Clinical applications of genomics and personalized medicine have transitioned from being on a theoretical wish list to becoming a transformational driver of medical practice. In the mere decade since the completion of the Human Genome Project, commercially available genetic tests now predict the behavior of certain breast cancers, help establish effective doses of Coumadin, determine the toxic potential of certain cancer drugs, or identify patients at risk for periodontitis. Many more clinical applications of genomics are in the pipeline which will have impact as diagnostics, risk predictors, or treatment determinants. Furthermore, gene-based therapy is maturing.

The mouth and its related structures represent a unique part of the human body. It is the only site in which two hard tissues (teeth and bone), different types of epithelium, and glandular tissue dynamically interact in an environment consisting of a myriad of microorganisms that is constantly bathed in a heterogeneous salivary fluid comprised of immunoglobulins, enzymes, and buffering agents. The opportunities for genes to influence the behavior of cells, saliva composition, and microorganisms are remarkable. Furthermore, the heterogeneity of its composition predisposes the mouth to a wide range of infectious, neoplastic and autoimmune diseases which range broadly in their frequency, severity and impact. And the mucosa and bone are frequent targets of toxicities of a range of therapeutic modalities. Genes govern the risk, course or response of almost every one of these conditions, whether their etiology is natural or iatrogenic.

The objective of this book is to catalyze the application of genomics to the diagnosis and treatment of oral diseases by comprehensively presenting focused discussions on the current state of knowledge. The first section of the book provides basic information about genetics, genomics, and personalized medicine and the informatical methods available to apply and organize genetic data so that it has clinical relevance. Recognizing the genetic robustness of the oral cavity, the introductory section also includes chapters on the oral microbiome and host genomics and response to infectious agents. The next two sections contain chapters which describe the genomics of specific oral diseases and conditions, including the genetic basis for mechanism and risk of treatment toxicities associated with cancer therapy and bisphosphonates. Four chapters focus on gene-based therapies and the
pharmacogenomics applied to oral disease. The book concludes with a provocative summary which describes a comprehensive vision of the melding of genomics to personalized medicine and the potential actionable outcomes that will likely affect clinical practice in the upcoming years.

Despite the biological complexities of many oral diseases, their heterogeneous etiology, and the opportunity for the genome to impact their risk, course and response to therapy, there is no comprehensive (or even incremental) discussion of the topic among the many fine texts on genomics and personalized medicine. It is my hope that this book will fill that void.

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