Contents

Preface		xi	Kin	61	
Abbreviations		xiii	Reg	ulation of enzyme activity	63
3.77			4	Transport into the Body:	
I	INTRODUCTION	1	7	The Gastrointestinal Tract,	
1	The Structural and Biochemical			Digestion and Absorption	69
	Hierarchy of a Cell and a Human	3		ss structure of the gastrointestinal tract	70
Cell structure		3		chemistry of cooking and food preparation	73
Tissues		8	-	estion and absorption	75
The whole human		10	The	gastrointestinal tract and disease	82
The biochemical hierarchy		13	5	Transport into the Cell: Particles,	
II	ESSENTIAL TOPICS IN			Molecules and Ions	85
	DYNAMIC BIOCHEMISTRY	15	Stru	cture of the plasma membrane	85
•	T 1 1 D 1 T			usion through membranes	87
	Energy: In the Body, Tissues and			ve transport	89
Biochemical Processes		17		ocytosis and exocytosis	91
Energy transformations in the whole body		18	Phys	siological importance of some transport systems	93
Energy transformations in tissues and organs		26			
Energy transformation in biochemical reactions and			III	ESSENTIAL METABOLISM	95
pa	athways	28	6	Carbahydrata Matabalism	97
Ade	nosine triphosphate: its role in the cell	32	6	Carbohydrate Metabolism	91
				colysis	98
3 Enzymes: Activities, Properties, Regulation and Physiology				biochemical and physiological importance of	
		35		naerobic glycolysis	104
			_	ulation of the flux through glycolysis	107
Nomenclature and classification		36		cogen synthesis	108
	c facts	37		hesis of Fructose and lactose	110
Mechanisms by which an enzyme enhances		• •		pentose phosphate pathway	110
the rate of a reaction		38		coneogenesis: glucose formation from	
Cofactors and prosthetic groups		40		on-carbohydrate sources	112
Factors that change the activity of an enzyme		41		of the liver in the regulation of	20.2
Allosteric inhibition		48		e blood glucose concentration	117
The physiological significance of $K_{\rm m}$ and $V_{\rm max}$ values		51		nones and control of gluconeogenesis	123
Enzymes as tools		54	_	ulation of glycolysis and gluconeogenesis	
Enzymes in diagnosis		58		ATP/ADP concentration ratio in the liver	124
Enzymes as therapeutic agents		59		oglycaemia	125
Enzymes as targets for therapy		59	Hyp	erglycaemia	126

7	Fat Metabolism	127	12	Hormones: From Action in the Cell	
Fat	ts in nutrition	128		to Function in the Body	253
Fat fuels		128	End	ocrine hormones: traditional and novel	25
Physiological importance of fat fuels		142		action, effects and functions of a hormone	250
Limitations or drawbacks of fats as a fuel		145		on of hormones	25
Genetic defects in fatty acid oxidation		146	The	biochemical and physiological effects of a hormone	258
Pathological concentrations of fat fuels		146		romones	26
			Kine	etic principles that apply to hormone action	260
8	Amino Acid and Protein Metabolism	149			
Int	roduction	149	***	ECCENTELL DE OCECCEC	
So	urces of amino acids	151	IV	ESSENTIAL PROCESSES	
	otein and amino acid requirements	155		OF LIFE	273
	te of amino acids	157	12	Dhamical Activity, In Non Athleton	
	ntral role of transdeamination	165	13	Physical Activity: In Non-Athletes,	
	nino acid metabolism in different tissues	167		Athletes and Patients	275
	utamine: an amino acid of central importance	172	The	mechanical basis of movement by skeletal muscle	275
Urea 'salvage'		177	Stru	cture of muscle	276
9	Oxidation of Fuels and ATP			eins involved in muscle action	279
-	Generation: Physiological and			hanism of contraction: the cross-bridge cycle	282
	•	101	_	ulation of contraction	282
	Clinical Importance	181		s for muscle	286
The	e Krebs cycle	181		s for various athletic events and games	291
	e electron transfer chain	184	Fatig		294
Ox	idative phosphorylation	185		gue in patients	299
	upling of electron transfer with oxidative		1000	sical training	300
ŗ	phosphorylation	186		Development of muscle	
Tra	insport into and out of mitochondria	190		th benefits of physical activity	303
'En	nergy' transport in the cytosol:			th hazards of physical activity	303
t	the creatine/phosphocreatine shuttle	193	Skei	etal muscle diseases	305
Reg	gulation of fluxes	194			
The physiological importance of mitochondrial ATP generation		200	14	Mental Activity and Mental Illness	307
	e effect of ageing on ATP generation	206	Men	tal activity	307
	e circuit of ageing on the generation	200	Cells	s in the brain	308
10	Metabolism of Ammonia and		Elec	trical communication	310
10		211	Cher	mical communication	311
	Nucleic Acids	211	Fuel	s and energy metabolism in the brain	319
Rol	les of ammonia	211	Men	tal illnesses: biochemical causes	320
Ure	ea synthesis	212	Recr	reational drugs	325
Deg	gradation of nucleic acids, nucleotides,				
n	nucleosides and bases: the generation of ammonia	217	15	Nutrition, Dischamistan	
Am	nmonia toxicity	219	15	Nutrition: Biochemistry,	224
Def	ficiencies of urea cycle enzymes	220		Physiology and Pathology	331
				c information required for discussion of	
11				me biochemical aspects of nutrition	331
	Triacylglycerol, Phospholipids and		Vita		332
	Fatty Messengers: The Roles of		Mine		345
	Polyunsaturated Fatty Acids	223		althy diet	350
				ition for specific activities or conditions	351
	nthesis of long-chain fatty acids	223		nutrition	355 356
Unsaturated fatty acids		229	Malnutrition		
Essential fatty acids		233		tional foods and nutraceuticals	358
Phospholipids		239		ition for patients with genetic disorders	359
Fatty messenger molecules		243	-	tarian diets	359
ratt	ty acids in neurological and behavioural disorders	251	Eatir	ng disorders	360

CONTENTS

16	Starvation: Metabolic Changes,		19	Sexual Reproduction	429
	Survival and Death	363	Mal	e reproductive system	429
Machanisms for the regulation of the blood glucose			Female reproductive system		
Mechanisms for the regulation of the blood glucose concentration		365		menstrual cycle	433 434 435
Metabolic responses to starvation		367		lation	
Sequence of metabolic changes from intermediate		501	Che	mical communication in male and female	
	arvation to death	372	re	production	430
Progressive decrease in protein degradation			Coit	us and the sexual response in the male and female	female 440
in starvation		373	Fertilisation		
			Preg	nancy	44
17	D.C		Part	urition	445
17	Defence Against Pathogens:		Con	traception	440
	Barriers, Enzymes and			menopause	448
	the Immune System	375	Sexually transmitted diseases		448
	n the physical barrier is breached	375	20	Growth and Death of Cells	
	immune system	377	20		
	ptive immunity	380		and Humans: The Cell Cycle,	451
	kines	390		Apoptosis and Necrosis	451
	hanisms for killing pathogens	391	Introduction to cell proliferation		451
	ng of intracellular bacteria and large parasites in	20/		cell cycle	452
	e extracellular fluid	396	Deat		477
Alle		398			
	s and generation of ATP in immune cells:	400			
	nsequences for a patient	400 402	V	SERIOUS DISEASES	483
Essential fatty acids and proliferation		402	•	SERIOUS DISEASES	400
The lymph nodes Tolerance		404	21	Cancer: Genes, Cachexia and Death	485
	nic inflammation and autoimmunity	405	D		407
Immunosuppressive agents		406	35.35	c information	486
	ditions that reduce the effectiveness	400		ogenes and proto-oncogenes	488
	the immune system	406		eins expressed by oncogenes	489
	ors that increase the effectiveness			esses by which proto-oncogenes can be activated	492
	the immune system	407		converted to oncogenes our suppressor genes	493
Return of the 'old' infectious diseases		408		Telomeres and telomerase in tumour cells	
New	infectious diseases	411		Metastasis	
Defence in the intestine		415		bolic changes in cancer patients	495
				view of cancer	500
10	Curring often Traumer			er-causing agents or conditions	500
18	Survival after Trauma:		Chemotherapy		505
	Metabolic Changes and Response			otherapy	507
	of the Immune System	417			21000
Physiological and metabolic responses the ebb &		2002	22	Atherosclerosis, Hypertension and	
flow phases		417		Heart Attack	509
Nutrition		420	Atha	roeclarosis	509
Mobilisation of triacylglycerol and protein in trauma		422	Atherosclerosis Hypertension Heart attack (myocardial infarction)		521
Metabolic changes in trauma and in starvation		423			524
Feve		424	ilcai	anack (myocardiai ililaiction)	324
Summary of the effects of trauma on the immune		100	1-4	N. W.	530
system and the whole body		426	Inde	c A	529