

Pediatric Allergy

Nima Rezaei
Editor

Pediatric Allergy

A Case-Based Collection with MCQs,
Volume 1

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Preface

Immunology has found its way well into the practice of pediatrics. Years after publication of the first pediatric text books, footprints of immunology can be found in diagnosis and practice of almost all pediatric disorders. Delivering a magnificent contribution is the advent of novel diagnostic methods of molecular genetics in pediatric practice. Genetic diagnosis is now an indispensable part of the routine practice of primary immunodeficiency diseases, inborn metabolic errors, and monogenic malformations, making its way into diagnostic criteria of some as well. It won't go far wrong to state that the science of pediatrics has entered an era of interdisciplinary practice with genetics and immunology. The rapid flow of discovery of biological drugs during the last decade, availability of whole exome (and genome) sequencing methods, and the outstanding boost in the rate of success of hematopoietic and solid organ transplantation are all affirmative to this notion. Thanks to molecular genetic methods, an increasing number of the newly introduced monogenic diseases are being characterized, donors and recipients are being cross-matched using intricate genotype:phenotype cross matching, and immunotherapy for allergy benefits from state-of-the-art characterization of culprit epitopes in peptide scale. This book series tries to strike a balance between cutting-edge science of immunology and clinical practice of pediatrics, through a series of meticulously chosen case discussions, presented by pediatric practitioners and immunology experts.

This three-volume book series is a collection of well-presented case discussions in the field of pediatric immunology and allergy. Volume I, *Pediatric Allergy*, is focused on diagnosis and practice of allergy, asthma, atopy, and relevant disorders. Volume II, *Pediatric Immunology*, thoroughly addresses primary immunodeficiency disorders, and finally, Volume III, *Pediatric Autoimmunity and Transplantation*, is a constellation of cases in autoimmune and rheumatologic disorders of childhood, secondary immunodeficiency conditions, and real cases with hematopoietic and solid organ transplantation.

Volume I of this series is dedicated to represent some of the many faces of hypersensitivity disorders, from food and drug allergy to allergic rhinitis, atopic dermatitis, to asthma, and finally anaphylaxis as a fatal outcome of all hypersensitivity

reactions. Starting by Chapters 2–12, with allergic rhinitis as the prototype of allergic disorders, we move onto Chapters 13–25, focused on case discussions on food allergy, and Chapters 26–36 presenting case discussions on urticaria and atopic dermatitis. Completing the picture of atopy triad, Chapters 37–44 give a glimpse over state-of-the art guidelines for asthma diagnosis and management. In Chapters 45–53, the reader is introduced to drug hypersensitivity reactions, as second most common cause of allergic reactions in the pediatric population. The final chapters of this volume, from Chapters 54–60, are dedicated to anaphylaxis, a potentially lethal systemic hypersensitivity reaction, and a must-know for every physician practicing in pediatric care.

The *Pediatric Immunology and Allergy Series* is the result of a multinational collaboration of more than 350 scientists from more than 100 well-known universities/institutes worldwide. I would like to hereby acknowledge the expertise of all contributors and their generous devotion of time and effort in preparing each of the 290 chapters of the series. I would like to extend my gratitude to the Springer publication for providing me the opportunity to publish the book.

Hopeful I remain that this book provides an exemplary touch to the fast-growing intersection of pediatric medicine and basic immunology, and a useful guide for pediatric practitioners worldwide.

Tehran, Iran

Nima Rezaei

Acknowledgment

I would like to express my sincere gratitude for the tremendous efforts of my Editorial Assistant, Dr. Farzaneh Rahmani. I would like to gratefully acknowledge her fine work, without which completion of this book would not have been possible.

Nima Rezaei

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Abbreviations

6-FED	6 most common food-allergens, milk, soy, egg, wheat, peanuts, tree nuts, and shellfish, fish
aAEDS	Atopic AEDS
ABPA	Allergic bronchopulmonary aspergillosis
ABPM	Allergic bronchopulmonary mycosis
ACE	Angiotensin-converting enzyme
AD	Atopic dermatitis
ADHD	Attention deficit hyperactivity disorder
ADR	Adverse drug reactions
AEDS	Atopic eczema/dermatitis syndrome
AERD	Aspirin exacerbated respiratory disease
AFRS	Allergic fungal rhinosinusitis
AFS	Allergic fungal sinusitis
AIT	Allergen immunotherapy
ANA	Anti-nuclear antibody
ANC	Absolute neutrophil count
ANCA	Anti-neutrophil cytoplasmic antibodies
Anti-TG	Anti-thyroglobulin
Anti-TPO	Anti-thyroid peroxidase
Anti-tTG	Tissue transglutaminase antibody
APK	Aquagenic palmar keratoderma
AR	Autosomal recessive
ASST	Autologous serum skin test
A-T	Ataxia-telangiectasia
BAL	Bronchoalveolar lavage
BANS	Budesonide aqueous nasal spray
BCG	Bacillus Calmette–Guérin (BCG)
BDP	Beclomethasone dipropionate
BMZ	Basement membrane zone
BP	Blood pressure
bpm	Beats per minute

BSA	Body surface area
c-ANCA	Cytosolic anti-neutrophil cytoplasmic antibodies
CBC	Complete blood count
CD	Cluster of differentiation
CF	Cystic fibrosis
CFTR	Cystic fibrosis transmembrane conductance regulator
CIndUs	Chronic inducible urticaria
CLR	Clarithromycin
CM	Cutaneous mastocytosis
CNIs	Calcineurin inhibitors
COPD	Chronic obstructive pulmonary disease
CRP	C-reactive protein
CRS	Chronic rhinosinusitis
CRSsNP	CRS without nasal polyposis
CRSwNP	CRS with nasal polyposis
CsA	Cyclosporine A
CSU	Chronic spontaneous urticaria
CT	Computed tomography
CTL	Cytotoxic T-lymphocytes
CTMs	Chinese topical medications
CXR	Chest X-ray
DAO	Diamine oxidase
DCM	Diffuse cutaneous mastocytosis
DHR	Drug-induced hypersensitivity reactions
DIA	Drug-induced anaphylaxis
DIF	Direct immunofluorescence
DNA	Deoxyribonucleic acid
DOCK8	Dedicator of cytokinesis 8
DPT	Drug provocation test
DT	Diphtheria and tetanus toxoids full strength
dT	Diphtheria-tetanus toxoids with reduced content of diphtheria
DtaP	Diphtheria-tetanus acellular pertussis vaccine
DTaP3	Diphtheria-tetanus-3-component acellular pertussis vaccine
DTaP5-IPV-Hib	Diphtheria-tetanus-3-component acellular pertussis-inactivated polio haemophilus influenzae type b"
DTaP-IPV-HBV+Hib	Hexavalent diphtheria-tetanus-acellular pertussis-inactivated polio-hepatitis B vaccine
EAACI	European academy of allergy and clinical immunology
EBV	Epstein-Barr virus
EGD	Esophagogastroduodenal endoscopy
EGIDs	Eosinophilic gastrointestinal disorders
EGPA	Eosinophilic granulomatosis with polyangiitis
ELISA	Enzyme-linked immunosorbent assay

EM	Erythma multiformis
EMM	Erythema multiform major
ESR	Erythrocyte sedimentation rate
FcεRIα	Fc subunit of high-affinity IgE receptor
FDA	Food and drug administration
FDEIA	Food-dependent exercise-induced anaphylaxis
FEF25%–FEF75%	Forced expiratory flow at 25–75%
FESS	Functional endoscopic sinus surgery
FEV1	Forced expiratory volume in 1 second
FF	Fluticasone furoate
FFP	Fresh frozen plasma
FiO ₂	Fraction of inspired oxygen
FPIES	Food-protein induced enterocolitis syndrome
FPNS	Fluticasone propionate nasal spray
FTU	Finger-tip unit
FVC	Forced vital capacity
GI	Gastrointestinal
GINA	Global initiative for asthma
GOS	Galacto-oligosaccharide
GU	Genitourinary
HAE	Hereditary angioedema
HAV	Hepatitis A vaccine
Hb	Hemoglobin
HBV	Hepatitis B virus
HCV	Hepatitis C virus
HDM	House dust mite
HFP	Histamine fish poisoning
HFS	Hyaline fibromatosis syndrome
Hib	Haemophilus influenza type b vaccine
HIES	Hyper-IgE syndrome
HIV	Human immunodeficiency virus
HLA	Human leukocyte antigens
HP	Hypersensitivity pneumonitis
HPA	Hereditary papulotranslucent acrokeratoderma
HPLC	High-performance liquid chromatography
HPV	Human papilloma virus
HRCT	High-resolution computed tomography
HR-test	Histamine release test
HSV	Herpes simplex virus
IA	Idiopathic anaphylaxis
ICD	Irritant contact dermatitis
ICS	Inhaled corticosteroids
ICU	Intensive care unit
IFN	Interferon
IFN-γ	Interferon-γ

IgA	Immunoglobulin A
IgE	Immunoglobulin E
IgG	Immunoglobulin G
IgM	Immunoglobulin M
IIF	Indirect immunofluorescence
IIV	Inactivated influenza vaccine
IL	Interleukin
IL-12	Interleukin-12
IM	Intramuscular
INCs	Intranasal corticosteroids
Inf	Influenza vaccine
INH	Isoniazide
IPEX	Immune dysregulation, polyendocrinopathy, enteropathy, X-linked syndrome
IPV	Inactivated polio vaccine
IV	Intravenous
kg	Kilogram
LABA	Long-acting beta-agonists
LDL	Low-density lipoprotein
LE	Lupus erythematosus
LFT	Liver function test
LP	Lumbar puncture
LTRAs	Leukotriene receptor antagonists
LTs	Leukotrienes
MAOIs	Monoamine oxidase inhibitors
MBL	Mannose-binding lectin
MCV	Mean corpuscular volume
Men	Meningococcal vaccine
MenCV4	4-Valent (A,C,W-135,Y) conjugate meningococcal vaccine
MFNS	Mometasone furoate nasal spray
MIS	Mastocytosis in the skin
mmHg	Millimetre of mercury
MMR	Measles-mumps-rubella
MRI	Magnetic resonance imaging
naAEDS	Non-atopic AEDS
NEC	Necrotizing enterocolitis
NECD	NSAID-exacerbated cutaneous disease
NERD	NSAID-exacerbated respiratory disease
NFAT	Nuclear factor of activated T cells
NIH	National institute of health
NIUA	NSAID-induced urticaria/angioedema
NK cell	Natural killer cell
NMBAs	Neuromuscular blocking agents
NOMID	Neonatal-onset multisystem inflammatory disease

NRS	Numeric rating scale
NSAIDs	Non-steroidal anti-inflammatory drugs
NUV	Normocomplementemic urticarial vasculitis
OAS	Oral allergy syndrome
OCS	Oral corticosteroid
OFC	Oral food challenge
OPV	Oral polio vaccine
ORS	Oral rehydration serum
OS	Omenn's syndrome
PAF	Platelet-activating factor
p-ANCA	Perinuclear anti-neutrophil cytoplasmic antibodies
PCD	Primary ciliary dyskinesia
PCR	Polymerase chain reaction
PCV	Pneumococcal conjugate vaccine
PEF	Peak expiratory flow rate
PER	Persistent allergic rhinitis
PFS	Pollen-food syndrome
PFT	Pulmonary function test
PIDs	Primary immunodeficiencies
PLE	Protein losing enteropathy
pMDI	Pressurized metered-dose inhalers
PO	Per os/oral
PPI	Proton pump inhibitor
PPSV	Pneumococcal polysaccharide vaccine
RAST	Radioallergosorbent test
RBC	Red blood cell
ROS	Reactive oxygen species
RSV	Respiratory syncytial virus
RV	Rotavirus vaccine
SABA	Short-acting beta-2 agonists
SBS	Short bowel syndrome
SCORAD	SCORing Atopic Dermatitis
SCUAD	Severe chronic upper airway disease
SI	Stimulation index
sIgE	Specific IgE
SLIT	Sublingual immunotherapy
SNIUAA	Single-NSAID-induced urticaria/angioedema or anaphylaxis
SPT	Skin prick test
STAT3	Signal transducer and activator of transcription 3
SU	Solar urticaria
T	Tetanus toxoid
TANS	Triamcinolone aqueous nasal spray
TBHT	Temporary black henna tattoo
TBI	Total body irradiation

TCD	Total cumulative dose
TCIs	Topical calcineurin inhibitors
TCS	Topical corticosteroids
Tdpa	Tetanus-diphtheria-acellular pertussis with reduced content of diphtheria and pertussis antigens
TG	Triglyceride
Th1	T helper 1
Th17	T helper 17
Th2	T helper 2
TIV	Trivalent influenza vaccine
TnT	Troponin T
TPO	Thyroid peroxidase
TPO-Ab	Thyroid peroxidase antibody level
TSH	Thyroid stimulating hormone
UA	Urinary analysis
URI	Upper respiratory tract infection
UV	Ultraviolet
Var	Varicella vaccine
VIT	Venom immunotherapy
VLM	Visceral larva migrans
VZIG	Varicella-zoster immune globulin
VZV	Varicella zoster virus
WAS	Wiskott-Aldrich syndrome
WBC	White blood cell
WBE	Whole-body extract
WDEIA	Wheat-associated FDEIA