## Contents

	Pref	ace	ix
1	The Background		1
	1.1	Meet the cast	1
	1.2	Food for microbes	13
	1.3	Basic molecular biology	15
2	Microbes and Health		19
	2.1	Microbes in the body	19
	2.2	Defences against infection	26
3	Microbial Infections		33
	3.1	Diseases of the past	33
	3.2	Diseases of the present	45
	3.3	Opportunist infections	50
	3.4	'New' diseases	52
	3.5	Animal diseases	58
4	Prevention and Cure		63
	4.1	Epidemics	63
	4.2	Antibiotics	72
5	Microbes and Food – Friend and Foe		83
	5.1	Food spoilage	83
	5.2	Food preservation	86
	5.3	Fermented foods	88
	5.4	Food poisoning and food-horne diseases	91

## CONTENTS

6	Micro	97	
	6.1	Water	100
	6.2	Soil	107
	6.3	Plants	108
	6.4	Biodegradation	112
	6.5	Extreme environments	116
7	Microbial Evolution – Genes and Genomes		119
	7.1	Evolution and inheritance	119
	7.2	Horizontal gene transfer	122
	7.3	Variation in gene expression	128
	7.4	Gene cloning and sequencing	131
8	Microbial Development and Communication		141
	8.1	Cell division	141
	8.2	Motility	145
	8.3	Biofilms	146
	8.4	Quorum sensing	150
	8.5	Bacterial sporulation	152
	8.6	Multicellular behaviour	153
	8.7	Biological clocks	156
9	Microbial Biotechnology – Practical Uses of Microbes		159
	9.1	Amino acids	160
	9.2	Biofuels	161
	9.3	Microbes and metals	163
	9.4	Oil spills	166
	9.5	Sewage and water treatment	168
	9.6	Antibiotics and other medical products	170
	9.7	Vaccines	172
	9.8	Proteins	177
10	Cont	roversies and Speculations	181
	10.1	Evolution and the origins of life	181
	10.2	Is there life elsewhere in the universe?	186
	10.3	Creating new life	187
	10.4	Is it safe? Assessment of risk, risk versus benefit	187
	10.5	Superbugs and killer viruses	192
	10.6	Microbes and climate change	193
	10.7	Microbes and non-infectious diseases	195
	10.8	Epilogue	200

## CONTENTS

Appendix	1: Explanations	201
A1.1	Monomers and polymers	201
	A1.1.1 Sugars and polysaccharides	201
	A1.1.2 Amino acids and proteins	202
	A1.1.3 Nucleic acids	204
	A1.1.4 Fats and lipids	205
A1.2	Enzymes and catalysis	206
	A1.2.1 Oxidation and reduction, respiration and photosynthesis	206
	A1.2.2 Hydrolysis	208
	A1.2.3 Polymerization	208
Appendix	2: Abbreviations and Terminology Abbreviations and jargon	<b>211</b> 211
A2.1 A2.2	Numbers	211
A2.2 A2.3	Units	213
AZ.3	Units	217
Appendix	3: Further Reading	215
Subje	ect Index	217
Inde	c of Names	229