Index

a
A1298C polymorphism 41–47
abdominal obesity 211
acceptable daily intake 92, 93
acetaldehyde 111
acylamide 110
adaptive fitness 283
adaptive immune responses 167, 171
adipocyte hyperplasia 160
adipocytokines 211
adiponectin 211, 216
adipose tissue 211
adolescence, health determinants 160, 161
β2 adrenoreceptor agonists 258
adult diseases see human diseases
adults, health determinants 160, 161
aflatoxin B1 92–94, 105, 109, 113, 117
aging
– anti-aging modalities 215–217
– cancer, epigenetic dysregulation 209–218
– cancer predisposition model 217
– cancer-prone metabolic phenotype 210–212
– diseases associated 158
– DNA hypermethylation during 183, 184
– epigenetic silencing via DNA methylation 212, 213
– extrinsic 27
– health determinants 160, 161
– inflammatory control of epigenetic regulators 214, 215
– intrinsic 27
– malignant cell development 180
– metabolism-associated genes 181–183
– nutrition 26–28
– see also life span; neurodegenerative diseases
agouti viable yellow murine model 136
air pollution 22, 253, 256, 258
alcohol
– aging 27
– cancer deaths 106
– carcinogens 111
– folate metabolism 43
– MTHFR variants 46
– NAFLD 56, 57
allergens/allergies 132, 255, 257
ALSPAC data set 68, 73, 75
aluminium 231
Alzheimer’s disease 225–228, 245, 246
– diet 237, 238
– environmental factors 231, 232
– epigenetic dysregulation 247, 248
– epigenetics 234–236
– gene expression 249
– susceptibility genes 229, 230
amyloid beta (Aβ) peptides 226, 228, 234, 236
amyloid precursor protein gene (APP) 226–228, 234–236
amyotrophic lateral sclerosis 225–228
– diet 238
– environmental factors 231, 232
– sporadic 236, 237
– susceptibility genes 229, 230
ancestors’ nutrition 71–74, 81, 82, 136
antiapoptosis 215
antibiotics 257
anticancer therapy 141, 142, 145–152
antioxidants 112, 113, 118, 151, 235
AP-1 transcriptional complex 148, 149
Apolipoprotein E (APOE) 229, 231
aristolochic acid 109
arsenic 5, 238
asthma
– epigenetic mechanisms 253–260
– fetal basis 256, 257
Index

ATRA 144–149
attachment theory 79
attributable risks 267, 275, 276
5-aza-2‘-deoxycytidine 195, 202, 203
5-azacytidine 202

b
babies see newborn
Bellagio Model of Public Health Genomics 268–271
benzo[a]pyren 113
biobanking and biomolecular resources 55
biobanks
– background 51, 52
– disease- and population-oriented 5, 52, 54, 55
– formats and purpose 52, 53
– genome-based 270
– key components and applications 53
– need for networks 53–55
– role in gene–environment interactions 51–60
– see also genetic epidemiology
bioflavonoids 142, 149, 150
bioinformatics 127, 128, 132, 214, 249
biological plausibility 77
biomarkers
– chemoprevention 204
– definition 53, 246
– identification 58
– neurodegenerative disorders 245–250
– see also epigenetic marks
birth weight 75, 159, 161, 175, 255
bisphenol A 21, 237
bladder cancer 187
blood cell transcriptome 130, 131
blood samples, DNA methylation 200
brain cancer 187
brain injuries 232
breast cancer
– aging 209
– diet 145
– enzyme polymorphisms 114–117
– estrogen receptor gene 148, 212, 213
– genes methylated 187
– MTHFR 44, 45
butyrate 25
cancer
– aging, epigenetic dysregulation 209–218
– aging predisposition model 217
– anticancer therapy 141, 142, 145–152
– caloric restriction 28
– causes of death 105, 106, 152, 210, 217
– deaths 158
– epigenetic progenitor model 200, 201
– genetic/epigenetic mechanisms 184
– genetic factors 106, 184
– HDAC role 189, 190
– histone modifications 19, 20
– hypermethylated gene promoters 187, 188
– hypo and hypermethylation see hypermethylation; hypomethylation
– low birth weight 255
– metabolic phenotype, cancer-prone 210–212
– see also carcinogenesis; malignancy; promoter hypermethylation
Cancer and Leukemia Group B 202
cancer cells
– DNA methylation 185, 196, 197
– genetics and epigenetics 180
– nuclear structure 179
cancer genome 195
cancer risk 209
– enzyme polymorphisms 114–117
– from genotoxic dietary carcinogens 111, 112
– MTHFR gene polymorphisms 37, 41–47
candidate genes see gene candidates
carbon tetrachloride 92
carcinogenesis
– hepatocarcinogenesis 90–99
– multistage concept 89, 90, 91–95
– see also cancer
– carcinogenic potency 107
carcinogens
– dietary protection 112–114
– DNA methylation 89, 96, 97
– in foods 105–118
– in plant-derived foods 109–111
– see also genotoxic carcinogens;
  non-genotoxic carcinogens
cardiovascular disease
– caloric restriction 28
– deaths 72, 158
– epigenetic inheritance 72, 78, 81, 82
– low birth weight 255
– obesity 8

C
C677T polymorphism 37, 41–47
CAG repeat length 228, 229
calcitriol 145
caloric restriction 26, 28, 209, 210, 215–217
Index
289
– overweight in childhood 160
– see also coronary heart disease
β-carotene 145
case-control study design 38
cases 52
catechins 142, 149, 150
catechols 142, 149–151
causative genes in neurodegenerative
diseases 226–231
cell-specific responses in asthma 259
cellular aging 27
chemoprevention 97, 112, 141, 142,
145–152
– biomarkers 204
childhood
– epigenetic inheritance and life span 75
– growth velocity 69, 70
– nutritional and environmental effects
20–22
– overweight 160, 161
– proband 68
– see also newborn; slow growth period
(SGP)
cholesterol 128, 129
chromatin
– DNA methylation interaction 188–190,
196, 197
– histone modifications 18, 258
– packaging 14, 15, 255
chronic noncommunicable diseases
158–162
cirrhosis 56, 57
coffee 133, 134, 138
coffee polyphenols 142, 149, 150
cohort studies 38
colon cancer
– aging 209
– C677T polymorphism 45, 47
– DNA methyltransferases 197
– genes methylated 187
– MGMT gene 212
common disease genetic and epigenetic
hypothesis 233
conjugated linoleic acids 25
countermechanisms
– epigenetic 169, 170
– evolutionary need 167, 168
– RNA silencing 168, 169
controls 52
coronary heart disease
– coffee consumption 133, 134
– deaths 78
– etiology 64, 65, 68
– obesity 161
– prenatal determinants 159
– see also cardiovascular disease
cortisol/cortisone 177
CpG islands 143, 255
– during aging 212
– in cancer cells 185
– methylation 3, 15–17
– neurodegenerative disorders 249
cutaneous T-cell lymphoma 195, 203
cycasin 110
cyclooxygenase-2 promoter 258
cytochrome P450 92, 109
– CYP1A1 114, 115
– CYP1A2 133, 134
cytokine transforming growth factor b1 95
cytosine methylation pathway 23, 24
cytotoxic stress 201, 202
d
dairy products, transcriptome 131
Data Schema and Harmonization
Platform for Epidemiological Research
(DataSHaPER) 54
de novo methylation 16, 143
deaths
– cancer 105, 106, 152, 158, 210, 217
– cardiovascular and diabetes-related 72,
158
– from coronary heart disease 78
– leading causes 68, 158
– lung cancer 198
defense mechanisms 167–171
depression 255
developmental origins of adult disease 65,
79
diabetes
– deaths 72, 158
– epigenetic inheritance 63, 72, 77, 81,
82
– epigenetic programming 28
– inflammatory control 214
– low birth weight 255
– NAFLD 56, 57
– obesity 8, 161
– pregnancy 175
– prenatal determinants 159
Dicer 168–170
diet
– age-related diseases 158, 213, 216
– cancer deaths 105, 106, 152
– DNA methylation 8, 22–26, 213
– epigenetic effects 8, 22–28, 282
– epigenetics in neurodegenerative
diseases 237, 238
Index

- genotoxic carcinogens 111, 112
- pregnancy 24, 159, 256, 257, 282
- protective effects towards carcinogens 112–114
- see also caloric restriction; foods; nutrition
- dietary natural compounds 141, 142, 144–152
disease clusters 270, 274
disease-oriented biobanks 5, 52, 55
diseases see human diseases;
- neurodegenerative diseases
DNA-adduct measurements 107
DNA methylation 15–18, 142–144, 151, 152, 255
- age-related epigenetic silencing via 212, 213
- asthma 254, 257–259
- carcinogens 89, 96, 97
- chromatin interaction 188–190, 196, 197
- clinical applications 203, 204
- CpG islands 3, 15–17
- diet 8, 22–26, 213
- epigenetic modification during lifetime 183, 184
- gene silencing 17, 19
- methods for detecting 197, 198
- monitoring in blood samples 200
- neurodegenerative diseases 236
- normal and cancer cells 185, 196, 197
- pathway 17
- regulation by natural compounds 141, 142, 144–151
- therapeutic applications of inhibitors 202, 203
- see also hypermethylation;
- hypomethylation; promoter
- hypermethylation
DNA methyltransferases (DNMTs) 16, 17, 135, 141, 143, 144
- activities of 181, 183
- colon cancer 197
- DNMT1 activity regulation 147–151
DNA-reactive carcinogens 112–114
DNA-repair genes 114, 116
DNA sequencing 129, 130, 133, 174
dUMP/dTMP ratio 42

e
ecology 11, 12
EGCG 150, 151
endocrine disruptors 98, 233
endogenous retroviruses 168
environmental epigenomics 238, 239
environmental health 11
environmental influences
- asthma 253, 254, 256
- complex diseases 272
- early life conditions 20–22
- ecology 11, 12
- epigenetics, and human diseases 233, 234
- fetal development 174–176, 282
- health 158
- neurodegenerative diseases 231–233, 239
- pollution and toxins 22
- see also alcohol; diet; foods;
- gene–environment interactions (GEI);
- nutrition; smoking
enzyme polymorphisms and genotoxic
carcinogen metabolism 114–117
epidemiology see biobanks;
- genetic epidemiology
epigenetic dysregulation
- aging and cancer 209–218
- human diseases 233
- neurodegenerative diseases 236, 247, 248
epigenetic health 281–285
epigenetic inheritance 77–79, 82
- future directions 80, 81
- methodology 65–70
- patterns 70–77
- transgenerational models 28, 29
epigenetic marks 13, 21, 180, 238
- in neurodegenerative disorders 245–250
- see also biomarkers
epigenetic mechanisms 15–20
- asthma 253–260
- cancer 184
- control mechanisms 169, 170
- neurodegenerative diseases 230
- see also DNA sequencing; histone
- modifications; microRNA (miRNA)
epigenetic misprogramming 28
epigenetic modifications 8, 15, 21, 174, 212
- DNA methylation 183, 184
- neurodegenerative diseases 233, 238
- nutrition 76, 77
epigenetic network, metabolism role 181, 182
epigenetic plasticity 200, 201
epigenetic progenitor model, cancer 200, 201
epigenetic reprogramming cycle 23
epigenetic risk factors 274
epigenetic “signatures” 209, 210, 213
epigenetic therapy approach 282
epigenetics
  – definition 4
  – environment and human diseases 233, 234
  – evolutionary aspects 28, 29
  – food metabolism 7, 8
  – genetics in cancer cells 180
  – neurodegenerative diseases 234–237, 245–248
  – new paradigm 3–5
  – nutri-epigenetics 135–137
  – public health policy 272, 273, 277, 278
epigenome 14, 15, 135, 233
epigenomics 246
  – environmental 238, 239
  – public health policy 272, 273
estrogen receptor (ER) gene 148, 210, 212, 213
ethics 272, 277, 283, 284
  – nutrition research 137, 138
ethnicity
  – gene–environment analysis 56, 57
  – MTHFR gene polymorphisms 43
  – study design 38
  – subgroup analysis 40
  – urine metabolite profile 133
European Community
  – biobank collaboration 55
  – Public Health Genomics European Network (PHGEN) 267, 271, 272, 281
  – see also “Health in all Policies”
evidence base 268, 271, 273, 276, 277
evolution theory, and self-organization 5
evolutionary aspects
  – control mechanisms 167, 168
  – epigenetics 28, 29
extrinsic aging 27
familial forms, neurodegenerative diseases 226–228
famine 21
feedforward control loop 63, 72
fetal basis
  – adult disease 255, 256, 282
  – asthma 256, 267
fetal development 159, 160
  – environmental influences 174–176, 282
fetal programming 64
  – epigenetic inheritance 78, 79
Finnish government 273
flavones 137, 146
flavonoids 25, 26
folate 23, 24, 118, 237–239
  – MTHFR role in metabolism 37, 41–43, 46, 47, 158
  – folate-methionine cycle 135
folic acid 175, 237
food additives 109–111
food availability 69
  – adult diseases 63, 81, 82
  – life span 71–74
  – scarcity 26, 28, 63
  – during the slow growth period 76, 77
  – see also caloric restriction
food metabolism, and epigenetics 7, 8
  – foods
    – carcinogens 105–118
    – diversity 157, 161, 162
    – functional 118, 137
    – genotoxic carcinogens 106–111
    – forest plot 44, 45
  – fragile X syndrome 246, 247
  – fragile X tremor and ataxia syndrome 246, 247
  – free radical theory of development 235
  – fumonisin B1 109
  – functional foods 118, 137
  – fundamental rights 277
fungi, RNA silencing 170
fungicides 20, 177, 233
gas chromatography-mass spectrometry 132
gastrointestinal cancers
  – C677T polymorphism 44–47
  – genes methylated 187
gene candidates 57, 229, 231
  – epigenetic biomarkers 248, 249
gene–environment interactions (GEI) 4, 43
  – asthma 254
  – NAFLD development 57, 58
  – role of biobanks 51–60
gene expression 7, 65, 66
  – diet 141, 142
  – hereditary and epigenetic interactions 13–29
  – neurodegenerative disorders 248, 249
gene polymorphisms see MTHFR gene polymorphisms; single nucleotide polymorphisms (SNPs); tandem repeat polymorphisms
gene silencing 184, 188
  – age-related via DNA methylation 212, 213
– DNA methylation 17, 19
  – see also RNA silencing
General Systems Theory 29
  – epigenetic inheritance studies 66–68
  – intergenerational effects 161, 162
  – proband 66–68, 75, 82
  – see also transgenerational effects;
transgenerational responses
  genetic and epigenetic plasticity 200, 201
  genetic association studies
    – MTHFR gene polymorphisms 44–47
    – population-based 37–41
  genetic epidemiology
    – definition and goals 37, 38
    – Human Genome Epidemiology
      Network 40, 41
    – Mendelian randomization approach 41
    – meta-analysis 39, 40
    – study designs 38
    – see also biobanks
  genetic modifiers 51, 57
  genetic selection 76
  genetics
    – asthma 254
    – cancer cells 180
    – cancer incidence 106, 184
    – genistein 144–147, 149, 237
    – genome see cancer genome; epigenome;
      human genome
  genome-wide association studies (GWAS) 3, 4, 14
  genomic biomarkers 246
  genomic imprinting 63, 72, 77
  genomics 128
    – nutrition research 129, 130
    – population genomics data 54
    – public health genomics 267, 278
    – genotoxic carcinogens 89–92, 99
    – dietary 111, 112
    – epigenetic effects 96, 97
    – foods 106–111
    – non-parenchymal liver cells 97, 98
    – polymorphism affecting metabolism 114–117
  genotypes
    – combinations, and cancer risk 114, 116, 117
    – thrifty 28
  glucocorticoids 176, 177, 258
  glutathione 216, 235
  glycidamide 110
growth velocity, childhood 69, 70
  gynaecology 173–177
h
  – haplotype blocks 133
  – HapMap 13, 14, 269
  – harmonized standard operating procedures 54
  – harvests, quality 67, 69, 71
  – HDACs see histone deacetylases (HDACs)
  – health
    – environmental 11
    – epigenetic 281–285
    – inheritance 268
    – nutrition 7–9
    – population health improvements 269
    – prerequisites 157
    – transgenerational effects 67
  – health care 268
  – health determinants, during life 147–162
  – Health Genome Concept 118
  – health impact assessment 271
    “Health in all Policies” 272–274
    – attributable risks 275, 276
    – limits in genomics and epigenetics 277, 278
  – health needs assessment 271
  – health promotion 157, 162
  – health technology assessment (HTA) 271, 276, 277
  – hematopoietic malignancies 186, 187
  – hepatocarcinogenesis 90–99
  – hepatocellular carcinomas 56, 57, 109
  – hereditary dispositions 13, 14
  – herpes viruses 171
  – heterochromatin 196
  – heterocyclic aromatic amines (HAAs) 105, 108–110, 113, 117
  – high birth weight 159
  – high pressure liquid chromatography 132
  – histone acetylation 19, 181, 258
  histone code 19
  – histone deacetylases (HDACs) 17, 19, 188–190
    – asthma 258, 259
    – cancer 189, 190
    – dietary compounds, effect 25, 152
    – inhibitors 248
  – histone methyltransferases (HATs) 17, 19
  – histone modifications 18–20, 24, 25, 255
    – asthma 258
    – cancer 19, 20
  – HIV, defense mechanisms acting 167, 170
  – homocysteine 23, 24, 42, 43, 237, 238, 248
human diseases
– developmental origins 65, 79
– epigenetics, environment 233, 234
– fetal basis 255, 256, 282
– public health issues 272
– susceptibility genes 270
– transgenerational explanations 63, 64, 81, 82
– see also neurodegenerative diseases
human epigenome see epigenome
human genome 38, 39, 129
– biobanks 270
– whole-genome association studies 231
Human Genome Epidemiology Network 40, 41
Human Genome Organization 127, 129
Human Genome Project 13, 127, 129, 267, 269
human hepatocellular carcinoma 96
human hepatoma cell line HCC-1.2 95
Human Metabolome Database 132
human microbiome 130
Human Relevance Framework Concept 94
Huntington’s disease 226, 228, 229, 245, 246
– epigenetic dysregulation 247, 248
– epigenetics 235
– gene expression 249
hypermethylation 128, 129
– aging 183, 184
– aging and cancer 210
– cancer 4, 8, 9, 142–144, 146, 151
– cancer cells 185
– prostate cancer 213
– see also DNA methylation; promoter
hypermethylation
hypertension 68, 161, 175
hypomethylation and cancer 4, 8, 9, 42, 142

in vitro fertilization 176
“indication” 277
individual freedom 272
inflammation
– aging and cancer 209–211, 213
– diet 26
– hepatocarcinogenesis 97
– proinflammatory response 254
inflammatory control, age-related
epigenetic regulators 214, 215
influenza A virus 170
inheritance
– health and disease 268
– hereditary dispositions 13, 14
– neurodegenerative disorders 246, 247
– see also epigenetic inheritance
“initiated” cells 89–93, 95, 97, 98
insecticides 232
insulin-like growth factor 182
insulin resistance
– aging and cancer 209, 211, 214
– pregnancy 175
interferon system 170
intergenerational effects 161, 162
interleukin 8 26
international collaboration in biobanks 54, 55
International HapMap Project 13, 14, 269
intestinal microflora 130, 159
intrauterine growth retardation 159, 161
intrauterine stress 177
intrinsic aging 27
Inuit populations 5
isochor maps 15
isogenic line 66

k
knowledge generation 269, 270
Kupffer cells 98, 99

l
latent early-life association regulation
model 235
lead exposure 231, 236, 239
legislation 272–274, 277, 278
– attributable risks 275, 276
leptin 211
leukemias
– acute myeloid 186, 202
– lymphoid 186
life span
– epigenetic inheritance and childhood
circumstances 75
– epigenetic modification by DNA methylation 183, 184
– food scarcity 26, 28, 63
– health determinants 157–162
– interactions throughout 161
– paternal ancestors’ nutrition 71–74, 81, 82
– see also adolescence; aging; childhood
d-limonene 110
lineage priming 171
lipokines 209, 211
lipoproteins 128, 129
liquid chromatography-mass spectrometry 132
Lisbon Treaty 276
longevity see aging; life span
low birth weight 75, 159, 161, 175, 255
lung cancer 22
– diagnostic tools 195
– genes methylated 187
– individualization of therapy 203, 204
– paradigm 198–200
– therapeutic inhibitors 202
lymphoid leukemia 186
lymphoma 186, 195

m
malignancy
– aging 180
– genetic and epigenetic factors 27
– hematopoietic 186, 187
– see also cancer; carcinogenesis
mammals, RNA silencing 170
manganese 231
margin of exposure concept 92
mass spectrometry 132
MDS see myelodysplastic syndrome
meat, cooking methods 108
Mendelian randomization approach 41
Mendelian traits 226, 228
mercury 231
meta-analyses
– definition 39
– genetic association studies 37–41
– MTHFR gene polymorphisms 44–47
metabolic programming 79
metabolic syndrome 209
– epigenetic programming 28
– non-alcoholic fatty liver disease 56, 58
metabolism
– aging 210–212
– folate metabolism 37, 41–43, 46, 47, 158
– food metabolism 7, 8
– genotoxic carcinogens 114–117
metabolome analysis 59
metabolomics 128
– nutrition research 132, 133
metallothionein proteins 237
metals, neurodegenerative diseases 231, 232, 236, 239
methionine 175, 181, 237
– folate-methionine cycle 135
– s-adenosylmethionine 97, 125, 143, 237
methionine restriction 210, 215–217
methyl-CpG-binding domains 17
methylation see DNA methylation;
hypermethylation; hypomethylation;
promoter hypermethylation
methylation-specific PCR 197, 198
methylole 236
MGMT gene 212
microarray analysis 59, 130
microenvironment, hepatic 97, 98
microRNA (miRNA) 20, 168–170, 255
mitochondrial efficiency 216
mitochondrial superoxide dismutase (MnSOD) 24
mobile elements 168
mode of action concept 94, 95
modifiable risks 275, 276
molecular nutrition research 127–129
mortality see deaths
motor neuron disease see amyotrophic lateral sclerosis
MTHFR gene polymorphisms 37, 41–47, 158, 213
multifactorial disorders 226
multiple inheritance systems 80
multiple myeloma 186
mycotoxins 109
myelodysplastic syndrome (MDS) 181–183, 186, 195, 202
myeloid leukemias 186, 202
myeloma, multiple 186
myricetin 150, 151

n
NAFLD see non-alcoholic fatty liver disease (NAFLD)
national task forces 271
natural compounds and DNA methylation 141, 42, 144–152
neoplasia, development 90, 91
nephrons 175, 176
neurodegenerative diseases 225, 226
– caloric restriction and 28
– causitive and susceptibility genes 226–231
– environmental factors 231–233, 239
– epigenetic markers 245–250
Index

– epigenetic role of diet 237, 238
– epigenetics 234–237, 247, 248
– neuromelanin 226
– neurotoxins 232, 238
– newborn
  – birth weight 75, 159, 161, 175, 255
  – overfeeding 175
  – postnatal development 159, 160
– see also fetal development
NF-KB see nuclear factor kappa B (NF-KB)
nitrosamines 105, 107, 108, 113, 117
no-threshold concept 89, 90, 92, 98
– non-alcoholic fatty liver disease (NAFLD) 51, 55–59
  – gene–environment risk factors 57
  – non-communicable diseases, chronic 158–162
– non-genotoxic carcinogens 89–93, 99
  – epigenetic effects 96, 97
  – non-parenchymal liver cells 97, 98
– non-modifiable risks 275, 276
  – non-parenchymal liver cells 97, 98
– non-small cell lung cancers (NSCLC) 198–200, 202
Nrf2 transcriptional factor 112
nuclear factor kappa B (NF-KB) 209–211, 214–217
nuclear magnetic resonance 132
nuclear structure in a cancer cell 179
– nutri-epigenetics 135–137
– nutrigenetics 133, 134, 158, 237
– nutrigenomics 127, 129–133
nutrition
  – aging 26–28
  – ancestors’ 71–74, 81, 82, 136
  – early life conditions 20–22
  – epigenetic modification of 76, 77
  – health 7–9
  – immune system 26
  – infancy and childhood 160
  – life-stage 159
  – during the slow growth period 63, 67, 72, 76, 77, 81, 82, 136
  – undernutrition 26, 28, 63
  – see also caloric restriction; diet; food availability; foods
nutrition research
  – ethics and socio-economics 137, 138
  – genomics 129, 130
  – metabolomics 132, 133
  – molecular 127–129
  – proteomics 131, 132
  – transcriptomics 130, 131
nutritional systems biology 137

o
– obesity 8
  – childhood/adolescence 160, 161
  – deaths from cancer 217
  – epigenetic programming 28
  – inflammatory control 214
  – intergenerational effects 161
  – maternal diet 282
  – NAFLD 56, 57
  – visceral/abdominal 211
  – see also overweight
ochratoxin A 109, 113
older people see aging
oncogenes 184
one-carbon metabolic pathway 135
ornithine transcarbamylase gene 236
osteoporosis 28, 175, 255
ovarian cancer 187
overfeeding, premature babies 175
Överkalix cohorts of 1890, 1905 and 1920 67, 68, 73, 75
overweight 8
  – cancer risk 111, 112
  – childhood/adolescence 160, 161
  – deaths from cancer 217
  – see also obesity
oxidative stress 214–216, 234, 235

p
p16 gene 199
p21\textsuperscript{WAF1/CIP1} 147, 148
p53 protein 94, 109
2D-PAGE 132
PAHs see polycyclic aromatic hydrocarbons (PAHs)
Parkinson’s disease 225–228, 245, 246
  – environmental factors 231, 232
  – epigenetic dysregulation 247, 248
  – gene expression 249
  – susceptibility genes 229, 230
paternal ancestors’ nutrition 71–74, 81, 82
paternal smoking 75
patulin 113
peroxisome proliferation 94, 97
peroxisome proliferator-activated receptors 21, 211
persistent organic pollutants 5
pesticides 231, 232
pharmacogenomics 127, 128
phase I enzymes 114
phase II enzymes 112, 114
phenotype, cancer prone, aging 210–212
phenotypic data 54
phthalates 94
phystoestrogens 144–149
plant-derived foods
– additives and carcinogens 109–111
– protective effects 112, 113
plants, RNA silencing 169, 170
pollution
– air pollution 22, 253, 256, 258
– persistent organic pollutants 5
polycyclic aromatic hydrocarbons (PAHs)
105, 107, 113, 117
– enzyme polymorphisms 114
polymorphisms see MTHFR gene
polymorphisms; single nucleotide polymorphisms (SNPs); tandem repeat polymorphisms
polyphenols 141, 142, 145, 146, 151
– catechol-containing 149–151
pooled analysis 39, 46
population-based biobanks 5, 52, 54, 55
population-based genetic association studies 37–41
population genomics data 54
population stratification 38, 40
preconceptional principle 277
pregnancy
– ALSPAC data set 68
– epigenetic changes 175, 176
– maternal diet 24, 159, 256, 257, 282
– paternal smoking 75
premature babies see newborn
prenatal development see fetal development
preneoplastic (initiated) cells 89–93, 95, 97, 98
presenilins 227, 228, 234
presymptomatic phase 245
prevention programs
– individualized strategies 29, 268, 269
– risk factors 64, 158
proactive approach 282
proband generations 66–68, 75, 82
proinflammatory response 254
proliferating cell nuclear antigen 147
promoter hypermethylation 22, 143, 144, 146, 151
– cancers 187, 188, 212
– hematopoietic malignancies 186, 187
prostate cancer
– aging 209
– genes methylated 187, 213
protective factors
– complex diseases 272
– dietary 112–114
proteomics 128, 246
– nutrition research 131, 132
public health challenges
– neurodegenerative diseases 245
– responding 282, 283
public health expenditure 284
Public Health Genomics 267–278
– Bellagio Model 268–271
– definition 271
– epigenetics/epigenomics 272
– risk 274–276
Public Health Genomics European Network (PHGEN) 267, 271, 272, 281
Public Health Genomics Foundation 281
public health policy 272–278
– epigenetic health and responsibility 281–285
Public Health Trias 270
Public Population Project in Genomics 54
publication bias 39, 40
pyrethroid insecticides 232
r
RASSF1A gene 199
rat liver models 91–97
Rb/E2F pathway 147, 148
reactive oxygen species 91, 92, 112, 113, 214–216, 234, 235
real-time quantitative PCR 198
regulations see legislation
relative risks 267, 274
renal cancer 187
reproductive medicine 173–177
reprogramming cycle, epigenetic 23
response 281
responsibility 281–285
resveratrol 144–149, 216
retinoic acid 144, 145
retroviruses, endogenous 168
risk assessment
– lung cancer 204
– toxicological 90, 91
risk factors
– attributable and relative 267, 274–276
– complex diseases 272, 274
– coronary heart disease 64, 65
– epigenetic 274
– hepatocarcinogenesis 92
– life cycle 157–159, 161
– NAFLD development 56, 57
– neurodegenerative diseases 230–232
– public health policy 275
– responding 282
– see also cancer risk
risk regulation 274, 275
RNA silencing 167
– control 168, 169
– fungi 170
– mammals 170
– plants 169, 170
– see also gene silencing

s
s-adenosylmethionine (SAM) 97, 125, 143, 237
saccharin 110
safety evaluation
– genotoxic chemicals 97, 98
– tumor promotion 89, 90, 93, 94
salicylates 214
secretases 226–228, 234, 235
self-organization, and evolution theory 5
senile plaques 226, 228, 247
sex chromosomes, and epigenetic inheritance 73–75, 77
short-chain fatty acids 25
short interfering RNAs 169, 170
single nucleotide polymorphisms (SNPs) 13, 14, 39
– cancer risk 114
– nutrigenetics 133
– in whole-genome association studies 231
sirtuins 26, 28, 209, 216, 217
slow growth period (SGP) 70, 81, 82
– male 73
– nutrition 63, 67, 72, 76, 77, 136
small cell lung cancers 199
smoking 22
– asthma 254, 256
– folate metabolism 43
– intergenerational effects 161
– lung cancer 198, 199
– nitrosamines 108
– paternal and pregnancy outcome 75
SNPs see single nucleotide polymorphisms
soccer players 232
social context, transgenerational responses 70, 71
socio-economics, nutrition research 137, 138
spices 110, 111
sporadic amyotrophic lateral sclerosis 236, 237
sporadic forms, neurodegenerative diseases 226, 229
stakeholders 138, 268, 278
steatohepatitis 56–58
steatitis 56–58
stress response 283

stroke 28
susceptibility, diseases, epigenetics, and the environment 233, 234
susceptibility genes 51, 57
– neurodegenerative diseases 226–231
– public health 270
systems biology 128, 137, 269

T cell immune responses 257, 258
tamoxifen 96
tandem repeat polymorphisms 134
tea catechins 142, 149, 150
6-thioguanine 201
thrifty genotype 28
“Together for Health” 273
transcription, DNA methylation and chromatin 196, 197
transcriptome 130, 131
transcriptomics 128, 246
– neurodegeneration 249
– nutrition research 130, 131
transgenerational effects
– adult diseases 63, 64
– epigenetic inheritance 28, 29
– on human health 67
transgenerational responses
– ancestors’ nutrition 71, 81, 136
– asthma 256, 257
– nutrition during slow growth period 72, 76, 81, 82, 136
– paternal ancestors’ nutrition 71–74, 81, 82
– social context 70, 71
transitions, concept 11, 12
translational research 267, 276
trichostatin A 203
trichotecenes 109
tumor initiation 91, 92
– cellular and molecular mechanisms 93–95
tumor progression 92, 93
tumor promotion 89, 90, 92, 93
– cellular and molecular mechanisms 93–95
– see also non-genotoxic carcinogens
tumor suppressor genes 181, 184, 188
– lung cancer 199

undernutrition and life span 26, 28, 63
urine metabolite profile 133
US National Office of Public Health Genomics 281
uterine cancer 187
v
valproic acid 203
vegans 24
vegetarians 24
vinclozolin 20, 233
viral infections 167–171
visceral/abdominal obesity 211
vitamin B₁₂ 23, 24, 175, 237–239

v
vitamin D₃ 144–149
vitamins 141, 144–149, 151
vorinostat 195, 203

W
Waddington 3, 4
whole-genome association studies 231