

Index

A

Absorption number, 24
Accommodation reflex, 201, 203
Almond digestion, 17
Antinutrients, 53
Antiperistalsis, 196
Aquaporins, 144, 258
Asymmetry, 170, 178

B

Bacteria
 biofilm, 43, 110, 253
 component species, 250, 253
 consortia, 43
 cross-talk, 237, 251
 FISH studies, 250
 mucin interaction, 250
Balloon distension, 126
Bernoulli's theorem, 132
Bile salts
 deconjugation, 84
 displacement of surfactants, 78
 quantity, 144
 structure, 76
 structuring, 82
Bolus
 cohesion, 157, 159
 compliance, 160
 formation, 157
 gastric layering, 204
 oesophageal transit, 168
 strength, 101
 swallow-safe, 157, 159
Boundary layer, 223
Brush border *See* Microvilli
Buoyancy of particles, 20, 103
 gastric emptying, 207

C

Casein micelles
 aggregation, 57
 structure, 50
Chitosan, 78, 241
Cholecystokinin (CCK)
 effect of emulsion droplet size, 78
 effect of emulsion stability, 75
 sphincter of Oddi, 141, 142
Clathrin-coated pits, 83, 258
Coating
 biopolymer, 19
 lactoglobulin, 23
Collagen, 52
 digestion, 5, 55
 effect of cooking, 21
Colonic fermentation
 carbohydrates, 42
 proteins, 57
Colonic folds, 196
Colonic motility, 190
 classification, 193
 diurnal variation, 192
 fast phasic, 194
 haustral progression, 195
 mass peristalsis, 194
 ripple contractions, 196
Colonic sorting mechanism, 104, 192
Common bile duct, 141
Compartmentation, 37, 222, 240, 256
Cooking
 effects on particle digestion, 20
Countercurrent
 exchanger, 231
 multiplier system, 231
Creep rheometry, 110
 mucus gel, 246
Critical micellar concentration, 81

Critical solid volume fraction, 105

Crypt

- colonic absorption, 145, 249
- gastric secretion, 238
- renewal, 230

D

Deborah number, 160

Defecation

- colonic motility, 194
- control of, 163

Degradation

- rate-limited process, 15

Diffusion

- coefficients, 225, 240
- intervillous, 231
- Nernst layer, 13
- rate-limited process, 13
- resistance, 223

Diffusivity

- Stokes–Einstein equation, 14
- tortuosity, 14

Digestion

- cellular plant material, 17
- native starch granules, 38
- protein, 54
- starch, 37

Discrete clustered contractions (DCC), 131, 143

Dissolution number, 24

Distensibility

- antral wall, 201
- effect of collagen fibres, 127
- measurement, 126
- small intestinal, 174

Dose number, 24

Dry matter content, 96

Duodenal brake, 182

Dyssynergia, oesophageal, 166

E

Emulsion

- apolipoprotein A-IV, 85
- dairy protein stabilised, 72
- droplet bridging and fusion, 73
- droplet size, 70
- duodenally delivered, 78
- intra-gastric destabilisation, 72
- isoelectric point, 71
- mesophase structuring, 81
- solid fat content, 73, 79
- structuring in stomach, 70
- tailored structure, 85

Endocytosis, 82, 258

Enteral microflora *See* Bacteria

Enterocyte

- maturity, 249
- membrane permeability, 226
- nutrient diffusion, 227
- renewal, 230

Erosion

- bulk, 13
- food particles, 19
- particle, 12
- surface, 12

Expression of fluid, 104

- cake compression, 106
- constriction point, 107
- mechanisms, 105
- pore sealing, 108
- pressure differential, 107
- rate, 106

F

Faecal water, 99

Fats and oils

- digesta rheology, 101
- emulsion droplet size, 70
- gastric emulsification, 75
- gastric layer, 74
- gastric lipolysis, 69
- gastric processing, 69
- intestinal lipolysis, 77
- oral perception, 68
- oral processing, 66
- unemulsified, 66

Fatty acids

- colonic absorption, 83
- diffusivity in mucus, 240
- short chain, 42, 57
- transporters, 82, 258

Fibre

- soluble, 211

Food

- intake control, 198
- oesophageal transit, 167
- physical properties, 158

Force

- bite, 12
- gastric antral, 12

Fractal pattern

- viscous fingers, 249

Fractionation of digesta, 103

G

Gall bladder, 141

Gaseous phase, 100

- effect on liquid permeability, 101

Gastric emptying, 208
 lag phase, 209
 mathematical description, 209

Gastric flow
 computer simulation, 205
 mixing patterns, 205
 postprandial, 203
 velocity, 206

Gastric morphology, 197

Gastric motility, 198
 antral and corporal tone, 201
 antrocorporal contraction, 199
 fundal tone, 201
 luminal occlusion, 199

Gastric sieving, 207
 liquid phase viscosity, 211

Gastric trituration, 205
 by direct compression, 206
 by shear, 205

Generalist strategy, 4

Glandular goblet cells, 238

Glycogen, 42

H

Hagen–Poiseuille law, 93, 190

Heterogeneity in foods, 16

Hill's model, 195

I

Ileal brake, 143

Interstitial cells of Cajal, 122
 colonic, 191
 pyloric sphincter, 138
 sphincter of Oddi, 140

Intervillous space
 mixing, 230, 260
 saturation, 227
 variation, 224, 231

Intrahepatic ducts, 141

Intraluminal pressure, 101, 108
 colonic, 194
 oesophageal, 166

J

Junctional morphology
 digesta flow, 132
 particle suspensions, 133

L

Lamellar barriers, 18

Laminar flow, 92

Larynx, 157

Legumes
 protein, 48
 starch granules, 36

Lipid

direct endocytosis, 83, 258
 functional properties, 64
 in colon and rectum, 84
 transport and absorption, 80

Liquid bridges, 100**Liquid crystallinity**

absorbed mucin layer, 244
 fatty acid/monoglyceride mixture, 81
 secreted mucin, 236

Lubrication by mucins, 242

absorption to surfaces, 243
 coefficient of friction, 243
 viscous boundary mechanism, 243

M

Magenstrasse, 203, 205

Maillard reactions, 53

Meat

digestion, 54
 structure, 49

Mechanoreceptors, 124, 125

Michaelis–Menten kinetics, 15, 24

Microvilli, 254

enzymes, 226
 vesicle release, 255

Mixed micelles, 65

calcium, 83
 formation, 77, 80

Mixing

laminar, 178
 macroscopic, 91
 optimal, 4
 physics, 92

MMC cycle, 128

colon, 130
 gall bladder, 142
 gastric emptying, 208
 phases, 129, 137
 propagation velocity, 129
 sphincter of Oddi, 141

Models

compartmental (CAT), 24
 finite element, 174
 mass balance, 24
 pharmacological, 3, 23

Motilin, 131**MUC genes, 235**

regional variation, 237

Mucin, 232

bacterial motility, 251
 charged side chains, 241
 effect of pH, 241
 glandular organisation, 237

- glycosylation pattern, 237
- high salt concentrations, 249
- ionic repulsion, 82
- lubrication, 242
- molecular structure, 233
- native fibre aggregation, 241
- particle envelopment, 252
- physical properties, 239
- rheology, 244, 248
- SEA domain, 237, 244, 255
- stress hardening, 245
- synthesis and secretion, 234
- volumetric expansion, 236
- Mucosa**
 - morphology, 228
 - plicae circulares, 229
 - pore sizes, 228
- Mucus**
 - adherent layer, 236, 246
 - laminar arrays, 238
 - layer thickness, 235
 - micelle permeability, 82
 - mobile layer, 236
 - permeability, 240
 - protection from shear, 244
- N**
- Nanoparticles, 22
 - transit through mucus, 23
- Nitrogen excretion, 58
- Noyes–Whitney equation, 13
- Nutrient bioavailability, 17
- O**
- Oesophageal motility, 164
 - regional variation, 167
- Orogenic displacement, 78
- Osmotic gradient
 - absorption against, 258
 - along villi, 231
 - luminal, 145
 - tight junction, 222, 261
- Ostwald-Freundlich effect, 22
- Overchewing, 160
- P**
- Pacemaker
 - colonic, 130
 - potentials, 122
 - rectosigmoid, 161
- Paracellular transport, 228, 259
- Particle entanglement, 95
- Particle size, 21
 - distribution, 97
 - fine particle separation, 109
 - milled starch, 41
- Passive flux, 260
- Pendular contractions, 169, 182
- Peristalsis, 169
 - contraction profile, 171
 - event structure, 175
 - mixing during, 170, 178
 - preceding zone of dilatation, 175
 - propagation speed, 124
 - pulsatile, 176
 - reflex, 171
 - zone of constriction, 176
- Permeability
 - intestinal, 222
 - mucus, 240
- Peyer’s patches, 229, 256
 - glycocalyx layer, 242
 - mucus layer, 235
- Pharyngeal transit
 - bolus properties, 135
 - pump mechanism, 168
 - retrograde, 136
- Phasic contractions, 122
 - triggering, 123
- Physiological ileus, 183
- Prolonged propagated contractions (PPC), 131, 143
- Propulsion
 - by extrusion, 156
 - small intestinal, 168
- Protein, 47
 - dairy, 50, 56
 - denaturation, 51
 - digestion, 54
 - meat, 49, 54
 - microstructure, 48
 - plant, 49, 56
- Pseudoplasticity, 95
- R**
- Reaction, homogeneous, 15
- Rectoanal junction, 160
 - contractile sequence, 163
- Reynolds number, 92
- Rugae, 203
- S**
- Saliva, 144
- Segmentation, 169, 180
- Sleeve contractions *See* Pendular contractions
- Solvent drag, 2

- effect of particle size, 225
 - paracellular route, 261
 - Sphincter
 - control, 133
 - ileocolic, 142
 - lower oesophageal, 137
 - of Oddi, 140
 - pattern generator, 135, 137
 - phasic contractions, 133, 137
 - pyloric, 137
 - upper oesophageal, 135
 - Starch, 32
 - digestion, 37
 - gelatinisation, 39
 - granules, 35
 - growth rings, 34
 - heat moisture treatment, 40
 - milling, 41
 - molecular structure, 32
 - resistant, 38
 - retrogradation, 40
 - Stomach *See* Gastric
 - Striated muscle, 156, 157, 161, 164
 - Surface area
 - effect of flow resistance, 109
 - effects on particle digestion, 21
 - Swelling
 - rate-limited process, 15
- T**
- Taeniae, colonic, 191
 - Tight junctions, 259
 - local variation in permeability, 228
 - Tonic contraction, 122, 124
 - Transcellular transport, 228, 256
 - co-transportation, 258
 - endocytosis, 258
 - membrane transporters, 257
 - Triglyceride
 - co-lipase, 76
 - hydrolysis, 64, 76
 - molecular structure, 64
 - regio-specificity, 79
- Turbulence, 92
- U**
- Ultrasonography, 127, 138, 140, 165, 203
 - Unstirred water layer (UWL), 5, 222
 - barrier to lipids, 64, 82
 - contributing components, 223
 - operational thickness, 223
- V**
- Vagus nerve, 131, 202
 - Villi
 - morphology, 229
 - nutrient absorption, 224
 - Virus capsid proteins
 - diffusivity in mucus, 241
 - Viscoelasticity, 98
 - Viscosity
 - liquid phase, 94
 - suspensions, 95
 - whole digesta, 94
 - Viscous diets, 92
 - Vortical flow, 93
 - eddies, 174
 - symmetrical, 170
- W**
- Water
 - secretion and absorption, 144
 - Weak gels, 98, 244
- Y**
- Yield stress, 98
- Z**
- Zymogen granules, 238