

OXFORD HANDBOOK OF APPLIED DENTAL SCIENCES

**Relevant to dental •
qualifying exams**

**International team •
of contributors**

**Relates the medical •
sciences to a clinical
dental background**

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Preface

The twentieth century saw impressive advances in science and information access and transfer, such that not only has the understanding of health and disease increased enormously, but the speed of transfer of the new knowledge into the clinical environment has accelerated in an almost incredible way.

Thirty years ago, when I qualified in biochemistry, having acknowledged the growing importance of the understanding of cellular physiology and molecular biology to clinical practice, I could not have foreseen the considerable changes ahead. Though there had been recognition of the importance of DNA, and the dawn of DNA technology, few could have imagined the rapid development of immunology (and the catastrophic advent of AIDS), the growth of molecular biology, the development of DNA technology, the dawn of information technology or the Human Genome Project—developments that have opened the way for tremendous leaps in our understanding of the biological sciences, which have (and will continue to) enhanced diagnosis, prevention, and treatment of disease. New words, acronyms, and abbreviations which could not have been foreseen, are now in daily usage. Examples include PCR, IT, ELISA, HIV, HPV, Western blot, CD4, p53, prions, DNA chips, gene therapy, recombinants, etc. Who indeed, could have predicted frazzle, or sonic hedgehogs!?

There have been many significant advances in all fields but none more dramatic and exciting than those in the fields of biochemistry, immunology, molecular biology, and now genomics, and these have overflowed into all other aspects of clinical science and changed the face of all disciplines.

The main aim of this handbook is to demonstrate why modern medical science is so relevant to clinical dental practice. Dental staff are increasingly obliged to understand the language, fundamentals, and applications of these sciences. To this end, this book aims to outline the preclinical sciences as applied to dentistry, relevant to dental qualifying examinations such as BDS and DDS and, in some countries, to higher examinations such as MFDS.

The authors are an international team of experts, gathered from most continents because of their experience of dental education and research in the applied basic sciences, and their willingness to participate in this project which was carried out solely by electronic mail. For this reason, and the fact that of the 300 million people worldwide who

speak English it is American English that is the major form (Bryson B. (1990). *Mother Tongue*. Penguin Books, London), we have adopted American spelling in this book.

The information is presented in 58 chapters, assembled in eight parts covering relevant anatomy and development, pain and behavioral sciences, biochemistry, genomics, immunology, microbiology, pathology, and physiology. Lack of space has precluded the inclusion of other relevant sciences such as medicine, surgery, informatics, and pharmacology. The advances in the sciences, the changed content of subjects, and the relevance to dental clinical practice are well illustrated and the reader may be surprised to find that traditional boundaries between the biological sciences overlap and are increasingly blurred. Inevitably this leads to a certain amount of repetition, which we trust the reader will find useful.

CS
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List of abbreviations

ACH	Acetylcholine
ACTH	Adrenocorticotrophic hormone
AD	Activation domain
ADCC	Antibody-dependent cellular cytotoxicity
ADH	Antidiuretic hormone
ADJ	Amelodentinal junction
ADP	Adenosine diphosphate
AP	Alkaline phosphatase
APC	Antigen-presenting cell
ASOT	Antistreptolysin O titre
ASR	Age-standardized mortality rate
AST	Aspartate aminotransferase
ATLPL	Adipose tissue lipoprotein lipase
ATP	Adenosine triphosphate
AV	Atrioventricular
BD	Binding domain
BMI	Body mass index
BMP	Bone morphogenetic protein
BMR	Basal (resting) metabolic rate
BMT	Bone marrow transplant
cADPr	Cyclic ADP ribose
cAMP	Cyclic adenosine monophosphate
CCK	Cholecystokinin
CGH	Comparative genomic hybridization
CMP	Cyclic guanosine monophosphate
CLIP	Class II invariant chain peptide
CN	Cranial nerve(s)
CNS	Central nervous system
CO	Carbonmonoxide
CoASH	Coenzyme A
COX	Cyclo-oxygenase
CREB	cAMP response element binding proteins
CRP	C-reactive protein

CSF	Cerebrospinal fluid
CSF	Colony stimulating factor
CTR	Common tendinous ring
CVS	Cardiovascular system
DAG	Diacylglycerol
DEJ	Dentinoenamel junction
1,25-DHCC	1,25-dihydroxycholecalciferol
DHLNL	Dehydrodihydroxy-lysinoonorleucine
EAM	External acoustic (auditory) meatus
EBP	Elastin binding protein
ECM	Extracellular matrix
EGF	Epidermal growth factor
ELISA	Enzyme linked immunosorbent assay
EMT	Epitheliomesenchymal transition
EPSP	Excitatory postsynaptic potential
ES	Embryonic stem
ESR	Erythrocyte sedimentation rate
FAK	Focal adhesion kinases
FGF	Fibroblast growth factor
FITC	Fluorescein isothiocyanate
FSH	Follicle stimulating hormone
GABA	γ -aminobutyric acid
GAGs	Glycosaminoglycans
GALT	Gut-associated lymphoid tissue
GCF	Gingival crevicular fluid
GH	Growth hormone
GI	Gastrointestinal
GVHD	Graft versus host disease
GTP	Guanosine triphosphate
HAART	Highly active antiretroviral therapy
HDL	High-density lipoprotein
HE	Hematoxylin-eosin
HERS	Hertwig's epithelial root sheath
HLA	Human leukocyte antigen
HLNL	Hydroxy-lysinoonorleucine
hnRNA	Heterogeneous nuclear RNA
HPV	Human papillomavirus
HRP	Horseradish peroxidase

HSCT	Hematopoietic stem cell transplant
ICAMs	Intercellular cell adhesion molecules
IDL	Intermediate-density lipoprotein
IEE	Inner enamel epithelium
Ig	Immunoglobulin
IL-1	Interleukin 1
iNOS	Inflammatory nitric oxide synthase
InsP3	Inositol 1,4,5-trisphosphate
IP3	Inositol triphosphate
IPSP	Inhibitory postsynaptic potential
IPTG	Isopropylthiogalactoside
IV	Intervertebral (intravenous)
JAK	Janus activated kinase
K_s	Solubility constant
LDL	Low-density lipoprotein
LH	Luteinizing hormone
LOD	Logarithm of odds for linkage
LOH	Loss of heterozygosity
LPS	Lipopolysaccharide
MAC	Membrane attack complex
MAI	Mycobacterium avium-intercellulare
MALT	Mucosa-associated lymphoid tissue
MAPK	Mitogen activated protein kinases
MCV	Mean corpuscular volume
MDR	Multi-drug resistant
MHC	Major histocompatibility complex
MMP	Matrix metalloproteinases
mRNA	Messenger RNA
NAD	Nicotinamide adenine dinucleotide
NADH	Nicotinamide adenine dinucleotide (reduced form)
NADP	Nicotinamide adenine dinucleotide phosphate
NADPH	Nicotinamide adenine dinucleotide phosphate (reduced form)
NANA	N-acetylneuraminic acid
NANBH	Non-A, non-B hepatitis
NO	Nitric oxide
NTM	Non-tubercular mycobacteria
OEE	Outer enamel epithelium

P	Phosphate group
P _i	Inorganic phosphate group
PP _i	Inorganic pyrophosphate
PCF	Peri-implant crevicular fluid
PCP	<i>Pneumocystis carinii</i> pneumonia
PCR	Polymerase chain reaction
PDGF	Platelet-derived growth factor
PDL	Periodontal ligament
PGE	Prostaglandin E
PKA	Protein kinase A
PLC	Phospholipase C
PMNs	Polymorphonuclear leukocytes
PP-H	Phosphophorin
PRP	Proline-rich proteins
PRPP	5-Phosphoribosyl-1-pyrophosphate
PTH	Parathormone
RCA	Regulator of complement activation
RER	Rough endoplasmic reticulum
RFLP	Restriction fragment length polymorphism
SA	Sinoatrial
SAB	Sabouraud dextrose agar
SAGE	Serial analysis of gene expression
SCM	Sternocleidomastoid
SLN	Superior laryngeal nerve
STAT	Signal transducers activators of transcription
STS	Sequence tagged site
TGF	Transforming growth factor
TGF- β	Transforming growth factor β
TKR	Tyrosine kinase receptors
TMJ	Temporomandibular joint
TRAP	Tyrosine-rich amelogenin protein
tRNA	Transfer RNA
TSH	Thyroid stimulating hormone
VIP	Vasoactive intestinal peptide
VLDL	Very low-density lipoprotein
VNTRs	Variable number of tandem repeats
vWF	von Willebrand factor

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