1

DIGESTION FROM THE START: THE MOUTH, SALIVARY GLANDS AND OESOPHAGUS 1

Clinical outlook 2 Introduction 2 The mouth 2 Anatomy and histology of the tongue 3 Causes, diagnosis and treatment 4 Saliva 9 Salivary glands 10 Oesophagus 14 Gastro-oesophageal reflux disease 16 Barrett's metaplasia 18 Oesophageal cancer 19 Achalasia 22

THE STOMACH: BASIC FUNCTIONS AND CONTROL MECHANISMS 25

Clinical outlook 26 Introduction 26 Anatomy and morphology of the stomach 26 Important cell types within the stomach 27 Composition of gastric juice 27 Parietal cells 27 Triggers of parietal cell acid secretion 28 Inhibitory control of parietal cell acid secretion 29 The mucosal barrier 30 Acid reduction therapy 32 Helicobacter pylori 33 The role of the stomach in nutrient absorption 33 Secretions of the chief cell 34 Peptic ulcer disease 35 Gastric cancer 36 Stomach motility 37 Control of motility in the stomach 39 Control of the pyloric sphincter 40 Control of gastric function by food 40 Gastroparesis 44

3

EXOCRINE FUNCTIONS OF THE PANCREAS 45

Clinical outlook 46 Introduction 46 Anatomy and morphology 46 Pancreatic juice 48 Pancreatic enzymes 50 Secretion of enzymes and precursors 50 Control of secretion 52 Control of secretion during a meal 53 Acute pancreatitis 54 Pancreatic cancer 57 Surgical resection 57

4

LIVER AND BILIARY SYSTEM 59

Clinical outlook 60 Introduction 60 Overview of the functioning of the hepatobiliary system 60 Anatomy and morphology of the liver 60 Liver cirrhosis 63 Bile 63 Biliary lipids 65 Micelle formation 66 Conjugation of metabolites and drugs 66 Determinants of preferential excretion into bile 69 Transport of organic ions 69 Jaundice 71 Proteins in bile 72 The gallbladder 72 Surgical resection 74 Liver cancer 77 Surgical resection 77 The sphincter of Oddi 77 The enterohepatic circulation of bile acids 77 Control of the hepatobiliary system during a meal 78



THE SMALL INTESTINE 79

Clinical outlook 80 Introduction 80 Anatomy and structure 80 Blood supply 81 Surgical resection 82 Structure of the intestinal wall 83 The villus and crypts 83 Cell histology of the villus and the crypt 83 Intestinal secretions 84 Absorption 85 Absorption of drugs 86 Mechanisms of absorption into the blood or lymph 87 Transport of water and electrolytes in different regions of the small intestine 88 Diarrhoea 90 Treatment of diarrhoea 92 Motility in the small intestine 93 Control of motility 94 Drugs that affect intestinal motility 96

6

DIGESTION AND ABSORPTION 97

Clinical outlook 98 Introduction 98 Absorption 98 Absorption of important nutrients 98 Protein 103 Minerals and trace elements 106 Water-soluble vitamins 109 Lipids 111

7

THE ABSORPTIVE AND POST-ABSORPTIVE STATES 117

Introduction 118 The absorptive state 118 Glycogen storage disorders 118 Insulin 119 Post-absorptive state 124 Control of the post-absorptive state 128

8

THE COLON 131

Clinical outlook 132 Introduction 132 Anatomy 132 Histology 133 The appendix 135 The anal canal 136 Functions of the colon 136 Ulcerative colitis 142 Colon cancer 143 Surgical resection 144 9

THE INTESTINAL MICROBIOME 145

Clinical outlook 146 Introduction 146 Composition of the microbiome 146 Functions of the intestinal microbiome 149 Dysbiosis of the intestinal microbiome 150 Dysbiosis in disease 150 Examining the Intestinal microbiome 151 Intestinal microbiome as .i therapeutic target 152

Glossarv 155 Index 159