

Index

- abortion, iodine toxicity 60
absorption tests for sugars 363
acclimatization, hair coat changes during 147
acetyl-CoA 224
acetylcholine 116
acid–base balance of blood
 base excess (BE) 245, 248–58, 379
 dietary cation–anion balance (DCAB) 209, 219, 248–58
 dietary protein and 279–80
acidosis 245
 lactic 315
 metabolic 33, 245, 247
 respiratory 245, 247
Addison's disease 359
adenosylcobalamin (vitamin B₁₂) 250
adiponectin 25
adrenal exhaustion 247
adrenal gland
 cortical hormone secretions of 228, 232, 237–8
 medullary hormone secretions of 232
aerobic exercise 226–9
aflatoxicosis 304
aflatoxin 117, 126, 130
alanine 243
alanine aminotransferase 356
albumin, blood 23, 32, 52, 356
 in foals 192
alcohol dehydrogenase 133
aldosterone 19, 45, 89, 247
alfalfa *see lucerne*
algae
 blue-green 87
 seaweed, kelp 132
algal blooms 179
alimentary canal *see* GI tract; *specific parts*
alkali disease 65
alkali treatment of fibre 63
alkaline phosphatase 13, 56, 59, 192, 355–6, 362
alkaloids 300–1
 reed canary grass 302
alkalosis
 exercise 234
 metabolic alkalosis 245, 247
 respiratory alkalosis 234, 245, 247
alkane pair technique, estimating DM intake 136
allergens
 in micro-organisms 350–1
 respiratory 350–1
 in seeds 130–1
 skin reactions 130
 tests 363
allergies 130–2
 dietary 130–2
alliesthesia for water 86
allowances *see* feed/feeds; rations
alpha-amylase 10
alpha-glucosidase 10
alpha-hydroxylase 74
aluminium 132
amino acids 23, 29–32, 250–4
 absorption 19
 arginine 32, 125
 availability 32
 branched chain (BCAA) 31, 125, 250, 259
 chelates *see* trace elements
 deamination 23, 29
 digestion, utilization 259
 dispensable 29–30, 33, 182
 essential/indispensable 15, 23, 29, 30, 182, 259
 lysine 19, 23, 29, 30–2, 94, 164, 182, 259
 threonine 19, 31, 259
 glucogenic 23
 glutamine 125, 259
 growth and exercise 30–1
 and health 125
 homocysteine 358
 ketogenic 23
 large intestine and 250–4
 methionine, sulphur amino acids 69, 80, 110, 129, 361
 mixtures of, anorectic horses 337
 plasma concentrations 259
 requirements of growing, working and breeding horses 32
 supplementation of a concentrate mix 31
 supplements 259
 transaminations 23, 29
aminopeptidase 10
aminopropionitrile 128
aminotransferases 356
ammonia 99
 alanine vehicle 243
 in blood 243, 334, 358
 in citrus pulp 111
 environmental 259
 non-protein N (NPN) 33–4
 in silage 283
 toxicity 33–4, 333, 334, 361
 treatment 33–4
 see also soil, straw
anaemia 57
 haemolytic anaemia of favism 129
 iron deficiency 55
 macrocytic 80
anaerobic bacterial fermentation 140
anaerobic exercise 226–7, 228
angular limb deformities 217–18
animal fats 113
annual ryegrass toxicosis 299
anorexia 26, 337
anthelmintics 194, 306–10, 325
 avermectins 309, 312
 benzimidazoles 307, 309–10, 312
 prohibited in meat production 308
antibiotics 134, 331
 ionophore antibiotics
 laidlomycin 134
 lasalocid 134
 lincomycin 134
 maduramicin 134
 monensin sodium 134
 narasin 134
 treatment of salmonellosis 179, 323
anticoagulant, warfarin 343
antihistamines 306
 sodium cromoglycate 352
anti-moulding, GRAS chemicals 134
antioxidants 75, 113, 351
 added, permitted 178
 feed additives 133–4
 natural 75, 76
 ROS 258, 351
 synthetic 100
antiprotease, trypsin inhibitor 105, 116, 128
antivitamins, and kidney beans 129
antral systole 7
appetite 173–4
 hormones involved 25
 leptin and 26–7, 173–4
 satiety 25
 timing of feeds 22
apples 99

- Archaea methanogenesis* 170
 arginine 32, 125
 arsenic 132
 arthropod parasites 305–6
 articulated joint 208
 artificial insemination 202
 aspartate aminotransferase (AST, AAT) 63, 76, 77, 340, 355, 356
 aspartic acid 32
Aspergillus
 aflatoxin 117, 126, 130, 304
 phytase 43
Aspergillus fumigatus 350
Aspergillus oryzae 121
 ataxia 33, 75
 ATP 222–6
 resynthesis 225
 synthesis 225–6
 autonomic nervous system 300
 see also dysautonomia
 avermectins 309, 312
 azoturia 338–9, 356
- bacteria, *see also* microorganisms
 bacteria
 causing disease 87, 127
 cellulose-digesting 16
 cultures of 120
 in feed 119
 fish-meals 119
 intestinal 15–17
 poisons/poisoning, encephalopathy 33
 bacterial protein 13, 19, 23, 120–1
 barley
 chemical composition/MADC 372
 comparison of DE and NE values 157
 efficiency of energy utilization 146
 glycaemic index 22
 basal metabolic rate (BMR) 138
 base excess (BE)
 blood, estimates 379
 dietary 245, 248–58
 estimates 379
- beans
 antivitamin factors 129
 chemical composition/MADC 372
 field beans 118, 119
 hyacinth bean 119
 kidney beans 119
 locust beans 109
 soya beans 105
 soya-bean meal 116
 soya hulls 9, 111
 UFC values 164
- bedding
 shredded paper 351
 wheat straw 351
 wood shavings 351
- beet *see* sugarbeet
- behaviour abnormalities 100, 174, 175
 crib-biting 97
 faeces eating, coprophagy 349
 prevention of stereotypies 349
 weaving 349
 wind-sucking 338
 wood chewing 349
- bentonite 94, 125
- benzimidazoles 307, 309–10, 312
 Bermudagrass (*Cynodon dactylon*) pasture 277, 296
 beta-carotene *see* vitamin A (retinol)
 beta-endorphins 349
 beta-galactosidase 10, 122
 beta-glucosidase 11
 beta-glycosidic bonds 120
 betaine 85
 choline substitute 109
Bifidobacterium bifidum 122
 bile 9
 bile acids 358
 bile duct obstruction 358
 bilirubin 336, 358
 bioflavonoids 124
 biotin 81–2
 hoof improvement 83, 84
 requirements for/dietary allowances 70
- Birdsville disease 294, 296
 biscuit meal 109
 Biuret, non-protein N (NPN) 33
 blister beetles 306
- blood
 acid–base balance, base excess (BE) 245, 248–58, 379
 albumin 23, 32, 52, 356
 foals 192
 alkalaemia 237–8
 alkaline phosphatase 192
 ammonia 243, 334, 358, 361
 anaemia 57
 haemolytic, of favism 129
 iron and 55
 macrocytic 80
 bicarbonate, carbonic acid in 244, 245
 bilirubin 358
 bleeding, pulmonary 236–7
 breed differences 237
 caeruloplasmin 53–4, 357
 cation–anion balance, base excess 245, 248–58, 279–80
 coagulation 79
 distribution effects 230, 236
 enzymes, normal characteristics 52
 erythrocytes 233, 358
 additional rbc boost 236
 count changes in endurance ride 2, 234
 essential amino acids *see* amino acids
 fat 192
 ferritin 77
 foal 192
 gases 233
 oxygen debt 226–7
 globulins 192
 see also immunity
 glucose 23, 25, 185, 232, 236
 and insulin 24
 reduction 232
 glycerol 225, 226, 228
 haematocrit (PCV) 233, 236
 haematology 363
 haematopoiesis 72
 haemoglobin 58, 80
 iron 357
 hypercalcaemia 39
 hyperglycaemia 33
- hyperlipaemia, hyperlipidaemia 34, 182, 329–30
 hyperthyroxaemia 217
 hypervolaemia of red cells 237
 hypocalcaemia 39, 342
 hypoglycaemia 23, 25, 200
 hypokalaemia 46
 hypomagnesaemia 45, 46
 iron deficiency, hypochromic 57
 leucocyte 357, 358
 leucopenia 87
 macrocytic 79
 NEFA, FFA 23, 182, 225, 226, 230, 252
 normal characteristics 52
 osmolality, osmolarity 33, 89
 osmotic pressure 241, 242
 oxygen carrying capacity 231
 PCV 233, 236
 pH 39, 233, 242, 243, 244, 247–9
 plasma
 donor 199
 serum, protein 89, 192, 356
 plasma lactate and glucose 256
 plasma minerals 357
 plasma pH 247–8
 plasma protein synthesis 356
 plasma proteins 334
 plasma volume 89
 potassium, *see also* electrolytes
 proteins of bone metabolism *see* bone
 prothrombin 357
 red cell haemolysis in foal 186
 red cell hypervolaemia (RCHV) 237
 stroke volume 233
 strong ion difference of 248
 transferrin 59
 unique rheological properties 237
 urea 29–30, 358
 very low density lipoproteins 23
 viscosity 236–7
 vitamins, normal characteristics 52
 volume 233, 236–7
see also acidosis; alkalosis; carbohydrates
- blood vascular system 233–41
 body condition scores (BCS) 180–4
 body fat 11, 34, 231, 232
 body weight 136–9
 birth 204
 effect of endurance work 237
 effect of season 207
 and energy requirements for maintenance 142
 estimates 137–9
 body measurements 137
 excessive 231
 fat reserves (depot fat) 253–5
 gain *see* growth of foal
 and height 138
 loss 337, 338
 metabolism and 34
 protein requirement 28
- bone
 apatite 37, 59
 articular cartilage 53, 55, 208
 ash 74
 brittle 40
 calcium and phosphorus 38–41

- chondroitin sulphate 57, 219
 collagen, elastin 54
 density 231
 epiphyseal, metaphyseal, plate in 38, 74, 208
 fractures 39, 231
 growth of long bones 208–9
 magnesium 45
 metabolism
 measurement 361–2
 measurement of 362
 minerals in *see* minerals
 mobilisation of Ca and phosphate 74
 remodelling 231
 silicon 67–8
 skeleton 37
 strength 41
 bone flour, chemical composition/MADC 374
 bone formation
 long bones 208–9
 measurement of changes 220–1
 ossification 60
 osteoblast, osteoclast 39–41, 54, 60
 osteocalcin 54, 67, 79, 209, 220
 ICTP, PICP 41, 362
 proteoglycans 67
 turnover 41
 boron 68
 borreliosis 305
 botulinum toxin 299, 330
 botulism 300, 330
 silage-associated 283
 bracken fern
 poisoning 79, 301
 thiaminase 129
 bradycardia 79
 brewer's grains, chemical composition/MADC 374
 brewer's yeast 43, 65, 81, 107
 chemical composition/MADC 372
 broken wind *see* heaves
 bruxism 8
 buffers/buffering 17, 19, 236
 bicarbonate in digestive secretions 4, 9
 sodium bicarbonate 46, 244–6
 butylated hydroxyanisole (BHA) 178
 butylated hydroxytoluene (BHT) 133, 178
 byproducts/waste as feed 99

 cadmium 132
 caecocolic junction 15
 caecovernal colonic valve 14
 caecum 5, 13, 15, 17, 18
 flora 15, 16
 see also GI tract
 caeruloplasmin 53–4, 357
 caffeine 135
 calcification, soft tissue 39, 74
 calcined magnesite 45
 calcinosis 38
 calcitonin, thyrocalcitonin 37, 39, 74
 calcium
 absorption, net 42
 availability 43
 and phytic acid 129
 bentonite 94, 125
 bioavailability, or true digestibility 166–7
 bone 37
 citrus pulp 111
 daily requirements (g/kg BW/day) 42
 growth 43
 dicalcium phosphate 43
 chemical composition/MADC 374
 dietary requirements, response of yearling Quarter Horses 41
 digestibility 43
 distillery dark grains 108
 excretion and reabsorption 41
 in gut 18
 homeostasis 41
 hoof 82
 hydroponic barley 109
 hypercalcaemia 342
 hypercalciuria 249
 hypocalcaemia 39
 incorrect Ca : P ratios caused by dilution 168
 loss of Ca in faeces/urine/sweat 42
 in lucerne 110
 mares' milk 44
 requirements in pregnancy/lactation 44–5
 rickets 73
 in sweat 239–40
 transport, recurrent ER 340
 urine 359, 360
 loss 42
 calcium bentonite 94, 125
 calcium carbonate 251–2
 urolithiasis 335, 358–9
 calcium gluconate 40, 192, 339, 342
 calculi 335, 358–9
 calorimetry 137–40
 cancer 338
 cane molasses 109
 cantharidin, in lucerne 306
 carbohydrates
 acid detergent fibre (ADF) 106
 apparent total intestinal tract digestibility 114
 cellulose 10, 15
 digestion 9–11, 34, 114
 as energy source 21–8
 fermentable 21–2, 34
 glucose 124
 glucose tolerance, glycaemic index 23, 104, 105, 113
 hemicellulose 13, 15
 hydrolysable 35
 lactose 10
 lactulose 34
 lignin 13, 15
 methods 35
 neutral detergent fibre, NDF 15, 17, 35, 90
 non-structural carbohydrate (NSC) 34
 oligosaccharides, fructans 9, 13, 35
 oxidation (RQ) 140
 pectin 13, 15, 109
 starch 34
 starch gelatinization 12
 starch/grain overload 13, 34, 121, 125
 see also laminitis
 sugar tolerance 202, 363
 carbonic anhydrase 56

 carboxy-terminal telopeptide of type I collagen (ICTP) 41
 carboxylase enzymes, and biotin 81
 carboxypeptidase 10
 carboxyterminal propeptide of type I collagen (PICP) 41, 362
 cardiovascular system 233–41
 carnitine 123–4
 carnosine 124, 252
 carob-seed meals 109
 beta-carotene *see* vitamin A (retinol)
 carotenoids 110
 carotenoids *see* vitamin A (beta-carotene)
 carrots 99, 110
 cartilage formation 54–5
 cassava, manioc 111, 129
 catalase 59
 catechins 124
 proanthocyanidins 124
 catecholamines 26, 232
 cation–anion balance, dietary (DCAB) 209, 219, 248–58
 cellulose 4, 10, 15
 cereal grains 101–5
 aleurone layer 101, 103
 amino acids in 101, 104, 107
 barley 103
 chemical composition/MADC 372
 by-products 106–8, 109–11
 brewery grains 107
 chaff 108, 109
 chemical composition/MADC 371–9
 distillery 107, 108
 distillery dark grains 108
 grain screenings 108
 maize germ meal 107
 maize gluten feed 107
 malt culms 107
 oatfeed 106
 rice bran 107
 rye bran 106
 wheat bran 106
 wheat germ 106
 wheat middlings 106
 wheatfeed 10
 composition 102, 372–9
 cooking 105
 costs 175
 costs and their energy contents 175
 dressed 109
 see also heavy metals
 embryo 101
 endosperm 101, 103
 energy data 145
 energy density 101
 grinding, rolling of 105
 maize 104, 105
 chemical composition/MADC 372
 millet 105, 372
 minerals in 102
 naked oats 102–3
 oats 102
 polyunsaturated fatty acids 102
 prediction of MADC nutritional values 165–6
 processing 12, 94–8, 105–7
 rice 105

- chemical composition/MADC 372
- rye milling by-products 106
- sorghum
 - chemical composition/MADC 372
 - grain 105
- spelt 103
- starch overload 12, 13, 34, 121, 125
- supplements to hay 106
- tissues 102
- triticale 104
- wheat 103, 105
 - chemical composition/MADC 372
- see also* compound feeds and mixes; feed/feeds
- chick pea 119
- chloride 49, 86, 87
 - daily requirements (g/kg BW/day) 42
 - GI tract 86–7
 - recommendations 50
 - requirements 50
 - sodium chloride, ECF 48
 - urine 359, 360
- choking 97, 323–4
- choline 85
- chondroitin sulphate 57, 219
- chondroprotective effects 220
- chromium 65–6
 - deficiency 25
- chronic obstructive pulmonary disease
 - COPD 350–1
 - see also* recurrent airway obstruction (RAO, heaves)
- chylomicrons 11
- cimetidine, ranitidine, omeprazole 8
- circadian rhythm, electrolyte excretion 359
- citrus pulp 111
 - chemical composition/MADC 374
- clay binders, bentonite 94, 125
- climate 147, 279
 - metabolic rate and 144, 147
- clostridia 300, 321–2, 330
 - colitis 321
 - silage 283
 - Tyzzler's bacillus 349
 - see also* botulism
- clover 272
 - alsike 301
- clover hay, chemical composition/MADC 374
- cobalt 55, 67, 79
 - nutritional requirements 167
- cocarcboxylase 82
- coconut meal 117
- coconut oil 113
- cofactors 56, 250
 - vitamins, tissue enzymes 355
- colic 8, 15, 16, 86, 100, 109
 - associated with salmonellosis 323
 - and cereal grains 105
 - characteristics 321
 - enteroliths in 326
 - flatulent 327
 - foal 326
 - gas 327
 - impaction 14, 34, 87, 324
 - kidney beans 119
 - mortality 321
- obstructive 324
 - overfeeding 328–9
 - parasitic worms as cause 306, 325
 - predisposing factors 328
 - prevention 328
 - sand 326
 - spasmodic 324
 - treatment of 326–7
- colitis 331
 - clostridia 321
 - malabsorption 331
- collagen, carboxy-terminal telopeptide, type I (ICTP) 41
- collagen synthesis 220
- collagenase 56
- colon 5, 13, 14, 15, 18
 - contractions 15
 - dorsal 18
 - flexures 15
 - flora 15, 16
 - impaction 325
 - small 13
 - ventral 13, 15, 18
- colostrum 198–9
 - banked 198
 - cow 185, 199
 - evaluation 198, 199
 - immunity 184, 198
 - and mannan-oligosaccharide 120
 - mare 184
- comfrey, alkaloids 304
- companionship of other stock/etc. 276, 278
- compound feeds and mixes
 - ash content 101
 - bushel, weight contained 101
 - chemical composition tables 372–9
 - coarse mix 100–1
 - complete diets 178
 - composition 101
 - concentrates 141
 - cubes, nuts 99–103
 - density 101
 - hay cubes 19, 105
 - Statutory Statement, declarations 100
 - sweetfeed 100
 - UFC values 174
 - see also* cereal grains
- computer
 - derivation of a hypothetical least-cost mix of three ingredients 172
 - formulation of rations 170–8
 - ingredients of a simple ration using NRC and INRA systems 173
 - graphic example of linear programming 171–3
 - least-cost feed formulation 170–1
 - procedure for calculating ingredient make-up 173
- concentrates 116–20
 - comparison of DE and NE values 157
 - efficiency of utilization of ME 146, 157
 - UFC values 174
- condition score, accuracy of weight prediction 138
- conformation 210
 - changes in foal body proportions 211
- changes with growth 207–10
 - colts/fillies 210
 - growth-correction mechanism 217–18
 - ideal 204
- copper 109, 357
 - articular cartilage 55
 - caeruloplasmin 53–4
 - deficiency 216
 - intoxication 53
 - and lysyl oxidase 54, 216, 219
 - molybdenum interaction 50
 - nutritional requirements 167
 - plasma and milk of mares 51
 - status, measurement 53–4
 - supplementation 219, 357
 - zinc interactions 56–60
 - zinc interactions in leucocytes 357
- coprophagy 349
- cortisol 232
 - Cushing's syndrome 25
 - glucocorticoids, adrenocorticosteroid 45, 228, 232
- cortisol rhythm 25
- cottonseed cake, chemical composition/MADC 372
- cottonseed hulls 111
- cottonseed meal 117
- cough 351
- coumarin 301
- creatine 124, 259
 - see also* energy expenditure
- creatine kinase, CK 63, 76, 77, 338–9, 356
- creatine phosphate 224–5
- creatinine clearance 359–60
 - abnormal values of 359
 - fractional electrolyte excretion (FE) test 359
 - method 359, 360
- cretinism 65
- crib-biting 328–9
- cromoglycate, sodium 352
- croup 210
- cryptosporidiosis 312
- cryptoxanthin 104
- Culicoides* (extract) 115, 306
- Cushing's syndrome 25
 - and laminitis 318
- cyanide toxicosis 303
- cyanocobalamin 67, 70, 79–80, 250, 357, 358
- cyanogenic glycosides 87, 111, 119, 128, 299, 300, 303
 - clover 300
- cyanophytes 87
- cyclo-oxygenase 115
- cytochrome c oxidase 53, 58
- degenerative myeloencephalopathy (EDM) 77, 78
- dehydration 88–9, 201, 241–3, 250, 332
 - potassium depletion 332
- density of feeds 101
- depot fat formation 145
- developmental orthopaedic disease (DOD)
 - see* limb diseases
- diabetes
 - insulin resistance 182
 - risk 182

- diarrhoea 33
 acute 331
 chronic 331
 foal 332
 K deficiency 48
- dicoumarol 301
- diet
 base excess 245, 248–58, 279–80
 calculating composition by computer 171–3
 chemical composition of feeds *see* feed/feeds
 common errors in 266–8, 369–71
 components by weight 168
 composition 101–2, 212–14, 372–9
 computer formulation of rations 170–8
 dehydration *see* water
 dietary change, hay/grain, risks 16
 enteral diet 4
see also energy; ration formulation; *specific substances*
- dietary cation–anion balance (DCAB) 209, 219, 248–58
- digestibility and Ca and Mg retention 249–50
- digestible CP (DCP) *see* protein
- digestible energy (DE) 155–7, 148–50
 daily DE needs of growing horses: NRC 144
 demands of maintenance and work 155
 energy values 141, 144
 estimation 156
 feed evaluation 155–7
- digestion/digestibility 11, 14, 15, 17, 32, 105, 106
 apparent N 13, 170, 212
 endogenous N losses 158–60
 fats 11, 251–4
 fibre 16–17
 large intestine
 minerals *see* minerals
 precaecal 11, 12, 105, 260
 products of digestion and fermentation 13, 21–2
 protein 23, 28–9, 32, 33, 259–60
 starch 260
 trace elements, Cu, Zn, Mn 57
 true 159
- dihydrofolate reductase inhibitors 80
- dilution, incorrect Ca : P ratios in rations 168
- N,N-dimethylglycine 124
- dimethylsulphone 124
- domperidone, fescue toxicosis 298
- donkeys 329
 gastric ulcers 322
- dopes 134–5
- dry matter (DM) intake 98, 141, 158, 173
 alkane pair technique, estimating 136
 changes, large intestinal impaction 34
 grassland/pasture 277–8
 haylage 96
- dysautonomia (EGS) 299–300
 grass sickness 299, 333, 334
- dyschondroplasia (DCP) 74, 212–18
 effects of diet and exercise 216–17
- dysmetria 77
- Echinacea angustifolia* 125
- efficiency, (k_m), efficiency of utilization of feed 157, 378
- electrolytes 18, 38, 186, 243, 359–61
 balance, status 339–40
 balance (amounts) 250
 calcium, chloride, potassium, sodium *see specific minerals*
 excretion, circadian rhythm 359
 fractional electrolyte excretion (FE) test 359
 intravenous 242
 losses in extended exercise 342–3
 for maintenance 167
 solutions 241, 242
 sulphur 167
 in sweat 239–40
- electroneutrality 247
- endocrine secretions 22, 180–2
- endocrine system 232–4
- endophyte toxins 299
- beta-endorphins 349
- endotoxaemia 312–14
- endotoxins 312–14
 airborne 350
 lipopolysaccharide (LPS) 220, 312, 350
- endurance work 26, 234–48
 body weight 237
 and dehydration 89
 fatigue, and interval training 242–3
 feeding before 261–2
 lactic acid/lactate 26
 RBC count changes 2, 234
- energy, sources, metabolism and fate 22
- energy balance (E) 140
- energy cost of eating 157
- energy digestibility (ED) 156
- energy expenditure 222–5
 aerobic 227
 anaerobic 226–8
 ATP in 222–6
 basal metabolic rate 138
 creatine in 225
 efficiency of
 ME/GE 146
 NE/DE 143
 NE/ME 146, 147
 fatigue after 225, 242–3, 245–6
 fattening 146
 heat increment (HI) 142, 144, 145, 147, 254, 260
 heat production 139–41, 144–7, 254, 260, 279
- indirect calorimetry measurement 136–40
 maintenance 138–40, 142, 143
 NRC assessment 142, 144
- oxygen consumption 141
 partition 147–8
 production 143
 TCA cycle 82, 225, 229
 work and 222–9
 work type 223–4
 worked example 234
- energy metabolism 26–8
- energy requirements 136–46
 for DE
 gestation 147–50, 182
 in growth 144–5
 lactation 147–50, 186, 187
 in light work 143
 in maintenance 142–4
 growing, working and breeding horses 32
 INRA units 158–64
 in lactation 365–6
 for maintenance 138, 139–40
 as UFC 101, 147, 156, 164–5, 174
 in lactation 191
 in maintenance 142, 144
- energy reserves 230–1
- energy substrates 224–9
- energy transfers, young adult working horse 27
- energy utilization
 efficiency of
 ME/GE 142
 NE/ME 146
- energy values
 digestible energy, DE 101
 digestible energy (DE) system 141, 144, 155–7
 energy digestibility (ED) 156
 energy-yielding sources, metabolism and fate 22
 gross energy (GE) 141–3, 146
 MADC 158, 162, 165–6
 prediction 165–6
 metabolizable energy (ME) 141, 141, 145, 161–2
 net energy system (NE) 142, 145, 156–8, 169–70
 UFC 101, 147, 156, 162, 164, 191, 377
 prediction 164
 UFC for maintenance 142, 144
- enteral feeding, foal 199
- enterotoxaemia 329
- enterotoxin 329
- environmental problems 179
- enzyme additives 123–4
- enzyme supplements, bacterial and fungal enzymes 122–3
- enzymes 9, 122, 354–6
 classification 354
 cofactors 250, 355
 isoenzymes 354
 normal, blood 52
 taxonomic identification 122–3
- epinephrine (adrenaline) 232, 239
- epiphysitis
 and energy and protein consumption 217
 metaphysitis 41, 54, 192–4, 205, 215, 348
- epistaxis 85
- equine degenerative myeloencephalopathy (EDM) 77
- equine dysautonomia (EGS) 299
- equine motor neuron disease (EMND) 77, 78
- ergonomic aids 125–6
- errors in diet 266–8, 369–71
- erythrocyte haemolysis 75
- Escherichia coli* 0111:B4 endotoxin 350
- ethoxyquin 133, 178
- EU Regulations on pharmaceutical preparations 135
- excretion and reabsorption of solutes and water 37, 45, 88, 89

- exercise 41, 75, 228–31
 adverse effects of excess 57, 58, 59
 alkalosis 234
 base excess during 245
 effect of terrain 222–3
 energy demands 146
 exhaustion 338–9, 342–3
 fat supplements 252–4
 fatigue 242–3, 245–6
 feeding before 261–2
 frequency, growth in foals 217
 and gastric ulcers 322
 on gradient, energy demands 146
 heart rate 237–8
 on pasture 268
 protein requirements 158–60, 248, 258–9
 protein requirements in foals 216
 rate and gut fill 174–5
 recovery from 231
 respiration during 226–7, 228
 tolerance 76
 warm-up 231
- exercise-induced pulmonary haemorrhage (EIPH or 'bleeders') 236–7
- exertional rhabdomyolysis 231, 338, 339–41, 356
- exertional stress, tetany 341, 342
- exhaustion 338–9
- extracellular fluid 239–40
- faeces
 coprophagy 349
 DM and feed content 85
 loss of Ca 42
 and pasture 278
 water 17
- fagopyrin 301
- fasting horse, energy data 145
- fat supplements 111–16, 252–5
 absorption 11
 choline 257
 composition 111–14
 cyclization 113
 desirable composition 112
 dietary 11, 25, 34
 and DOD 216
 emulsification 11
 and exercise 252–4
 fatty acid residues 23, 25
 glycerol 112
- fatigue, and interval training 242–3
- fats/oils 11, 34, 111–16
 animal fats 113
 coconut oil 113
 depot fat formation 145
 digestibility 113
 efficiency of energy utilization 146
 fish-oils 258
 grape seed oil 113, 125
 and heat increment (HI) 254
 linseed oil 113
 long-chain fatty acids (LCFA) 224
 maize oil, corn oil 258
 marine oils 113
 medium chain triglycerides 252
n-3 fatty acids 258
 anti-inflammatory effects 115
- oat oil 113
- omega 6:omega 3 ratio 115, 220
- oxidation (RQ) 140
- polyunsaturated fatty acids 63, 78, 102, 114, 257
- rapeseed oil 113
- recovered vegetable oil 113
- RQ 255
- RVO 113
- soya oil 113
- sunflower seed oil 113
- supplements
 effects on blood plasma lactate and glucose 256
 high fat diets 257
 lecithin 257
 medium-chain triacylglycerols (TAGs) 198, 252
 and OCD 218
 peroxide value 113
 points to note 253
 polymerization 113
 rancidity 113
 recovered vegetable oil, RVO 113
 supplementation 76
 vitamin E deficiency and 113
- vegetable oil, chemical composition/
 MADC 374
- waste/damaged, contaminated 113
see also fatty acids; triacylglycerols (TAGs)
- fattening, vs maintenance 146
- fatty acids
 long-chain fatty acids (LCFA) 224
 membrane phospholipids 115
n-3 fatty acids 115
 nonesterified fatty acids (NEFAs) 23–4, 182, 225, 226, 230, 252
 polyunsaturated fatty acids (PUFA) 63, 78, 102, 114, 257
see also volatile fatty acids
- fatty liver 182
- faults/errors in diet 266–8, 369–71
- favism 129
- feed additives 133–4
 antioxidants 133–4
- feed allowances
 growing horse 215
 and work intensity 262–3
- feed blocks 280–1
- feed mangers 176
- feed/feeds 12, 90–135
 acidification 106
 alkane pair technique, estimating DM intake 136
 allowances 215
 bolting 175
 byproducts/waste as feed 99
 capacity of horse: estimates 136–40
 cereals 101–9
 chemical composition 372–9
 coarse mixes 100–1
 compounded 99–100
 concentrates 116–20
 contaminants/toxicants 129–34
 costs 170–2
- daily feed allowances, growing horse 215, 262
- daily rations 95
- efficiency of utilization (k_m) 157, 378
- enteral 199
- expansion, extrusion 12, 105, 118
- fat supplements 111–16
- frequency 175
- general requirements of analytical method 34–5
- GI tract, transit through 5
- grass, dried nuts 99–100
- group feeding 99
- gut fill 174–5, 260–1
- hay vs silage 96
- haylage, *see also* hay; haylage
- intake 174, 175
- kibbling, bruising 105
 (k_m), efficiency of utilization of feed 157, 378
- light destruction 178
- lucerne/alfalfa 94
- micronisation 12, 105, 118
- mixtures for liver disease 337
- modification of 11–12, 175
- moisture content 91, 96, 99, 109
- overfeeding 182, 329
- pellets, cubes, nuts 97–8
- prebiotics 120–1
- probiotics 121–2
- processing of cereal grains 12, 94–8, 105
- prohibited substances/dopes 134–5
- protein concentrates 116–20
- punctuality 175
- rate 174, 175
- responses of blood glucose and insulin 24
- sequence of feeding and amount fed 21–2
- shelf-life and acceptability of feeds 178
- silage 94, 96
- steam rolling, flaking 105, 106, 128
- storage 126–7, 178
- straw, nutritionally improved 99, 109
- sugarbeet pulp 9–10, 16, 19, 45, 109
- sugarbeet roots 99
- traditional 175–6
- vitamin/mineral supplements 123–6
- wafers 97
- weights/density 101
- wet mashes 337
 liver disease 337
see also cereal grains and their byproducts; fibre; nutritional values
- feeders, mangers 176
- feeding
 frequency and punctuality 175
 rate and gut fill 174–5
- fencing
 creosote 281
 electric 281
- fermentation *see* haylage, large intestine
- fertility in mares 160–3, 180–4
 body condition (BCS) 180–4
 carotene and 111
 dietary cholesterol 182
 obesity 182
 oestrous cycle 180–3

- foal heat 182
 - mineral requirements 57, 59
- photoperiod 180
 - see also* mare, breeding
- fescue toxicosis 297–9
- fetlock joint
 - distortion 208
 - exercise effects 216
 - see also* limb diseases; limbs
- fibre
 - alkali treatment of 63, 99, 108
 - amino acid value of 94
 - digestibility of 96
 - intake of 96
 - physical form of 90–100
 - straw 99
 - sodium hydroxide treated 108
 - succulents 99
 - see also* haylage, silage
- fibre degradability 16–17
- field beans 118, 119
- fish-meals
 - bacteria 119
 - chemical composition/MADC 372
- fish-oils 258
- fitness, and exhaustion, measurement 243
- flies 306
- flour mites 126
- fluorine 59, 132
- foal
 - birth weight 183
 - blood, normal characteristics 52
 - blood glucose 185
 - creep feeding 192
 - diarrhoea 185
 - lactose intolerance 202
 - rotaviruses 202
 - drinking behaviour 191
 - early weaning 197–8
 - enema 186
 - enteral feeding 199
 - feed supplements, first winter 210–11
 - feeds, frequency 198, 200
 - fluid intake 87
 - fostering 200
 - fostering crate 200, 201
 - imprinting 197
 - ingestion of mare's faeces 186
 - meconium 185, 186
 - milk intake 186
 - neonatal maladjustment syndrome 199
 - orphan 197, 198, 199–201
 - pneumonia 352
 - sick 186, 201
 - sucking frequency 186
 - suckling 200
 - total parenteral nutrition (TPN) 201, 335
 - ulceration, stomach 202
 - weaning 194, 197–8
 - weaning age, effect of early nutrition 206–7
 - see also* growth of foal
- foetus 60, 181
 - growth 160
- folic acid 70, 80, 358
 - requirements for/dietary allowances 70
- follicle-stimulating hormone, FSH 181
- forages
 - chemical composition/MADC 376
 - UFC values 174
- fractional electrolyte excretion (FE) test 359
- fructans, and laminitis 317
- fructo-oligosaccharides (FOS) 120, 121
- Fuller's earth (sodium montmorillonite) 125
- fungal diseases 292
- fungal toxins 68, 94, 107, 116, 117, 126, 129–30, 297–301, 333
 - aflatoxin 68, 94, 117, 130
 - colic 130
 - ergot, ergotamine 104, 130, 297–8
 - fumonisin 68, 129–30
 - ochratoxin 68
 - zearalenone 68, 106, 130
- fungi, *see also* microorganisms
- fungi/moulds
 - mould inhibitors 127
 - moulds in feed 91
 - threshold safe limiting value of spores 350
 - see also* *Aspergillus*
- Fusarium moniliforme* 129–30
- beta-galactosidase 10, 122
- gallium 68
- gamma-glutamyl transferase 356
- gastric impaction 324
- gastric ulcers 8, 175, 322–3
 - foal 202
 - and training 322
 - treatment 323
 - and volatile fatty acids (VFA) 322
- geophagia 349
- geriatric horse 338–9
 - amino acid supplement for anorectic 337
 - renal function 338
 - teeth 338
 - treats 338
- gestation
 - energy requirements 147–50, 182
 - length, and daylight length 207
 - nutritional requirements 182–3, 186, 187, 365–9
 - pregnancy 44–5, 54, 57, 161–3
 - requirements of growing, working and breeding horses 32
- ghrelin 25
- GI tract
 - adult horse (relative volumes) 6
 - bacterial fermentation 140
 - development 4–6
 - electrolytes/water requirements 86–7
 - hyperaemia 22
 - potassium 86–7
 - rate of passage/transit 4–5
 - see also* oesophagus, stomach, small intestine, large intestine
- giardiasis 312
- girth, estimates of body weight 137–9
- glomerular filtration rate 233
- glossary of terms* 381–404
- glucagon 24, 227, 232
- glucocorticoids, intra-articular treatment of osteoarthritis 220–1
- gluconeogenesis 23, 25
- glucosamine 119–20, 219–20
- glucose 124
- glucose tolerance 23, 24, 104, 105, 113
- glucose transporter (GLUT) proteins 230–1
- alpha-glucosidase 10
- beta-glucosidase 11
- glutamic acid 32
- glutamine 125, 259
- glutathione (GSSG) 258, 351
- glutathione peroxidase (GSH-px) 52, 59, 63, 65, 75
- glycaemic index 22, 23, 104, 105, 113
- glycogen
 - and added dietary fat 254
 - as affected by dietary fat 230
 - depletion rate and diet 230
 - liver 230
 - loading 331
 - muscle 225, 226, 241, 242
 - depletion 240
 - net loss 331
 - raised 340
 - type 230
 - muscle dystrophy 63
 - polysaccharide storage myopathy 231, 339–41
 - storage disorders 231, 339–41
- glycogenolysis 230
- glycolysis 252
- glycosaminoglycans (GAG)
 - mussel extract 220
 - synthesis 219
- glycosyltransferases 57
- goitre 59, 128
 - goitrogens and 60
 - in iodine deficiency 60, 63
 - in iodine toxicity 60–2
- goitrogens 60, 118
- gonadotrophic hormones 32
- gonadotropin-releasing hormone 181, 182
- gossypol 117, 129
- gradient work 141, 146, 147
- grain overload 12, 13, 34, 121, 125
 - laminitis 34
 - and laminitis prevention 316–17
- grain weevils 126
- grape seed oil 113, 125
- GRAS chemicals 133
- grass sickness (dysautonomia) 299, 333–4
- grasses
 - chemical composition 272
 - chemical composition/MADC, seasons 376
 - chlorophyll 269
 - copper 269
 - cubes, nuts 99–100
 - digestible DM 278
 - fructans 271
 - iodine 269
 - minerals 266, 268
 - oestrogens 301
 - protein 271, 272
 - ruminant stocking 275–6
 - selenium 269
 - soluble carbohydrates 283
 - species distribution 266
 - species and fertility 265–7
 - sugars 271
 - temperate species 90, 91

- trace elements 54, 269
 tropical, oxalates 44
 UFC values 164
see also fibre; grassland/pasture
 grassland/pasture 265–80
 Bermudagrass (*Cynodon dactylon*) pasture 277
 burning for reseeded 285
 camping areas 278
 companionship 276, 278
 cultivation 279
 cutting for hay or haylage 274, 275
 denitrification 271
 discing for reseeded 285, 292
 disease control 292
 drainage 279
 exercise and maintenance areas 268
 fencing 281
 fertility, grass species 265–7
 fertility cycle 265–6
 fertilized 268
 foal grazing 192
 glyphosate treatment during reseeded 285
 grass breeding 268
 grazing 275–80
 bite size, rate 280
 time occupied by 279
 grazing frequency 276
 grazing intensity 275–80
 grazing season 268, 279
 grazing season extended 279
 grazing and topping 279
 tillering 275–6, 279
 growth 271–3
 herb strips 265
 horse urine 278
 improvement 285–6
 leaching from 270
 liming 272–3
 N recovery from cutting/grazing 202
 N uptake by 271
 nutrients from chemical fertilizers 275
 nutrients from organic fertilizers 274–5
 nutrients required by 270, 271
 from chemical fertilizers 270
 grassland/pasture, from farmyard manure 274, 275
 superphosphate 273
 P, K, N 274–5
 paddocks 276, 281
 parasites 278
 phosphate excess/deficiency 270
 photosensitization 301
 plant toxicants 301
 pollution 270, 280
 productivity 268, 278
 removal of horse droppings 278
 reseeded 285
 seed mixtures 267, 268, 291
 seedbeds 275
 shelter 146
 soil *see* soil
 types
 clover 273–4
 herb mixtures 268
 sward height 275
 vitamin, content 268
 weedkillers, herbicides 284–5
 yield 275–9
 DM intake 277
 see also tropical grassland/pasture
 grassmeal, chemical composition/MADC 372
 green-lipped mussel (*Perna canaliculus*)
 extract 220
 gross energy (GE), average utilization
 efficiency 143–4, 146
 groundnut meal 117
 chemical composition/MADC 372
 growth
 coefficients, defined 205
 conformational changes 207–10
 daily DE needs, NRC 144
 daily feed allowances 215
 effects of dietary composition 212–14
 Gompertz models 206
 long yearlings 212
 growth of foal 193–8, 204–8
 abnormalities 192–6
 and age of mare, effect on body weight and height 206
 birth weight, effect of 204–5
 bone *see* bone
 breed differences 205
 catch-up 207
 changes in body proportions 211
 coefficients, defined 205
 curve 205
 daily feed allowances 215
 effect of month of birth 207
 effect of sex 207
 frequency of exercise 217
 in height 205
 high protein diets 216
 long yearlings 212
 NRC weighted least squares 206
 protein requirements 32, 163
 protein short of NRC recommendations 218
 rate 207
 sex differences 207
 supplementary feeding in the first winter 210–11
 weaning age, effect of early nutrition 206–7
 see also foal
 growth hormone 134
 and DOD 134
 GH 32, 60
 haemagglutinins, lectins 128
 haematocrit (PCV) 233, 236
 haemolysis 360
 haemorrhage 59
 haemosiderin accumulation 236
 hair 50
 hair analysis 362
 hair coat changes 147
 hair shedding, N loss 159
 hay
 advantages and disadvantages 94
 chemical composition/MADC 374
 comparison of DE and NE values 157
 composition 96
 cubes, pellets, wafers 9–10, 19, 94–8, 99–100, 105
 DM content 155
 dry matter content of 281
 efficiency of energy utilization 146
 energy cost of eating 157
 energy data 145
 ground 100
 heat increment (HI) 145
 legume vs grass 90
 loose 90–4, 96
 mature, hard 91, 92–3
 ME:DE ratio 170
 NDF content of, and intake 90
 prediction of MADC nutritional values 165–6
 soaked 344
 voluntary intake of 91, 96
 yield 91
 see also fibre
 haylage 91–4
 adapting to 94
 chemical composition/MADC 374
 composition 98–101
 digestibility 96
 DM intake 96
 dry matter content 91, 96
 moulding 91, 94
 plastic wrapping 94–5
 secondary fermentation 94
 and silage making 281–3
 see also silage
 heart, stroke volume 233
 heart arrhythmias, K deficiency 47
 heart rate 33, 79, 237–8, 261
 heat increment (HI) 142, 144, 145, 147, 254, 260
 efficiency of utilization of ME 142
 fats 254
 heaves *see* recurrent airway obstruction (RAO)
 heavy metals 55, 109, 132, 362
 pollution 280
 silage 284
 height *see* withers height
Helicobacter equorum 8
 hepatitis 301
 hepatotoxicosis 303
 herbs, in feeds 125
 hesperidine 124–5
 hirsutism 26
 homeopathy 304
 homocysteine 80, 358
 and cyanocobalamin 80
 hoof
 coronary band 82
 health 82
 horn 56
 defects 81
 shoeing 315
 hordeine 135
 hormonal responses to feeding 22
 hormone sensitive lipase 23, 65, 182
 hormones, endocrine secretions 180–2
 housing 344–52
 dust 344, 348
 heat conduction through and temperature 344, 348

- shelters 146
 ventilation 344–8
 rates 348
 viral infections 350
- hyacinth beans 119
- hyaluronan, intra-articular treatment of
 osteoarthritis 220–1
- hydroponics 108–9
- alpha-hydroxylase 74
- hygiene 185
 foal rearing 349
- hyoscine 135
- hyperadrenocorticism 23
- hyperaesthesia 77
- hypercalcaemia 342
- hypercalciuria 249
- hypericin 301
- hyperkalaemic periodic paralysis 46, 48, 341
- hyperparathyroidism, nutritional secondary
 (NHSP) 38, 39, 44
- hypocalcaemia 39
- hypoglycaemia
 decrease in exercise tolerance 26
 and insulin 24
- hypothalamo-pituitary-adrenal (HPA) activity,
 maternal nutritional deprivation
 206
- ileo-caecal junction 14
 water movement 17
- immunity 65
 acquired, passive 184
 active 184
 and antibody titre 63, 184, 185
 colostrum 184, 198
 immunoglobulins, IgG, IgM, IgA 56, 76,
 121, 184, 198
 parasitic worms 306
 serum protein changes 192, 198
 T-helper-cell 56
 vitamin E (tocopherol) 76
- Indian pea 119
- indospicine 294
- infertility, iodine toxicity 60
- inflammatory cytokines 25
- inosine monophosphate (IMP) 225, 228
- Institut National de la Recherche
 Agronomique (INRA) 158–64
 feed evaluation 164
 foals, protein requirements for growth 163
 INRA coefficients used in the estimates of
 requirements for growth of light
 breeds 162
 INRA lysine requirements for growing
 horses 164
 INRA protein requirements for
 maintenance of growing horses
 163–4
 micronutrient requirements 164–7
 NE system 145, 156–8
 prediction of MADC nutritional values
 165–6
 young horses, protein requirements for
 growth 163
- insulin 22–5, 181, 182, 232, 329
 chromium and 65
 glucose responses 22
- insulin resistance 182
 and DOD 219
 and laminitis 317
 and OCD 219
- insulin response
 foal 206
 young horses 218
- insulin-dependent diabetes 25
- insulin-like growth factor-1 (IGF-1) 181, 216
- intestinal impaction 324
 see also caecum; large and small intestine
- intestinal stones 335
 see also sand colic
- intracellular fluid 239–40
- iodine 55, 132
 hyperthyroxaemia 217
 intoxication 59–62
 nutritional requirements 167
- iodothyronine deiodinase 65
- ionophore antibiotics 134
- iron 58–61
 adverse effects of Fe supplements 58
 intoxication 58–9
 in milk 119
 nutritional requirements 167
 plasma and milk of mares 51
 stores 50
- iron deficiency, hypochromic 57
- isoleucine 259
- joint-ill 184
- kidney beans 119
- kidney disease 335
 Birdsville 290, 294, 296
 urolithiasis 358–9
- kidney failure 46, 361
- kidney function
 and calcium-phosphorus homeostasis 37,
 38, 41
 in fixed ion homeostasis 240
 nephrocalcinosis 39
 renal tubules 37, 45, 74
 tests for function 358
 uraemia in ER 339
- (k_m), efficiency of utilization of feed 157, 378
- L-carnitine 123
- laboratory methods 353–64
- lactase
 alpha-glucosidase 10
 beta-galactosidase 120
- lactate-utilizing bacteria 7
- lactation 182, 186
 calcium requirements 44
 energy requirements 147–50, 186, 187,
 365–6
 as UFC 191
 example calculation of dietary composition
 requirements 365–6
 INRA protein requirements 161
 nutritional requirements 32, 182–3, 186,
 187, 365–9
 minerals 167
 vitamins 167
 see also milk
- lactation tetany 191, 342
- lactic acid/lactate 5, 13, 15, 18, 19, 34, 40,
 226–8, 242–3, 255
 in colic 321
 effect of endurance work 26
 in endotoxaemia and laminitis 315–16
- lactic acidosis 315
- lactate dehydrogenase, LDH 228, 340
- Lactobacillus* spp 7, 15, 120, 122
 as probiotics 122
- lactose 10
- lactose intolerance 202
- lactulose 34
- lameness 39, 40, 44, 74, 343
 causes (not laminitis) 320
 hoof wall hardness and Zn 56
 see also limb diseases
- laminitis 16, 19, 33, 34, 86, 94, 314–20
 black walnut shavings 303, 317
 causes 316, 317, 319
 control, cereal replacement 110
 and energy intake 34
 grain overload 34
 prevention 316–17
 insulin resistance 317
 lactic acid production 315–16
 nitric oxide and 320
 non-structural carbohydrate (NSC)
 34
 Obel grades 314
 obesity 34
 thyroxine and 320
 treatment 319–20
 dietary 316
- large intestine 5, 13–26
 contractions 14, 15
 fermentation 13, 15, 17, 21–2
 flexures 14, 15
 diaphragmatic 14
 pelvic 14
 sternal 14
 fluid absorption 18
 gases 19
 impaction 34
 DM changes 34, 354
 pH 13, 15, 16, 19, 34
 reflux 14
 silage fermentation 96
 valves 14
 volume 6
 see also GI tract
- lasalocid 134
- lathyrisms 119, 128
- lathrogens 128
- lead 132, 362
 hair 50
 plasma and milk of mares 51
- least-cost feed formulation 170–1
- lectins 105, 116, 128
- legumes
 pasture 44
 seeds, prediction of MADC nutritional
 values 165–6
 toxins 301–2
- lentils 119
- leptin 25, 181
 and appetite 26–7
- leptospira, water quality 87

- lesser ingredients and byproducts *see* named feed items
- leukoencephalomalacia 130
- lice 305
- ligands, metal–ligand bonds 56
- lignin 13, 15
- limb bones 208–9
- limb diseases 215–21
 - angular limb deformities 60, 192–4, 217–18
 - and season 217–18
 - brachygnathia 60
 - cartilage erosion 54
 - developmental orthopaedic disease (DOD) 38, 39, 78, 215–21
 - causes 215
 - control 221
 - and EDM 78
 - effects of diet and exercise 216–17
 - dyschondroplasia 74, 212–18
 - extension shoes 192
 - fetlock distortion 208
 - filled legs 100
 - flexural deformity
 - ‘contracted tendon’ 57, 71, 192–4
 - knuckling-over 57
 - osseous dysplasia 60
 - osteochondrosis, osteochondritis 54, 215, 321
 - osteodystrophia, osteomalacia 38, 39, 73, 74
 - osteoporosis 44
 - physisitis, epiphysitis, metaphysitis 41, 54, 192–4, 205, 343
 - rickets 39, 73, 74
 - spavin 195, 216
 - tying-up 231, 338
 - wobbler 215
- limbs
 - fetlock joint, exercise effects 216
 - growth of foal and frequency of exercise 217
 - load on physis 217–18
 - Young’s modulus 218
- limestone flour, chemical composition/MADC 374
- linamarin 300
- linase, legislation 116–17
- lincomycin 134
- linoleic acid 63, 114, 115
- linseed meal 116
 - chemical composition/MADC 372
- linseed oil 113
- linseeds 116
- lipid hydroperoxide (LPO) 243
- lipoic acid 82
- lipopolysaccharide (LPS), and endotoxaemia 220, 312, 350
- lipoprotein lipase 23, 244, 330
- lipoxigenase 128
- lips 2
- liver 9
 - damaged 301
 - development 4
 - foetal 54
 - function 354–5
 - glycogen 4
- reticuloendothelial system 358
- tests for liver function 354–6, 358
- liver disease 335–7
 - cholelithiasis 356
 - cholestasis 356
 - clinical signs and abnormalities 336
 - diet for liver disease 337
 - diets 361
 - tropical grass 290, 294, 296
 - fatty liver 182
 - hepatic encephalopathy 358, 361
 - icterus, jaundice 88
 - wet mashes 337
- locust beans 109
- lolitrem 298
- long-chain fatty acids (LCFA) 224
- lotaustralin 300
- lucerne/alfalfa 44, 45, 92–3, 94, 110
 - cantharidin 306
 - chemical composition/MADC 372
 - efficiency of energy utilization 146
 - photosensitization 301
 - prediction of MADC nutritional values 165–6
 - UFC values 164
 - lucerne/alfalfa hay, chemical composition/MADC 374
- lungs 246–7
- lupin-seed meal 118
- lupinosis 300, 301
- luteinizing hormone 181
- Lyme disease 305
- lysine 19, 23, 29, 30–2, 94, 164, 182, 259
- lysyl oxidase 54, 216, 219
- magnesium 17, 167
 - daily requirements (g/kg BW/day) 42
 - homeostasis 45
 - hyperpnoea 45
 - hypomagnesaemia 45, 46
 - nutritional requirements 45, 167
 - supplementary sources 45
 - urinary determinations 359–60
 - urine 359, 360
- maintenance
 - energy expenditure 138–40, 142, 143
 - NRC assessment 142, 144
 - energy requirements 138
 - nutritional requirements, vitamins 167
 - protein requirements 164
 - adult horse 158
 - working vs idle horse 158
- maize
 - chemical composition/MADC 372, 374
 - comparison of DE and NE values 157
 - energy cost of eating 157
 - glycaemic index 22
 - silage 284
- malabsorption 331, 333
- malignancy-associated hypercalcaemia 38
- malonyldialdehyde (MDA) 257
- malt sprouts, chemical composition/MADC 374
- maltase 10
- manganese 55, 57–8, 167
 - in cartilage formation 57
 - nutritional requirements 167
- mannan-oligosaccharide, colostrum and 120
- mare, breeding 160–3
 - body condition (BCS) 180–4
 - foetus 60, 160, 181
 - pregnancy/lactation 44–5, 54, 57, 161–3
 - protein requirements 161
 - see also* fertility; milk, mares’
- marine oils 113
- matières azotées digestibles corrigées (MADC) 158
 - daily energy (UFC) and protein, adult horses 162
 - prediction of nutritional values 165–6
- MCPA 285
- meat production 212
 - prohibited substances 308
- medium-chain triacylglycerols (TAGs) 11
- foals 198
- melatonin 180, 202
- menadione bisulphite 79
- mercaptans 361
- mercurial dressings 109
- mercury 132
- metabolic acidosis 33, 245, 247
- metabolic alkalosis 245, 247
- metabolic enhancers 123–4
- metabolic profiles 353
- metabolism
 - endogenous N 158–60
 - energy substrates 224–9
 - gluconeogenesis 23, 25
 - glycogenolysis 230
 - homocysteine 358
 - ketoacids 33
 - methylmalonate 358
 - in muscle 226
 - N retention, balance 31, 32
 - pathways 26–8, 226, 244
 - RQs 255
 - TCA cycle 82, 225, 229
 - tests 353–6
- metabolizable energy (ME) 141
 - efficiency of ME utilization 145
 - growth and 161–2
 - and HI 145
- methane
 - energy 170
 - for DE 140, 156, 170
 - energy loss 170
- methicillin-resistant *Staphylococcus aureus* (MRSA) 120
- methionine, sulphur amino acids 69, 80, 110, 129, 361
- methionine synthetase 80
- methylsulphonyl methane 82, 124, 219–20
- microbial toxins *see* fungal diseases; fungal toxins
- microcystins 87
- microorganisms
 - fauna, intestinal ciliate protozoa 16
 - feed spoilage organisms 312
 - flora, intestinal 16, 17
 - fungi, intestinal 15
 - intestinal 13, 14, 15–17, 19, 323
 - moulds *see* fungal diseases; fungal toxins
 - moulds

- feed 106, 110
 IgE response 350
 and RAO 349–51
 moulds in feed 91, 116
 see also bacteria; fungi
 midges 306
 milk, cows' 119–20
 automatic feeders 200
 dried skimmed milk, chemical composition/MADC 372
 milk, mares' 54, 87
 calcium 44
 colostrum 120, 184, 198–9
 composition 160–2, 186–9
 copper, lead, zinc 51
 nurse mare 200
 oestrogenic activity 185
 yield 160, 186–8
 milk replacer 186, 200
 foals 184
 mineral supplements 123–4, 250
 minerals 37–68, 150, 167
 absorption, availability of 43
 in blood 38, 40, 74, 150
 calcium, phosphorus, sodium etc. *see specific minerals*
 intracellular minerals 357
 and lameness 343
 for maintenance 167
 plasma minerals 357
 requirements 42
 rock phosphate 43
 see also electrolytes
 mites 305
 mitochondria 225, 356, 357
 modified acid detergent fibre (MAD) extract 68
 molasses 45, 94, 109–10, 283
 chemical composition/MADC 374
 molybdenum 50, 51, 132
 monensin sodium 134
 morphine 135
 motor neuron disease (EMND) 77, 78
 moulds *see* fungal diseases; fungal toxins; fungi
 mouth 1–4
 muscle
 fibre type 228–9
 fast-twitch
 high oxidative (FTH) fibres 228
 low oxidative (FT) 228
 slow-twitch, high oxidative fibres (ST) 228
 hypertrophy 229
 myoglobin in urine *see* kidney
 pH 243
 muscle disease 39, 76
 mussel extract 220
 mycotoxicosis 333
 mycotoxins 333
 myoglobinuria 339–41
 myopathy
 atypical 300
 exercise-linked 338
 nutritional myopathy 342
 polysaccharide storage myopathy 231, 339–41
 naked oats 9
 narasin 134
 nasal discharge 4
 navicular disease 343
 isoxsuprine hydrochloride use 343
 warfarin use 343
 neonatal disease
 diarrhoea 185
 haemolytic icterus 186
 net energy (NE) 142, 145, 156–8, 169–70
 neuroaxonal dystrophy 78
 neurotoxins 333
 neurotransmitters 32, 116
 niacin 7, 69, 70, 82
 nickel 67
 hair 50
 nitrates, nitrites 129
 non-protein N (NPN) 13, 33–5, 158
 ammonia 13, 23–4, 33–4
 Biuret 33
 nucleotides 120
 urea 13, 19–20, 23, 31, 33, 187, 260
 see also ammonia
 non-starch polysaccharides (NSPs) 17
 non-structural carbohydrate (NSC) 34
 nonesterified fatty acids (NEFAs) 24
 norepinephrine 232
 NRC assessment
 comparisons between the DE and CP systems 152–3
 digestible energy (DE) system 155–8
 maintenance energy 142, 144
 NRC conclusions, ration formulation 169
 NRC recommendations
 CP
 effect of shortfall 218
 growing horses 212
 digestible energy (DE) needs 144
 ingredients of simple ration, computer 173
 supplements 219
 NRC weighted least squares, growth of foal 206
 nucleotides, non-protein N (NPN) 120
 nutraceuticals 124
 nutritional myopathy 342
 nutritional requirements
 computer formulation of rations 170–8
 estimation 136–79
 gestation, lactation 182–3, 186, 187, 365–9
 investigation of anomalies 363–4
 sources, metabolism and fate 22
 see also energy requirements; *specific substances*
 nutritional secondary hyperparathyroidism (NHSP) 38, 39, 44
 oat groats, glycaemic index 22
 oat hulls 9
 oats 102
 chemical composition/MADC 372
 comparison of DE and NE values 157
 efficiency of energy utilization 146
 naked oats 9
 Obel grades
 laminitis 314
 see also laminitis
 obesity 34, 182, 319, 328
 oesophagotomy 4
 oesophagus
 impaction 323–4
 obstruction of 4
 oestrous cycle, foal heat 182
 oils *see* fats/oils
 oligosaccharides 120, 121
 fructans 9, 13, 35
 olive pulp 111
 osteoarthritis, intra-articular treatment 220–1
 osteocalcin 54, 67, 79, 209, 220
 ICTP, PICP 41, 362
 measurement of changes in bone formation 220–1
 osteochondritis dissecans (OCD) 215–18
 osteosclerosis, effect of exercise on trabecular thickening 217
 overfeeding 328–9
 oxalates 43, 129
 kidney disease 335
 plant toxins in seeds/feeds 118, 302
 rapeseed meal 118
 tropical grasses 44
 oxidative damage
 disease process 216
 reactive oxygen species (ROS) 215, 252, 351
 oxidative stress 351
 oxygen debt 226–7
 oxygen deficit, maxima 231
 oxygen uptake, maxima 231
 palate 5
 palm kernel meal 117
 pancreatic juice 9
 pangamic acid 85
 pantothenic acid 82, 85
 requirements for/dietary allowances 70
 paper, waste 351
 paralysis 78
 parturient paresis 187
 parasites, horse 305–12
 arthropod parasites 305–6
 protozoan parasites 16, 312
 worms, gastrointestinal 306–12
 parathyroid hormone (PTH) 39, 40, 45, 73–4, 150, 342, 362
 PTH-rP 37
 parenteral nutrition 201, 335
 parturient paresis 187
 parturition 183–5
 pasture *see* grassland/pasture
 paxilline 298
 peaches 99
 pears 99
 peas 118
 chemical composition/MADC 372
 pectin 13, 15, 109
 pelletting aids
 bentonite 94
 lignosulphonite 94
 molasses 94
 pellets
 compound feeds and mixes, complete diets 178
 disadvantages 97
 pepsin 5

- perchlorates, goitrogenicity 62
 Perissodactyla 1
 peristalsis 14, 16
 pesticides 133
 pests in feed 127
Phaseolus 119
 phosphine 133
 phosphocreatine (PCr) 224–5
 phosphorus 17, 37, 38, 45, 73
 absorption, net 42
 and algal blooms 179
 in bone-flour 43
 daily requirements (g/kg BW/day) 42
 growth 43
 excess 167–8
 incorrect Ca : P ratios caused by dilution 168
 nutritional requirements 167–8
 phosphate clearance 362
 in phytic acid 43
 phytic acid as source 43, 102, 106, 107, 118, 123
 rock phosphate 43
 superphosphate 273
 urine 359
 photoperiod, daylight length 180, 202
 photosensitization 88, 110, 301
 physiological solutions 242
 see also electrolytes
 phytitis, epiphytitis, metaphytitis 215, 343
 phytase 45
 phytic acid 56, 102
 availability of Ca 44, 129
 availability of Zn 56–7
 oxalates 118
 P source 43, 102, 106, 107, 118, 123
 pituitary adenoma, Cushing's syndrome 25
 plant toxins in forage 286–91
 alkaloids 117
 bracken fern 79, 129, 301
 cyanogenic 87, 111, 119, 128, 299, 300, 303
 erucic acid 118
 fescue toxicosis 297–8
 goitrogens, glucosinolates 60, 118
 gossypol 117, 129
 grass toxins 302
 haemagglutinins, lectins 118, 119
 hepatotoxins 303
 legumes 301, 302
 linamarin 111, 119, 299
 linase 116
 oestrogen-like 128
 oxalic acid, *see also* oxalates
 rye-grass staggers 299
 saponins 125, 301, 302
 seneciosis 303
 and shortage of grazing 285
 tannins 106, 118–19, 125
 theobromine 109
 trees 303
 trypsin inhibitor, antiprotease 105, 116, 128
 plant toxins in seeds/feeds 127–33, 301–4
 alkaloids 129, 300, 301
 aminopropionitrile 128
 cyanogens 111, 128, 299, 300
 destruction of by cooking 116, 118, 119, 128
 dicoumarol 301
 fagopyrin 301
 goitrogens, glucosinolates 128
 haemagglutinins, lectins 128
 hypericin 301
 lathrogens 128
 linamarin 128
 lipoygenase 128
 natural vs contaminants (list) 127
 nitrates, nitrites 129
 oestrogen-like 128
 oestrogenic 128
 oxalates 118, 302
 pyrrolizidine alkaloids 303, 304
 solanine 129
 swainsonine 302
 tannins 127
 thiaminase 129
 trypsin inhibitor, antiprotease 128
 see also poisonous plants
 plasma, base excess 245, 248–58, 279–80
 poisonous fungi and toxicoses *see* fungal toxins
 poisonous plants *see* plant toxins in forage;
 plant toxins in seeds/feeds;
 prohibited substances
 poisons/poisoning
 ammonia, toxicity 33–4, 333, 334, 361
 botulism 300, 330
 silage-associated 283
 ethylene glycol 133
 iodine 59–62
 pollution, US EPA regulations 178–9
 polyester bags 9, 10
 transit of digesta 9, 15, 105
 polysaccharide storage myopathy 231, 339–41
 polyunsaturated fatty acids (PUFA) 63, 78, 102, 114, 257
 potassium 45, 86, 87, 167
 daily requirements (g/kg BW/day) 42
 deficiency, heart arrhythmias 47
 GI tract 86–7
 hyperkalaemic periodic paralysis 46, 48, 341
 hypokalaemia 46
 intravenous 333
 losses 342–3
 nutritional requirements 167
 requirements 46
 sources 48
 status 332, 363–4
 urine 359, 360
 potatoes 111
 Potomac horse fever 87
 prebiotics 120
 pregnancy 44–5, 54, 57, 161–3
 INRA protein requirements 161
 proanthocyanidins 124
 probiotics 121
 bacterial 120, 121–2
 fungi 121
 prognathia 60
 prohibited substances/dopes
 caffeine 134–5
 hordeine 135
 hyoscyne 135
 morphine 135
 theobromine 135
 prolactin 32, 181
 proline hydroxylase 67
 propionate 80
 see also volatile fatty acids (VFA)
 proscribed compounds 135
 protein 32, 34, 258–9
 animal protein 119–20
 cows milk, liquid 119–20
 dried skimmed milk 120, 372
 fish-meals 119
 assimilation 258
 bacterial 13, 19, 23, 120–1
 coconut meal 117
 cottonseed meal 117
 crude protein (CP) 10, 212
 as amino acids 165
 digestible CP recommendations (DCP) 163
 DCP N, as amino acids 165
 digestion/digestibility 23, 28–9, 32, 33, 259–60
 efficiency of energy utilization 146
 as energy source 28–30
 and exercise 248, 258–9
 expeller extraction of 116–18
 field beans 118, 119
 in grass 271, 272
 groundnut, peanut, meal 117
 for growth and exercise 30–1
 high protein diets 259
 high protein diets in foals 216
 hyacinth bean 119
 INRA requirements, pregnancy, lactation 161
 kidney beans 119
 lentils 119
 linseeds 116
 lupin-seed meal 118
 maintenance requirement, adult horse 158
 NRC dietary CP requirements for growing horses 212
 NRC recommendations, effect of shortfall 218
 nutritional requirements 150
 oxidation (RQ) 140, 255
 palm kernel meal 117
 peas 118
Phaseolus 119
 prediction of MADC nutritional values 165–6
 pyruvate 226, 227
 see also metabolism
 rapeseed meal 117–18
 requirements
 body weight 28
 growing, working and breeding horses 32
 INRA units 158–64
 RQ 140, 255
 sesame-seed meal 118
 solvent extraction of 116
 soya-bean meal 116
 sunflower-seed meal 117
 protein-losing enteropathy 333, 356

- protein-losing nephropathy 335
 proteoglycans, synthesis 220
 protoanemonin 300–1
 protozoa, gut 16
 protozoan parasites 312
 psyllium 326
 pulmonary bleeding 236–7
 pyridoxine 82, 85, 358
 requirements for/dietary allowances 70
 pyrrolizidine alkaloids 303, 304
 pyruvate dehydrogenase (PDH) 253
- rapeseed meal 117–18
 chemical composition/MADC 372
 ration formulation 168–76
 components by weight 168
 computers 170–8
 data, working horses 2–4 years 137
 DE and NE compared 169–70
 digestible energy (DE) 155–7
 dilution, incorrect Ca : P ratios 168
 DM values for raw materials 169
 and estimates of body weight 137–9
 incorrect Ca : P ratios 168
 net energy (NE) 145, 156–8, 169–70
 NRC conclusions 169
 principal components 168
 for work 152
- reactive oxygen species (ROS) 215, 252, 351
 oxidative damage 216
- recurrent airway obstruction (RAO, heaves)
 349–51
- recurrent exertional rhabdomyolysis (RER)
 340
- red cell haemolysis in foal 186
- red cell hypervolaemia (RCHV) 237
- renal calculi, removal with ascorbic acid 85
- renin–angiotensin system 19, 48
- reproduction 180–6, 202
 endometrial function 71
 energy requirements 148–51
 gestation 183–6
 hormone *see* hormones
 lactation, *see also* lactation; milk, mares’
 mineral requirements 148–51
 oestrous cycle 180–3
 mineral requirements 57, 59
 ovarian activity 73
 parturition 183–5
 placental retention 63, 71
 protein requirements 148–51
 and the stallion 181, 202
- residence or retention time 4–5, 14
- resistin 317
- respiration 237–8
 aerobic, anaerobic *see* energy expenditure
 hyperpnoea 45, 237–8
 hypoxia 243
 inflammatory airway disease, heaves
 349–51
 lungs 88
 tricarboxylic acid (TCA) cycle 82, 225, 229
 ventilation rate, respiratory, rate 237–8
 see also aerobic; anaerobic
- respiratory acidosis 245, 247
 respiratory alkalosis 234, 245, 247
 respiratory infections 72
- respiratory minute volume 245
 respiratory quotient (RQ) 140, 255
 respiratory rate, and pulse 239
 respiratory system 233–5, 237–8
 retinyl-palmitate 72
 rhabdomyolysis 231, 300, 338, 339–41, 356
 riboflavin 79, 82–3
 nutritional requirements 167
 requirements for/dietary allowances 70
- rice, chemical composition/MADC 372
- rodent pests 126, 127
 Tyzzer’s bacillus 349
- rotaviruses 202
- roughage/fibre *see* fibre
- ruminants
 differences 14, 16, 19
 glucose tolerance 24
 stocking, and grasses 275–6
- ryegrass toxicosis 299
- salinomycin 134
 saliva 4, 6
Salmonella, 20% active shedders 179
 salmonellosis, colic 323
 salt intake 168, 251–2
 and thirst 174, 241–2
- saponins 125, 301, 302
- satiety 25
- seasons, chemical composition/MADC of
 grass 376
- secretin 9
- selenium 55, 57, 63–5, 76, 78, 132
 and alkali disease 65
 deficiency and toxicity 63–6, 77
 in forages 63
 accumulator plants 64
 GSH-Px activity 63
 in GSH-Px activity 357
 interaction with iodine 65
 interaction with vitamin E 63
 nutritional requirements 167
 in soils 63
 toxicosis 66, 77
- serotonin 32
- sesame-seed meal 118
- shelter 146
- shoeing 315
- silage 75, 281–3
 additives 283
 formic acid 283
 Lactobacillus plantarum 283
 molasses 283
 comparison of DE and NE values 157
 composition 94, 96
 big-bale 96
 clamp 96
 grass 96
 MADC 374–7
 pH 96
 red clover 96
 DM content 283
 heavy metals 284
 pH 96
 toxins 282–3
- silicon 67–8
 binders 67
- skin diseases, sweet itch 115, 306
- sleepygrass toxicosis 299
- small intestine 4–7, 8–12
 carbohydrate digestion 10
 development 4
 duodenum 9
 fat digestion 11
 ileum 9
 impaction 324
 jejunum 10
 motility 9
 pancreatic juice 9
 pH 11
 protein digestion 11
 see also GI tract
- snails 312
- sodium 46, 86, 87
 and calcium loss 41
 daily requirements (g/kg BW/day) 42
 GI tract 86–7
 nutritional requirements 167
 urine 359, 360
- sodium bicarbonate 125–6, 244–6
 dose, method of administration and overall
 effects 251
 see also ergonomic aids and buffers
- sodium chloride 251–2
 ECF 48
 feeding 250–1
 see also salt
- sodium hydroxide 99, 108
- soil
 ADAS classification 274
 ammonia loss from 270
 availability of major nutrients 273–5
 drainage 266, 269, 285
 fertility 273
 fertilizers 273–5
 composition 275
 geological strata 50
 ingestion 280
 liming 272–3
 nitrogen fixation 273
 pH 273
 trace elements 50, 54, 58, 65, 269, 270
- soil-eating 349
- solanine 129
- solutes and water, excretion and 39–48
- sorbitol dehydrogenase 336, 356
- sorghum, chemical composition/MADC 372
- soya beans, cooking 105
- soya hulls 9, 111
 chemical composition/MADC 374
 UFC values 164
- soya-bean meal 116
 chemical composition/MADC 372
- stables, boxes 345–7
- stallion 202
 photoperiod, the effect of 181, 202
- starch 10, 34
 gelatinization 12
 precaecal digestion 12
 RQ 255
- starch overload 12, 13, 34, 121, 125
- steatitis 331
- stocking density 275–9
 behaviour 278, 279–80
 bullying 276

- capacity 276–8
 companionship needs 276, 278
 dominance hierarchy in 279
 and frost 276
 ryegrass 265
 stocking-up 263
 stomach 4–10
 bicarbonate, sodium chloride 4, 9
 cardiac sphincter 5
 concretions 9
 distension, tympany 5, 8
 fermentation 5
 foals 8
 gas 8
 gastric acid 5
 gastrin 5
 glandular mucosa 5
 impaction 324
 malfunction 5–7
 margo plicatus 8
 pepsin 5
 pH 5, 8
 pyloric sphincter 5
 saccus caecus 5, 7
 and saliva entering 4, 5
 squamous mucosa 8
 ulceration 8, 175, 323
 foal 202
 see also gastric ulcers; GI tract
 storage
 shelf-life 178
 temperatures 126, 127
 strangles 85
 straw
 chemical composition/MADC 374
 comparison of DE and NE values 157
 energy cost of eating 157
 UFC values 164
Streptococcus spp 7, 15, 120, 122
 stress
 tetany 341, 342
 transport 264
 stridor 39
 stringhalt 299
 sucrase 10
 sugar tolerance 202
 sugar tolerance test 363
 sugarbeet molasses 109, 374
 sugarbeet pulp
 chemical composition/MADC 374
 digestibility 19
 energy cost of eating 157
 sugars
 absorption tests for sugars 363
 grasses 271
 see also specific substances
 sulphonamides 79
 sulphanilamide and 79, 129
 sulphur
 nutritional requirements 167
 requirements 49
 sunflower seedmeal 117
 chemical composition/MADC 372
 superoxide dismutase 53, 57, 357
 supplements 62–3
 carnosine 124, 252
 feed blocks 280
 glucosamine 119–20, 219–20
 methylsulphonyl methane 82, 124, 219–20
 and NRC recommendations 219
 pasture 280
 swainsonine 302
 sweat 88, 239–40
 K losses 48
 loss of Ca 42
 Na and Cl losses 240
 sweet itch, *Culicoides* (extract) 115, 306
 tachycardia 33
 taurine 199, 259
 teeth 2–4, 175
 cement 2–3
 cheek 2–3
 chewing 2, 96
 energy costs 157
 deciduous 2–3
 dentine 2–3
 diseased 2–3
 enamel 2–3
 incisors 3
 molars 3
 permanent 2–3
 premolar 3
 wolf 3
 temperature
 body 234–5, 261, 269
 increase 234
 environmental 147
 testosterone 181
 tetany
 in exertional stress 341, 342
 in lactation 191, 342
 theobromine 109, 135
 threshold level in urine 135
 thiamin 79, 80, 85, 250
 nutritional requirements 167
 requirements for/dietary allowances 70
 signs of deficiency 72
 thiaminase, bracken fern 129
 3-thiobarbituric acid reactive substances
 (TBARs) 76, 257
 thiobarbituric acid (TBA) 258
 thiocyanates, goitrogenicity 62
 thirst 174, 241–2
 threonine 19, 31, 259
 thrombocytopenia 59
 thrombophlebitis 201
 thyroid hormones, and transportation 263
 thyroid-stimulating hormone, TSH 59
 thyrotropin-releasing hormone 181
 thyroxine 24, 45, 59–61, 181
 hyperthyroaemia 217
 ticks 305
 tongue 1
 total parenteral nutrition (TPN) 201, 335
 toxins *see* poisons
 trace elements 50–8, 167, 269, 270
 chelated 54, 56, 63
 digestibility of 57
 and DOD 219
 intoxication 58
 for maintenance 167
 requirements of growing, working and
 breeding horses 55, 168
 in seaweed 132
 see also specific elements
 traditional feeds 175–6
 training 228–31
 age 243
 blood, normal characteristics 52
 causes of withdrawal 231–2
 daily rates of protein intake 263
 fat supplements 252–3
 fitness 243
 and gastric ulcers 322
 interval 242–3
 meeting increase in energy needs 262
 see also exercise
 transit of digesta, rate of passage 5, 17
 transketolase 79
 transport stress 264
 transportation 263
 treadmill 142
 triacylglycerols (TAGs) 11–12, 198
 clearance 37
 fat supplements 198, 252
 medium-chain, foals 198
 TAG molecule 112
 tricarboxylic acid (TCA) cycle 82, 225, 229
 and ammonia 33–4
 trimethylglycine 124
 tropical grassland/pasture 292–300
 Bermudagrass (*Cynodon dactylon*) pasture
 277, 296
 digestibility 290, 294
 equine diseases 290, 294, 296
 oxalate poisoning 295–6
 poisonous plants 293–300
 trypsin 9
 trypsin inhibitor 105, 116, 128
 antiprotease 104, 105, 116, 128
 tryptophan 32, 124, 259
 tuberculosis 338
 tying-up *see* exertional rhabdomyolysis
 Tyzzer's bacillus 349
 UFC (unitless horse feed unit) values
 as energy requirements 101, 147, 156,
 164–5, 174
 from chemical composition and digestible
 OM or DE content 174
 (k_m) 157, 378
 nutritional values 101, 147, 156, 162, 164,
 191, 378
 prediction 164–5, 378
 urea
 Biuret 33
 blood 29–30, 358
 non-protein N (NPN) 13, 19–20, 23, 31,
 33, 187, 260
 supplements 33
 urease 8, 19, 33
 urinary fractional electrolyte excretion, FE
 see creatinine clearance
 urinary stones (urolithiasis) 335, 358–9
 urine
 calcium 359, 360
 calculi 335, 358
 chloride 359, 360
 energy losses 170
 loss of Ca 42

- magnesium 359, 360
 myoglobinuria 339
 pH 340
 phosphorus 359
 potassium 359, 360
 sodium 359, 360
 water losses 88
 urticaria 333
 US Environmental Protection Agency (EPA)
 Animal Feeding Operations 178–9
 CAFOs 178–9
 vagus nerve
 valine 259
 vanadium 68
 vascular system 233–41
 vegetable oil, chemical composition/MADC 374
 vegetables/succulents 99
Veillonella gazogenes 15
 ventilation, breathing, rate 228
 very low density lipoproteins (VLDLs) 23
 vices *see* behaviour, abnormal
 virginiamycin 349
 viruses 350
 vitamin A (retinol) 71–2, 110, 357
 fertility 69
 measurement of status from blood values 71
 requirements for/dietary allowances 70, 167
 toxicosis 73
 vitamin B₁₂ (cyanocobalamin) 67, 79–80, 250
 assessment 357–8
 requirements 70
 vitamin C (ascorbic acid) 69, 70, 76, 85
 vitamin D (calciferol) 37, 39, 69, 70, 73, 187
 1,25-D metabolite 74
 25-(OH)-D metabolite 74, 357
 deficiency 357
 and phytins 43
 requirements for/dietary allowances 72, 167
 ultraviolet irradiation and 74
 vitamin E (tocopherol) 63, 75–7, 357
 daily requirements (without access to pasture) 77
 immune function 76
 motor neuron disease (EMND) 77, 78
 nutritional requirements 167
 requirements for/dietary allowances 72, 167
 vitamin K (phylloquinone) 79–80
 requirements for/dietary allowances 70
 vitamin-like substances 123–4
 vitamins 69–85, 167, 357–8
 B vitamins 250
 biotin 358
 choline and 69
 fat-soluble 69–79, 333
 folic acid 70, 80, 358
 level of vitamin intake 72
 lipoic acid 82
 for maintenance 167
 malabsorption 333
 microbial synthesis 69, 82
 microorganisms and 79, 80, 82
 niacin 7, 69, 82
 normal, blood 52
 nutritional requirements 167
 pantothenic acid 82
 requirements for/dietary allowances 70
 signs of deficiency 72
 sulphonamides, sulphanilamide and 79, 129
 supplements 123–4
 thiamin 79, 80, 250
 water-soluble 79–85, 107
 see also specific named vitamins
 volatile fatty acids (VFA) 8, 9, 18, 19, 43, 224–6
 absorption 18
 acetic/butyric/propionic 17, 19, 104, 105
 and appetite 173
 clearance 37
 concentrations, GI tract 7–8
 in fermentation 17, 21–2
 and gastric ulcers 322
 propionate and vitamin B₁₂ 80
 vomiting 5
 vomitoxin 299
 warfarin (dicoumarol) 343
 waste materials as feed *see* byproducts
 waste products, in complete diets 98–9
 water 85–9
 absorption 241
 activity 126
 bowls 177
 characteristics of a good source 168
 dehydration 201, 241–3
 deprivation of 88–9
 drinking 241, 243
 and electrolyte loading 250
 faecal 17
 on grassland 281
 intestinal contents 89
 metabolic water 86
 quality of 87, 168
 requirements for 86, 87
 temperature 86
 thirst for 174, 241
 water bowls 177
 water restriction 250
 weaning *see* foals
 weather, stock, effect on 147, 279, 280
 weight loss 337, 338
 weight-carrying ability 147
 weights/density of feeds 101
 wheat 103, 105
 chemical composition/MADC 372
 wheat bran 106
 wheat germ 106
 wheatfeed 10
 white cells *see* leucocytes, blood
 white line disease 320
 withers height 142, 207
 and age (months) 138
 contributing factors 208
 and estimates of body weight 137–9
 estimation, models 206
 and growth hormone 134
 and hip height 210
 wobbler syndrome 215, 297, 404
 work/working horse 222–9
 2–4 years, data, rations 137
 energy expenditure 223–4
 energy transfers 27
 gradient 141, 146, 147
 INRA protein requirements related to
 energy requirement 164
 maintenance requirement 158
 nutritional requirements 222–9
 requirements for growth
 amino acids 32
 trace elements 55
 on slope 141, 146, 147
 trace elements requirements 55
 weight-carrying ability 147
 work intensity, feed allowances 262–3
 see also endurance; exercise; training
 wormers 312
 avermectins 309, 312
 benzimidazoles 307, 309–10, 312
 worming programme, control 309–12
 worms, gastrointestinal 306–12
 bot fly, larvae of 306
 cyathostomes 308
 large redworm 307, 308
 large roundworm 306, 307
 large-mouthed stomach worm 308
 life cycles 311
 liver fluke 312
 lungworm 308, 350
 neck threadworm 309
 nematode 306–9
 pinworm 308
 removal of equine faeces from pasture 309
 small redworm 307
 stomach hairworm 308
 strongyloids 307
 tapeworm 309
 threadworm 307, 309
 trematode 306, 307
 yeast cultures, protein source 120
 yeasts
 brewer's 43, 65, 81, 107
 chemical composition/MADC 372
 foal-heat diarrhoea 185
 see also fungi
 yellow fat disease 331
 Young's modulus 218
 zearalenone 106, 299
 zinc 56–8, 102, 357
 as cofactor of SOD 56, 357
 nutritional requirements 167
 phytins 129
 plasma and milk of mares 51