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CONTENTS

Preface		vii
Chapter 1	Potential Treatment Strategies for the Management of Cholera: A Review <i>Archita Gupta, Priyadarshi Aparajay, Vijayshree, Sabya Sachi Das, Sneha Singh and Abhimanyu Dev</i>	1
Chapter 2	An Insight into the Physiological Properties and Virulence of <i>Vibrio cholerae</i> <i>Parimal Dua, Tuhin Manna, Smritikana Biswas, Prithwiraj Mukherjee, Amtya Kumar Panda and Chandradipa Ghosh</i>	67
Chapter 3	Transcription Regulatory Systems of the Human Helicases <i>Fumiaki Uchiyumi</i>	115

Chapter 4	Pharmacophore Perception by Pattern Recognition: Model Construction, Validation and Application to Virtual Screening in a Practical Exercise <i>Daniel Fábio Kawano, Carlos Henrique Tomich de Paula da Silva and Carlton Anthony Taft</i>	155
Chapter 5	Effects of Folate on the Health of the Fetus and Neonate <i>Ozgun Uygur and Mehmet Yekta Oncel</i>	181
Chapter 6	Storage and Supply Site, Localization, and Fluorescent Angioscopic Imaging of High-Density Lipoprotein in Human Coronary Plaques <i>Yasumi Uchida</i>	195
Chapter 7	Advances in Cholecystectomy: A Review <i>Diego Rossi Kleitnubing, Henrique Prochmann and Antonio Junior de Sousa</i>	215
Chapter 8	Mycoplasma UHomo Sapiens: Contamination in E-Science <i>William B. Langdon</i>	225
	Contents of Earlier Volumes	239
	Index	247

Chapter 2

**AN INSIGHT INTO THE PHYSIOLOGICAL
PROPERTIES AND VIRULENCE
OF *VIBRIO CHOLERAE***

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ABSTRACT

Cholera, the watery diarrhea caused by *Vibrio cholerae*, is one of the major public health issues predominant in the developing world. *V. cholerae* is a gram negative, facultative anaerobic, aquatic bacterium with single polar flagellum and is a member of γ subdivision of the family Proteobacteriaceae. Among the ~206 identified serogroups, only O1 and

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O139 cause epidemic cholera while the rest (non-O1/non-O139s) cause sporadic outbreaks. This human pathogen survives naturally in aquatic bodies and causes secretory diarrhea once it encounters the human host. The diarrheal infection commences with the ingestion of contaminated food and water, followed by colonization of the bacteria in the small intestine by toxin-coregulated pilus (TCP), expressed coordinately with cholera toxin (CT). CT and TCP are considered as the major virulence factors of *V. cholerae*. Besides, synergistic effects of other virulence-associated factors, viz., heat-stable enterotoxin (ST), accessory cholera enterotoxin (Ace), zonula occludens toxin (Zot), outer membrane proteins (OmpU, OmpT) and cytotoxic hemolysin A (HlyA: classical and El Tor) are also responsible for the pathogenesis. Phenotypic expressions associated with motility, biofilm formation, slime production, protease, lipase and hemolysin activities are also significant in the pathogenesis of the organism. Moreover, the transcriptional regulators ToxR, ToxS and ToxT are involved in coordinate expression of several genes linked with growth, survival and pathogenicity in *V. cholerae*. The non-O1/non-O139 strains have resulted in the emergence of variants of *V. cholerae* associated with newer cholera epidemics. Virulence acquisition by horizontal gene transfer remains significant in the emergence of potentially pathogenic organisms, considered as the underlying reasons for lacking effective management strategies of the disease till date.

Keywords: cholera, *Vibrio cholerae*, epidemic, diarrhea, virulence, toxin, evolution

INTRODUCTION

Cholera is a severe, sometimes lethal, diarrheal disease that affects human population for centuries (Rahaman et al., 2015). This devastating secretory diarrhea is one of the major threats to public health all over the world. *Vibrio cholerae*, the facultative anaerobic, gram-negative, curved and highly motile uni-flagellated aquatic bacterium belonging to the γ subdivision of the Proteobacteriaceae family is the causative agent of cholera. The disease is induced when the organisms are ingested through contaminated water and food (Pottinger et al., 2004; Faruque and Nair, 2008). Human beings are the natural hosts of *V. cholerae*. Although in most of the cases the infection is mild and asymptomatic, however, it is