Meeting Report

1st International Academy of Periodontology Research Conference (IAPRC)

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Introduction

The 1st International Academy of Periodontology Research Conference (IAPRC) was successfully held in Giessen, Germany from on October 2-4. The objectives of the IAPRC were: to examine the state of the art in periodontal research, to encourage new scientific collaborations and to develop new directions for research. Eighty-five invited delegates from 18 countries (Australia, Belgium, Brazil, Egypt, Finland Germany, Hong Kong, India, Israel, Japan, Netherlands, Romania, Spain, Sweden, Switzerland, Turkey, UK, and USA) attended this special research conference convened by the International Academy of Periodontology. The opening address was given by Professor DW Weidner (Dean of Medical Faculty of Giessen) and other welcoming remarks were given by Magda Feres (President of the IAP), Joerg Meyle (meeting convenor and local host) and Mark Bartold (meeting organizer). The meeting was dedicated to our late-colleagues Dr. Ricardo Teles and Dr. Steven Offenbacher, who unexpectedly passed away during the preparations of the conference. The dedications were made by Alpdogan Kantarci and Thomas Van Dyke.

The three-day program was very full. Three key note presentations by Robert Genco, Klaus Lang and Thomas Van Dyke provided insightful and thoughtful lectures covering in excess of a collective 150 years of periodontal research experience! Session chairs and session summary speakers were responsible for the successful running of each of the 6 scientific sessions involving 24 invited speakers. The format of the meeting was to share the latest perspectives in periodontal research covering a range of contemporary topics and the goal was to set the vision for periodontal research.

The IAP acknowledges the generous and critical support and principal sponsorship of this meeting by Colgate Palmolive. Additional funding was provided by Deutsche Forschungsgemeinschaft, DGparo (German Society of Periodontology) and von Behring-Röntgen foundation.

Program Overview and summary of key research directions

Keynote Lectures:

Chair: Ajay Kakar
Robert Genco: Are we at the end of the beginning - New frontiers for periodontology?
Chair: Lijian Jin
Niklaus Lang: The tooth the whole tooth and nothing but the tooth - retain it or implant it?
Chair: Vincent Iacono
Thomas Van Dyke: Is the Innate immune system the master controller of periodontal destruction?

Session 1. Host response and dysbiosis of the oral biofilm

Chair: Magda Feres
Session Summary Speaker: Denis Kinane
Host modulation of the microbiota: Luigi Nibali
Periodontal immunity in humans: Chris Cutler
Microbial dysbiosis and inflammation: George Hajishengallis
From microbial homeostasis to dysbiosis: Flavia Teles

Research Directions: Host response and dysbiosis of the oral biofilm

There is need to identify whether single or multiple pathogens are responsible for, or arise as a result of, the inflammation associated with periodontal diseases. How these bacteria interact with each other in the form of co-associations should be investigated. These studies should be carried out in the context of understanding dysbiotic biofilms and community wide changes and co-associations develop in both health and disease. The identification of "new" pathogens may be useful and, if identified, strategies should be developed to nullify them. Biofilms should be analyzed in both spatial and

temporal levels. Dysbiotic biofilms should be tested *ex vivo* to determine their disease causing capacity.

Session 2. Genetics, epigenetics and individual risk

Chair: Alpdogan Kantarci
Session Summary Speaker: Panos Papapanou
Genetic Studies: Arne Schaefer
"Implant-omics": Moritz Kebschull
Impact of dental implants on oral mucosal homeostasis and periodontal susceptibility to tissue destruction: Asaf Wilensky
Periodontics in the New Millennium: Maria Ryan

Research Directions: Genetics, epigenetics and individual risk

The role of genetics in the pathogenesis of periodontitis is well established but larger-scale studies to address specific questions relating to this topic need to be carried out. These could include: SNP/SNP and SNP/environment interactions; next generation sequencing; whole exosome sequencing of families with extreme phenotypes; and how epigenetics influences the heritability of periodontitis.

Research Directions: Peri-implantitis

Peri-implantitis is a very significant issue that, to date, is proving difficult to understand and treat successfully. The differences between periodontitis and peri-implantitis have been well-documented. The role implant surface roughness and the shedding of titanium particles is an emerging area of significance for this condition and requires further investigation to determine if this is a potential distinguishing feature of peri-implantitis compared to periodontitis. Other emerging areas of research interest with regards to peri-impantitis include: determining the best strategies to prevent peri-implantitis; investigating the systemic effects of implant therapy and peri-implantitis; and using human transcriptomic studies to corroborate the findings from the animal studies.

Session 3. Novel methods for the prevention and treatment of periodontal diseases

Chair: Jamil Shibli
Session Summary Speaker: Mariano Sanz
Proposal and validation of a new clinical endpoint for periodontal treatment: Magda Feres
Applying the new endpoint in a meta-analysis: Dagmar Else Slot
Host modulation therapy: Weight of evidence and future directions: Hatice Hasturk
Targeting the immune response in periodontitis: clinical applications and new directions: Srinivas Myneni

Research Directions: Design of clinical studies

Determining the efficacy of different periodontal treatments or comparing the clinical data of randomized clinical trials in periodontology is a challenge, mainly due to the lack of standardized primary outcomes variables for treatment. Clinical studies of therapeutic agents and treatment protocols require the development of precise clinical outcome measures. These need to be defined in the context of agreed treatment "endpoint targets", as opposed to the traditional outcomes normally based on mean reduction in pocket depth and mean gain in clinical attachment. In addition, these well-defined criteria should allow properly planned meta-analyses of data arising from clinical studies.

Research Directions: Host Modulation

One of the goal's of host modulation therapy is to restore the balance between pro-inflammatory and anti-inflammatory mediators and promote homeostasis. New research should follow the paradigm shift that resolution of inflammation is an active process and requires a well-orchestrated cellular and molecular event that takes place at multiple levels. Within this context, immune-modulatory properties of a number of molecules are potential targets for treatment of periodontitis. The challenge remains to optimize the best dose and delivery method to translate the knowledge from basic science and animal studies into clinic and evaluate the efficacy and the risks and benefits in randomized controlled trials.

Research Directions: Stem Cells and Immune Response

While mesenchymal stem cells from periodontal tissues possess immunomodulatory properties, do not exert any antigenic response when implanted into animals and may enhance tissue regeneration their clinical utility remains unclear due to quality control, efficacy and cost/benefit issues.

Session 4. Periodontal Regeneration

Chair: Anton Sculean
Session Summary Speaker: Keith Kirkwood
Growth and differentiation factors and scaffolds: William Giannobile
Periodontal Tissue Engineering Using Additive Manufacturing: Saso Ivanovski
Clinical issues for successful regenerative outcomes: Shinya Murakami
Long-term outcomes of regenerative therapy: Andreas Stavropoulos

Research Directions: Periodontal Regeneration

Periodontal regeneration is a rapidly advancing field embracing a number of new technologies. The major issue confronting the field is to enhance the clinical predictability of regenerative procedures. This will come from further understanding of the complex biologic and bioengineering issues required for successful tissue engineering. Accordingly there is need to continue to explore the development of novel tissue engineering scaffolds using composite materials that can be manufactured using 3D printing and electron spinning. Exploration of how these scaffolds can be tailor made for individual periodontal defects will become a very significant development. New avenues for the delivery of biomimetic agents and further investigations into the clinical utility of stem cells for management of periodontal defects in humans are required. To improve clinical outcomes, there is need to develop protocols and appropriately designed clinical trials to determine the indications for different types of scaffolds +/- biological and cells.

Session 5. Periodontal Medicine

Chair: Dana Graves
Session Summary Speaker: Lior Shapira
Periodontal–systemic interrelationships: Iain Chapple
Mechanism linking periodontitis to systemic diseases: Alpdogan Kantarci
A medical model for managing periodontitis: Mark Bartold
Salivary diagnostics: Ulvi Gursoy

Research Directions: Periodontal Medicine

Periodontal medicine has been a recognized field of investigation in periodontology for over 20 years. Over this time numerous conditions have been proposed to be associated with periodontal infection and inflammation. There is urgent need to determine how robust these associations are identify those conditions that specifically associate with periodontitis based on sound biologic and clinical outcome measures. New diagnostic and treatment outcome processes that will allow us to focus on following the individual patient response to treatment should be developed. This may be achieved partly through the development of salivary and gingival crevicular fluid analysis to assist in diagnostic, prognostic and assessment of treatment outcomes.

Session 6. Periodontics for the aging population - Baby boomers and beyond

Chair: Joerg Meyle
Session Summary Speaker: Philip Preshaw
Inflammaging/immunosenescence and the oral microbiota: Jeffrey Ebersole
Microbiological / immunological alterations of the aging periodontium: George Belibasakis
Special considerations for aging and aged populations: Ira Lamster
Aging, inflammation, immunity and periodontal disease: Octavio Gonzalez

Research Directions: Periodontics for the aging population

The aging population presents a new set of challenges in periodontology in terms of disease experience and management. Notwithstanding the importance of periodontal disease in the aging population efforts should be taken to describe and understand periodontal health in the aged individual. There is need to start to understand how aging affects the immune responses to the (evolving) microbiome that we have lived with for all our life. Other modifying factors such as how aging affects the genetic component of susceptibility to periodontitis and pathogenic processes. Investigation into the role of dietary nutrients and anti-aging/anti-senescence therapeutics in maintaining periodontal health with age should be carried out. The impact of periodontitis (a chronic inflammatory disease with systemic impacts) on the aging process has been poorly studied as have the general health benefits (and cost benefits) to treating periodontitis in older adults. Finally, preventive strategies targeted for older adults should be explored and include: improving student education, eliminating silos, expanding interprofessional practice and cross-referrals, political influence and public health policy.