Subject Index

Page numbers in italics followed by "f" indicate illustrations; page numbers in italics followed by "t" indicate tabular material.

A
AA. See Arachidonic acid
Adenosine triphosphate (ATP), 175
role in nutrition, 165
Alanine, 113t, 115t, 125t, 142t
Albumin, 117t, 141t
Allergies
of bovine milk fortifiers, 147
new generation of probiotic bacteria in prevention of, 10
prevention of, 13
α-Tocopherol, 95–96
in the newborn, 92
Amino acids
clinical significance of differences in, 135–136
composition of diets, 115t
concentrations, 121–137
essential, in plasma of infants, 126t
as markers, 122–123
protein content in human milk and conventional formulas, 113, 115t
reference intervals for concentrations of, 122
Anemia, 53
Antibiotic agents
-associated diarrhea, 33
change in bowel habits and, 18
diarrhea and, 17–18
versus probiotic agents, 15
with probiotic agents, 24–25
Antibody production, in immune-mediated defense mechanisms, 2
Arachidonic acid, 197. See also Long-chain polyunsaturated fatty acids
Arachidonic acid (AA), 220–221, 221f
Arginine, 113t, 115t, 125t, 142t
Ascorbic acid, 74
in the newborn, 92
Aspartate, 113t
Aspartic acid, 115t, 125t
ATP. See Adenosine triphosphate
interaction of nonpathogenic with mixed mucosal cell population, 7–10, 7f, 8f, 9f
modulation of mucosal immune response by commensal, 4–10
modulation of surface antigens by nonpathogenic, 4t
new generation of probiotic, in prevention of gastrointestinal disorders and allergy, 10
nonpathogenic, 4
Bailey tests, 209–210
Behavioral disturbances, iron fortification and, 77–78
Bifidobacteria
breast-fed versus bottle-fed infants and, 16
diarrhea and, 17–18
in the elderly, 10
Bifidobacterium adolescentis, 10
Bifidobacterium bifidum, in prevention of diarrhea in hospital, 32
Bifidobacterium breve, 10, 21
for treatment of diarrheal disease in children, 19–20
Bifidobacterium infantis, 50
Bifidobacterium lactis, 10
Bone disease, 156–157
Bone mineralization, 156–157
Bovine milk, 111
clinical and nutritional applications for growth-factor extract, 188–191, 190t
fortifiers, 146–147
growth factors and enrichment strategies, 187–188, 187t, 188f
BPD. See Bronchopulmonary dysplasia
Brain
iron deficiency during early development of, 85
iron uptake of, 85–86
long-chain polyunsaturated fatty acids and, 200
normal axonal transport of iron, 91
Breast feeding
advantages, 15–16
estimates of protein intake, 112t
gain in length from birth to 120 days, 116t
plasma amino acid concentrations in, 121–137
weight gain from birth to 120 days, 116t
Breast milk, 26, 111
  absorption of iron from, 74-75
  change in body mass index from birth to 120
days, 117
  dependence of plasma isoleucine, 129f
  gain in weight versus Eurogrowth values, 117
  iron in, 73
  long-chain polyunsaturated fatty acids and, 208-209
  necrotizing enterocolitis and, 47-18, 51-52
  protein intake of infant, 99, 99t
Bromchopulmonary dysplasia (BPD), 161-162
Brunet-Lezine scale, 201
Caco-2 cells, 7-8, 7f
  colon carcinoma cells, 12
  leukocyte cocultures and, 10
Calcium
  in cow’s milk, 74
  results of metabolic balance studies, 102, 102f
Campylobacter jejuni, for treatment of diarrheal
disease in children, 19-20
Cancer, iron fortification and, 79
Carcinoma, Caco-2 cells and, 12
Casein formulas, 111
CDP. See Cytidine diphosphate
CFU. See Colony-forming units
cGMP. See Cyclic guanosine monophosphate
Chelating agents, 91
Chemosomes, 4
Chemotherapy-induced oral mucositis, 190-191
Children
  development with iron fortification, 77-78
  iron fortification and growth in, 78
  iron requirements during, 53-69
  prevention of diarrheal disease in, 20-21
  rationale for iron-fortified follow-on formulas
  and growing-up milks, 59, 62
  role of probiotic agents in gastrointestinal
disorders of, 29-45
  safety of probiotic agents in, 21-22, 25
  treatment of diarrheal disease in, 18-20
Ciprofloxacin, for Crohn’s disease, 36
Clinical trials
BEBA HA, 223
  effects of long-term consumption of infant
  formulas containing probiotic agents, 21
  of iron fortification, 76-78
  growth, 78
  hematologic outcome, 76-77
  neurodevelopmental outcome, 77-78
  on iron requirements during infancy and early
  childhood, 64
  with Lactobacillus GG, 30
  of long-chain polyunsaturated fatty acids, 215-216
  on low birthweight infants, 154-155
  for prevention of diarrheal disease in
  children, 20-21
  for probiotic agents in treatment of diarrheal
disease in children, 18-20
Clostridium difficile, diarrhea and, 17, 33-35, 34f
  perfringens, 1
CoA. See Coenzyme A
Coenzyme A (CoA), role in nutrition, 165
Colitis
  Clostridium difficile, treated with
  Lactobacillus GG, 34f
  Colony-forming units (CFU), 19
  Colonstrum, high concentrations of growth factor
  in, 193
Constipation, 21-22
Cow’s milk, 139
  gut microflora, 170
  risk of iron deficiency and iron-deficiency
  anemia, 55, 56t
Crohn’s disease
  bovine milk growth factors and, 187
  in children, 37-39, 38f, 39f
  treatment, 36
CTP. See Cytidine triphosphate
Cyclic adenosine monophosphate (cAMP), role
in nutrition, 165
Cyclic guanosine monophosphate (cGMP), role
in nutrition, 165
Cystine, 113t, 115t, 125t
Cytidine diphosphate (CDP), 175
Cytidine triphosphate (CTP), 166
Cytokines, 4
Dairy analyzer, 148
DCT-1. See Divalent cation-transport pathway
Deferiprone, 91
Deferoxamine mesylate (DFO), 91
Development quotient (DQ), 201
DFO. See Deferoxamine mesylate
DHA. See Docosahexaenoic acid
Diaper rash, 26-27
Diarrhea
  acute, 29-33, 31t, 32f
  antibiotic-associated, 17-18, 33
  breast feeding advantages and, 15-16
  Clostridium difficile and, 17, 33-35, 34f
  duration of, 31-32, 31t, 32f
  mortality, 30
  prevention in children, 20-21
  treatment in children, 18-20
  divalent cation-transport pathway (DCT-1), 88
Docosahexaenoic acid (DHA), 197, 221, 222f.
  See also Long-chain polyunsaturated
  fatty acids
DQ. See Development quotient
EGF. See Epidermal growth factor
Energy
  intakes in preterm infants, 144t
  and protein intakes, 115t
Enteral feeding, necrotizing enterocolitis and, 47–48

*Enterococcus faecium*, 29

*Enterococcus faecium*-SF68, 18

Epidermal growth factor (EGF), 185

Epithelial cells
intestinal, 3
regulation of immune phenotype in vitro, 4–5, 4t, 5f–6f

E/PUFA ratio, 62–63

Erythropoietin, in preterm infants, 96

Escherichia coli, 15–16
breast feeding advantages and, 15–16
gut colonization and, 48
sensitivity to human serum, 16–17
for stimulation of the human intestinal cell, 4
for ulcerative colitis, 37

Essential elements, 125t
iron, 85–86

Factorial method of determining protein requirements, 98–99, 98t
FAD. See Flavin adenine dinucleotide
Fas, 4
Fat, results of metabolic balance studies, 102, 102t
Fatty acids. See also Long-chain polyunsaturated fatty acids
arachidonic acid, 220–221, 221f
composition, 217t
docosahexaenoic acid, 221, 222f
N-3, 214, 221, 222f
N-6, 214, 220–221, 220f, 221f
omega-6, 220, 220f
Flavin adenine dinucleotide (FAD), role in nutrition, 165
Food sterility, 26
Formula Blue, 101–102, 102t
Formula milk
absorption of iron from, 74–75
casein, 111
change in body mass index from birth to 120 days, 117t
composition for older infants, 108–109
composition of formulas used in clinical trials, 217t
dependence of plasma citrulline, 129f
dependence of plasma threonine, 128f
fatty acid profiles of infants fed with, 211–226
gain in length from birth to 120 days, 116t
gain in weight versus Eurogrowth values, 117c
history of, 111–112
history of iron-fortified, 72–73
iron erythrocyte incorporation after consumption of, 58, 58t
iron-fortified, 56–62, 57t, 58t, 60f, 61f
iron in, 73, 73t, 86
for premature infants, 62–63

long-chain polyunsaturated fatty acids and, 209
necrotizing enterocolitis and, 47–48, 51–52
numbers of infants with amino acid analyses by age group, 126t
plasma amino acid concentrations in, 121–137
postdischarge from hospital, 154
protein content in, 113, 113t
recommendation: for protein content in, 114
with reduced protein content, 114–118, 115t, 116t, 117t
vitamin E in, 62–63
weight gain from birth to 120 days, 116t
whey-modified, 118

Formula Yellow, 102, 102t
Free iron, 86–87
Free radicals, role of, 95–96
Fructose, breast milk and, 16

FAS. See Flavin adenine dinucleotide
Fas, 4
Fat, results of metabolic balance studies, 102, 102t

Fatty acids. See also Long-chain polyunsaturated fatty acids
arachidonic acid, 220–221, 221f
composition, 217t
docosahexaenoic acid, 221, 222f
N-3, 214, 221, 222f
N-6, 214, 220–221, 220f, 221f
omega-6, 220, 220f
Flavin adenine dinucleotide (FAD), role in nutrition, 165
Food sterility, 26
Formula Blue, 101–102, 102t
Formula milk
absorption of iron from, 74–75
casein, 111
change in body mass index from birth to 120 days, 117t
composition for older infants, 108–109
composition of formulas used in clinical trials, 217t
dependence of plasma citrulline, 129f
dependence of plasma threonine, 128f
fatty acid profiles of infants fed with, 211–226
gain in length from birth to 120 days, 116t
gain in weight versus Eurogrowth values, 117c
history of, 111–112
history of iron-fortified, 72–73
iron erythrocyte incorporation after consumption of, 58, 58t
iron-fortified, 56–62, 57t, 58t, 60f, 61f
iron in, 73, 73t, 86
for premature infants, 62–63
long-chain polyunsaturated fatty acids and, 209
necrotizing enterocolitis and, 47–48, 51–52
numbers of infants with amino acid analyses by age group, 126t
plasma amino acid concentrations in, 121–137
postdischarge from hospital, 154
protein content in, 113, 113t
recommendation: for protein content in, 114
with reduced protein content, 114–118, 115t, 116t, 117t
vitamin E in, 62–63
weight gain from birth to 120 days, 116t
whey-modified, 118

Formula Yellow, 102, 102t
Free iron, 86–87
Free radicals, role of, 95–96
Fructose, breast milk and, 16

FAS. See Flavin adenine dinucleotide
Fas, 4
Fat, results of metabolic balance studies, 102, 102t

Fatty acids. See also Long-chain polyunsaturated fatty acids
arachidonic acid, 220–221, 221f
composition, 217t
docosahexaenoic acid, 221, 222f
N-3, 214, 221, 222f
N-6, 214, 220–221, 220f, 221f
omega-6, 220, 220f
Flavin adenine dinucleotide (FAD), role in nutrition, 165
Food sterility, 26
Formula Blue, 101–102, 102t
Formula milk
absorption of iron from, 74–75
casein, 111
change in body mass index from birth to 120 days, 117t
composition for older infants, 108–109
composition of formulas used in clinical trials, 217t
dependence of plasma citrulline, 129f
dependence of plasma threonine, 128f
fatty acid profiles of infants fed with, 211–226
gain in length from birth to 120 days, 116t
gain in weight versus Eurogrowth values, 117c
history of, 111–112
history of iron-fortified, 72–73
iron erythrocyte incorporation after consumption of, 58, 58t
iron-fortified, 56–62, 57t, 58t, 60f, 61f
iron in, 73, 73t, 86
for premature infants, 62–63
long-chain polyunsaturated fatty acids and, 209
necrotizing enterocolitis and, 47–48, 51–52
numbers of infants with amino acid analyses by age group, 126t
plasma amino acid concentrations in, 121–137
postdischarge from hospital, 154
protein content in, 113, 113t
recommendation: for protein content in, 114
with reduced protein content, 114–118, 115t, 116t, 117t
vitamin E in, 62–63
weight gain from birth to 120 days, 116t
whey-modified, 118

Formula Yellow, 102, 102t
Free iron, 86–87
Free radicals, role of, 95–96
Fructose, breast milk and, 16

Galactose, breast milk and, 16
GALT. See Gut-associated lymphoid tissue
Gastrointestinal disorders
gut microflora, 170
new generation of probiotic bacteria in prevention of, 10
nucleotides and, 169
recovery after injury, 169–170
Gastrointestinal tract, unabsorbed iron in, 53–54
G-CSF. See Granulocyte colony-stimulating factor
GDP. See Guanosine diphosphate
Genetic disorders, iron fortification and, 79
Glucose, breast milk and, 16
Glutamate, 113t
Guanosine diphosphate (GDP), 175
Guanosine diphosphate (GDP), 113t, 125t
Gluatmine, 119–120
Glycine, 113t, 115t, 125t, 142t
Granulocyte colony-stimulating factor (G-CSF), 190
Growth
analysis of data of preterm infants, 150
bovine milk and enrichment strategies, 187–188, 187t, 188t, 188f
clinical and nutritional applications for bovine milk growth-factor extract, 188–191, 190f
iron fortification and, 78
in preterm infants, 141t
role and function in infant nutrition, 185–195
studies, 104–107, 105t, 106t
from whey protein extract, 187–188, 188t
Guanosine diphosphate (GDP), 175
Gut-associated lymphoid tissue (GALT), antibody production at mucosal surfaces and, 2
Gut colonization, necrotizing enterocolitis and, 48
Gut microflora, 170
Haemophilus influenzae, 173
Heart, iron deficiency during early development of, 85
Helicobacter pylori, 29
Hematology, iron fortification and, 76–77
Heme pathway, 88
Hemochromatosis, iron fortification and, 79
HFE polymorphism, 68
Histidine, 113t, 115t, 125t, 126t, 142t
HLA. See Human leukocyte antigen
HMF. See Human milk fortifier
Homeostasis, of iron, 88–89
Hormones, 185, 186t
Hospital-acquired disease, 43
Hospitalization
nutrition of preterm infants discharged from, 149–163
predischarge nutrition, 150–152, 151t, 152t
HT-29 cells, modulation of surface antigens by nonpathogenic bacteria, 4t
Human colostrum
nucleotide, 176, 176t
Human leukocyte antigen (HLA), 3
Human milk
current fortification process and, 142
developmental advantage of long-chain fatty acids and, 197–198
long-chain fatty acids and, 198–199
nucleotide content, 175, 175t, 178, 178t
nucleotides in, 174–178, 175t, 176t, 177t, 178t
protein composition, 112
protein content in, 113, 113t, 143t
protein-enriched, 139
Human milk fortifier (HMF), 143–144
Hydroxyethyl starch, 91
Hypoxia, 91
Hypoxia–reoxygenation, 91
ICAM-1, 4
IDP. See Inosine diphosphate
IFC. See Infant Formula Council
IFN-γ. See Interferon γ
IFN-γ receptor, 4
IgA. See Immunoglobulin A
IL. See Interleukin
Immune function
cellular, 170–172
human infant studies, 172–174
humoral, 172
immune modulation of the neonatal intestine, 191
nucleotides and, 170–174
probiotics and, 1–14
Immune-mediated defense mechanisms, 2–3
antibody production at mucosal surfaces, 2
intestinal epithelial cells, 3
stimulation of immunoglobulin A production by L. johnsonii, 3
Immune response, adhesion and, 13–14
Immunoglobulin A (IgA), stimulation by L. johnsonii, 3
Immunostimulation, by lactic acid bacteria, 1
IMP. See Inosine monophosphate
Infant Formula Council (IFC), 63
Infants
amino acid analysis by age group and formula, 126t
available foods for low birthweight, 139–142, 140t, 141t, 142t
change in body mass index from birth to 120 days, 117t
daily iron needs of the erythrocyte, 59, 61f
desirable intakes to meet iron requirements, 53–54
fatty acid profiles of, 211–226
gain in length from birth to 120 days, 116t
gain in weight versus Eurogrowth values, 117t
as human studies of nucleotides, 172–174
immune modulation of the neonatal intestine, 191
intake, retention, and incorporation of iron from NAN, 59, 60f
intestinal flora in, 15–17
iron requirements during, 53–69
nutritional interventions during the first year of life, 157–159
plasma amino acid concentrations in breast-fed and formula-fed, 121–137
proposal to decrease the iron-fortification level in infant formulas, 56–59, 57t, 58t, 60f, 61f
protein quantity and quality in formula, 111–120
requirements in infant formulas during the first 6 months of life, 71–84
role and function of growth factors in infant nutrition, 185–195
role and function of long-chain polyunsaturated fatty acids in nutrition of, 197–209
role and function of nucleotides in, 165–184
role of probiotic agents in gastrointestinal disorders of, 29–45
safety of probiotic agents in, 21–22
serum-ferritin and, 57, 57t
toxicity in the perinatal period, 90–91
weight gain and weight-gain composition in term and postdischarge-fed, 156, 156t
weight gain from birth to 120 days, 116t
Inflammatory bowel disease, 35–40, 36f, 38f, 39f
Inosine diphosphate (IDP), 175
Inosine monophosphate (IMP), 173
Interferon γ (IFN-γ), 3
Interleukin (IL)-4, 2
Interleukin (IL)-5, 2
Interleukin (IL)-6, 47
Interleukin (IL)-8, 4, 7, 7f
Interleukin (IL)-10, 2
colonic histologic injury score, 36f
Intestinal flora
differences between breast-fed and bottle-fed infants, 16
in infancy, 15–17
Intestine pseudo-obstruction, 35
IREs. See Iron-responsive elements
Iron
absorption from breast milk and infant formula, 74–75
absorption pathways, 88
as an essential element, 85–86
biochemistry of, 86–88
in breast milk, 73
clinical trials of iron fortification, 76–78
daily needs of the erythrocyte, 59, 61f
daily requirements, 67
–deficiency anemia, 53, 55, 56t
desirable intakes to meet requirements, 53–55
detoxification, 91–92, 96
fortification, 75–76
–fortified formulas, 56–62, 57t, 58t, 60f, 61f
future studies, 80
history of iron-fortified infant formula, 72–73
homeostasis, 88–89
influence of dietary factors on status, 55–56, 56t
intake, retention, and incorporation of iron from NAN, 59, 60f
potential negative effects of iron fortification, 78–79
as a pro-oxidant, 85–96
recommended iron levels in iron-fortified infant formulas, 73, 73t
requirements during infancy and early childhood, 53–69
requirements in infant formulas during the first 6 months of life, 71–84
response of iron-regulatory proteins to oxidative stress, 89–90
supplementation, 62, 227
toxicity in the perinatal period, 90–91
Iron-regulatory proteins (IRPs), 88–89
Iron-responsive elements (IREs), 88–89
IRPs. See Iron-regulatory proteins
Isolated soy protein (ISP), 104
Isoleucine, 113t, 115t, 125t, 126t, 129f, 142t
ISP. See Isolated soy protein
Keratinocyte growth factor (KGF), 190
KGF. See Keratinocyte growth factor
Kruskal–Wallis test, 126
Lactic acid bacteria, immunostimulation, 1
Lactobacillus acidophilus, 18
Lactobacillus bulgaricus, 18
Lactobacillus casei, 48–49
Lactobacillus delbrueckii, for treatment of diarrheal disease in children, 19
Lactobacillus GG, 18, 38, 38f
beneficial effects in acute diarrhea, 30
breast-fed versus bottle-fed infants and, 17
cellobiose/mannitol ratio during, 38, 39f
colitis, 34f
diarrhea and, 17
effect in oral rehydration solution on diarrhea duration, 31–32, 31t
necrotizing enterocolitis and, 49
for treatment of diarrheal disease in children, 19
Lactobacillus johnsonii, 1, 7f, 8f, 8f–9f
immunoglobulin A stimulation, 3
proinflammatory response and, 11
Lactobacillus plantarum, 35, 43
Lactobacillus reuteri, 36, 36f
for treatment of diarrheal disease in children, 19
Lactobacillus rhamnosus, for treatment of diarrheal disease in children, 19
Lactobacillus sakei, 7f–9f
Lactoferrin
breast milk and, 16
in breast milk compared to cow’s milk, 74
LCPUFAs. See Long-chain polysaturated fatty acids
Leucine, 113t, 115t, 125t, 126t, 142t
Linoleic acid, 62–63
Liver
iron deficiency during early development of, 85
nucleotides and, 170
Long-chain polysaturated fatty acids (LCPUFAs), 197–209, 228
biologic and experimental developmental advantages, 199–200
clinical trials, 215–216
analytic methods, 216
BEBHA HA Start trial, 219, 219t
NAN trial, 218–219, 218t
sources used for supplementation, 212f–213f, 216
study protocols and methods, 217t, 218–220, 218t, 219t
comparison of fatty acids and, 220–222, 220f, 221f
dietary, 202–204
evidence in infants, 200–202
fatty acid profiles of infants fed formulas supplemented with, 211–226
functions of, 214
history of, 197–198
in human milk, 198–199
human milk and developmental advantage, 197–198
influence of sources used for supplementation, 223
placental transport, 207
red blood cell fatty acid profiles, 217–223
synthesis and metabolism, 211–212, 212f–213f
Low birthweight infants
available foods for, 139–142, 140t, 141t, 142t
clinical trials, 154–155
iron supplementation in, 68–69
long-term effect of early growth restriction in,
152–153, 152t, 153t
male versus female, 163
necrotizing enterocolitis and, 48
Lysine, 113t, 115t, 125t, 126t, 142t

M
Magnesium, results of metabolic balance
studies, 102, 102t
Major histocompatibility complex (MHC), 4
Mann–Whitney U test, 126
MCP-1. See Monocyte chemoattractive protein
1
Mesalazine, for ulcerative colitis, 37
Metabolic balance studies, 102, 102t
Metabolism, 102, 102t
of long-chain polyunsaturated fatty acids,
211–212, 212f–213f
of nucleotides, 165–169, 167f
Methionine, 113t, 115t, 125t, 126t, 142t
Methotrexate-induced small intestinal damage,
188–190, 190f
Metronidazole, for Crohn's disease, 36, 38,
38f
MHC. See Major histocompatibility complex
Milk products
administration of natural milk extract,
191–192
cow's milk-based preterm formula, 139
fermented, 3
fresh own mother's, 139
iron erythrocyte incorporation after
consumption of, 58, 58t
protein-enriched human milk, 139
Mineralization, 157
Mitogens, 185, 186t
Mobilferrin–integrin pathway, 88
Monocyte chemoattractive protein 1 (MCP-1), 4
Mortality, associated with acute and prolonged
diarrhea, 30
Mucosa
antibody production at surfaces, 2
chemotherapy-induced oral mucositis,
190–191
intestinal, 2
modulation of response by commensal
bacteria, 4–10
Mucosal immune response, modulation by
commensal bacteria, 4–10

N
N-acetyl-glucosamine, breast milk and, 16
NAD. See Nicotinamide adenine dinucleotide
National Health and Nutrition Examination
Survey (NHANES), 55
National Institute of Child Health and
Development, 49
NCC. See Nestlé Culture Collection
NEC. See Necrotizing enterocolitis
Necrotizing enterocolitis (NEC)
breast-fed versus bottle-fed infants and,
51–52
breast feeding advantages and, 15–16
enteral feeding and, 47–48
gut colonization and, 48
low birthweight infants and, 48
prevention, 193
prevention with probiotic agents, 47–52
Nestlé Culture Collection (NCC), bifidobacteria
from, 10
N-3 fatty acid, 214, 221, 222f
N-6 fatty acid, 220–221, 220f, 221f
NH₃, 125t
NHANES. See National Health and Nutrition
Examination Survey
Nicotinamide adenine dinucleotide (NAD), role
in nutrition, 165
Nitrogen balance studies, 101–102
conclusions, 102
formula composition, 101
intake and absorption, 103f
metabolic studies with reformulated NAN,
101
methods, 101
results, 102, 102t, 103f
urinary excretion and retention, 103f
Nonprotein nitrogen (NPN), 113
NPN. See Nonprotein nitrogen
Nucleic acids, in digestion and absorption, 167,
167f
Nucleotides
absorption, 167–169
biologic effects, 169–174
collection of dietary, 167, 167f
gastrointestinal effects, 169–170
hepatic effects, 171
in human milk, 174–178, 175t, 176t, 177t,
178t
immunity, effect on, 170–174
metabolism, 165–169, 167f
role and function in infant nutrition, 165–184
salvage pathway, 166
supplementation, 183–184
synthesis and catabolism, 166
temperature, effect on, 182
Nutrients
in the gastrointestinal tract, 47–48
protein requirements in infancy, 97–110
to replace losses, 97
requirements, 97
Nutrition. See also Preterm infants
bifidobacteria and, 10
dietary and other factors associated with the
risk of iron deficiency and iron-
deficiency anemia, 56t
eyellow growth and postdischarge, 153–159
growth factors, role and function of, 185–195
influence of dietary factors on iron status,
55–56, 56t
intakes to meet iron requirements, 53–55
interventions during the first year of life, 157–159
iron-fortified food history, 72–73
long-chain polyunsaturated fatty acids, role and function in, 197–209
nucleotides, role and function in, 165–184
of preterm infants discharged from hospital, 149–163
solid food intake, 83
Nutritional deficiency disease, 53. See also Iron

Ω
Omega-6 fatty acid, 220, 220f
Omithine, 142t
OMP. See Ornithine monophosphate
Oral rehydration therapy (ORT) in early rehydration phase, 30–31
for treatment of diarrheal disease in children, 19
Ornithine monophosphate (OMP), 166
ORT. See Oral rehydration therapy
Osteopenia, 150, 151f
O-Trensox, 92
Oxidative stress, response of iron-regulatory proteins to, 89–90
Oxygen plus iron hypothesis, 62

P
PAF. See Platelet-activating factor
PCDAI. See Pediatric Crohn’s Disease Activity Index
Pediatric Crohn’s Disease Activity Index (PCDAI), 38–39, 39f
Perinatal period, iron toxicity in, 90–91
Phenylalanine, 113t, 115t, 125t, 126t, 142t
Phosphoribosylpyrophosphate (PRPP), 166
Phosphorus in cow’s milk, 74
results of metabolic balance studies, 102, 102t
Plasma amino acid concentrations, 121–137
comparing concentrations in breast-fed and formula-fed infants
at ages 1, 2, and 4 months, 126–127, 126t
effect of sampling time, 127–130, 128f, 129f
harmful effects, 130, 131f, 132f, 133f
protocol, 124–126, 125t, 126t
in study of preterm infants, 142t
Platelet-activating factor (PAF), 47
Polyunsaturated fatty acids (PUFAs), 62–63
Pouchitis, 37
Premature infants. See Preterm infants
Preterm infants
desirable intakes to meet iron requirements, 54–55
erthropoietin in, 96
iron in formulas for, 62–63
nutrition on discharge from hospital, 149–163
protein requirements in, 139–149
Probiotic agents, 227
versus antibiotic agents, 15
with antibiotic agents, 24–25
antibiotic-associated diarrhea and, 17–18
Clostridium difficile diarrhea and, 17
definition, 29
in gastrointestinal disorders of infancy and childhood, 29–45
immune function and, 1–14
individual versus combination, 13
intestinal flora in infancy and, 15–17
over-the-counter, 22
prevention of diarrheal disease in children, 20–21
to prevent necrotizing enterocolitis, 47–52
safety in infants and children, 21–22
treatment of diarrheal disease in children, 18–20
Proline, 113t, 115t, 125t
Pro-oxidants, iron, 85–96
Proteases, in milk products, 195
Proteins in bovine milk, 185, 186t
comparison in infant formula and human milk, 112–114, 113t
composition in human milk, 112
differentiation between requirement and recommended intake, 107–108
and energy intakes, 115t
estimates of intake in exclusively breast-fed infants, 112t
experimental approaches, 100–107
growth studies, 104–107, 105t, 106t
nitrogen balance studies, 101–102, 102t, 103f
human milk content, 143t
individualized fortification, 142–143, 143t, 146t
intakes in preterm infants, 144t
quality in growth studies, 104
quantity and quality in formula, 111–120, 227
recommendations for content in infant formulas, 114
requirements, 104–107, 105t, 106t
of healthy term infants, 112, 112t
in infancy, 97–110
in male infants versus female infants, 110
in preterm infants, 139–149, 228
theoretical approaches for determination of requirements, 98–99
estimates by the factorial method, 98–99, 98t
protein intake of the breast-fed infant, 99, 99t
urea concentrations and, 109
variable level of fortification, 143–144, 144t
PRPP. See Phosphoribosylpyrophosphate
PUFAs. See Polyunsaturated fatty acids
R
Red blood cell fatty acid profiles, 217–223
Reference intervals, 121–137
for amino acid concentrations, 122
questions concerning, 124
Retinopathy, iron supplementation and, 62
Rotavirus IgA antibodies, 20–21
in diarrheal disease in children, 19
Lactobacillus GG and, 30
mechanism of action, 44

S
Saccharomyces boulardii (yeast), 18
prophylactic use in diarrhea, 17
safety issues and, 21–22, 25–26
for treatment of diarrheal disease in children, 19
Saccharomyces thermophilus, 20, 21–22
Safety issues, 21–22, 25
Salmonella typhi vaccine, 3
Salvage pathway, nucleotides and, 166
Scientific Committee for Food of the European Commission, 63
Septicemia, breast feeding advantages and, 15–16
Serine, 113t, 115t, 125t
Serum ferritin, 57, 57t
Serum urea nitrogen, 117t, 141t
studies of energy and protein intakes, 105–106, 105t
SGA. See Small-for-gestational-age infants
Small-bowel bacterial overgrowth syndrome, 35
Skeletal muscle, iron deficiency during early development of, 85
Small-bowel bacterial overgrowth syndrome, 35
Small-for-gestational-age (SGA) infants, 152
Small intestine, methotrexate-induced damage, 188–190, 190f
Soy protein, isolated, 104
Staphylococcus aureus, 168–169
Streptococcus thermophilus, 29
in prevention of diarrhea in hospital, 32
for treatment of diarrheal disease in children, 19
for ulcerative colitis, 37

T
Taurine, 142t
T cells, regulatory, 2
Temperature, effects on nucleotides, 182
Tetrakis (2-pyridylmethyl) ethylenediamine (TPEN), 91
TGF-β. See Transforming growth factor β
Threonine, 113t, 115t, 125t, 126t, 128f, 137, 142t
TNF-α. See Tumor necrosis factor α
Toxicity
detoxification, 91–92
in the perinatal period, 90–91
TPEN. See Tetrakis (2-pyridylmethyl) ethylenediamine
Transforming growth factor β (TGF-β), 2, 186
in human milk, 193–194
induction of, 8, 8f
Tryptophan, 115t, 125t
computed transport rate across the blood–brain barrier, 132f
computed unidirectional transport velocity of, 131f
Tumor necrosis factor α (TNF-α), 4, 8f–9f, 47
Tyrosine, 113t, 115t, 125t, 142t

U
UDP. See Uridine diphosphate; Uridine diphosphoglucose
Urea, concentrations, 109
Uridine diphosphoglucose (UDP), 175
Uridine diphosphoglucose (UDP), 166
role in nutrition, 165
Uridine triphosphate (UTP), 166
Urinary tract infections, breast feeding advantages and, 15–16
UTP. See Uridine triphosphate

V
Vaccines, for Salmonella typhi, 3
Valine, 113t, 115t, 125t, 142t
Vitamin C, 96
in the newborn, 90
Vitamin E, in formula, 62–63
Votif, 3
VSL#3, for ulcerative colitis, 37

W
Weight gain, 119–120
from birth to 120 days, 116t
studies of energy and protein intakes, 105–106, 105t
Whey, comparative growth-promoting activity from bovine, 187, 187t

Y
Yeast. See Saccharomyces boulardii
Yogurt, for treatment of diarrheal disease in children, 18–19