a similar positive impact. As toxicology in RATIA is incorporated into One Health veterinary pharmacology should follow to ensure that research between the two disciplines continues. A veterinarian with pharmacology expertise in species differences in xenobiotic metabolism and pharmacokinetics would fit well in the Veterinary School and with toxicologists in RATIA.

Other future concerns are that RATIA is dependent on shifting research priorities of funding agencies making sustained funding a challenge. Ratio of temporary to tenured staff in RATIA is so high that a reduction in tenured staff will reduce productivity. Finally, high costs of lab animal maintenance, especially when research budgets are "cut to the bone", make it difficult to compete for diminishing research funds.

**Programme IVR 5: Strategic Infection Biology (SIB)**

Programme coordinator: Prof. dr. Jos P.M. van Putten  
Research staff 2011: 19.6 tenured, 74.2 total fte

Assessments: Quality: Excellent (5)  
Productivity: Excellent (5)  
Relevance: Excellent (5)  
Viability: Excellent (5)

*Short description*

The SIB programme aims to discover principles of infection at the cellular, individual, and population level. One important goal is the development of infection intervention and prevention strategies. In order to control (re)emerging and persisting infectious agents and antimicrobial resistance, research is conducted on relevant aspects of the entire infection chain, i.e. genome plasticity and virulence potential of infectious agents, cellular infection mechanisms, innate and adaptive host responses, and infection dynamics. The programme combines expertise in microbiology, immunology, cell biology, biochemistry, pathology, animal health and epidemiology.

SIB follows three research lines, working on principles of infection at different levels.: (i) dissection of molecular mechanisms that drive infection and associated changes in host cells; (ii) innate and adaptive immune response against pathogens, and (iii) infection dynamics.

*Quality*

The outlined projects comprise work on selected pathogens in order to unravel virulence factors, signalling pathways and host cell receptors. In direct connection with the research on host defence one goal is to design novel vaccines and therapeutics. Moreover factors are studied which determine transmission, genome plasticity and adaptation of infectious agents.

The ideas and approaches are original and of high significance for the field. The coherence among and between the research lines is clearly visible and very convincing. Interaction between research groups is also evident by weekly SIB research seminars. In order to perform high level research it is appropriate that the research groups focus on selected pathogens. The number and especially the quality of publications are outstanding; this is reflected for example by a mean impact factor of  $\sim 4$ . The major output concerns the biomedical field. However, SIB also has a significant impact on the veterinary field. The professors who lead research groups in SIB have an excellent national and international reputation in particular the ones within the Department of Infectious Diseases and Immunology. Members of SIB have organized national and international scientific meetings, gave invited lectures and serve on editorial boards of journals. SIB members have obtained several grants from different sources (second and third flow money). The university provides one year grants in the field of infection and immunity for pilot studies which may be the basis for future grant proposals. In conclusion: SIB is at the forefront of infectious diseases and has a major impact on the field.

*Productivity*

SIB is considered to be highly productive with differences between individual research groups. This statement is based on the number of peer-reviewed publications, total research earnings, total sum of external research funds and number of publications per fte of direct funding. Over the period 2001-2010/2011 the mean normalized citation score (MNCS) of SIB is 40-50% above world average. The SIB output is beyond the level expected in all categories of highly cited

publications. In the last three years 35 PhD theses were completed. In summary: the productivity of SIB is excellent.

#### *Societal relevance*

SIB addresses areas of infectious diseases that are highly significant for society, in particular emerging and re-emerging diseases like influenza, SARS and Q-fever, zoonotic and food-borne diseases. The work on prevention and therapy of infectious diseases including vaccine development and host-defense-based antimicrobials also belongs to this category. Thus the societal impact of SIB research is high.

#### *Viability*

The size of SIB with the focus on infectious diseases and immunology is appropriate. There is a healthy balance between the fields of Biomedical and Veterinary Sciences. Thus the “veterinary mission” of SIB is not jeopardized. The criticism from the previous report concerning pathobiology has been convincingly addressed. One scientist works now at the interface between pathology and virology and she has already made important contributions. Thus the perspectives of the research projects within SIB are excellent.

#### **Conclusion**

The strategy of SIB has turned out to be highly successful. This is particularly due to a strong Department of Infectious Diseases and Immunology which is nicely complemented by other departments like Biochemistry and Cell Biology. Within the interfaculty Public Health Programme SIB will play a particularly important role.

**Programme IVR 6: Advances in Veterinary Medicine (AVM)**

Programme coordinator: Prof. dr. Mirjam Nielen  
Research staff 2011: 11.6 tenured, 31.7 total fte

Assessments:                      Quality:            Very good (4)  
  Productivity:    Excellent (5)  
  Relevance:      Excellent (5)  
  Viability:        Very good (4)

*Brief description*

The aim of the AVM programme is to maintain the broad spectrum of veterinary specializations at FVM at a high level, by supporting research training of residents and by providing research time for the maintenance of the board certification of the permanent staff. In addition, AVM is the research programme of FVM to address important emerging topics in the field of veterinary medicine.

The key objectives of the programme are:

- Provide research time for residents and permanent staff in those specializations that are not covered by the thematic programmes.
- Publish results of research in the clinical veterinary and public health domain, to provide high level scientific evidence to the international veterinary community.
- Use professional networks of FVM veterinary specialists to identify potentially interesting new areas of research (also for the thematic programmes).
- Provide knowledge to emerging issues in society, and translate knowledge gaps into relevant (& fundable) research questions.
- Support the Royal Dutch Veterinary Association (KNMvD) in the development of official Dutch veterinary clinical guidelines.
- Support non-veterinary stakeholders (i.e. animal & livestock owners, animal production chains, food industry, wild life & leisure) with relevant knowledge.

*Quality*

The AVM program has seen significant development in quality over the review period. There has been a maturation of strategy and a coherence that was lacking in the earlier years and there is now a clear identity of purpose and a prioritisation of this theme as a quality activity in its own right. By necessity, and appropriately, the range of species and the applied nature of much of the research mean that target journals range from the scientific excellent to the more professionally relevant and it is important that this balance is maintained. Whilst there is some variation within the sub themes, the totality is of a quality that is leading in the field for an organisation of this kind. The groups are internationally competitive and where funds are available, are successful in securing these funds.

*Productivity*

In this area, the productivity of papers and PhD students is commendable; similar groups internationally would be envious of the strategic vision and support for AVM; this support has led to excellent productivity. The Faculty has heeded guidance on the need to address “asset stripping” by other groups of the high impact factor publications and both the number and quality (see above) reflect the standing of this grouping. Inevitably, there is variation amongst the sub groups but with the need to maintain academic focus across the species disciplines, this is to

be expected and ensures that productivity and capacity are matched as societal needs change and agriculture and veterinary science respond.

#### *Societal relevance*

In line with comments made at mid-term review, this group, by definition, is highly relevant to society. Without this research theme it would be impossible to advance veterinary science where society needs it most, that is at the level of the sick animal, the diseased population and entry to the food chain. There is good evidence of a broad based interaction with industry stake holders as well as significant investment of external funds in the programme by these organisations. There is also evidence of technology and knowledge transfer and exchange.

#### *Viability, feasibility and vision for the future*

Group size varies between sub themes and over time and this is to be expected. With a significant number of younger scientists, succession planning (contrary to other organisations) should not be difficult and there is evidence that the group has been able to change to the varying economic and political trends in science and agriculture in the Netherlands, in the EU and internationally. Changes of directorship have been handled appropriately and there is a clear vision for the group as a whole. The challenge of winning competitive grant funding in this area has been and will remain considerable but with appropriate investment through other means, the group is viable for the foreseeable future.

#### **Conclusion**

AVM is one of the leading groupings of its kind internationally. With the challenge of having to effect change through species and/or discipline based identities, the overarching brand of AVM is more useful as an internal management structure rather than an external “marketing” identity. This is common to other organisations working in this area. Nevertheless, it is clear that there is strategy for this research to remain at the core of the “veterinary” ethos of the Faculty. In any institutional change, management would be wise to ensure that this ethos is preserved. The Faculty is to be congratulated on the investment of core resources to support this area of high societal relevance and on ensuring that high impact outputs are credited to AVM where appropriate. There is no doubt that Utrecht is a field leader in this area, in outputs and in in creation of the next generation of research scientists and clinicians. With continued focus and investment, it can continue to be a leader.

## Appendix A: Measures taken after the mid-term review

In the mid-term review of 2009, the Committee had observed an increased focus in the programmes:

- BRC covers a very interesting and innovative field, and the link with biochemistry has created novel challenges, linked to the medical profession, presenting opportunities, e.g. to detect failures in embryonic development that may be relevant for human reproduction as well.
- TR is an intriguing example of bridging, of developing biochemistry research in clinically relevant ways, in line with the trend in the funding organisations. The comments of the Committee are aimed at bringing the right people together in the forefront of the field.
- E&C started as a new programme in 2008, it offers a surprising opportunity to improve the experimental set-up of the Faculty, by trying to develop validated observation procedures, not only for laboratory animals, but also for companion and farm animals, covering the traditionally difficult areas of emotion and psychology in veterinary medicine. Based on techniques from the neuro- and behavioural sciences it will have an important role in animal welfare.
- RATIA has a well balanced profile and international recognition. Risk assessment has a broad focus on animal and human diseases and ecosystems. The epidemiology has improved markedly from the exposure to the veterinary field and is performing a bridging role. The veterinary public health line is relevant for the stature of the Faculty in discussions on health interventions in general, and an effort is needed to connect this line to the general public debate.
- SIB has succeeded in putting together a very strong programme, in line with the renewed interest in infectious diseases in general and in zoonotic diseases in particular. There is a good focus on basic molecular aspects of infections and on immunopathology. There is still work to be done to further integrate the pathology.
- AVM combines the typically veterinary (clinical) research aspects. The Committee encourages the programme leaders to focus on specific clinically relevant issues. Spearheads in the programme, based on clinical questions must be translated into research and lead to developing new clinical procedures. The final goal must be to use the research to develop evidence-based interventions relevant for veterinary medicine.

In 2009 the Committee praised the general directions and research achievements, and raised several general points of consideration. These points are listed below, together with the way in which the IVR has addressed them.

1. *“In terms of impact and productivity it would not be appropriate to regard the ISI field of Veterinary Sciences as the only bibliometric benchmark for all the publications of the Institute. The individual research groups should point out the scientific (sub)field in which they are competing. Their bibliometric results should also be measured against the level of those (sub)fields, and not only against the general level of the veterinary world”.*

In response to this comment, the IVR revised its internal assessment procedure to enable proper bibliographic benchmarking of biomedical and veterinary research, respectively. They introduced predefined targets for the proportion of each type of domain. In addition, it is now specified beforehand in which scientific ISI (sub)field(s) the research groups are competing using the median impact factor of the top-25% journals of the relevant bibliometric domain(s) as target value. This enables positioning of the bibliometric performance of the groups in the respective

fields and creates more quality awareness and steering capabilities to achieve optimal performance.

2. *“The IVR programme aims at scientific excellence, but should also be relevant for a variety of stakeholders including policy makers in human and veterinary health, ecosystems and wildlife. Interactions with public stakeholders including animal rights, companion and livestock owners are encouraged. Directly relevant for the veterinary profession should be the focus on research supporting the development of clinical guidelines”.*

The IVR is fully aware that Veterinary Science serves a variety of public stakeholders including veterinary and human health professionals, the general public, policymakers, industry, and animal owners. This is already apparent from the range of the research programs which all may include applied research. In response to the growing societal demands for visibility, accountability, and relevance. IVR actively seeks and facilitates interaction with the various stakeholders through all types of communication channels, (inter)national advisory boards, the organization of public events, and education of veterinarians. To support translational medicine and link clinical questions and research, and in particular to promote the development of clinical guidelines, a dedicated chair in Evidenced-based Veterinary Medicine has been installed. Details of the societal relevant initiatives are listed at the appropriate sections throughout this report.

3. *“Funding is not allocated to the programmes under review, but ‘task oriented’ to the research groups. Though this could potentially be regarded as a source of friction in terms of responsibility and quality control, in the interviews no complaints or problems were voiced regarding this aspect”.*

The steering, allocation of funds, and quality control of the programs was kept unchanged in the period 2006-2011 as this demonstrated to be a satisfactory model for the period of transition and maturation of the new programs. Funding of one research group of the Tissue Repair program was terminated based on results of the internal quality assessment. It is anticipated that in the next period budget will be allocated to the programme management rather than individual research groups to enable more steering and programme flexibility.

## Appendix B: Curricula vitae of the committee members



**Prof. dr. E.J. Ruitenberg**, Athena Institute for Research on Communication and Innovation in Health and Life sciences, Faculty of Earth and Life Sciences, VU Amsterdam, De Boelelaan 1085, 1081 HV Amsterdam, The Netherlands.

In 2001, Joost Ruitenberg was appointed professor of International Public Health in the department of Biology and Society. This chair focuses on education and research within the field of Science, Technology and Society, in particular the relationship between biomedical sciences and society and especially the strategies which are used to control infectious diseases in developing countries. From 1962 to 1989 he worked at the National Institute for Public Health and the Environment (RIVM), where, in 1970, he was appointed Head of the Laboratory for Pathology. From 1980, as a Director at the same institute, he was responsible for vaccine preparation, control and research. In 1986 he was appointed Vice Director General. From 1989 to 2001, he was General Director and Scientific Director for the Central Laboratory of the Blood Transfusion Service of the Dutch Red Cross (since 1998: CLB-Sanquin). He taught Veterinary Immunology as a professor at the Faculty of Veterinary Science at Utrecht University from 1984. He is Chairman of the Medical Committee of The Netherlands-Vietnam (MCNV) and the Vice Chairman of the Ghanaian-Dutch Health Research Programme.



**Prof. dr. H.J. Thiel**, Institute of Virology, J1 University Giessen, Frankfurter Str. 107, 35392 Giessen, Germany.

Heinz-Jürgen Thiel is director of the Institute of Virology at the Faculty of Veterinary Medicine since 1994. He is a specialist in microbiology and university professor for Virology. Since its foundation in 1964 the institute has performed research into the identification and characterization of viruses and the diseases caused by viruses. The main areas of work comprise animal virology, molecular biology, cell biology and immunology.



**Prof. dr. R.E. Peterson**, Pharmaceutical Sciences Division, University of Wisconsin, 777 Highland Ave., Madison, WI 53705, USA.

Richard Peterson is Deputy Director of the NIEHS Center for Developmental and Molecular Toxicology. His research interests are in toxicology. He joined the School of Pharmacy and the Environmental Toxicology Center at the University of Wisconsin-Madison in 1975.



**Prof. dr. T.J. Rosol**, College of Veterinary Medicine, Ohio State University, 307 Goss Lab, 1925 Coffey Road, Columbus, Ohio 43210, USA.

Thomas Rosol is Professor of Veterinary Pathobiology in the Department of Veterinary Biosciences. He is also Senior Advisor Life Sciences for the OSU Office of Technology Commercialization and Knowledge Transfer and

Special Assistant to the Senior Vice President for Research. He was Dean of the College of Veterinary Medicine in 2005-2008. He maintains an active, NIH-funded research laboratory that uses molecular, in vitro, and in vivo techniques to investigate the pathogenesis of human and animal cancers. New laboratory expertise has been developed for in vivo imaging of cancer in mouse models using bioluminescence, high resolution ultrasound, microCT, and near infrared imaging of molecular markers. The lab is also examining the ability of nanoparticles to enhance the ultrasound imaging of cancer molecular markers.



**Prof. dr. H. Niemann**, Institut für Nutztiergenetik, Friedrich-Loeffler-Institut), Department of Biotechnology, DE 31535 Neustadt-Mariensee, Germany.

Heiner Niemann is Head of the Institut für Nutztiergenetik and the Department for Biotechnology at the Institut für Nutztiergenetik (Institute of Farm Animal Genetics) in Mariensee, near Hannover. The Institute is one of 11 Institutes in the Friedrich-Loeffler-Institute, Federal Research Centre for Animal Health (FLI). He is a specialist in reproductive biotechnology, and over the past decade he has further specialised in molecular and gene technologies. His research combines reproduction, embryology, and molecular and cellular biology, and is aimed at benefiting agricultural industry (such as addressing the high embryonic losses in livestock breeding programs), biomedical science (such as using animals as models for research into ageing) and the community.



**Prof. dr. C. Belzung**, University Tours, CNRS, FRE 2448, INSERM, U 930, Parc Grandmont, F-37200 Tours, France.

Catherine Belzung is director of a research unit in INSERM on fundamental clinical neurosciences. From 2000-2007 she was director of the research team Psychobiologie des Emotions. The general scientific aim of the Unit 930 is the study of normal and abnormal cerebral development from the perinatal period to adulthood. Among their research interests is the function of hippocampal neurogenesis, especially neurons produced in the dentate gyrus (DG) whose activity possibly induces a specific inclination that can be activated later by similar information, thus associating comparable experiences across time. To explore this, behavioural experiments are combined with immunohistochemistry.



**Prof. dr. S.W. Reid**, Royal Veterinary College, University of London, Hawkshead Lane, North Mymms, Hatfield Herts AL9 7TA .

Stuart Reid is Principal of the RVC since January 2011. He was Dean of the Faculty of Veterinary Medicine, University of Glasgow, and Professor of Veterinary Epidemiology and Informatics. His research focus was on epidemiology in both human and veterinary medicine.

## Appendix C: Explanation of the SEP scores

<b><i>Excellent (5)</i></b>	Research is world leading. Researchers are working at the forefront of their field internationally and their research has an important and substantial impact in the field.
<b><i>Very Good (4)</i></b>	Research is nationally leading. Research is internationally competitive and makes a significant contribution to the field.
<b><i>Good (3)</i></b>	Research is internationally visible. Work is competitive at the national level and makes a valuable contribution in the international field.
<b><i>Satisfactory (2)</i></b>	Research is nationally visible. Work adds to our understanding and is solid, but not exciting.
<b><i>Unsatisfactory (1)</i></b>	Work is neither solid nor exciting, flawed in the scientific and/or technical approach, repetitions of other work, etc.

Quality is to be seen as a measure of excellence and excitement. It refers to the eminence of a group's research activities, its abilities to perform at the highest level and its achievements in the international scientific community. It rests on the proficiency and rigour of research concepts and conduct; it shows in the success of the group at the forefront of scientific development.

Productivity refers to the total output of the group; that is, the variegated ways in which results of research and knowledge development are publicised. The output needs to be reviewed in relation to the input in terms of human resources.

Societal relevance covers the social, economic and cultural relevance of the research. Aspects are:

- societal quality of the work. Efforts to interact in a productive way with stakeholders in society who are interested in input from scientific research, and contributions to important issues and debates in society.
- societal impact of the work. Research affects specific stakeholders or procedures in society.
- valorisation of the work. Activities aimed at making research results available and suitable for application in products, processes and services. This includes interaction with public and private organisations, as well as commercial or non-profit use of research results and expertise.

Vitality and feasibility. This dual criterion regards the institute's ability to react adequately to important changes in the environment. It refers to both internal (personnel, research themes) and external (developments in the field, in society) dynamics of the group. On the one hand, this criterion measures the flexibility of a group, which appears in its ability to close research lines that have no future and to initiate new venture projects. On the other hand, it measures the capacity of the management to run projects in a professional way. Policy decisions and project management are assessed, including cost-benefit analysis.

## Appendix D: Programme of the site visit

<b>Sunday 10 June 2012</b>	
19:00	Committee dinner

  

<b>Monday 11 June 2012</b>	
09:00	- Short welcome by the Dean - Committee meeting (review aims & procedures, first impressions, preliminary assessments, preparing the interviews)
11:00	Meeting with the IVR management (presentation and interview about Institute part of self-assessment and plans for the future)
12:30	Lunch
13:30	Programme Biology of Reproductive Cells (BRC)
15:00	Programme Tissue Repair (TR)
16:30	Tour of the facilities: - Research labs J. Donkervoet Building - CSCA clinics
19:00	Dinner with the Dean, the IVR management, and the IVR Strategic Advisory Board.

  

<b>Tuesday 12 June 2012</b>	
09:00	Programme Emotion & Cognition (E&C)
10:30	Programme Strategic Infection Biology (SIB)
12:00	Lunch
13:00	Meeting with PhD students
14:00	Programme Advances in Veterinary Medicine (AVM)
15:30	Committee meeting/break
16:00	Poster session PhDs (all programmes)
19:00	Committee dinner

  

<b>Wednesday 12 June 2012</b>	
09:00	Programme Risk Assessment of Toxic and Immunomodulatory Agents (RATIA)
10:30	Committee meeting (conclusions & calibration, tasks)
12:00	Lunch
13:00	First report to the Dean, the IVR management and the IVR SAB
14:00	End of proceedings