

Personalized dentistry

Sir,

Personalized medicine is a young, but rapidly advancing field of health-care that is informed by each person's unique clinical, genetic, genomic and environmental information. Because these factors are different for every person, the nature of diseases—including their onset, their course and how they might respond to drugs or other interventions—is as individual as the people who have them. Personalized medicine is about making the treatment as individualized as the disease. It involves identifying genetic, genomic and clinical information that allows accurate predictions to be made about a person's susceptibility of developing disease, the course of disease and its response to treatment.

In order for personalized medicine to be used effectively by oral health-care providers and their patients, these findings must be translated into precise diagnostic tests and targeted therapies. This has begun to happen in certain areas, such as testing patients genetically to determine their likelihood of having a serious adverse reaction to various cancer drugs. Because the 2003 sequencing of the human genome provided crucial insight into the biological workings behind countless medical conditions, scientists and physicians are advancing the field of personalized medicine at a fast pace. It is not yet an established part of clinical practice, but a number of top-tier medical institutions now have personalized medicine programs and many are actively conducting both basic research and clinical studies in genomic medicine. Genomic and personalized medicine aims to tackle more complex diseases, such as cancer, heart disease, diabetes, malocclusion, dental caries, periodontal diseases and craniofacial syndromes including cleft lip and palate for years believed to be influenced primarily by environmental factors and their interaction with the human genome. It is now understood that because these diseases have strong multi-gene components and in some cases might be caused by errors in the deoxyribonucleic acid between genes instead of within genes—they can be better understood using a whole genome approach.

"Personalized medicine" is based initially on pharmacogenetics and now exploding as genome-wide association studies are undertaken. However, it remains to be seen how much this will really affect daily practice. The same may be projected for the future of dentistry. What would personalized oral health practice be based on, how would the studies be undertaken and then validated in practice? How will this be funded? The understanding of the combination and interaction of genetic and environmental (including treatment) factors (nature and nurture together) that influence the treatment response of our patients is fundamental to the evidence-based practice of oral health science.^[1]

Dental and medical care is generally based on an examination and assessment of the patient's status, diagnosis and prescription of treatment. The treatment is typically based on a positive response in the majority of individuals with the diagnosis. This approach will work for most patients most of the time. However, what will be effective for most of the population may not be the optimum treatment for others. Recently, the analysis of an individual's response to treatment, largely determined by intrinsic genetic factors and individual behavior, has become more comprehensive, resulting in what has been termed "personalized medicine."

Multiple factors and processes contribute to the response to dental treatment. Some patients will exhibit unusual outcomes linked to polymorphic genes. Analysis of overall treatment response requires a systems analysis using informatics for integration of all relevant information. Genome wide association studies are necessary to further the evidence base for the practice of dentistry. Only then will we begin to truly understand how nature (genetic factors) and nurture (environment factors, including treatment) together affect our treatment of our patient.^[1] These and hundreds of other "highlights" reflect a "tipping point" or that time in human history when scientific discoveries are rapidly translated into improved oral health-care for people around the world.

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