



Prof. Denis F. Kinane

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Prof. Denis F. Kinane BDS, PhD, FDSRCS, FDSRCP is the past Dean of UPenn Dental School and his research focus is in clinical translational research, molecular genetics, cell biology, pathology and immunology. He has held Professorial appointments in Immunology, Pathology, Periodontology and as Research Dean at Louisville created the Center for Oral Health and Systemic Disease. He has more than 240 peer-reviewed papers and regularly presents nationally and globally. He has received various awards and his 'h statistic' is 80. He is editor in chief of the Springer publication, Current Oral Health Reports and regularly organizes international research conferences. Current research is on modifying the host response in chronic inflammation using tools such as CRISPR to modify receptors, signaling molecules, gene transcription and epigenetics.

## Professionalism in Periodontology – Science and practice becomes Periodontal Precision Medicine

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It is critical that an ethical health profession or subdiscipline seeks to constantly progress in the delivery of the best diagnostic and therapeutic approach for patients by translating and incorporating the latest science into practice.

The mainstay of periodontitis and peri-implantitis treatment is the mechanical and chemical eradication of the plaque biofilm both professionally and as a preventive home care regime, however many scientific breakthroughs in periodontology relate to improved understanding of the host response in periodontics, yet few therapies have arisen from these highly cited papers and well funded projects. Such new therapies would be welcome adjunctive approaches to the mechanical therapies.

Precision medicine approaches are highly applicable to this chronic inflammatory disease as periodontitis has a strong genetic and individual susceptibility profile that has the possibility to be modified. In order to improve periodontal health and create resistance to new episodes of disease, individual susceptibility elements need to be identified and genetically and molecularly modified. This review seeks to take our thinking further and utilize current accepted paradigms regarding the etiology of the disease, the contributing host factors and using precision medicine-like approaches using our vast laboratory and animal based knowledge of systems biology, molecular and -omics knowledge, to fashion new approaches.

An example is given of one approach, which is the reduction in inflammation by utilizing CRISPR to replace genetic haplotypes responsible for defective IL-8 response. A further example considered is through modifying the epigenome, specifically reducing the methylation of TLR2 related DNA to improve the receptor function in the innate immune response to the biofilm. And lastly we will review CRISPR modification of NOD receptor genes to improve PMN related netosis to improve host response to the biofilm.

Currently, gene modification, deletion and replacement therapies, predominantly through CRISPR are starting to become FDA approved and may develop relevance for oral diseases. Thus we will review these examples of precision medicine approaches to reducing periodontal susceptibility that might prove in future to have therapeutic utility or provide inspiration to develop other approaches to exploit the enormous body of molecular and genetic knowledge on the etiology of the disease to address this common and debilitating disease.