N-Acetylcysteine effects on glutathione levels 188, 196 metabolism 196, 206 Acute renal failure etiology 247 nutrition enteral 248, 249, 252 oral 248 parenteral 248 requirements 248, 254 treatment 247, 248 Alanine portal availability in pigs 27 splanchnic uptake efficiency 49 Albumen splanchnic synthesis 50, 51, 54, 55, 59, 60, 275 value of dietary formulations 86 Amino acid, see also geradesteheud composition as physicochemical property 110, 111 conditionally indispensable 199, 200 essential vs nonessential 200 factors affecting absorption from hydrosylates 259-261 fortification 117, 118 metabolism in disease 273, 274 overview of functions 2, 3 sequence considerations in proteins 111, 127, 128

Amino acid transport cystinuria gene defects 64, 66 enterocytes 72 evaluation techniques 66, 67 history of study 63, 64 regulation by diet 72-74 stress effects 86 transporter types, substrates, and distribution 65, 68, 257, 258 Aminoacyl-tRNA, protein synthesis measurement 51 Ammonia assimilation pathways 6, 7 intestinal production 33, 34 Arginine conditional indispensibility 173 functions 207 immunomodulation 278 intestinal synthesis 35, 36, 45 metabolism 206, 207 portal availability in pigs 27 splanchnic uptake efficiency 3, 49 supplementation in disease animal models 207 clinical trials 207, 208 Aspartate, portal availability in pigs 27 Bacteria intestinal content 157 intestinal permeability alterations in trauma 159, 160

lysine synthesis in human gut 8, 9, 100, 101, 107, 108 synthesis in human gut 8, 9 threonine Bombesin, immunomodulation 166-168, 170 Casein gastric emptying 87, 88, 222 hydrolysate digestibility 259, 260 Cholecystokinin immunomodulation 170 regulation of release 240, 243, 244, 246 Chronic pancreatitis, see Pancreatitis, chronic Chronic renal failure homocysteine levels 256 leptin and appetite 256 malnutrition 249, 255 nutrition acidosis effects 254, 255 diet composition 250, 251 enteral nutrition adults 252 children 251 monitoring 255 requirements 249, 250, 254 Crohn's disease, protein nutrition 87, 225, 265-267, 271, 272 Cysteine catabolic state effects circulating concentrations 181, 182, 191, 192 metabolic disturbances 182, 183 catabolism 178 compartmentation of metabolism 194 conditional indispensability 192, 205 fortification 117, 118 functions 174, 205, 206 glutathione synthesis 175-178 muscle levels 23 nutritional regulation of metabolism catabolism 179, 180 synthesis 178, 179 reliability of tracer assays 21 splanchnic utilization 40 synthesis 175, 192, 193, 205 Cystic fibrosis arachidonic acid role 242 malnutrition 242 nutrition therapy 242, 246

pathophysiology 241 Cystine glutathione relationship 14-16, 22, 23, 187 methionine relationship in diet 13, 14 splanchnic uptake efficiency 3 uptake in catabolic states 187 Cystinuria, oligopeptide transport 259 Digestibility, proteins absorption overview 221-224, 261 assessment 25, 26 efficiency of enteral formulas 229-231 indications for protein, peptide, or amino acid solutions 224, 232, 261 Digestion normal physiology 221-224 phases 112, 113, 257 Dipeptide clinical trials in disease 211 solubility and stability 210, 211 transport, see Peptide transport Fast protein concept absorption kinetics evaluation 124, 125 aging effects 130, 133 appetite regulation 132 clinical implications 129, 130, 133, 276 factors affecting absorption 124 overview 116, 121 Food matrix, physiochemical interactions 112 Glucose transport energetics 70 regulation of SGLT1 expression 72 transporter types and distribution 65 Glutamate catabolic state effects 194 cellular uptake 44, 45 portal availability in pigs 27 splanchnic uptake efficiency 26, 49 visceral utilization in milk-fed piglets 28, 43 Glutamine conditional indispensability 173 fortification 117 immunomodulation 166, 278 intestinal utilization for energy 32-34, 158

levels in disease 218, 219 metabolism 201 portal availability in pigs 27 splanchnic uptake efficiency 26, 49 stability 219 supplementation in disease animal models 201, 202 clinical trials of enteral feeding 202-204, 217, 218 composition of commercial formulae 204, 205 safety 218 visceral utilization in milk-fed piglets 28 Glutathione assay in gut 42 catabolic state effects circulating concentrations 183, 184, 191, 194 consequences of deficiency 186 oxidative stress 184 synthesis rate 185, 186, 188 degradation 177, 178 dietary sulfur amino acid effects on metabolism 14-16, 22, 23, 40, 180, 181, 188 feeding effects on levels 187, 188 functions 175, 178 intestinal synthesis 36 redox ratios 176, 194 structure 175, 176 synthesis 176, 177 Glycine, portal availability in pigs 27 Gut associated lymphoid tissue anatomical units 162, 163 enteral feeding stimulation 163 Hartnup disease, oligopeptide transport 259 Homocysteine, levels in renal failure 256 Hydrosylate, see Protein hydrosylate Immune dysfunction diet composition effects in injury 171, 172diet consistency effects 169, 170, 172 gut associated lymphoid tissue anatomical units 162, 163 enteral feeding stimulation 163 immunization, enteral feeding effects of host response 163 immunoglobulins 161-163, 165

innate mucosal defense factors 160, 161 intestinal permeability alterations to macromolecules and bacteria in trauma 159, 160 protein catabolic factors 157, 158 surrogates of enteral feeding bombesin 166-168, 170 cholecystokinin 170 glutamine 166 Insulin postprandial protein gain role 123, 124 vasodilator activity 277 Intestine absorption disease states 224, 225 overview 221-224 amino acids as energy sources 31-34, 61 bacterial content 157 biosynthetic pathways using amino acids 35, 36 enteral management of chemotherapy patients 236 metabolic compartmentation 35-37, 41 nitrogen flow amino acid balance required for normal metabolism 101, 102 amino acids in nitrogen exchange 99, 100 chemical exchange factors 105, 106 dietary fiber effects 98, 99 fates of urea tracer placed directly in colon 96-98 hydrolysis in nitrogen balance 89, 99 lactose-ureide studies of colon metabolism 98, 106 large intestine 94 quantitative flow 90, 91 sheep model caveats 106, 107 small bowel 91, 92 urea kinetics 94, 95 oral feeding and atrophy prevention 55, 158, 159 peptide transport, see Peptide transport permeability alterations to macromolecules and bacteria in trauma 159, 160 protein synthesis and accretion 29-31, 58

reabsorption of amino acids, measurement 30, 31 regional differences in mucosal free leucine labeling 29, 30 transit time 223 visceral amino acid utilization in milk-fed piglets 28 Isoleucine, portal availability in pigs 27 Leptin, levels in renal failure 256 Leucine absorption kinetics evaluation 124, 125 intestinal utilization for energy 34 nitrogen gain mechanisms during feeding 122 oxidation rates administration route effects 4 meal size effects 12 reliability of tracer assay 21 portal availability in pigs 27 postprandial protein utilization measurement using carbon-13 leucine balance 138, 139, 150, 152, 153 oxidation variables 149, 150 protein degradation suppression 60 splanchnic rates of release and synthesis 49, 50 splanchnic uptake efficiency 3, 4, 26, 44, 49, 54 visceral utilization in milk-fed piglets 28 Lysine biological availability of fortification derivatives 118 intestinal utilization for energy 34 microbial sources in human gut 8, 9, 100, 101, 107, 108 oxidation rates by administration route 4 portal availability in pigs 27 splanchnic uptake efficiency 26, 49 visceral utilization in milk-fed piglets 28, 41 Malnutrition, enteral feeding of protein chronic renal failure 249, 255 cystic fibrosis 242 intact gastrointestinal function 262

moderately impaired gastrointestinal function 262, 263 Methionine catabolic state effects circulating concentrations 181, 182, 193 metabolic disturbances 182, 183 cystine relationship in diet 13, 14 fortification 117 metabolism 175, 176, 192, 193 portal availability in pigs 27 reliability of tracer assays 21 splanchnic uptake efficiency 3 Milk bioactive proteins and peptides 117 cow's milk intolerance 236, 237 Mucin, synthesis 31, 42, 43 Multidrug resistance, see Organic anion transport Nitrogen balance stress response 1 urea role, see Urea Nonspecific nitrogen enteral formulations 7 roles in diet 7, 8 Organic anion transport regulation of multidrug resistance proteins 71, 72 transporter types, substrates, and distribution 65, 66, 71 Ornithine

metabolism and functions 208 supplementation with α-ketoglutarate salt 208, 209, 211

Pancreatic disease, enteral feeding of protein 263, 264, 272, 273 Pancreatitis, chronic antioxidant status 240, 241 enteral treatment approaches 241, 243-245 fatty acid analysis 244, 245 nutritional regulation of exocrine pancreas 240, 245, 246 pathophysiology 239, 240 Peptide transport enterocytes 72 evaluation techniques 66, 67 history of study 63, 64 intestinal transport, overview 258, 259 oligopeptide transport, nutritional significance 259-261

parenteral nutrition considerations 85 PepT1 energetics of transport 69, 70 intestinal distribution and regulation 72, 73 peptide specificity 70, 71 structure 69 regulation by diet 73-76, 84, 85 stress effects 86 transporter types, substrates, and distribution 65, 68, 69, 258, 259 Phenylalanine oxidation rates by administration route portal availability in pigs 27 splanchnic rates of release and synthesis 49, 50, 59 splanchnic uptake efficiency 3, 26, 49 visceral utilization in milk-fed piglets 28 Portal blood flow, regulation 277, 278 Postprandial protein gain factors affecting hyperaminoacidemia 123, 124 insulin 123, 124 substrate availability 123 nitrogen gain mechanisms during feeding 121, 122 Postprandial protein utilization calculation 10, 135 clinical relevance 155 factors affecting aging 141, 143, 153, 154 leucine oxidation 149, 150, 154, 155 meal size 146-149 overview 10-13, 142 protein concentration in meals 139, 141 protein quality in meals 144, 145 measurement using carbon-13 leucine balance 138, 139 metabolic model 136, 137 net protein utilization comparison 153 Proline intestinal synthesis 35, 36 portal availability in pigs 27 Proteases cleavage specificity 111, 112 protein diet effects on exocrine pancreas 115, 116

Protein digestibility, see Digestibility, proteins Protein hydrosylate characterization of peptides 75 degree of hydrolysis and digestibility 113-115 peptide transport regulation 75, 76 prediction of peptide composition 113 Pulse feeding, effects on protein retention in elderly women 12 Renal failure, see Acute renal failure Chronic renal failure Serine, portal availability in pigs 27 SGLT1, see Glucose transport Short bowel syndrome, protein nutrition 87, 107, 108, 225, 264, 265 Slow protein concept absorption kinetics evaluation 124, 125 absorption rate effects on whole body protein kinetics 125-129 aging effects 130, 133 appetite regulation 132 clinical implications 129, 130, 133, 276 factors affecting absorption 124 overview 116, 121 Splanchnic protein synthesis, regulation by enteral feeding albumin synthesis 50, 51, 54, 55, 59, 60 amino acid uptake efficiency, see geradesteheud animal models 52 blood circulation 47 diet composition effects 52-54 fasting state 48-52 fractional synthetic rate measurement 48, 51, 52, 58 nitrogen compund exchange components 48 oxygen consumption effects of meal composition 56, 60, 61 Taurine

antioxidant activity 209, 210 catabolic state effects 181 conditional indispensability 209 functions 174, 209 metabolism 209

supplementation in disease 210 uptake 277 Tertiary structure, proteins 111 Threonine gut utilization for glycoproteins 31 microbial sources in human gut 8, 9 oxidation rates by administration route 4 portal availability in pigs 27 Tolerance, enteral nutrition solutions children 235 clinical symptoms of intolerance 226 factors affecting endogenous factors 228 formula composition effects 226, 227, 232 overview 226 timing and rate of administration effects 227, 228 Total body protein aging effects 10 synthesis 122 Total parenteral nutrition efficacy and hazards 237, 238 peptide transport considerations 85 Trypsin inhibitors, inactivation 116 Tyrosine clinical use 206 conditional indispensability 206 portal availability in pigs 27

splanchnic uptake efficiency 3, 26, 49 visceral utilization in milk-fed piglets 28

Urea

meal size effects on excretion 12 nitrogen flow in intestine amino acid balance required for normal metabolism 101, 102 amino acids in nitrogen exchange 99, 100 chemical exchange factors 105, 106 dietary fiber effects 98, 99 fates of urea tracer placed directly in colon 96-98 hydrolysis in nitrogen balance 89, 99 lactose-ureide studies of colon metabolism 98, 106 large intestine 94 quantitative flow 90, 91 salvage in colon 8, 94 sheep model caveats 106, 107 small bowel 91, 92 urea kinetics 94, 95 nitrogen intake effects on production and hydrolysis 5, 6

Valine, portal availability in pigs 27