ANNUAL RESEARCH REPORT 2017
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INTRODUCTION

ACTA is the combined Faculty of Dentistry of the University of Amsterdam (UvA) and the VU University Amsterdam. ACTA has a unique position in the Netherlands, being a combined faculty of two universities since 1984. The boards of both the University of Amsterdam and the Vrije Universiteit Amsterdam share the responsibility for the research at ACTA. Research at ACTA is organized in the ACTA Dental Research Institute.

The annual report starts with chapters containing the annual survey of the dean, and overviews of the scientific activities. As in preceding years the scientific performance is subsequently presented for each programme. Detailed information is given of dissertations, scientific publications in refereed journals, other scientific publications, professional publications, indicators of esteem, collaborations and societal impact.

In 2014 an international review committee evaluated the two research programs of ACTA. Both programmes Oral Infections and Inflammation and Oral Regenerative Medicine received a very good to excellent rating.

An overview of the scientific output in 2017 is presented in Table 1. During the last decade, the output has increased considerable. The number of scientific publications and the impact factor sum remained high in 2017. The number of PhD theses continued to increase and an all time high number of 33 PhD theses were published and defended in 2017.

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REPORT OF THE DEAN

The Research Institute ACTA

• mission statement
Dental research at ACTA focuses on the study of health and diseases of essentially all tissues of the oral cavity, the masticatory system and of oral fluids. Besides infectious diseases like dental caries, periodontal and periapical inflammatory processes, and inflammatory processes around dental implants, attention is paid to the development, function and regenerative capacities of the hard tissues, pain and dysfunction of the masticatory system, and diseases of salivary glands and oral mucosa. It is the general aim to improve strategies for diagnosis, treatment indication and treatment planning as well as prevention of diseases, functional repair of the affected tissues in and around the oral cavity and evaluation of therapies developed to treat patients. Moreover, we aim to gain insight in the aetiology and pathology as well as the risk factors involved in these diseases. In our attempts to fulfill this mission we aim to establish:
- integration of the clinical sciences with fundamental disciplines
- education and further academic training of post-graduate and PhD-students
- knowledge transfer and improvement of the quality of the research in ACTA with special attention to the translation of the results into applications in clinical dentistry. To this end there is a vivid interaction with professional dental organizations and industries.

• positioning of the research institute
National position. ACTA comprises the combined Faculties of Dentistry of the University of Amsterdam and the Vrije Universiteit Amsterdam. The ACTA Research Institute is the only institute for research of the faculty. Research programs. From 2011, ACTA research has been organized into the two research programmes. Both programmes have been acknowledged by the University of Amsterdam as Research Priority Areas (see below). Next to these two major programmes, some limited other research is performed, which is mainly education-related.
The programme Oral Infections and Inflammation (OII) focuses on (i) the aetiology, prevention and therapy of oral infections such as caries, periodontal and endodontic infections, on (ii) oral inflammatory processes, protective functions of saliva, oral cancer and on (iii) the definition of a normal, healthy oral cavity including psychosocial factors.
The programme Oral Regenerative Medicine (ORM) focuses on (i) the biological process of adaptation and repair of teeth, bone, mucosa and periodontium, on (ii) the biocompatibility of dental materials, and on (iii) regenerating damaged oral tissue by means of stem cell therapy and/or tissue engineering techniques, taking into account the mechanical threats of the masticatory system.

• description of output, leading scientific journals in the field
Within both research programmes considerable differences exist in the approaches used; yet, both range from fundamental medical-biological to clinical-applied science. This is reflected by the type of scientific journals in which ACTA researchers publish. Some groups primarily present their findings in journals read in the dental research community, while others also aim for the general medical-biological literature.

Evaluation of the research program

• external evaluation
SEP external evaluation. In 2014 an external evaluation of dental research of ACTA was completed according to the Standard Evaluation Protocol designed by the VSNU. The two research programs of ACTA, Oral Infections and Inflammation and Oral Regenerative Medicine were evaluated separately with respect to quality of the research, relevance to society and viability.
The committee concluded about the program Oral Infections and Inflammation: The quality of research in this programme was considered excellent. Many strong publications from the OII group have had a considerable impact in the field of dental research and have influenced opinion development on these topics in the broader scientific community. The relevance of the group’s research to society was considered to be very good. Collectively the future of the programme was considered to be very good.
The committee concluded about the program Oral Regenerative Medicine: Because of the future trajectory and promise provided in particular by the increased integration of cell biology approaches into scaffold development and prosthodontics/implantology research, the research quality of the ORM programme was considered to be excellent. The ORM programme’s impact on society is considered to be very good. While
there are some structural organizational issues that need to be resolved to ensure further integration, research success and ongoing productivity, the group’s viability is considered to be very good.
The committee gave a number of valuable recommendations that will be elaborated in the next years, to further strengthen the research at ACTA. For more details about this evaluation we refer to the assessment report of the committee.
In spring 2017, an external evaluation of both Research Priority Areas of the University of Amsterdam has been performed. The scientific quality of both the Oral Infections and Inflammation program as well as the Oral Regenerative Medicine program was qualified as excellent.

**Citation analysis.** In 2013, the CWTS in Leiden has performed a bibliometric analysis of the ACTA scientific publications over the years 2001-2011. One of the goals of this study was to identify possible benchmarks. These benchmark candidates were investigated in more detail and compared with the performance of ACTA. The conclusions of this study are as follows:

In this study we developed and applied a method to identify benchmark candidates for institutes with a non-mainstream research profile. These benchmarks are used to position the performance of ACTA. The outcome of this study shows an important role of ACTA in terms of output. ACTA has published an impressive amount of publications over the years 2001-2011. One of the conclusions of this study is that ACTA is among the top 10% most highly cited (P_top10). It should be noted, however, that the latter two are size-dependent: the more you publish, the more citations you will receive. If we look at the impact (MNCS and PP_top10, citations per publication normalized by field), ACTA is among the middle group. Still the impact is well above world average (10%).

**Summary of research output and input**

**Table 1. Comparison of research indicators 2005-2017**

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<tbody>
<tr>
<td>Dissertations</td>
<td>11</td>
<td>11</td>
<td>12</td>
<td>13</td>
<td>6</td>
<td>18</td>
<td>15</td>
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<td>18</td>
<td>13</td>
<td>15</td>
<td>25</td>
<td>33</td>
</tr>
<tr>
<td>Refereed publications</td>
<td>166</td>
<td>189</td>
<td>185</td>
<td>214</td>
<td>216</td>
<td>196</td>
<td>199</td>
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<td>250</td>
<td>255</td>
<td>286</td>
<td>272</td>
<td>296</td>
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<td>First author from ACTA</td>
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<td>131</td>
<td>117</td>
<td>159</td>
<td>132</td>
<td>105</td>
<td>103</td>
<td>117</td>
<td>127</td>
<td>126</td>
<td>161</td>
<td>140</td>
<td>150</td>
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<td>Other scientific publications</td>
<td>17</td>
<td>13</td>
<td>6</td>
<td>24</td>
<td>12</td>
<td>18</td>
<td>15</td>
<td>14</td>
<td>16</td>
<td>18</td>
<td>31</td>
<td>22</td>
<td>29</td>
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<td>Professional publications</td>
<td>99</td>
<td>114</td>
<td>113</td>
<td>98</td>
<td>168</td>
<td>164</td>
<td>169</td>
<td>132</td>
<td>159</td>
<td>167</td>
<td>175</td>
<td>131</td>
<td>132</td>
</tr>
<tr>
<td>Publications for general public</td>
<td>8</td>
<td>14</td>
<td>12</td>
<td>9</td>
<td>13</td>
<td>31</td>
<td>3</td>
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<td>19</td>
<td>20</td>
<td>25</td>
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<td>22</td>
</tr>
<tr>
<td>Impact factor sum</td>
<td>322</td>
<td>344</td>
<td>354</td>
<td>435</td>
<td>509</td>
<td>434</td>
<td>503</td>
<td>493</td>
<td>696</td>
<td>656</td>
<td>745</td>
<td>686</td>
<td>776</td>
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**Personnel WP 1**

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>WP1</td>
<td>46.0</td>
<td>46.5</td>
<td>50.3</td>
<td>43.4</td>
<td>40.8</td>
<td>36.7</td>
<td>36.2</td>
<td>39.5</td>
<td>42.2</td>
<td>40.6</td>
<td>38.6</td>
<td>46.2</td>
<td>42.4</td>
</tr>
<tr>
<td>WP2</td>
<td>4.8</td>
<td>7.9</td>
<td>7.8</td>
<td>9.6</td>
<td>7.0</td>
<td>7.8</td>
<td>10.1</td>
<td>9.4</td>
<td>6.3</td>
<td>5.9</td>
<td>4.9</td>
<td>3.9</td>
<td>3.6</td>
</tr>
<tr>
<td>WP3</td>
<td>6.7</td>
<td>7.4</td>
<td>6.5</td>
<td>5.4</td>
<td>12.9</td>
<td>13.5</td>
<td>14.4</td>
<td>17.6</td>
<td>19.6</td>
<td>19.6</td>
<td>28.1</td>
<td>27.8</td>
<td>23.3</td>
</tr>
<tr>
<td>Guests</td>
<td>2.2</td>
<td>4.2</td>
<td>4.3</td>
<td>3.6</td>
<td>pm</td>
<td>pm</td>
<td>pm</td>
<td>pm</td>
<td>pm</td>
<td>pm</td>
<td>pm</td>
<td>pm</td>
<td>pm</td>
</tr>
<tr>
<td>Total personnel</td>
<td>59.8</td>
<td>66.1</td>
<td>68.7</td>
<td>62.1</td>
<td>61.6</td>
<td>57.9</td>
<td>60.7</td>
<td>66.5</td>
<td>68.1</td>
<td>66.1</td>
<td>71.6</td>
<td>77.1</td>
<td>69.4</td>
</tr>
</tbody>
</table>

**wp1** = academic personnel funded by 1st source in fte; this includes direct funding by the university

**wp2** = academic personnel funded by 2nd source in fte; this includes research grants obtained in national competition from NWO, STW and KNAW

**wp3** = academic personnel funded by 3rd source in fte; this includes research contracts for specific projects obtained from external organizations, such as industry, governmental ministries, European Commission and charity organizations

- **long time performance**

**Dissertations (PhD theses).** The performance of the research institute over a longer period is shown in Table 1. These data show that between 2005 and 2015 the number of dissertations per year fluctuated between 6 and 18. This reflects variations in external collaborations, such as non-ACTA employees receiving a PhD from our universities and tenure staff members finishing their PhD. However, in 2016 the number of dissertations has started to increase and in 2017 an all time high of 33 dissertations were accomplished.
PhD performance. The percentage of PhD students that finished their thesis averages 91% over the last 20 years, and the mean time period between start of employment and defending the thesis is 4.6 years. This figure is corrected for the 0.6 to 0.8 fte employment of several PhD students and for long leave of absence (e.g. maternity and illness) of some PhD students.

Scientific publications. The main attention in the research assessment at the individual and program level is given to publications in scientific journals with a peer review referee system. This category has increased considerable since the turn of the century, and resulted in a stable high output since 2013. In 2017, again a high number of 296 refereed publications was obtained. The average quality of the publications has also improved during the last two decades, as indicated by the increased impact factor (Figure 1).

Professional publications. ACTA scientists are very active in communicating their research findings not only to the scientific community, but also to professionals. The number of professional publications in 2017 was 132.

Figure 1. Impact factor sum of ACTA publications, scientific publications in refereed journals, professional publications and total scientific personnel in fte.

- notable events in 2017

Publications in high ranking journals. Outstanding contributions for the year 2017 were publications in high ranking biomedical journals, i.e. ACS Nano (impact factor 13.9), ISME Journal (impact factor 9.6), Space Science Reviews (impact factor 7.5), European Journal of Nuclear Medicine and Molecular Imaging (impact factor 7.3) and Frontiers in Immunology (impact factor 6.4). ACTA scientists also published 23 papers in the top 10% journals in dentistry.

Impact factors. In addition to the output indicators given, the percentage of papers in high impact journals in the field gives valuable information. ACTA published in total 296 scientific papers in refereed journals, of which 266 in journals with an impact factor (SCI journals). 47% of these 266 papers appeared in journals belonging to the field Dentistry, Oral Surgery and Medicine. 16% of all publications were in the top 10% of the journals, 48% in the top 25% and 81% in the top 50% (Table 2). This means that, as in previous years, a relatively large number of publications were published in the top journals in the field, both in dental and in non-dental journals.

Indicators of esteem. On a personal level a number of ACTA employees rank in the top of the international dental community, as determined by the various indicators of esteem, such as editorships, invited lectures,
and congresses organized. In 2017 a total of 18 awards were received by ACTA scientists for their achievements. For more details we refer to the description of the two research programs.

**Grants.** In 2016, the successful participation of ACTA in the nationally funded and oriented Top Institute Food and Nutrition (TIFN) was completed. This work was further extended by a TKI-project, in which TNO, Philips and GSK participate, running from November 2017 to November 2019.

In 2013 the large Marie Curie ITN EU project Euroclast was granted by the EU. This project is coordinated by ACTA and involves participation of seven academies and two industrial partners and a total of 11 PhD students. In 2015, the EU Horizon 2020 Research Program awarded 6 million Euro’s for the project ADVOCATE – Adding value to oral care. A grant was obtained in collaboration with the Radboud University Nijmegen from the Dutch Cancer Society to explore oral complications in cancer patients (KWF-HOME). The Netherlands Organisation for Health Research and Development (ZonMw) granted a project for the development of biomimetic bone substitutes (BIOBONE).

**Table 2. Percentage of publications in different quartiles of dentistry and non-dental journals in 2017**

<table>
<thead>
<tr>
<th></th>
<th>dentistry journals</th>
<th>non-dental journals</th>
<th>all journals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>numbers</td>
<td>percentage</td>
<td>Numbers</td>
</tr>
<tr>
<td>top 10%</td>
<td>23</td>
<td>18 %</td>
<td>19</td>
</tr>
<tr>
<td>Quartile 1</td>
<td>54</td>
<td>43 %</td>
<td>73</td>
</tr>
<tr>
<td>Quartile 2</td>
<td>48</td>
<td>38 %</td>
<td>40</td>
</tr>
<tr>
<td>Quartile 3</td>
<td>15</td>
<td>12 %</td>
<td>18</td>
</tr>
<tr>
<td>Quartile 4</td>
<td>9</td>
<td>6 %</td>
<td>9</td>
</tr>
<tr>
<td>total</td>
<td>126</td>
<td>100%</td>
<td>140</td>
</tr>
</tbody>
</table>

- **assessment at the program level**

In 2017, both research programs published the same number of refereed publications. However, the output of the OII programme was higher than the ORM programme with regard to the number of dissertations prepared and the number of professional publications published, see Table 3. Other research (OWI), not related to the two programs, is limited both in terms of input (personnel and budget), and of output.
Table 3. Summary of the number of publications, impact factor sum and academic personnel in fte

<table>
<thead>
<tr>
<th>Program</th>
<th>Dis</th>
<th>Ref publ</th>
<th>OSP</th>
<th>PP</th>
<th>PGP</th>
<th>IF</th>
<th>wp1</th>
<th>wp2</th>
<th>wp3</th>
<th>wp tot</th>
</tr>
</thead>
<tbody>
<tr>
<td>OII</td>
<td>21</td>
<td>160 (71)</td>
<td>19</td>
<td>100</td>
<td>3</td>
<td>398</td>
<td>24,00</td>
<td>0,25</td>
<td>12,20</td>
<td>36,45</td>
</tr>
<tr>
<td>ORM</td>
<td>16</td>
<td>160 (79)</td>
<td>12</td>
<td>35</td>
<td>-</td>
<td>413</td>
<td>18,15</td>
<td>3,35</td>
<td>11,15</td>
<td>32,65</td>
</tr>
<tr>
<td>OWI</td>
<td>1</td>
<td>2 (2)</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>2</td>
<td>0,30</td>
<td>-</td>
<td>-</td>
<td>0,30</td>
</tr>
<tr>
<td>ACTA*</td>
<td>33</td>
<td>296 (150)</td>
<td>29</td>
<td>132</td>
<td>3</td>
<td>776</td>
<td>42,45</td>
<td>3,60</td>
<td>23,35</td>
<td>69,40</td>
</tr>
</tbody>
</table>

This table summarises the number of scientific publications in refereed journals, the number of other scientific publications, and the number of professional publications. Also the personnel involved in full time equivalent (fte) and the impact factor-sum (IF-sum) are included in this table. The IF-sum was calculated for each program by adding together the impact factor values of all 2017 publications.

- **Dis** = number of dissertations
- **Ref publ** = number of scientific papers in refereed journals. Between parentheses is the number of first authors belonging to the program in question
- **OSP** = other scientific publications (international, refereed)
- **PP** = professional publications
- **PGP** = publications for the general public
- **IF** = sum of impact factors as indexed by ISI.
- **wp1** = academic personnel funded by 1st source in fte
- **wp2** = academic personnel funded by 2nd source in fte
- **wp3** = academic personnel funded by 3rd source in fte
- **wp tot** = all academic personnel in fte
- **OII** = Oral Infections and Inflammation
- **ORM** = Oral Regenerative Medicine
- **OWI** = Education Institute and other research
- *ACTA* = the total number of dissertations and papers reflects the total for ACTA; a dissertation or paper was counted only once; the total impact factor sum is not a summation of the data from each program

Table 4: fte of staff and PhD students (see table 2) by type of position

<table>
<thead>
<tr>
<th>Program</th>
<th>1st</th>
<th>2nd</th>
<th>3rd</th>
<th>1st</th>
<th>2nd</th>
<th>3rd</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>OII</td>
<td>17,40</td>
<td>0,25</td>
<td>5,75</td>
<td>6,60</td>
<td>-</td>
<td>6,45</td>
<td>36,45</td>
</tr>
<tr>
<td>ORM</td>
<td>12,30</td>
<td>0,95</td>
<td>4,70</td>
<td>5,85</td>
<td>2,40</td>
<td>6,45</td>
<td>32,65</td>
</tr>
<tr>
<td>OWI</td>
<td>0,30</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0,30</td>
<td>-</td>
<td>0,30</td>
</tr>
<tr>
<td>Total</td>
<td>30,00</td>
<td>1,20</td>
<td>10,45</td>
<td>12,45</td>
<td>2,40</td>
<td>12,90</td>
<td>69,40</td>
</tr>
</tbody>
</table>

This table summarises the number of scientific publications in refereed journals, the number of other scientific publications, and the number of professional publications. Also the personnel involved in full time equivalent (fte) and the impact factor-sum (IF-sum) are included in this table. The IF-sum was calculated for each program by adding together the impact factor values of all 2017 publications.

- **Dis** = number of dissertations
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- *ACTA* = the total number of dissertations and papers reflects the total for ACTA; a dissertation or paper was counted only once; the total impact factor sum is not a summation of the data from each program

**Societal impact**

- **impact on teaching and dental care**

The prime societal values of a strong research program in a dental discipline are the effect on teaching and on dental care. The research improves the quality of teaching given at ACTA, both for undergraduate students, graduate students, students participating in the post-initial specialist courses, and for PhD students. New findings and concepts are included in the curriculum at ACTA, but are also presented to dental practitioners at frequently held education activities, e.g. Quality Practice. The Research Institute participates in the ACTA curriculum by offering scientific training to all ACTA dental students. The societal impact of the research of ACTA is also focussed on the influence on patient care, both within ACTA and externally. Research on different
main areas of interest contributes to improved prevention, diagnosis and treatment of relevant patient
groups. The high number of professional publications contributes to this societal impact.
In this annual report the societal impact of each research program is described in more detail in the respective
chapters.

• functions in the scientific and professional community
ACTA employees take an active role as executives in international scientific organizations (106 international
functions), as members of editorial boards of scientific journals (64) and in being leading in 'wetenschappelijke
verenigingen' of researchers and dental practitioners in the Netherlands.
Furthermore, the societal impact is evident from the organization of symposia and conferences in the
Netherlands and abroad, presentations for dentists, medical specialists and patient groups, memberships of
advisory councils, and frequent contacts with the industry. In addition many scientists are also practising as
dentists in specialized clinics at ACTA or in the Amsterdam region. Obviously the societal impact of their
activities, individually as clinically active professionals and leading among their peers, should be acknowledged.
The societal impact is also evident from the relatively large number of 132 professional publications. Some
ACTA researchers also wrote popularising publications aimed at a more general audience. Several research
findings were high lightened in the general press.

• invited lectures and congresses organized
In 2017 ACTA researchers have again contributed actively in internationally held meetings, workshops and
symposiums, both as organizers and participants. A total of 170 lectures were given as ‘invited speaker’ at
international congresses and symposia. In addition a large number of presentations were given at international
congresses after selection on submission of abstracts and during congresses and symposia for a Dutch or
international audience. Due to this large number, congress abstracts are not listed in this annual report. A total
of 70 international meetings were organized by ACTA scientists.

Management

• finances
The overall budget of the research institute is divided into a part controlled directly by the directorate and
another part that is allocated to the departments.
The institute budget (senso stricto) of k€ 963 is used for the management of the institute, salaries of PhD
students, for travel allowances of PhD students, for the organization of courses for PhD students and for
printing PhD theses.
The research budgets for the departments (in total being k€ 3298) are distributed based on a model containing
several parameters, such as external peer review, bibliometric data over the last 5 years, education, PhD
theses and external funding. In addition, standard bench fees are issued for PhD students appointed by the
research institute.
In addition to the university budget (1\textsuperscript{st} source) ACTA scientists were involved in many research projects with
external funding. The total amount of research grants (2\textsuperscript{nd} source) was k€ 536 and the total amount of
research contracts (3\textsuperscript{rd} source) was k€ 1725.

• personnel
The directorate of the institute comprises:
prof.dr. A.J. Feilzer, dean and director of research ad interim p.m.
dr. T.J.M. van Steenbergen, co-ordinator of research 0.55 fte
dr. H.S. Brand, co-ordinator of research 0.40 fte
mrs. F.M. Meijer, secretary 0.60 fte
dr. J.A.M. Korfage, research technician 0.15 fte

The activities of the research institute directorate consist of organizing scientific meetings with presentations
of PhD students, the screening of new research projects, the day-to-day interaction with graduate students on
practical matters regarding their position, compiling the annual research report, the planning of graduate
courses, allocating budgets for research to the departments, controlling the institutes budget and dealing with
general correspondence on research issues with UvA, VU etc.
PhD students
The ACTA PhD training program is organized in the ACTA Graduate School of Dentistry (AGSD). As ACTA has currently no research master training, the AGSD is limited to the PhD program.

- PhD student appointments
In Figure 2, the number of new PhD students at ACTA is shown from the years 1993 to 2017. In 2017, 11 new PhD students were appointed by ACTA which is above the long-term average number. Two-thirds of all PhD students have a dental background (see Table 5). Of all PhD students 62% is female.

Figure 2. Numbers of new ACTA PhD students from the Netherlands and other countries

![Chart showing numbers of new ACTA PhD students from the Netherlands and other countries from 1993 to 2017.](chart.png)

Table 5: PhD students by type of undergraduate training

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OII = Oral Infections and Inflammation
ORM = Oral Regenerative Medicine
OWI = Education Institute and other research
• **PhD Courses**

The following courses are organized for PhD students: Scientific Integrity, Dentistry for non-dentist PhD students, Writing and Presenting in English, Methodology and Statistics, and Oral Biology. Dentistry is a multidisciplinary science and the background of the PhD students of ACTA is diverse. Therefore, most PhD students also follow external courses on specific research areas, organized by research schools in other disciplines.

• **PhD thesis duration and completion rate**

Attention has been paid to the problems related to the social security benefits of PhD students and the time that PhD students need to finish their thesis. The mean time between start of the PhD project and the defence of the thesis within ACTA amounts 4.6 years.

![Figure 3. Mean duration of completing the thesis of ACTA PhD students related to the year of entry](image)

Over the last 20 years, about 90 % of all PhD students in ACTA completed their thesis (Figure 4). The PhD programma was evaluated by an external review committee in 2014. They concluded: Following queries about the infrastructure and core facilities, there was strong and unanimous agreement on the effectiveness of the ACTA programme to provide excellent PhD training. The students indicated that their programmes were well-organized and were well-supported to enable fulfilment of their research goals.
Points of attention

- **HRM and retirement**
  In the coming years several full professors who were active in 2017 will retire, thus giving the opportunity to appoint highly qualified researchers with a focus on one of the two programmes. The fte staff members on university budget (1st source) was comparable to 2016, while the fte PhD-students on university budget (1st source) showed a slight decrease. A slight decrease was also observed for scientific personnel on grants (in particular 3rd source).

- **PhD training**
  The duration of the PhD programme is, like elsewhere in the Netherlands, in general 4 years full time. PhD students with an employee status are generally employed for 4 years full time or for 5 years during 4 days a week. PhD students funded by EU grants are appointed for 3 years. Recently, it has been decided that future PhD students funded by ACTA will also be appointed for 3 years.
  The research institute will continue its strategy, concentrating on the two main research programmes. New PhD positions will be reserved for high quality projects which focus at the integration of fundamental and clinical science.
  According to the PhD regulations of both universities the course programme has been formalized with 30 ECTS points and examinations. The integration between the PhD training programme and the post-graduate clinical training programmes for dental specializations, which is limited now to the courses on statistics and oral biology, will be intensified. Following a course on Scientific Integrity is obligatory for all PhD-students.

**Conclusion**

The research at ACTA has always been characterized by a wide range of different topics that covered most dental disciplines. The present policy is to focus on the two specific research areas with an excellent performance.

The analysis of the various parameters of performance shows that the research at ACTA is, despite of budget restrictions, increasingly improving. Future performance will be dependent among others from the success in obtaining 2nd and 3rd source grants.
Oral Infections and Inflammation

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Full professors

E. Bloemena  J.J.M. Bruers  J.M. ten Cate  T. Forouzanfar
E.C.I. Veerman  G.H.W. Verrips  G.A. van der Weijden  E. Zaura
Introduction

Oral Infections and Inflammation

The oral cavity is one of the most infected parts of man. We hardly understand why most people are completely healthy with at least a thousand different species of microorganisms in billions of numbers present in the mouth, while other individuals develop oral infectious diseases, chronic inflammatory processes and other pathologies, including oral cancers. The central research theme “Oral Infections and Inflammation” (OII) focusses on the pathophysiology, epidemiology and (psycho)social aspects of oral infections and inflammation and prevention and treatment of those, as well as defining and understanding the healthy oral cavity as a complex ecosystem, with applications far beyond the mouth alone. The four topics in this program interact with each other and can be depicted in the schematic diagram below.

Research theme Oral Infections and Inflammation

- Healthy oral cavity and good systemic health
- Innate immunity (cells/saliva), and susceptibility for caries and periodontal diseases
- Epidemiology and pathophysiology of oral cancer
- Prevention and therapy of oral infections and inflammation

Research objectives

1) The healthy oral cavity and good systemic health.
   Oral health is an essential part of the general health of each person during his or her life. Poor oral health, oral infections and inflammation, oral cancer and other oral pathology, can lead to major health risks and might affect the progression of cardiovascular diseases, diabetes, cancer and cancer dissemination, systemic chronic and acute infections and vital organ failure. Poor oral health leads to a lower quality of life and economic hardship. In collaboration with several industrial partners, the Netherlands Organization for Applied Scientific Research (TNO) and the Top Institute of Food and Nutrition (TIFN), we work on defining normal oral health using a molecular biology approach (-omics). At the same time, we investigate the systemic effects of oral infectious processes in relation to atherosclerotic cardiovascular disease and diabetes, both by literature review and with an intervention trial (focus is mainly on changes in the microbiome and in biomarkers of the named systemic diseases).

2) Innate immunity (cells/saliva), and susceptibility for caries and periodontal diseases.
   Studies into the role of saliva and innate immune cells (oral PMN) in the maintenance of oral health have a prominent place. Several salivary proteins have strong antimicrobial capabilities and have important proteinase inhibitory actions. Synthetic peptide analogues of salivary histatins are tested as broad spectrum antibiotics. The influence of saliva on the interaction of oral microorganisms with oral epithelial cells and the in vitro wound healing capacities of salivary components are also being investigated. We find PMN in rinsing samples and they have antimicrobial functionality and are thought to have an essential role in maintaining oral health. For periodontal diseases, we collaborate in a self-supported European consortium to identify genetic variations, and we model periodontal disease as a complex system (environmental, lifestyle factors, systemic factors, randomness).
3) Epidemiology and pathophysiology of oral cancer.
Forms of oral cancer, precursor lesions of oral cancer, particularly leukoplakia, and salivary tumours are studied. Amongst others, the prognostic value of molecular markers is examined with regard to the malignant transformation of leukoplakia, and the role of the human papilloma virus (HPV) has been studied. Poor oral health with its concomitant increase in the oral bacterial load, can predispose for oral cancer. Oral infections are independently associated with oral (pre)cancers. Therefore, not only the traditional risk factors smoking and alcohol usage play a role in oral cancer, but also oral bacteria, yeasts and viruses. Laboratory and clinical studies are ongoing. Intervention in the precursor lesions of oral cancer, particularly leukoplakia, may prevent the development of frank malignancies. Also other odontogenic tumours are studied, with emphasis on ameloblastomas and keratocystic odontogenic tumours. Characterization is also included of salivary gland tumours at the genomic and protein level.

4) Prevention and therapy of oral infections and inflammation.
The knowledge that oral infections may have systemic effects, provides a fundamental basis for new cost-effective prevention programs as well as economic and social spin-off product-innovations in the food and oral care products and dental restorative materials. The dental and medical profession is (re)educated with new knowledge on the fundamentals of normal oral health and the risks of having chronic oral inflammatory processes. The formation, structure and properties of oral and dental biofilms are studied, also in relation to tooth and implant structures. In addition, new antimicrobials and peptides have come into focus as caries and periodontitis preventive agents. Studies into the most effective clinical measures to prevent inflammation of the gingiva and mucosa and to control oral health are being conducted, including substantial efforts to reach clinical standards for evidence based dentistry. Part of successful prevention measures is to improve and to maintain the well-being of both regular dental patients and subgroups of patients suffering from (extreme forms of) anxiety or (anticipated) pain or from physical/mental handicaps.

The researchers within the theme Oral Infections and Inflammation have an international prominence in the field of oral health and have acquired a global leadership role in the emerging field of complex ecosystems such as the oral cavity; thus understanding of oral infections, inflammatory processes, oral cancer and the definition of a normal, healthy oral cavity including psychosocial factors. We have been awarded a grant from the University of Amsterdam (UvA) (starting date 1-1-2011) and we demonstrated the multiplier effect (both on the academic as well as the economic aspects) by participating in the Top Institute of Food and Nutrition (TIFN) (contract signed December 2011, first year research in 2012, ending date December 2016). This work was further extended by a TKI-project, in which TNO, Philips and GSK participate, running from November 2017 to November 2019.

Results obtained
- A cross-sectional study was carried out to evaluate parents' Willingness to Invest in their children's oral health and the results showed a higher prevalence of dental caries in children whose parents are willing to pay more money and visit the dentist more often, while a lower prevalence was seen in children of parents who were willing to invest more minutes in tooth brushing.
- A cross-sectional study was carried out to determine the dental fear cut-off points of young children in the city of Thessaloniki (Greece) and the results showed that the dental fear cut-off point for the CFSS-DS was estimated at 37 for 6-12 year old children. Dental fear was correlated to age and not to caries experience or gender.
- An update of a systematic review and meta-analysis was published regarding the survival rate of ART restorations compared to the conventional approach in occlusoproximal cavities in primary molars. A total of four articles were included in the qualitative and quantitative analyses and no statistically significant difference was observed between ART and conventional approaches in survival rate of occlusoproximal cavities.
- Data from the GLOBE cohort showed that behavioural factors and material factors (education level and income) contributed most to the explanation of socioeconomic inequalities in adult oral health; both cultural and psychosocial factors add little.
- A systematic review on the current state of evidence regarding patient satisfaction with, and the impact of, orthognathic surgery on psychosocial functioning of patients 17 yr of age and older showed that the quality of methods of the published studies does not allow inferences on the effects of orthognathic surgery on patient satisfaction or their psychosocial functioning.
• The EU H2020 ADVOCATE project has resulted in a comprehensive topic list that is perceived and consented by an international multiple-stakeholder as valid, important, and relevant for describing oral health and oral health care. The list is used for guiding the implementation of transparent and explicit measurement of routine data of oral health and oral health care.
• Virtual reality exposure therapy (VRET) has been developed as a viable and effective option for treatment of anxiety disorders. Our controlled feasibility study showed that this novel promising approach is feasible, safe and effective and could play an important role in managing patients who due to their fears and phobia avoid dental treatment. We are the first to determine the efficacy of VET in a randomized clinical trial.
• The development of a quality and safety software tool for general dental practitioners. The development has led to an overview of all adverse drug effects relevant for the dentist and will be used as the basis for de EMRRH revision.
• Candida glabrata, Candida kefyr and Porphyromonas gingivalis inhibited wound healing in vitro. Due to inhibition of migration of the epithelial cells.
• Interim analysis of the multi-center prospective Orastem study revealed an incidence rate of graft-versus-host disease of 51%. 61% of GVHD patients was diagnosed with oral GVHD after hematopoietic stem cell transplant. Oral GVHD was associated with oral pain and functional limitations.
• It was found that a coating of phyosphingosine (PHS) on hydroxyapatite inhibits the formation of young salivary biofilms in vitro. Using both static as well as dynamic biofilm models it was found that the coating was formed within minutes and that the anti-adhesive properties last for at least 16 h under shear conditions. Experiments revealed that PHS binds to various surfaces including glass and contact-lenses, rendering PHS an interesting compound for various cosmetic applications. In line, a license of our patent on the protective properties of PHS has been sold to a commercial party.
• It was found that the salivary peptide histatin-1 enhanced the epithelial barrier function by enhancing the membrane expression of the cell-adhesion molecule E-cadherin, resulting in increased cell-cell adhesion. Furthermore was found that histatin-1 strongly enhanced adhesion of a variety of cell types, including epithelial cells and osteoblast, to titanium and hydroxyapatite in a dental implant integration model.
• In collaboration with the department of Gastroenterology, the relation was explored between oral dryness, oral diseases and gastrointestinal diseases. The results showed that both patients with coeliac disease as well as Crohn’s disease have an increased prevalence of oral health problems and experienced more severe xerostomia, indicating a possible role of saliva in the etiology of these oral health problems.
• In oral cancer gene profiles and clinicopathological variables can be used to predict outcome.
• PLK1 might serve as a target for a novel chemo preventive approach to eradicate preneoplastic mucosal changes in the head and neck.
• High number of chromosomal copy number aberrations inversely relates to t(11;19)(q21;p13) translocation status in mucoepidermoid carcinoma of the salivary glands.
• We are involved in the field of osteoimmunology, in particular the inflammation-driven processes of osteoclastogenesis, from monocytes to pre-osteoclasts, to bone resorbing multinucleated giant cells and fully differentiated osteoclasts. This was carried out as preclinical studies in mice or with ex vivo human cells. Cell cultures with and without various cytokines, growth factors, inhibitors were studied. Also interactions between monocytes (and preosteoclasts) with gingival and periodontal ligament fibroblasts were studied, showing a key role for these latter type of cells.
• Many studies based on systematic reviews and clinical trials were published on the topic of oral hygiene devices, oral hygiene techniques and materials. Among others they dealt with tooth brush and bristle design, design of interdental brushes, dentifrices and tongue scrapers.
• The link between poor oral health, including gingivitis and periodontitis, and some prevalent systemic diseases (atherosclerotic cardiovascular diseases, diabetes and metabolic syndrome) was this reporting year again subject of study. For example, we found that periodontitis can be an early sign of diabetes, and we found that basic periodontal therapy reduced the prevalence of metabolic syndrome and reduced platelet hyper-activity.
• Research also focused on the further understanding of the pathogenesis of periodontitis and the oral ecosystem. For this, genetic studies as well as reviews on mouse models with experimental periodontitis and the role of resolvins were written. In addition, circulatory PMNs as well as the role of these cells in the gingivitis and periodontitis lesions and oral cavity (oPMNs) were studied. oPMN are end stage cells, but yet very capable to phagocytize and digest oral bacteria, and to produce reactive oxygen species (ROS), proving their role in the maintenance of oral health.
Clinical studies investigating a novel irrigation solution which was patented last year, are ongoing. Another clinical study involves associations between blood values of certain factors with periapical periodontitis.

A clear correlation was found between advanced stage periodontitis and presence of periapical lesions was investigated.

New filling materials were investigated with micro CT and found to shrink and result in gaps created in the interphase between root canal wall and filling material.

Disinfection of the infected root canal system is a crucial step in root canal treatments. Different aspects of irrigation with hypochlorite have been investigated in order to improve the cleaning of the root canal. Activation with ultrasonic energy is a common activation method for the irrigation, however resulted in damage to the root canal walls.

In our in situ model we found that by swishing of a 10% sugar rinse with a fixed frequency and duration did not enhance caries progression.

In our in vitro studies, we found that the remineralizing deposition profiles inside dentine lesions differed per fluoride formulations such as titaniumfluoride, silverdiaminefluoride, stannousfluoride and sodiumfluoride.

When evaluating the effect of several quorum sensing modifiers on growth and the cariogenic potential of microcosm oral biofilms, we showed that 3-Oxo-N changes the ecological homeostasis of in vitro dental plaque. It reduces its cariogenic potential by minimizing lactic acid accumulation.

Bacterial metabolism of arginine in the oral cavity has a pH-raising and thus, potential anti-caries effect. In a pilot study, the presence of 8% arginine in toothpaste affects the arginolytic capacity of saliva and reduces its sucrose metabolic activity. Additionally, it leads to a shift in the salivary microbiome composition towards a healthy ecology from a carries point of view.

We examined the ecobiological heterogeneity of the salivary ecosystem and relations between the salivary microbiome, salivary metabolome and host-related biochemical salivary parameters. Our analysis grouped the individuals into five microbiome and four metabolome-based clusters that significantly related to biochemical parameters of saliva. Low salivary pH and high lysozyme activity were associated with high proportions of streptococcal phylotypes and increased membrane-lipid degradation products. Samples with high salivary pH displayed increased chitinase activity, higher abundance of Veillonella and Prevotella species and higher levels of amino acid fermentation products, suggesting proteolytic adaptation. An over-specialization toward either a proteolytic or a saccharolytic ecotype may indicate a shift toward a dysbiotic state.

Recently, it was shown that Candida albicans, in vitro, influences the bacterial composition of young oral biofilms, indicating it possibly plays a role in increasing diversity in the oral ecosystem. We studied the role of mitochondrial respiration, as mechanism by which C. albicans modifies its environment and showed that C. albicans is responsible for inducing growth of strictly anaerobic oral bacteria in aerobic growth. The described mechanism of O2 depletion may be a general mechanism by which fungi modulate their direct environment.

Streptococcus oligofermentans inhibits growth of cariogenic Streptococcus mutans in biofilms in vitro and is considered a probiotic candidate for caries prevention. We examined the effects of various environmental factors on the competition between S. oligofermentans and S. mutans in a dual-species biofilm mode and showed that inhibition efficacy of S. oligofermentans can be modulated in various ways, providing practical information on how to maximize the efficacy of S. oligofermentans.

Though a lot of knowledge exists on the role of periodontal fibroblasts in bone turnover, surprisingly little is known about the role of alveolar bone. Clinically, knowledge on this particular part of bone is of high relevance, since this bone is prone to degradation in periodontitis. In a pilot study, it was shown that the cells grown from alveolar bone are capable of both inducing osteoclast formation as well as to form bone.

In the past decade, many articles on genetically modified mice and their susceptibility to periodontitis have appeared. The current state of the art was reviewed.

Periodontal ligament fibroblast as the central cell type in orchestrating bone formation and bone degradation was introduced in the rare bone disease fibrodysplasia ossificans progressive (FOP). Bone formation parameters were slightly increased. Also, osteoclast formation regulated by the fibroblasts from FOP patients was significantly decreased when culture was performed in the presence of a TGF-beta inhibitor.
## Academic personnel in 2017

### Research staff ACTA – OII Oral Infections and Inflammation
(in full time equivalents)

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### Output

#### Dissertations


Scientific publications (referreed)


Cao, Y., Jansen, I.D.C., Sprangers, S., de Vries, T.J. & Everts, V. (2017). TNF-α has both stimulatory and inhibitory effects on mouse monocyte-derived osteoclastogenesis. Journal of Cellular Physiology, vol 232, no. 12, pp. 3273-3285. DOI: 10.1002/jcp.26024


Annual Research Report 2017


chimera on enteroaggregative Escherichia coli.\textsuperscript{1} Biochemistry and Cell Biology, vol 95, no. 1, pp. 76-81. DOI: 10.1139/bcb-2016-0088


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Professional publication


Nascholingstijdschrift voor Tandartsen, vol 12, no. 4, pp. 49-50.


Other scientific publications

Baart, J.A. (2017). Additional anaesthetic techniques. in J.A. Baart & H.S. Brand (eds), Local anaesthesia in dentistry. 2 edn, Springer, Cham, pp. 103-111. DOI: 10.1007/978-3-319-43705-7_7

Baart, J.A. (2017). General practical aspects. in J.A. Baart & H.S. Brand (eds), Local anaesthesia in dentistry. 2 edn, Springer, Cham, pp. 51-67. DOI: 10.1007/978-3-319-43705-7_4

Baart, J.A. (2017). Local anaesthesia in the lower jaw. in J.A. Baart & H.S. Brand (eds), Local anaesthesia in dentistry. 2 edn, Springer, Cham, pp. 87-102. DOI: 10.1007/978-3-319-43705-7_6

Baart, J.A. (2017). Local anaesthesia in the upper jaw. in J.A. Baart & H.S. Brand (eds), Local anaesthesia in dentistry. 2 edn, Springer, Cham, pp. 69-85. DOI: 10.1007/978-3-319-43705-7_5


Publications aimed at the general public


Grants: current projects with external funding


Bolscher, J.G.M. Co-investigator of research project: Antibiofilm activities of antimicrobial peptides against *Staphylococcus aureus*. Principal Investigator: dr. A. Pukun, Division of Microbiology and Parasitology, School of Medical Science, University of Phayao, Thailand, granted: 311.600 Thai baht by the Thailand Research Fund (Grant no. MRG6080039)/51/2551). (2017, July 01 - 2019, December 31).

Bolscher, J.G.M. Co-investigator of research project: Effect of antibiotics on biofilm structure of *Burkholderia thailandensis* and *Burkholderia pseudomallei* under various nutrient conditions. Principal Investigator: prof.dr. S. Taweechaisupapong, Faculty of Dentistry, Department of Oral Diagnosis, Khon Kaen University, Thailand. Funded by the Biofilm research group, Khon Kaen University and the Post-doctoral Program from Research Affairs and Graduate School, Khon Kaen University (Grant no. S8437), granted: 420.000 Thai baht. (2016, January 01 – 2017, December 31).

Bolscher, J.G.M. Co-investigator of research project: Effect of antimicrobial peptides alone and in combination with antibiotic against biofilm matrix composition of bacteria isolated from patients with chronic sinusitis. Principal Investigator: dr. S. Kanthawong, Faculty of Medicine, Khon Kaen University, Thailand. National Research Council of Thailand (Grant no. 503777) and Faculty of Medicine, Khon Kaen University, granted: 1.025.306 Thai baht. (2017, August 01- 2020, July 31).


Bolscher, J.G.M. Co-investigator of research project: The effects of modified-antimicrobial peptides and in combination with conventional antibiotic against *Burkholderia pseudomallei* biofilm. Principal Investigator: dr. S. Kanthawong, Faculty of Medicine, Melioidosis Research Center, Khon Kaen University, Thailand,


Brandt, B.W. Bioinformatics processing of dog samples. Commissioned Research with Institute of Veterinary Bacteriology, University of Bern, Bern, Switzerland, granted CHF 5000 (2017, January 01 –2017, April 01).


Crielard, W., Buijs, M.J., Brandt, B.W. & Zaura, E. Subgingival microbiome in relation to periodontal health. Collaborative Research with Faculty of Medicine and Dentistry, Department of Clinical Dentistry, University of Bergen, Bergen, Norway, granted: €15.000 (2016, January 01 –2017, December 31).


Van Loveren, C. Effect of the amount of sugar on caries development. PI, Funded by World Sugar Research Organisation (WSRO), total investment: 5.5 K€ (2016, January 01 – 2017, December 31).


Wismeijer, D. & Gorter, R.C. Digital dentistry in practice; On dentists’ interaction with technological transformations. ITI research grant 123.821 CHF (2012, January 01- 2017, December 31).


Indicators of Esteem

Book editorship
Scientific awards/honours


Geuns, E. (2017, November 3). 1st scriptie prijs, Nederlandse Vereniging voor Kindertandheelkunde, Soesterberg, NL.

Haverman, T.M. (2017, October 6). VMTI stipendium €500 voor een veelbelovend protocol voor onderzoek op het gebied van de medisch-tandheelkundige interactie, VMTI congres: Bloedserieu, Gooiland Theater Hilversum, NL.


Pooters, Y. (2017, November 3). 3rd scriptie prijs, Nederlandse Vereniging voor Kindertandheelkunde, Soesterberg, NL.

Raber-Durlacher J.E. (2017, June 24). Distinguished Service Award, International Society for Oral Oncology, Annual meeting MASCC/ISOO, Washington DC, USA.


Memberships editorial board

Aartman, I.H.A.: European Journal of Dental Education.

Bloemena, E.: ISRN Gastroenterology.


Bonifacio, C.C.: Revista da APCD.


Brand, H.S.: Nederlands Tijdschrift voor Tandheelkunde.

Crielaard, W.: Critical Reviews in Microbiology.


Danser, M.M.: ACTA QP mondhygiënisten.

Danser, M.M.: ACTA QP tandartsen.


Deng, D.: Critical Reviews in Microbiology.


Gorter, R.C.: European Journal of Dental Education.


Krom, B.P.: Critical Reviews in Microbiology.

Krom, B.P.: Odontology.

Krom, B.P.: Scientific Reports.

Laine, M.L.: Current Oral Health Reports.
Laine, M.L.: Journal of Dental Research.
Zaura, E.: Caries Research.

Organization of (inter)national scientific congresses and symposia
Rozema, F.R. (2017, August 23). Chair of ADEE Special Interest Group Medical and Surgical Competencies in Dental Education, ADEE annual meeting, Vilnius, Lithuania.

Invited speakers at (inter)national scientific congresses or symposia


Dubois, L. (2017, March 30). Biomaterials in orbital reconstruction and how they influence our daily practice, SORG preconference course ICOMS 2017, Hong Kong, China.


Zaura, E. (2017, June 2). Female oral microbiome. Women & their microbes, Amsterdam, NL.


Other (inter)national scientific functions


Brand, H.S.: President - Salivary Research Group, International Association of Dental Research (IADR).

Bruers, J.J.M.: Lid - Werkgroep Bijtrometer (ontwikkelen indicatoren bijzondere tandheelkunde), COBIT.


Crielaard, W.: Board member - Oral Microbiology and Immunology Group, British Society for Oral and Dental Research.


Crielaard, W.: Visiting professor - Oral Microbiology School of Stomatology, Sun Yat-sen University, Guangzhou, China.

Danser, M.M.: President - NVvP.

De Jongh, A.: Honorary Professor - Institute of Health and Society, University of Worcester, United Kingdom.

De Jongh, A.: Honorary professor - School of Health Sciences, Salford University, Manchester, United Kingdom.


De Jongh, A.: Lid - Werkgroep Richtlijnontwikkeling PTSS-traumatisch ervaren bevalling.


De Soet, J.J.: Treasurer - Stichting Orale Biologie.

Deng, D.: Coordinator - International Summer camp for ACTA students, Chengdu, Sichuan, China.

Deng, D.: Guest professor - Oral Microbiology, School of Stomatology, Sun Yat-sen University, Guangzhou, China.

Deng, D.: Visiting professor - School of Dentistry at Araraquara, UNESP, Brasil.

Deng, D.: Visiting professor - University of Sassari, Italy.


Gorter, R.C.: Executive board member - Association for Dental Education in Europe (ADEE).

Helder, M.N.: Board member - International Federation of Adipose Therapeutics and Science.

Lagerweij, M.D.: Member - Medical Ethical Committee (METc), VUmc, Amsterdam.

Lagerweij, M.D.: Secretary – Ethische Toetscommissie (ETC) ACTA.

Laine, M.L.: Corresponding member - Finnish Dental Society Apollonia.

Loos, B.G.: Member committee - Annual Meridol Research Prize, German Society of Periodontology (DGP), Germany.
Loos, B.G.: Ad hoc reviewer - Grant proposals: Wellcome Trust, UK; German Research Foundation (Deutsche Forschungsgemeinschaft); Polish National Research Organization; Medical Research Council (MRC), UK; United Kingdom Diabetes Foundation.

Loos, B.G.: Board member & Treasurer - Society for the Advancement of Natural Sciences, Medicine and Surgery, University of Amsterdam, NL.


Loos, B.G.: Member - IADR Distinguished Scientist Award Committee.

Loos, B.G.: Member - IADR Young Investigator Awards Committee.

Shemesh, H.: External examiner - Post graduate endodontics; 2017, April 5, Delhi, India & July 19, Barcelona, Spain.

Shemesh, H.: Member scientific committee - Nederlandse Vereniging voor Endodontologie (NVvE).

Van der Heijden, G.J.M.G.: Lid - GRADE Working group.

Van der Heijden, G.J.M.G.: Lid - Nederlands Epidemiologen College, Vereniging voor Epidemiologie.

Van der Veen, M.H.: Honorary lecturer - University of Liverpool, UK.

Van der Veen, M.H.: Invited expert and member - Working group 3 of EFP-ORCA joined workshop The boundaries between caries and periodontal diseases.

Van der Waal, S.V.: Member Scientific Committee - Nederlandse Vereniging voor Endodontologie (NVvE).

Van der Weijden, G.A.: Chairman - Guideline committee, Richtlijn Parodontologie in de Algemene Praktijk-NVvP.

Van der Weijden, G.A.: Member - Advisory board Dentalsens.


Van der Weijden, G.A.: Member - Guideline committee, Richtlijn de derde molaar, NVvMKA.

Van der Weijden, G.A.: Member - Science committee NVvP.

Van Loveren, C.: Member advisory board - Sugar Bureau UK.

Van Loveren, C.: Member advisory board - Tooth Friendly Society.


Zaura, E.: Board member - Associates at Institute for Advanced Study (IAS) at UvA.

Zaura, E.: Board Member - CED-IADR.

Zaura, E.: Invited expert and member - Working group 1 EFP-ORCA joined workshop: The boundaries between caries and periodontal diseases.

Zaura, E.: Member - Universitaire Toetsingscommissie VU.

Zaura, E.: Visiting professor - Oral Microbiology and Preventive Dentistry, Faculty of Medicine, University of Latvia, Riga, Latvia.

Supervisor of an external PhD student


Crielaard, W. & Deng, D. (2017, May 23). Co-supervisors of external PhD student Q. Han, West China College of Stomatology, Sichuan University, Chengdu, China.

Collaborations
- AMC, Medische Informatica, Epidemiologie en biostatistiek (prof.dr. K. Zwinderman).
- Amsterdam Public Health (J. Sluiter & M. de Bruijne).
- Antonie van Leeuwenhoek (AvL) / Nederlands Kanker Instituut (NKI), Amsterdam, NL.
- Ben Gurion University of the Negev, Beer Sheva, Israel, dr. M. Meijler.
- Budapest Semmelweis University (G. Nagy).
- Carolinas Medical Center, Charlotte, NC, United States of America, prof. M. Brennan.
- Center for Advanced Research in Public Health, Valencia, Spain, dr. A. Mira.
- Centrum Seksueel Geweld, Utrecht, NL.
- Cipto Mangukusumo Hospital, Jakarta, Republic of Indonesia.
- Clinic for Carolinas Health Care System Charlotte, North Carolina, USA, prof. M. Brennan.
- College of Dentistry, New York University, USA, R. Niederman.
- Copenhaen University (L. Boge & K. Rosing).
- Dental School, School of Medicine, College of Medicine, Veterinary and Life Sciences, University of Glasgow, United Kingdom.
- Department of Biomedical and Neuromotor Sciences (DIBINEM), School of Dentistry, Endodontic Clinical Section, Master in Clinical Endodontontology, Alma Mater Studiorum, University of Bologna, Bologna, Italy (dr. P. Chiara).
- Department of Conservative Dentistry and Endodontics, Thai Moogambigai Dental College and Hospital, (dr. P.K. Angambakkan Rajasekharan).
- Department of Conservative Dentistry, King’s College London Dental Institute, London, UK; Specialist Practice, London, UK (dr. S. Patel, dr. F. Mannocci).
- Department of Dental Medicine, Karolinska Institute, Stockholm, Sweden (dr. L.E. Chávez de Paz).
- Department of Endodontics, Dental School, University of Athens, Greece (G.N. Tzanetakis, E.G. Kontakiotis).
- Department of Endodontics, School of Dentistry, Federal University of Santa Catarina, Florianópolis, Santa Catarina, Brazil.
- Department of Endodontology Cagliari, Italy (dr. E. Cotti).
- Department of Endodontontology, Aristotle University of Thessaloniki, Greece (prof. T. Lambrianidis).
- Department of Endodontontology, Maurice and Gabriela Goldschleger School of Dental Medicine, Tel Aviv University, P.O. Box 39040, 6997801, Tel Aviv, Israel (dr. l. Tsesis, dr. A. Kfir).
- Department of Operative Dentistry Charite, Berlin (dr. P. Zaslansky).
- Department of Oral Diagnosis, Piracicaba Dental School, University of Campinas, São Paulo, Brasil.
- Department of Otorhinolaryngology, VUMc.
- Department of Pathology, VUMc.
- Department of Pedodontontology, dr. B. Özen, Istanbul Kemerburgaz University, Istanbul, Turkey.
- Department of Periodontology, School of Dentistry, University of Missouri-Kansas City, USA, C. Cobb.
- Department of Periodontology, Endodontology and Cariology, University of Basel, Switzerland.
- Department of Restorative Dentistry and Endodontics, Universitat Internacional de Catalunya, Barcelona, Spain (dr. F. Duran).
- Dept. of Cariology, Restorative Sciences & Endodontics, School of Dentistry, University of Michigan, Ann Arbor, MI, USA.
- Division of Cariology and Endodontontology, prof.dr. I. Krejci, University of Geneva, Switzerland.
- Dokters van de Wereld (M. Kroese & M. van Midde).
- Dr. J. Neillands, Department of Oral Biology, Faculty of Odontology, Malmö University, Sweden.
- Dr. M. Zourob, Department of Chemistry, Alfasal University, Al Zahrawi Street, Al Maather, Al Takhassusi Road, Kingdom of Saudi Arabia.
- Dr. W. Kaman-van Zanten, Department of Medical Microbiology and Infectious Diseases, Erasmus MC, Rotterdam, NL.
- Erasmus Medisch Centrum, NL, F. van Lenthe.
- Erasmus Medisch Centrum, NL, dr. M. van Zelm.
- Erasmus Medisch Centrum, NL, Job van Exel.
- F. Koumans, BioClin B.V. Delft, NL.
- Faculty of Dentistry, University of Hong Kong, Sai Ying Pun, Hong Kong (dr. P. Neelakantan, dr. G. Cheung).
- Faculty of Dentistry, University of Toronto, Toronto, Ontario, Canada (dr. A. Kishen).
- Gezondheidscentrum Maarn (E. van der Snoeck & J. Plaisier).
- GGD Amsterdam, NL (prof.dr. A. Verhoeff & J. de Ruyter).
- GGZ-instelling De Bascule, NL (C.J.A.M. de Roos).
- GGZ-instelling Dimence, Deventer, NL (N.I. van Vliet).
- GGZ-instelling Karakter, Almelo, NL (R. Knipschild).
- Health Science Research Center, Indiana University-Purdue University, Fort Wayne, IN, USA, M. Putt.
- Heidelberg University (S. Listl, F. Gabel & A.L. Treschner).
- ISALA, Zwolle, NL.
- Julius Wolff Institute, Charité-Universitätsmedizin Berlin, Germany (dr. P. Zaslansky).
- KKNMT, Nieuwegein, NL (J. den Boer & dr. B. van Dam).
- Labonovum, dr. D. Poland, Rotterdam, NL.
- Massachusetts General Hospital, Boston, USA.
- MGR Educational and Research Institute University, Chennai, India (dr. A.R. Pradeep Kumar).
- National Institutes of Health, Washington DC, USA.
- OLVG, Amsterdam, NL.
- Otago University (J. Broadbent).
- Prof.dr. H. Haagsman, Dept. of Infectious Diseases and Immunology, Division of Molecular Host Defence, Faculty of Veterinary Medicine, Utrecht University, Utrecht, NL.
- Prof.dr. J. Mollenhauer, Division of Molecular Genome Analysis, German Cancer Research Center, Heidelberg, Germany and Molecular Oncology, University of Southern Denmark, Odense, Denmark.
- Radboud UMC Nijmegen, NL (S. Listl, A. Righolt & dr. W. van der Sanden).
- Radboud UMC Nijmegen, NL, afdeling hematologie, prof.dr. N.M. Blijlevens.
- Radboud UMC Nijmegen, NL, afdeling tandheelkunde, prof.dr. M.C.D.N.J.M. Huysmans.
- Radboud UMC Nijmegen, NL, prof.dr. W.H. van Palenstein Helderman & prof.dr. N. Blijlevens.
- Research Group Microbiology and Systems Biology, TNO Earth, Life and Social Sciences, Zeist, NL.
- Sahlgrenska Academy, Göteborg University, Göteborg, Sweden, prof. I. von Bültzingslöwen.
- School of Dentistry at Araraquara, UNESP, Brasil, prof. A. Rastelli.
- School of Dentistry, University of Sassari, Italy, prof. G. Campus.
- School of Stomatology, Sun Yat-sen University, Guangzhou, China, prof. X. Wei.
- Sunstar, Genève, Switzerland, dr. T. Takatsuka.
- Temple University Philadelphia, Kornberg Dental School, United States.
- The Swammerdam Institute for Life Sciences, UvA, Amsterdam, dr. J. Teixeira de Matos.
- TNO, Zeist, prof.dr. B.J.F. Keijser, Preventive dentistry, ACTA-TNO Zeist.
- TU, Delft, NL.
- UMC Utrecht, Julius Centrum (prof. N. de Wit, dr. N. Blijenberg & M. Bots).
- UMCG, Groningen.
- Universitat International Catalunya, Barcelona, Spain.
- Universität Zurich, MKG.
- University Federico II, Naples, Italy. Department of Periodontology, A. Blasi.
- University Medical Center Regensburg, Germany, dr. F. Cieplik, Dept. of Conservative Dentistry and Periodontology.
- University of Bandung, Indonesia, dr. Amalia.
- University of Berlin, Germany, Institute for Clinical Molecular Biology, dr. A. Scheafer.
- University of Bonn, Dept. of Periodontology, prof.dr. S. Jepsen.
- University of Cairo, Dept. of Oral Medicine & Periodontology Faculty of Dentistry, Egypt, K.M. Fawzy El-Sayed.
- University of Edinburgh, prof. M. Greenwood.
- University of Gothenburg, Sweden, prof. I. von Bültzingslöwen.
- University of Kiel, Germany, Dept. of Gastro-Enterology, prof.dr. S. Schreiber.
- University of Kristianstad, Sweden, prof.dr. S. Renvert.
- University of Maryland, Dental School, Baltimore, USA, dr. M.A. Jabra-Rizk.
Current PhD projects


Broers DLM. Experienced-based dentistry in individuals with physical and/or mental limitations. Supervisor: prof.dr. A. de Jongh; co-supervisor: prof.dr. G.J.M.G. van der Heijden; start: January 2012.


Societal impact

Oral infections and oral cancer have a substantial impact on the society. Oral infectious diseases are the most frequent infections in the western society and have important consequences, both medically and economically. Head and neck squamous cell carcinomas (HNSCC) and specifically oral squamous cell carcinomas (OSCC) are the most prevalent forms of head and neck cancer. The general aim of the program is to understand the normal healthy oral cavity and to understand links with general health, to study oral innate immunity and susceptibility to caries and periodontal diseases, to study prevention and treatment options for...
the oral infectious and inflammatory processes and to study the epidemiology and pathogenesis of oral cancers, in particular in relation to good/poor oral health. In addition, attention is paid to social and psychological aspects of dental treatment, such as dental anxiety.

Through education, a new generation of dentists and researchers in the Netherlands, Europe and the world are trained to implement a radical shift from mechanistically and (invasive) treatment oriented professionals to 21st century oral physicians focused on diagnosis and prevention of dental and oral infections and maintenance of the quality of life. Over the last 5 years it has become increasingly clear that oral infections are having negative impact on cardiovascular health, diabetic status and quality of life. The researchers in this theme focus on this aspect.

The members of our priority area have had a relative large number of invitations to give lectures at dental congresses, and to educate the dental profession on fundamental understanding of oral health. Moreover, we experienced increased interest from newspapers, magazines and radio programs on the above subjects, in which we participated. The link oral health - general health is actively communicated by the researchers.

Important for the dental profession and the general public, is the substantial number of published and accessible systematic reviews (and meta-analyses) on the various modes of prevention and oral hygiene measures. These contribute to clinical protocols for the dental profession and form the basis for evidence based dentistry.

Ongoing clinical research on oral and head/neck cancer contributes to improved prevention, diagnosis and treatment of relevant patient groups. New plans are developed to bring together knowledge on oral microbiomes and salivary innate immune peptides with oral cancer diagnosis and pathophysiology. The program has strong links with all players in the oral care industry; this not only results in contract research, but also in industrial co-funding of grants (STW) and has led to participation of ACTA in the Top Institute Food and Nutrition (TIFN), where the theme Oral Health has been initiated. In this theme, world players in the oral care industry, the chewing gum industry, flavour industry, food industry and (oral) care appliances industry collaborate with the University of Wageningen, TNO and ACTA.

The societal impact of the research is evident from the impact on patient care and public dental health, and from collaborations with the industry, as is shown by for instance the grants obtained and the external reports. The societal impact of the clinical research contributes to improved prevention, diagnosis and treatment of relevant patient groups. The societal impact is evident from the items listed below.

The societal impact of the clinical research on oral and maxillofacial surgery is focussed on the influence on patient care, both within the department and externally. Research contributes to improved treatment of relevant patient groups.

I. Societal relevance for the dental professional in the Netherlands

Courses organized for Dutch dental and medical professionals


Lectures given during courses for Dutch dental and medical professionals


Bizzarro, S. (2017, June 16). De systemische reacties van parodontale ontstekingen op de algemene gezondheid en de mogelijk nadelige effecten daarvan voor de (top)sporter. THIM, Nieuwegein, NL.


Danser, M.M. (2017, April 12). Periodontal treatment in oncology patients. Referral evening for dentists and oral hygienists, Amsterdam, NL.


De Jong, T.M.H. (2017, November 11). Effecten van de initiële behandeling in de algemene praktijk + Patienten casus. IT-groep mondhygiëniest bij PPI Hoorn, NL.


De Soet, J.J. (2017, April 21). Tandheelkunde & Geneeskunde. Duet nascholing, Ede, NL.


De Vries, T.J. (2017, September 25). Guest lecture on periodontitis. Exercise Immunology (Research Master, Human Movement Sciences VU), Amsterdam, NL.

De Vries, T.J. (2017, December 19). 1. Human cell culture models to study periodontitis, 2. Los(s)/t without: genes that protect us from periodontal bone loss, lessons from genetic mouse models and human null mutations. Internal Medicine Minor Much to learn about bone, (course coordinator: dr. R. de Jongh, VUmc, Amsterdam, NL).


Laine, M.L. (2017, June 10). Post HBO Mondhygiëne, course Halitose, ACTA Amsterdam, NL.

Laine, M.L. (2017, October 31). Halitose course. Study group iQual, Nieuwegein, NL.


Laine, M.L. (2017, December 1). Halitose in the tandarts praktijk. ADE middagcursus, Amsterdam, NL.


Loos, B.G. (2017, April 21). Hartklachten en de tandarts en Diabetes en mondgezondheid, Mark Two Academy, Ede, NL.


Rosema, N.A.M. (2017, July 1). Abracadabra in de tandheelkunde. QP mondhygiënisten. Amsterdam, NL.
Rosema, N.A.M. (2017, November 1). Voorlichting, instructie en adviezen geven 3 x workshop QP assistenten. Utrecht, NL.
Teeuw, W.J. (2017, April 12). Moderator Symposium Periodontal Clinic, Academic Centre for Dentistry Amsterdam (ACTA), University of Amsterdam and VU University Amsterdam, NL.
Teeuw, W.J. (2017, November 1). Diabetes mellitus and oral health. Compact Clinics, Clinic for Periodontology Amsterdam, NL.
Van der Sluijs E. (2017, November 1). Slechte adem – poetsen of spoelen? Referral evening for dentists and oral hygienists, Amsterdam, NL.

Organization of congresses and symposia for professionals in the Netherlands
Invited speakers at professional congresses or symposia in the Netherlands


Bikker, F.J. (January 13, 2017). Saliva diagnostics, state of the art and developments. TNO, Rijswijk, NL.


Crielard W. (22 November 2017). The oral microbiome in health and disease; antibiotics and the (oral) microbiome. KNMT bijeenkomst, Ridderkerk, NL.


Raber-Durlacher, J.E. (2017, October 6). The role of the dental professional in hematopoietic stem cell transplantation. VMTI annual meeting, Gooland Theater Hilversum, NL.


Van Spreuwel, P.C.J.M. (2017, November 10). Gezonde peutermonden. SCEM Congres; Mondzorg voor het kind, Bunnik, NL.


Professional functions in the Netherlands

Aartman, I.H.A.: Lid - Stuurgroep Kennisdeling UvA.
Bloemena, E.: Bestuurslid - Nederlandse Vereniging Voor Pathologie (NVVP).
Brand, H.S.: Lid - Employabilityfonds ACTA.
Brand, H.S.: Lid - Ondernemingsraad ACTA.
Brand, H.S.: Lid - Projectgroep besturingsmodel.
Bruers, J.J.M.: Onderzoekencoördinator - KNMT.
De Jongh, A.: Hoofdopleider - 3-jarige postdoctorale opleiding tot tandarts-angstbegeleiding.
De Jongh, A.: Lid - Bestuur Vereniging EMDR Nederland.
Gorter, R.C.: Lid - Stuurgroep Studiesucces 2.0 UvA.
Gorter, R.C.: Lid - Kennisplatform Ergonomie in de Mondzorg KEM.
Gorter, R.C.: Lid - Overleg Portefeuillehouders en Directeuren Onderwijs VU.
Gorter, R.C.: Lid - Stuurgroep Blended Learning UvA.
Gorter, R.C.: Lid - Universitaire Commissie Onderwijs, UvA.
Krom, B.P.: Board member - KNVM, section General and Molecular Microbiology.
Özok, A.R.: Member – Richtlijn commissie NVvE.
Rozema, F.R.: Voorzitter - Vereniging Medisch Tandheelkundige Interactie.
Schreuder, W.H.: Lid - PAOK commissie NVMKA.
Shemesh, H.: Member – Richtlijn commissie NVvE.
II. Societal relevance for the dental professional internationally

Professional functions internationally

Brand, H.S.: Co-opted member - Association of Basic Science Teachers in Dentistry.
Danser, M.M.: Member - European projects committee of the EFP.
Raber-Durlacher, J.E.: Member - Advisory Board, MASCC/ISOO Mucositis Study Group.
Rozema, F.R.: Chair - IT advisory committee IAOMS.
Shemesh, H.: Membership committee – European Society of Endodontology (ESE).

Invited speakers at international professional congresses or symposia


III. Contacts with the general public

Interactions with the press and the general public

Bikker, F.J. (2017, August 15). Vertelt een kauwgomje ons straks of we een ontsteking hebben. Interview NOS.


Danser, M.M. (2017, May 16). European Gum health day, ACTA, Amsterdam, NL.


De Jongh, A. (2017, June 2). Iedereen dezelfde glimlach! Interview door Boris Lemereis, NRC.


Eijkman, M.A.J. (2017, August 11). Ik leerde dat je moet luisteren met je ogen. Interview door Jannetje Koelewyn, NRC.


Teeuw, W.J. (2017, May 16). European Gum health day, ACTA, Amsterdam, NL.


Zaura, E. (2017, May 9). The relevance of a healthy oral ecosystem. Two lectures given to the participants of the Health Ambassadors Programme: De Gezonde Mond. Hogeschool van Amsterdam, Amsterdam New West, NL.
Zaura, E. (2017, October 2). The role of microbial symbionts on our wellbeing. Genootschap ter bevordering van Natuur-, Genes- en Heelkunde, Amsterdam, NL.

Impact of the research on the general public or professionals
The department of Preventive Dentistry carries out several projects in the Netherlands and abroad for the oral health of people with a social disadvantage and/or mild intellectual disability. Patients referred to the Cariology clinic by their dentist are seen and advised.
The department of Oral Biochemistry sold the licence of PHS patent to Bioclin B.V. for 250K€/5 years.
The guidelines for diagnosis and treatment of patients have been adopted by the Dutch association for Oral and Maxillofacial Surgery (Nederlandse Vereniging voor Mondziekten, Kaak- en Aangezichtschirurgie, NVMKA and KIMO)
Oral Regenerative Medicine

Program Leaders

Prof.dr. D. Wismeijer
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Full professors

A.G. Becking  C.M. ten Bruggenkate  V. Everts  A.J. Feilzer  T. Forouzanfar
S. Gibbs  J. Klein-Nulend  J. de Lange  F. Lobbezoo  F.J.M. Roeters
E.A.J.M. Schulten  P.F. van der Stelt  D.B. Tuinzing  N. de Vries  A. Zentner

Introduction

ACTA’s research program “Oral Regenerative Medicine” (ORM) focuses on improving the quality of life of patients with medical problems related to the maxillofacial area. Within this scope we have defined a long-term aim to regenerate parts of the masticatory system, e.g. teeth, jaw bone, joints, muscles, nerves, and mucosa. Since this dot on the horizon is far away we also develop intermediate solutions, such as implants and restoratives. We aim to develop innovative methodologies for bone regeneration and transplantation, tooth
ORM is a multi-disciplinary research program combining the expertise from the departments of Oral Kinesiology (OKI), Oral Implantology and Prosthodontics (IMP), Dental Materials Sciences (DMS), Oral Cell Biology and Functional Anatomy (OCB/FA), Oral Radiology (ORA), Orthodontics (ORT) and Oral and Maxillofacial Surgery (OMS), the latter being embedded in Amsterdam UMC (locations Academic Medical Center (AMC) and VU University Medical Center (VUmc)). ORM is one of the two research priority areas (“zwaartepunt”) of ACTA. As implied above, a healthy oral system is characterized not only by the absence of infection and inflammation of dental and periodontal tissues, but also by a healthy musculoskeletal system and oral mucosa. Musculoskeletal tissues (bone, cartilage, muscles, and joints) and mucosa (epithelium and underlying connective tissue) can be damaged or even destroyed by, for example, mechanical overloading, disuse, disease or trauma. When tissues or organs are lost, their replacement or preferably their regeneration is needed to restore normal function as much as possible. ORM studies these processes both at a fundamental and translational level in a multidisciplinary setting, in which dentistry and oral medicine closely collaborate with medical disciplines like orthopaedics, neurology, dermatology and plastic surgery, both within and outside The Netherlands. The ultimate goal of oral regenerative medicine is to regenerate parts of the masticatory system, e.g.: teeth, jaw bone and mucosa.

Research objectives

A. Regeneration of jaw bone and oral mucosa

The focus lies in investigating how (stem) cells and biomaterials can be used to stimulate growth and repair of tissues and organs. Human adipose stem cells and fibroblasts are combined with matrix materials such as fibrin and calcium phosphate, and the influence of growth factors on these bone substitutes are studied with the aim of regenerating bone tissue. The combination of these clinically relevant materials with cells is giving very promising results. Furthermore, major steps are being made in the development of 3D techniques, like scanning, planning, milling, and printing of crowns, dental implants, and cranio- and maxillofacial defects. New ceramics, e.g. zirconia and lithium disilicate, which are biocompatible alternatives for metals, have been thoroughly evaluated. New clinical procedures are investigated for the production of patient-specific medical devices using computer-guided placement with the aim to make the procedures time-saving, more predictable and more patient friendly.

B. Tissue response of the host to implant materials and restoratives

Clinical studies from ORM focus on adverse reactions to metals present in dental medical devices, e.g. nickel, palladium, titanium. Major efforts are being put into the development of improved diagnostic tools. A new patch test palladium salt has been implemented internationally for diagnosing palladium allergy. ORM has developed unique tissue-engineered immune-competent skin and mucosa equivalents with integrated immune cells (Langerhans Cells) in order to investigate human innate immune responses. Most recent advancements include incorporation of commensal and pathogenic multi-species biofilm onto the model to increase physiological relevance even further. These human organotypic models can be used in risk assessment for medical devices and are valid alternatives for animal tests in full compliance with the European 3Rs principles.

C. Gaining in depth knowledge of pain, trauma and dysfunction of the masticatory system

The ORM program has a 3Rs principles assessment for medical devices and are valid alternatives for animal tests in full compliance with the European regulatory requirements. Major efforts have been made in the development of 3D techniques, like scanning, planning, milling, and printing of crowns, dental implants, and cranio- and maxillofacial defects. New ceramics, e.g. zirconia and lithium disilicate, which are biocompatible alternatives for metals, have been thoroughly evaluated. New clinical procedures are investigated for the production of patient-specific medical devices using computer-guided placement with the aim to make the procedures time-saving, more predictable and more patient friendly.

Results obtained

- The static, mechanical and fatigue properties of the dental CAD-CAM materials zirconia and lithium disilicate with respect to pre-treatment procedures and cementation have been determined.
- The immunostimulatory capacity of sensitizers in dental casting alloys has been investigated with regards to potential adverse effects of metals and leachables released from dental implants and restorations.
- An in vitro model for bone implant loosening has been developed, allowing analysis of biophysical and biological parameters contributing to mechanical instability-induced osteoclast differentiation and peri-implant bone loss. MLO-Y4-osteocytes were mechanically stimulated for 1 h by fluid shear stress using regimes simulating supra-physiological loading in the peri-prosthetic interface or physiologic loading in
the cortical bone, or stress shielding. The in vitro model recapitulated the catabolic biological situation in the peri-prosthetic interface during instability that is associated with osteoclast differentiation and enhanced RANKL expression. The model thus provides a platform for pre-clinical testing of pharmacological interventions with potential to stop instability-induced bone implant loosening.

- Cryotherapy is successfully used in the clinic to reduce pain and inflammation after musculoskeletal damage, and might prevent secondary tissue damage under the prevalent hypoxic conditions. Whether cryotherapy reduces mesenchymal stem cell (MSC) number and differentiation under hypoxic conditions, causing impaired callus formation is unknown. Our results implicate that hypothermia treatment in vivo, applied to alleviate pain and inflammation, is not likely to harm early stages of callus formation.

- Resin-based composites are used for bone repair applications and comprise resin matrix and different sized filler particles. Nanometer-sized filler particles improve composite’s mechanical properties compared with micrometer-sized filler particles, but whether differences exist in the biological response to these composites is unknown. We observed different responses to mechanical loading of human adipose stem cells on composite with nanometer-sized and micrometer-sized filler particles, which might have important implications for bone tissue engineering.

- The microporosity of bone plays an important role in bone biology and bone mechanical quality. We explored the accuracy and reproducibility of nondestructive desktop μCT for 3D visualization and subsequent morphometric analysis of mouse cortical bone microporosity including the vascular canal network and osteocyte lacunae. The desktop μCT appeared to be a valuable tool to quantify the 3D characteristics of bone vascular canals as well as lacunae which can be applied to intact murine bones with high accuracy and reproducibility. Thus, μCT might be an important tool to improve our understanding of the physiological and biomechanical significance of these canicular and lacunar structure in cortical bone.

- A comparison was made between the mode of action of our advanced therapy medicinal product gingiva substitute and skin substitute in order to elucidate the superior wound healing potential of oral mucosa compared to skin. Both constructs have previously been used in pilot studies to close oral and skin wounds (surgical, chronic and burn). Furthermore, we identified oral fibroblast chemokine receptors CCR3 and CCR4 as potential wound healing targets.

- Dendritic cells migrating from healthy human oral mucosa biopsies were of an activated phenotype compared to those migrating from skin biopsies indicating that the oral cavity is primed in steady state to counteract pathogens. Also, saliva-derived host defence peptides histatin 1 and IL-37 increased secretion of antimicrobial skin and oral mucosa chemokine CCL20 in an IL-1alpha-independent manner. Saliva-derived commensal biofilms stimulated innate immune responses whereas pathogenic biofilms show immune evasion in the human organotypic gingiva model.

- A randomized controlled trial on the effects of a mandibular advancement device, continuous positive airway pressure, and a placebo on obstructive sleep apnea (OSA) showed that all treatment modalities resulted in the same improvements in associated psychological distress as well as in sleep disorders. In addition, positive effects were suggested of bariatric surgery and upper airway stimulation on OSA.

- Orofacial pain and pathologies affecting the hard dental tissues were found to occur frequently in older people with dementia. Individuals with Alzheimer’s dementia indicate a reduced pain experience as compared to controls, while the opposite was observed for individuals with vascular dementia. For the assessment of pain in dementia, the Dutch version of a new, universal tool was tested for its content validity.

- Patients who received a juvenile arthritis diagnosis at a young age and in combination with early physical limitations are at increased risk of long-term degeneration of the temporomandibular joint (TMJ) and impaired mobility. In addition, TMJ pain was observed in about 10% of patients with newly diagnosed rheumatoid arthritis; higher disease activity is a risk factor for this occurrence. Finally, the association between TM disorders (TMD) and headache was found to be confounded by bruxism.

- Experimental studies have shown that experimental TMD pain (delayed-onset muscle soreness, DOMS) does not influence the time intervals between sleep bruxism (SB) episodes. In addition, DOMS does not influence occlusal sensitivity or mandibular position sense.

- TMD pain did not show linear associations with polysomnographically established SB and psychological stress, suggesting the role of other, possibly as yet unknown factors. Similarly, psychological distress does not influence the association between self-reported bruxism and TMD pain. Finally, a series of studies was performed focusing on SB in children, in which it was show that, amongst others, neither parental report nor electromyography correlated with the gold-standard polysomnographic assessment of SB.
A study regarding the effects of aging of condylar cartilage in the temporomandibular joint revealed that despite a hardly affected stiffness, its possibilities for nutrition by diffusion considerably decreased with age.

Together with other departments in VUmc, the department of Oral and Maxillofacial Surgery (OMS), has installed a laboratory for stem cell technology and nanotechnology.

### Academic personnel in 2017

#### Research staff ACTA – ORM Oral Regenerative Medicine

(in full time equivalents)

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### PhD students

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**Total non tenured staff**: 20,60

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**total 2nd funding**: 3,35 2

**total 3rd funding**: 11,15 3

**Total research staff**: 32,65

### Output

#### Dissertations


Scientific publications (referred)  


Cao, Y., Jansen, I.D.C., Sprangers, S., de Vries, T.J. & Everts, V. (2017). TNF-α has both stimulatory and inhibitory effects on mouse monocyte-derived osteoclastogenesis. Journal of Cellular Physiology, vol 232, no. 12, pp. 3273-3285. DOI: 10.1002/jcp.26024

70


Di Girolamo, N. & Meursinge Reyners, R. (2017). Health care articles with simple and declarative titles were more likely to be in the Altmetric Top 100. Journal of Clinical Epidemiology, vol 85, pp. 32-36. DOI: 10.1016/j.jclinepi.2016.11.018


Other scientific publications


Frankenmolen, F.W.A. & Baart, J.A. (2017). Local anaesthesia for children. in J.A. Baart & H.S. Brand (eds), Local anaesthesia in dentistry. 2 edn, Springer, Cham, pp. 125-146. DOI: 10.1007/978-3-319-43705-7_9


Van den Akker, H.P. & Baart, J.A. (2017). Local complications. in J.A. Baart & H.S. Brand (eds), Local anaesthesia in dentistry. 2 edn, Springer, Cham, pp. 147-159. DOI: 10.1007/978-3-319-43705-7_10


Professional publications


Nascholingtijdschrift voor Tandartsen, vol 12, no. 6. pp. 39-44.


Nascholingtijdschrift voor Mondhygiënenisten, vol 10, no. 1. pp. 30-34.


Nascholingtijdschrift voor Tandartsen, vol 12, no. 5. pp. 30-35.


Patents

Grants: current projects with external funding
GSK
Chen, H. van der Stelt, P.F. Lobbezoo F., de Lange, J. & Aarab, G. Use of Cone Beam Computerized Tomography (CBCT) for the diagnosis of obstructive sleep apnea. Grant China Scholarship Council (CSC), PhD project financially supported during 4 years, project number 530-5CDP12, granted: €26.700,00.- (2013, October 01 - 2017, October 31).
Everts, V., van Lenthe, G.H., Koolstra, J.H. & Lobbezoo, F. Biomechanical changes in articulation of the jaw joint due to aging. MOVE-Age project, granted: €129.000,- (2014, October 01 - 2017, October 01).


Helder, M.N., & Klein-Nulend, J. Hard tissue production using tissue engineering and adipose stem cell technology for large bone defects. Iranian research council/University of Teheran, granted: € 200,000,- (2013, January 01 – 2019, December 31).


Klein Nulend, J., Bravenboer, N. & Bakker, A.D. Mechanosensitivity of osteocytes embedded in their native matrix. China Scholarship Council (CSC) grant to C. Zhang, 1 fte PhD student, 4 years, (2017, January 01 - 2022, December 31).


Scherder, E.J.A. & Lobbezoo, F. Diagnostiek en behandeling van pijn bij mensen met een dementia die thuis wonen of in het verpleeghuis zijn opgenomen. F. Lobbezoo responsible for the dental part of this project which equals approx. 1/3 of the total amount granted: €126,667,– NutsOHRA, RCOAO, SBOH, Henriëtte Hofje as sources for the funding of three PhD projects (NutsOHRA €150.000,–; RCOAO €160.000,–; Henriëtte Hofje €40.000,–; Alzheimer Nederland €30.000,–; total = €380.000,– (2012, January 01 - 2017, December 31).


Wang, T. TOPPER project: Treatment of periodontal disease, prosthodontics evaluated by oral radiology,. Grant China Scholarship Council (CSC) for PhD program during 4 years, granted: €57.600,00. (2016, September 01 - 2020, November 1).


Wismeijer, D. & Evans, C. Evaluating CAD CAM zirconium implant crowns (together with Chris Evans (Sydney AUS), ITI grant, €30.000,–, (2015, January 01-2020, December 31).

Wismeijer, D. & Gorter, R.C. Digital dentistry in practice; On dentists’ interaction with technological transformations. ITI research grant 123.821 CHF (2012, January 01- 2017, December 31).


Wismeijer, D. Comparing the immediate loading (within 48 hours) of two interconnected implants with an overdenture to the immediate loading of 4 Mini Dental implants and an overdenture in a randomized controlled clinical trial. Granted €22.000,– (2012, January 01- 2017, December 31).


Wu, G. FGF and Wnt synergistically enhanced the signal pathway of bone formation induced by low dose BMP. Young researcher program, National Natural Science Foundation of No.2017/81600844), granted: €22.600. - (2017, January 01- 2019, December 31).


Wu, G. Study on the prefabrication of customized tissue-engineered bone by 3D printed scaffold with bidirectional effective osteogenesis and angiogenesis for large-volume jaw defect reconstruction. The General Program of National Natural Science Foundation of China (No.2017/81671029), granted €78.600.- (2017, January 01- 2020, December 31).


Wu, G. The signaling pathway and molecular mechanism for the antioxidative and osteogenesis promoting effects of Notoginsenoside R1. The General Program of Zhejiang Provincial Natural Science Foundation of China (No. LY17H140010), granted: €15,000.- (2017, January 01- 2019, December 31).

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Indicators of Esteem

Editorship book


Memberships editorial board
Aarab, G.: Journal of Dental Sleep Medicine.
Bakker, A.D.: Odontology.
De Vries, N.: The Open Otorhinolaryngology Journal (TOOTORJ).
Hoekema, A.: Sleep & Breathing.
Klein Nulend, J.: Current Osteoporosis Reports (section Osteocytes).
Klein Nulend, J.: Stem Cells International (special issue: Bone microenvironment, stem cells, and bone tissue regeneration).
Koolstra, J.H.: Applied Bionics and Biomechanics
Lobbezoo, F.: Journal of Craniomandibular Function.
Lobbezoo, F.: Journal of Dental Sleep Medicine.
Van der Stelt, P.F.: Clinical Oral Implants Research.
Van der Stelt, P.F.: Dentomaxillofacial Radiology.
Van der Stelt, P.F.: Journal of Dentistry Shiraz University of Medical Sciences.
Wismeijer, D.: Journal of Functional Biomaterials, a special issue on 3D Printing for Biomaterials.

Scientific awards/honours
Lobbezoo, F. (2017, October 21). Thuréus prize 2017. Faculty of Medicine, University of Umeå, Sweden.

Organization of (inter)national scientific congresses and symposia


Wismeijer, D. (2017, May 4-6). Chairman scientific program committee. ITI world symposium: Key factors for long term success, Basel, Switzerland.

Wismeijer, D. (2017, October 5-7). Member scientific program committee. 26th annual meeting of the EAO, Madrid, Spain.

Invited speakers at (inter)national congresses or symposia

Aarab, G. (2017, March 1). Dental management of OSA. Scientific meeting, Shandong University, Jinan, China.


De Vries, N. (2017, April 6-8). Upper airway surgery in obstructive sleep apnoea: can we rely on the current evidence? 4th Sleep and Breathing Conference, Sleep and Breathing Marseille, France.


Dubois, L. (2017, March 30). Biomaterials in orbital reconstruction and how they influence our daily practice. SOG preconference course ICOMS 2017, Hong Kong, China.


Uniken Venema, J.A.M. (2017, June 2-4). Dental side-effects of long-term obstructive sleep apnea therapy: a 10 year follow-up study. Annual meeting American Academy of Dental Sleep Medicine, Boston, USA.

Van der Stelt, P.F. (2017, April 26-29). 3D analysis of CBCT datasets of the upper airway to understand breathing disorders. 21st IADMFR/TAOMFR 2017 World Congress, Kaohsiung, Taiwan.


Wetselaar, P. (2017, April 10). Dental sleep disorders. Scientific meeting, Shandong University, Jinan, China.


Other (inter)national scientific functions

Aarab, G.: Member of research committee - Dutch Society of Dental Sleep Medicine (NVTS).
Aarab, G.: Member research committee - American Academy of Dental Sleep Medicine (AADSM).
Baggen, J.H.M.: Member research committee - Nederlandse Vereniging Tandheelkundige Slaapgeneeskunde (NVTS).
Bakker, A.D.: Board member - Nederlandse Vereniging voor Calcium en Botstofwisseling.
Bakker, A.D.: Leader - Theme 1 Trauma & Reconstruction in Program 3 Restoration & Development, Amsterdam Movement Sciences.
Becking, A.G.: President – SORG.
De Lange, J.: Chairman - SORG trauma section.
De Vries, N.: Consultant - AE Mann Foundation.
De Vries, N.: Consultant - Olympus.
De Vries, N.: Consultant - Philips Health care.
De Vries, N.: Member - Medical Advisory Board Night Balance.
De Vries, N.: Member - Medical Advisory Board Recent.
De Vries, N.: Member - Medische Advies Raad Apneu Vereniging.
Gibbs, S.: Board member - Dutch Society for Experimental Dermatology.
Gibbs, S.: Jury member - ZonMw MKMD.
Gibbs, S.: Member European Research Group for Experimental Contact Dermatitis (ERGECD).
Helder, M.N.: Board member - International Federation of Adipose Therapeutics and Science.
Hoekema, A.: Member research committee - American Academy for Dental Sleep Medicine (AADSM).
Hoekema, A.: Member steering committee - Oral Appliance Network for Global Effectiveness (ORANGE Registry).
Hoekema, A.: Member steering committee - OSAS richtlijn, Kennisinstituut Medisch specialisten, Utrecht, NL.
Hoekema, A.: President - Nederlandse Vereniging voor Tandheelkundige Slaapgeneeskunde (NVTS).
Klein Nulend, J.: Board member - American Society for Bone and Mineral Research (ASBMR), Women in Bone and Mineral Research Committee, USA.
Klein Nulend, J.: External Professor - San Carlos University, Dept. Physics, Cebu City, Philippines.
Klein Nulend, J.: Member Scientific Board - Department of Regenerative Medicine, Research Centre for New Technologies in Life Science Engineering, University of Tehran, Iran.
Klein Nulend, J.: Referee Panel Member - Research Council of Norway for independent research projects in Mathematics, Physical Science and Technology (FRINATEK)/Medicine, Health Sciences and Biology (FRIMEDBIO), 16-17 Oct, 2017.
Koutris, M.: Chair scientific committee - European Academy of Orofacial Pain and Dysfunction (EAOPD).
Koutris, M.: Council Member (Greek National Representative) - European Academy of Craniofacial Disorders (EACD).
Koutris, M.: Secretary/Treasurer - International RDC/TMD Consortium Network, IADR.
Kramer, G.J.C.: Chair - Wetenschap-en Accreditatiecommissie NVvO.
Kuitert, R.B.: Honorary member - Richtlijncommissie NVVO.
Lobbezoo, F.: Chair - Nederlandsch Tandheelkundig Genootschap (NTG) Dutch Dental Society.
Lobbezoo, F.: Past President - International RDC/TMD Consortium Network, IADR.
Lobbezoo, F.: Senior member - Society of Oral Physiology (Store Kro Club).
Muzalev, K.S.: Council member (Russian National Representative) - European Academy of Craniofacial Disorders (EACD).
Prahl, C.: Member – NVOS.
Van Westing, K.: Member - Richtlijncommissie NVVO.
Wismeijer, D.: Chairman - ITI Education Committee ITI.
Wismeijer, D.: External examiner - MSc Curriculum Implant Dentistry, University of Hong Kong, China.
Wismeijer, D.: Visiting professor - University of Belgrade, Dental School.
Wolff, J.E.H.: Granted the title of Docent - University of Tampere, Finland.
Wu, G.: Visiting professor - Guangzhou Medical University, China.
Wu, G.: Visiting professor - Wenzhou Medical University, China.

Supervisor of an external PhD student

Collaborations
- Amsterdam Rheumatology and Immunology Center, Reade, prof.dr. D. van Schaardenburg, Amsterdam, NL.
- Amsterdam University of Applied Sciences, prof. dr. R. Engelbert, Amsterdam, NL.
- Ankara University, Department of Dentomaxillofacial Radiology, Faculty of Dentistry, Ankara, Turkey. prof. K. Kamburoglu.
- AvL/NKI.
- Boerhave Kliniek, Afdeling Klinische Neurophysiologie, dr. H.L. Hamburger, Amsterdam, NL.
- Cipto Mangukuusumo Hospital, Jakarta, Republic of Indonesia.
- Department of Otorhinolaryngology, VUmc.
- Department of Pathology, VUmc.
- Dr. A. Fahlgren, Department of Clinical and Experimental Medicine, Division of Cell Biology, Linköping University, Linköping, Östergötland, Sweden.
- Dr. G. Pals, VUMC, Amsterdam, NL.
- Dr. N. Bravenboer, prof.dr. W.F. Lems, VUMC, Amsterdam, NL.
- Dr. P.A. Nolte, Spaarne Hospital Hoofddorp, Dept. Orthopaedics, Heemstede, NL.
- Dr. R.T. Jaspers, AMS, VUA, Amsterdam, NL.
- E. Corsini, Università degli Studi di Milano, Milan, Italy.
- E. Roggen, 3Rs Management and Consultancy, Denmark.
- Ege University, Faculty of Medicine, Center for Brain Research & Department of Physiology, prof.dr. K. Türker, Bornova, Izmir, Turkey.
- Erasmus MC.
- Faculty of Behavioral Sciences, VU.
- Guangzhou Medical University, China.
- Harvard School of Dental Medicine, Boston, USA.
- ISALA, Zwolle.
- Leiden University Medical Center (LUMC), Department of Public Health and Primary Care (PHEG), prof.dr. W.P. Achterberg, Leiden, NL.
- Massachusetts General Hospital, Boston, USA.
- National Institutes of Health, Washington DC, USA.
- New York University Dental College, prof. dr. K.G. Raphael, New York, NY, USA.
- Newcastle University, Centre for Oral Health Research & Institute of Health and Society, Newcastle-upon-Tyne Hospitals NHS Foundation Trust, prof.dr. J. Durham, Newcastle-upon-Tyne, UK.
- OLVG.
- Prof.dr. E. Peterman, VU: Atomic force spectroscopy.
- Prof.dr. G. Amoabediny, University of Theran, Theran, Iran.
- Prof.dr. H. Kamioka, Okayama University, Dept. Orthodontics, Okayama, Japan.
- Prof.dr. H. van Lenthe, KU Leuven, Belgium.
- Prof.dr. L. Delidique, dr. R. Manders, prof. P. Hespels, Leuven.
- Prof.dr. P. Jonkheijm, Twente University.
- Prof.dr. R.G. Bacabac, San Carlos University, Cebu City, Philippines.
- Prof.dr.ir. Th.H. Smit, AMC, Amsterdam, NL.
- R. Monge, BeOnChip, Spain (Eurostars).
- Radboud UMC, Nijmegen.
- Radboudumc, Department of Dentistry, dr. B. Loomans, Nijmegen, NL.
- Radboudumc, IQ-healthcare, prof.dr. R. Nijhuis, Nijmegen, NL.
- S. de Moraes Barros , Sao Paulo University, Brazil.
- S. Monstrey, Ghent University hospital, Belgium.
- School of interdisciplinary dentistry, Vienna medical faculty, Austria.
- Shandong University, Department of Orthodontics, Faculty of Dentistry, Jinan, China, prof. Jing Guo.
- TNO Life Style - Behavioral and Societal Sciences, dr. E. Vermaere and dr. A.A. Schuller, Leiden, NL.
- TU, Delft.
- UMCG, Groningen.
- Universitat International Catalunya, Barcelona, Spain.
- Universiteit Zurich, MKG.
- University at Buffalo, Department of Oral Diagnostic Sciences, dr. R. Ohrbach, Buffalo (NY), USA.
- University College of Dentistry, Department of Biomedical Sciences, dr. E. Schneiderman, Dallas, Texas, United States of America.
- University Estadual Paulista (UNESP), Department of Dental Materials and Prosthodontics, prof.dr. D. Aparecida de Godoi Gonçalves, Araraquara School of Dentistry, Araraquara, Brasil.
- University Medical Center (UMC) Utrecht, dr. C.M. Speksnijder, Utrecht, NL.
- University of Aarhus, Department of Orofacial Pain and Jaw Function, prof.dr. P. Svensson, Aarhus, Denmark.
- University of Adelaide, School of Dentistry, prof.dr. G.C. Townsend, Adelaide, Australia.
- University of Antwerp, Faculty of Medicine and Health Sciences, Department of Rehabilitation Sciences and Physiotherapy, dr. W. de Hertogh, Antwerp, Belgium.
- University of Athens, Orofacial Pain Clinic, Dental School, National and Kapodistrian, dr. M. Tzakis, Emeritus prof. V. Droukas, Athens, Greece.
- University of Gothenburg, Institute of Odontology, Department of Behavioral and Community Dentistry, Sweden, dr. M. Hakeberg & dr. G. Jonasson.
- University of Helsinki, Department of Stomatognathic Physiology & Prosthetic Dentistry, dr. J. Ahlberg, Helsinki, Finland.
- University of Minnesota, School of Dentistry, Department of Diagnostic and Biological Sciences, Division of Temporomandibular Joint Disorder and Orofacial Pain, Assoc. prof. D. Nixdorf, USA.
- University of Montreal. Faculty of Dentistry, prof.dr. Gilles Lavigne, Montreal, PQ, Canada.
- University of Naples Federico II, Department of Neurosciences, Reproductive and Oral Sciences, Section of Orthodontics and Temporomandibular Disorders, prof.dr. A. Michelotti, Naples, Italy.
- University of Padova, TMD Clinic, prof.dr. D. Manfredini, Padova, Italy.
- University of Shandong, Department of Stomatology, prof.dr. J. Guo, Jinan, China.
- University of Tel Aviv, Department of Oral Rehabilitation, The Maurice and Gabriela Goldschleger School of Dental Medicine, prof.dr. E. Winocur, Tel Aviv, Israel.
- University of Umea, Faculty of Medicine, department of Clinical Oral Physiology, prof.dr. A. Wännman, Umea, Sweden.
- University of Washington Medical Center, Dept. of OMSF, Seattle.
- Vrije Universiteit, Department of Clinical Neuropsychology, prof.dr. E.J.A. Scherder, Amsterdam, NL.
- Vrije Universiteit, Nederlands Tweelingen Register (NTR), prof.dr. D.I. Boomsma, Amsterdam, NL.
- VU University Medical Center Amsterdam, Department of General Practice & Elderly Care Medicine, prof.dr. C.M.P.M. Hertogh, Amsterdam, NL.
- VU University Medical Centre Amsterdam, Department of Anesthesiology, EMGO+ Institute for Health and Care Research, prof.dr. R.S. Perez, Amsterdam, NL. (e.g. Perez died in 2017).
- Wenzhou Medical University, China.

Current PhD projects


Annual Research Report 2017


Societal impact
ORM is developing products to enable innovative use of stem cells and relevant scaffold materials in oral surgical procedures; these bone constructs will be further developed for clinical use. Furthermore, ORM has developed a bruxism management tool for practicing dentists, which improves patient care in clinical dentistry. ORM’s research on the adverse reactions of dental materials, including allergies, and the ability to bring this research to the attention of the dental industry and practicing dentists, has had a considerable impact on product development within the dental industry and will eventually lead to improvements in public dental health. The human organotypic bone, skin, and mucosa models, which can be used in risk assessment for medical devices as alternatives for animal tests (Replacement, Reduction and Refinement (3Rs)) will have an increasingly larger societal impact. These unique models are already gaining attention from industry and manufactures of medical devices, and may be implemented into the new ISO standard for bio-safety in the future. Multinationals and SMEs are involved in active research collaborations in national and European funded projects like STW and Eurostars. All of these projects aim to develop market ready products. ORM researchers actively reach out to the relevant professionals by means of courses and congresses for professionals.

The societal impact of the clinical research on oral and maxillofacial surgery is focussed on the influence on patient care, both within the department and externally. Research contributes to improved treatment of relevant patient groups.

The societal impact of the scientific merits of the section of Oral Kinesiology is expressed by the various post-academic courses organized and large amount of lectures provided for professionals, including dentists, oral hygienists, physical therapists and dental assistants. Research in the field of Oral Kinesiology contributes to improved diagnosis and treatment of patients with orofacial pain, movement disorders and sleep apnea.

Several staff members of Oral Radiology are involved in committees of professional organizations and advice the government on radiation protection and the use of radiology in dentistry. The entire staff of the section provides continuing education for dentists, dental hygienists and dental assistants.

I. Societal relevance for the dental professional in the Netherlands
Courses organized for Dutch dental and medical professionals
Berkhout, W.E.R. (2017, February 16; March 16; June 29; August 4; September 28; October 26; November 9). Stralingshygiënisch Gekwalificeerd Beroepsbeoefenaar – tandheelkunde.

Berkhout, W.E.R. (2017, May 12; June 9; September 29; October 20; November; December 15). Stralingshygiënisch Gekwalificeerd Beroepsbeoefenaar m.b.t. CBCT.


Hoogeveen, R.C. (2017, February 16; June 29; September 28). Stralingshygiënisch Gekwalificeerd Beroepsbeoefenaar m.b.t. CBCT.

Lectures given during courses for Dutch dental and medical professionals


Baggen J.H.M. (2017, February 14). Aangezichtspijn, Vervolgopleiding tot huisarts (VOHA), RadboudUMC, Nijmegen, NL.


Baggen, J.H.M. & van de Rijt, P. (2017, November 2 & 9). Een blik op het aangezicht, Werkgroep Deskundigheidsbevordering Huisartsen (WDH), Baarlo, NL.


Hoekema, A. (2017, October 11). Gnathologie en MFP, Iqual groep Nijmegen, NL.

Hoekema, A. (2017, November 11). Objective compliance with oral appliance therapy versus CPAP in moderate obstructive sleep apnea. 231e vergadering NVKNO, Nieuwegein, NL.


Koutris, M. (2017, June 9). Neuropathic pain. Tandarts Endodontologen Nederland (TEN), Amsterdam, NL.


Hoekema, A. (2017, October 5). OSAS; Achtergronden, diagnostiek & therapie. KIO-cursus Schisis & Orthognatische chirurgie, Nijmegen, NL.

Hoekema, A. (2017, October 10). Mini-OSAS cursus, Leiderdorp, NL.

Hoekema, A. (2017, November 11). Objective compliance with oral appliance therapy versus CPAP in moderate obstructive sleep apnea. 231e vergadering NVKNO, Nieuwegein, NL.


Koutris, M. (2017, June 9). Neuropathic pain. Tandarts Endodontologen Nederland (TEN), Amsterdam, NL.


Tandheelkunde. Utrecht, NL.


Organization of congresses and symposia for professionals in the Netherlands

Bakker, A.D. (2017, November 9-10). Organizer. Najaarsvergadering Nederlandse Vereniging voor Calcium en Botstofwisseling, samen met de botgroep van de Nederlandse Vereniging voor Endocrinologie, Zeist, NL.


Gimenez Gonzalez, B. (2017 July). Coordinator Consensus meeting Campus BOPT technique in Padua, Italy.

Gimenez Gonzalez, B. (2017, December 8). Member organizing committee & moderator. NVGPT Jaarcongres: 3D Aan de slag er mee, Ermelo, NL.


Invited speakers at professional congresses or symposia in the Netherlands

Baart, J.A. (2017, June 7). Hij die zonder zonde is..... NWVT, Amsterdam, NL.


Becking, A.G. (2017, October 25). 1. Assessment and correction of the zygoma. 2. Assessment and correction of the chin. AMC International rhinoplasty course, Amsterdam, NL.


De Lange, J. (2017, April 22-23). Collum mandibula fracturen en complexe mandibula fracturen. KIO cursus, AMC, Amsterdam, NL.


De Vries, N. (2017, May 30). MRA vs positietherapie trial: 3 en 12 maanden resultaten. OSA up to date, Arnhem, NL.


Dubois, L. (2017 February 20). Aangezichtstraumatologie 2.0, opvang, behandeling & innovaties, Masterclass Aangezichtstraumatologie, VCMS, Amsterdam, NL.


Dubois, L. (2017 May 17). Tandletsel, refereeravond op de grens: van tandheelkunde naar kaakchirurgie. ACTA, Amsterdam, NL.


Gimenez Gonzalez, B. (2017, December 8). Intra oral scanners. NVGPT Jaarcongres: 3D Aan de slag er mee, Ermelo, NL.


Visscher, C.M. (2017, April 6). Diagnosis and treatment of TMD related headache. Symposium MSG Science Network Fysiotherapie. VU, Amsterdam, NL.


Wetselaar, P. (2017, September 15/23 & October 5). Gebitsluitage, diagnostiek. Dental Design Academy Martijn Molkenaar, Blaricum, NL.

Professional functions in the Netherlands

Baart, J.A.: Lid bestuur – NWVT.
Baart, J.A.: Voorzitter - WTA cie NWVT.
Baart, J.A.: Voorzitter - WTA leesie (Hamer-Duyvenszprijz).
Becking, A.G.: Lid - Commissie onderzoek en aanbeveling, NVMKA.
Becking, A.G.: Lid - Concilium Chirurgicum Oris
Becking, A.G.: Lid - stipendium commissie BOOA research grant, NVMKA
Berkhout, W.E.R.: Member - Raad van Commissarissen Nederlands Tijdschrift voor Tandheelkunde.
Berkhout, W.E.R.: Member - Redactieadviesraad ACTA QP.
De Lange, J.: Lid - Capaciteitsorgaan.
De Lange, J.: Lid - CKC KNMT.
De Lange, J.: Lid - COK.
De Lange, J.: Lid - Consilium Chirurgicum Oris (CCO).
De Lange, J.: Voorzitter - CTS.
De Lange, J.: Voorzitter – NVMKA.
Disse, M.A.: Dutch representative/member – Efosa.
Disse, M.A.: Member - Amsterdam Cleft Lip and Palate team, location VUMC/ACTA.
Disse, M.A.: Vice-president – RTS.
Dubois, L.: Chef de kliniek – WPM.
Dubois, L.: Lid - Coördinatie Commissie Traumatologie AMC.
Dubois, L.: Lid - Expertise team divisie chirurgie.
Dubois, L.: Lid - KLS Martin expertise group Osteosynthesis.
Dubois, L.: Lid - Richtlijn spoedoperaties kwaliteitsinstituut medisch specialisten (NVH).
Dubois, L.: Lid - SORG Trauma sectie.
Dubois, L.: Secretaris - Stichting Bridge the Gap, NOMA en schisis team.
Gimenez Gonzalez, B.: Board member - Spanish Society of Aesthetic and Prosthetic dentistry (SEPES).
Goené, R.J.: Lid - Raad van Advies NVOI.
Goené, R.J.: Voorzitter - Commissie Postacademisch Onderwijs Implantologie, NVOI.
Goené, R.J.: Voorzitter - Implantologie Overleg Commissie NVOI.
Kaaij, N.C.W. van der: Member - Schisis- & Craniofaciaal team Erasmus MC, Sophia kinderziekenhuis.
Koolstra, J.H.: Commissielid - Expertisegroep Onderwijs UvA.
Kramer, G.J.C.: Chair/secretary - Special interest group orthodontics NVSCA.
Kramer, G.J.C.: Gastlid - Schisisteam VUMc.
Kramer, G.J.C.: Lid - Wetenschappelijke commissie NVvO i.v.m. Van Loon prijs.
Kramer, G.J.C.: Voorzitter/secretaris - Overleg tandheelkundige specialismen NWZ.
Kuitert, R. B.: Member - Centraal College.
Kuitert, R.B.: Member - Concilium Orthodonticum.
II. Societal relevance for the dental professional internationally

Professional functions internationally

Becking, A.G.: Visiting surgeon - Cipto Mangukusumo Hospital, Jakarta, Republic of Indonesia.
De Lange, J.: Faculty member – AOCMF.
De Lange, J.: Faculty member - SORG/chairman trauma section.
De Lange, J.: Member - KLS Martin expertise group Osteosynthesis.
Dubois, L.: Member - KLS Martin expertise group Osteosynthesis.
Dubois, L.: Member - SORG Trauma sectie.
Koutris, M.: Board member - Greek Society of Orofacial Pain.
Koutris, M.: Member Governance Committee - RDC-TMD Consortium.
Visscher, C.M.: Board member - Physical Therapy Board of Craniofacial and Cervical Therapeutics (PTBCCT), USA.

Organization of international congresses and symposia for (health care) professionals


Invited speakers at international professional congresses or symposia

Aarab G. (2017, June 8-9). Associations between sleep bruxism and other sleep-related disorders. Annual meeting Swiss Dental Society, Bern, Switzerland.


Liu, Y. (2017, November 13-16). Osteoinductive bone substitute for tissue engineering: development, preclinical studies and production. Australia – China Centre for Tissue Engineering & Regenerative Medicine (ACCTERM) Research Forum Nanjing Stomatological Hospital, Medical School of Nanjing University.


Wismeijer, D. (2017, January 31). The industry at a tipping point. 3D dental printing conference, Maastricht, NL.


Wismeijer, D. (2017, August 13-18). 1. Digitisation in implant dentistry. 2. Additive or subtractive technologies in implant restorations. 3. Esthetics in implant dentistry. 9th Hong Kong ITI education week. Prins Philip Dental Hospital, Hong Kong, China.


Wismeijer, D. (2017, September 1). We know what we have but do we know what we are in for? Keynote speaker. ITI education day, Hotel Rydges Southbank, Brisbane, Australia.


Wismeijer, D. (2017, November 1). Implant planning, edentulous patients, peri implantitis. Course for Chinese dentists, ACTA, Amsterdam, NL.


Wismeijer, D. (2017, November 15). The history and development of dental impression taking. Webinar for Imetric, ACTA, Amsterdam, NL.


III. Contacts with the general public

Interactions with the press and the general public


Impact of the research on the general public or professionals

The guidelines for diagnosis and treatment of patients have been adopted by the Dutch association for Oral and Maxillofacial Surgery (Nederlandse Vereniging voor Mondzieken, Kaak- en Aangezichtschirurgie, NVMKA) and Apical Surgery (KIMO).
Education related research, including other research

Research on Dental Education
Associate dean of educational research and development
Dr. J.M. Vervoorn
Education Institute
ACTA, Gustav Mahlerlaan 3004
1081 LA Amsterdam
Tel: +31-20-5980438
E-mail: J.Vervoorn@acta.nl

Research objectives
In the ACTA faculty of Dentistry research is performed on several aspects of education in dentistry. This includes research on the evaluation of courses and performance of students within the curriculum, research on new teaching methods, development and evaluation of a computer aided digital teaching system creating a virtual learning environment including the application of haptics (the Simodont Dental Trainer). Also some projects are carried out on assessment of the safety of the learning environment and the effect of interventions.

The input of academic personnel is limited to staff of the educational institute, and to some members of the various departments. The research is not considered as a separate programme; however it is intended that this research will increase in the coming years.

Results
In 2017 again several experiments have been carried out with respect to choices in the development of the virtual dental trainer. It appeared that availability of force feedback (FFB) in a dental trainer is essential for good performance but some variance in FFB is acceptable for learning. Data on inter and intra observer reliability of assessment showed that including calibration in the workflow of an assessment procedure improved the reliability of the assessments till a certain extend, after that calibration did not further affect the interreliability. Students that were able to perform well in reality are also able to perform in VR; a longer learning curve in Reality does not seem to result in a longer learning curve in VR. Giving students freedom to decide on their testing moment for Manual Dexterity provides better result on these tests than when the test date is fixed by the school.

Academic personnel in 2017

<table>
<thead>
<tr>
<th>Position</th>
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<th>2017</th>
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<tbody>
<tr>
<td>Staff members education institute</td>
<td>Boer, dr. I.R. de</td>
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<td>Vervoorn, dr. J.M.</td>
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<td>Wesselink, prof.dr. P.R.</td>
<td>pm</td>
<td>guest</td>
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<td>PhD students</td>
<td>Bakker, drs. D.R.</td>
<td>pm</td>
<td>pm</td>
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<tr>
<td></td>
<td>Serrano Petrillo, dds. C.M.</td>
<td>pm</td>
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Output
Dissertations

Publications aimed at the general public
Scientific publications (refereed)

Indicators of Esteem

Organization of (inter)national congresses or symposia

Invited speakers at (inter)national congresses or symposia
Vervoorn, J.M. (2017, August 26-30). Simulation in Dental Education. AMEE, roundtable discussion, Helsinki, Finland.
Wesselink, P.R. (2017, August 24). Teaching and learning with virtual reality, from concept to reality. ADEE, Vilnius, Lithuania.

Other (inter)national scientific functions
Serrano Petrillo, C.: Chair - Working Group ADEE.
Vervoorn, J.M.: Chair - Simodont Forum ADEE and ADEA.
Vervoorn, J.M.: Chair - Special Interest Group (SIG): new and emerging technologies, ADEE.

Current PhD projects

Societal impact
The societal impact of the research and development is focused on the effect of learning behaviour on learning outcomes and on the implementation of new technologies in education. Also developments have an increased focus on improving safety of the learning experience. This involves in particular the developments of virtual exercise on a digital impression of the patient in advance of the actual clinical procedure using a computer aided digital learning environment (the Simodont dental trainer).

Contacts with the general public

Interactions with the press and the general public
## Appendix

List of SCI journals, their impact factors and the number of ACTA publications in 2017 in each journal

<table>
<thead>
<tr>
<th>Journal</th>
<th>IF</th>
<th>Number of publications</th>
<th>Journal</th>
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