Index

Academy for Nutrition and Dietetics, 83
active oxygen method (AOM), 161
adequate intakes (AI) for α-linolenic acid, 174
advanced glycation end products, 81
acrylamide, 81
dietary oxidants, 81
α-linolenic acid (ALA) metabolic reactions, 170
American Association of Cereal Chemist, 151
American Heart Association (AHA), 82, 175
animal fats, 13, 146, 200
anisidine value, 133
antiarrhythmic effect, 169
antiatherogenic effect, 169
antiinflammatory effect, 169
antioxidants, 42
ascorbyl palmitate, 44
extract of sesame seed, 181
with fish oils, 182
rosemary extract, 44
tert-butylhydroquinone (TBHQ), 44
tocopherols, 44
antithrombotic effect, 169
application of SDA in food, 86
sensory, 86
applications of trait enhanced soybean oils, 71
heat stability, 71
oxidative stability, 71
trans fat labeling, 71
arachidonic acid (AA)-derived eicosanoids, 173
Archer Daniels Midland (ADM), 116
ascorbyl palmitate chelating agent, 181
autoxidation of linoleate, 180
of linolenate, 180
of oleate, 180
of stearate, 180
bakery shortenings, 146
removal of trans fats from food products, 147
trans fats by industrial hydrogenation of vegetable oils, 146
basestocks and blends, 4
B739 “Bay”, 62
$21 + billion industry, 146
biotechnology goals, 6
all purpose shortening, 8
shortenings, 7
specialty application, 8
β-polymorphic crystals, 142
Brassica derived oil, 94

© 2015 John Wiley & Sons, Ltd. Published 2015 by John Wiley & Sons, Ltd.
breeding biotechnology, 1
Brigham and Women’s Hospital, 122
butylated hydroxy toluene (BHT), 181
cancer, 9
canola oil, 35
- advances in plant breeding, 109
- analytical sciences, 109
- composition of, 98
- allergen potential, 101
- chlorophyll content from early frost, 98
- genetic variability, 98
- market classes of canola, 99
- proximate composition range, 99
- range, contribution of genetics, geographic and climate of regular grade #1 canola for 2009 growing season, 99
- specialty canola developed using mutant genes, 99
- typical composition, 98
- variation in oil composition, 98
- weather effect on quality of canola oil, 98
definition, 94
- extraction and refining of, 96
- combination, anti expeller press, 97
- single/double pressing, 97
- supercritical carbon dioxide, 97
- temperature less 50C, 97
in food service, 49
low erucic acid, 94
origin of, 94
- analytical technologies and seed development, 95
- erucic acid less than 2%, 94
- grain glucosinolate less than 30 µmoles/grain whole seed, 94
- half seed analysis, 96
- single half seeds, 96
- tools of molecular biology, 95
- polymerization, 36
- cardiovascular diseases (CVD), 9, 10, 128
- trans link for, 10
- cardiovascular protection, 169
- Center For Science in the Public Interest 1994, 5
C16 fatty acid, 130
C18 fatty acid, 130
- chemical interesterification vs. enzymatic modification, 188
Clear Valley® omega-9 canola, 22
cold pressed oil, 97
Commercial production of high stability oils in North America, 29
confectionery products, 119
consumer demand, 126
Crisco® shortening developed free of trans fats, 120
β-crystal form, 130
crystal matrix, 150
cyclo-oxygenase (COX), 173
cytokines, 173
degree of saturation, 4
demand for low saturated and no trans fats, 198
deodorization, 97
development of trait-modified soybean oil, 59
autoxidation of polyunsaturated fatty acids, 59
- genetic reduction of 18:3, 60
- oleic acid concentration, 60
Dietary Guidelines for Americans
2010, 83
docosahexaenoic acid (DHA), 83, 169, 171
Dow AgroSciences, 117
Dupont Plenish, 226

edible vegetable oils
canola, 15
palm, 15
soybean, 15
sunflower, 15
eicosapentaenoic acid (EPA), 83, 169, 171

emulsifier systems
lecithin, 151
mono/diglycerides, 151
polyglycerol monoesters (PGMS), 151

enhanced stability issues
Hi-Oleic, 21
NuSun, 21

enzymatic degumming, 97
enzymatic interesterification of liquid oils, 152
extended fry life, 122

fast food chain fry studies, 205
fatty acid comparisons, 117
average oleic acid level, 118
variance related to geography, 117
fatty acid composition, 35, 45
of commodity and trait oils, 132
fatty acid content
low, medium and high, 160
fatty acids
component, 4
prominent
linoleic, 99
linolenic, 99
oleic, 99

Final Rule: Trans Fatty Acids in Nutrition Labeling, 19
fish vs. plant origin PUFA consumption, 176
flavor stability, 166
focus now on health/nutrition, 198
Food and Drug Administration (FDA), 5, 120
mandate 2003, 2
mandated labels trans fats, 129
partially hydrogenated oils, 2
regulations for commercial fish, 176
food service applications, 157, 159
batch frying, 157
rate of oil turnover, 158
replacing all the oil, 158
slow oil turnover limits, 159
steam and fresh oil addition, 158
useful fry life, 159
food service test mid oleic sunflower oil, 122
foods reformulated with low/zero trans increases, 199
food uses of high saturate soybean oil, 52
baked goods, 52
cheeses, 52
dairy products, 52
frozen desserts, 52
hardstock addition, 52
shortenings, 52
spreads, 52
free fatty acid formation (FFA), 133
free radical chain mechanism, 180
Frito Lay, 116, 120
frying agents, 14
frying oils, 128
assessment of, 204
blends of oils, 137
conventional plant breeding, 132
flavor, 129
frying performance, 132
mouthfeel, 129
non-GMO, 132
nontransgenic, 132
oxidative stability, 159
reactions during frying, 228
stability, 129
texture, 129
TFA, 131
used to exhaustion, 159
frying protocol, 121
frying studies, 205
fry life
  baking applications, 51
  bread shortening, 51
cake and browning mixes, 51
  French fries, 50
  pan and griddle frying, 51
  pizza dough, 51
tortilla chips, 51
functional properties-baking, 147
  all purpose baking shortenings, 149
  blending hardstocks with trait-modified high oleic canola oil, 149
  cake and cake mix shortenings, 151
cake quality, 148
  cellulose fibers, 149
creaming, 148
  emulsifiers, 149
  fibers aid in structuring the shortening, 150
icing shortenings, 148
  melting profile, 149
  monoglycerides as emulsifiers, 148
  pie shortenings-plastic, 148
  shelf life, 149
technology development of liquid shortenings, 149
gas chromatography, 1
Generally Regarded as Safe (GRAS), 19, 20, 28
genetically modified canola oils, 101
  high laurate, 102
  high linolenic, stearidonic, 102
  high stearate, 102
  modifying oil properties, 101
  pathway to long chain fatty acid (DHA and EPA), 102
genetically modified oils, 6
  high oleic acid, 6
  high saturated, 6
  mid oleic acid, 6
  ultra low linolenic, 6
genetically modified soybean oils, 141
  genetic engineering, 14, 109
  Glycine soja, 62
  hard basestocks, 138
  health benefits of omega 3 fatty acids, 169
  heart health and cholesterol reduction, 125
  high density lipoprotein (HDL) cholesterol, 129
  high end niche markets, 120
  high monounsaturated soybeans, 62
  environmental instability, 64
  high oleic acid oil (85%), 63
  isoforms
    FAD 2-1A, 63
    FAD 2-1B, 63
  omega 6 desaturase, 63
  oxidative stability, 62
  temperature and gene expression, 64
  high oleic acid sunflower oil, 1
high oleic canola oil, 22
high oleic low linolenic canola oil (HOLLCO), 132
high oleic low linolenic (HOLL) oil profile, 100
high oleic (HO) oils, 73, 162, 222
antioxidants TBHQ, 77
availability of, 236
benefits, 230
EBRO food sensor, 75
flavor benefits, 78
2, 4 decadienal, 78
fried flavor, 78
fried food quality, 79
as frying oil and food applications, 214
fry studies, 75
hexanal, 77
nutrition benefits, 79
dietary intake assessment, 81
reduced cardiovascular risk, 81
oils comparison charts, 225
oils uptake, 79
reduced 18:3 content, 73
and tocopherol, 38
TOTOX, 77
high oleic patent, 115
high oleic safflower oil, 37
high oleic soybean oil, 25, 35
FAD2-1A, 25
FAD2-1B, 25
FAD2-1 gene mutations, 25
FAD2-1 gene sequence, 25
genomic roadmaps, 25, 26
Glyma1 genome, 25
high-throughput, 25–6
Plenish, 27
Vistive Gold, 27
W-6 desaturase, 25
high oleic sunflower in US, 115
baby food formulas, 115
farmers, processors and end user, 115
niche food products, 115
high oleic sunflower oil (HOSO), 34, 136
North and South America, India and Spain, 118–19
switch from hydrogenated oil, 119
high OSI values, 164
high polyunsaturate soybeans industrial application, 62
variation of FAC, 62
high pressure homogenization, 185
high saturates
FAS, 65
high smoke point 230°C, 121
high-stability oils, 29
algae, 22
cottonseed, 22
cottonseed (high oleic acid), 24
high oleic algae oil, 24
high oleic safflower oil, 24
palm, 22
peanut, 22
safflower, 22
transgenic modification, 22
high stearic acid soybean oil, 35
high stearic (C18-0) sunflower oil, 116
to replace hydrogenated oils, 123
seed developed in conventional manner (non GMO), 117
Hi-Oil palm, 23
hybrid cross oil, 116
hydrogenated frying oils, 134
hydrogenated soybean oil, 80
hydrogenated vegetable oil, 72
hydrogenation, 4
physical properties, 4
stabilization, 1
to today’s expectations of low
saturates to low/no trans, 217
trans acids, 2
hydrolysis, 228
hydroperoxyeicosatetraenoic acids
(HPETEs), 173
hydroxyeicosapentaenoic acids
(HEPEs), 173
hydroxyeicosatetraenoic acids
(HETEs), 173
identity preservation, 4
immobilized lipases, 187
increased oleic acid
specialty canola, 100
Institute of Medicine (IOM), 19
intercellular mediators, 173
interesterification and carbonyl
groups of fatty acids, 187
interesterified blends, 140
interesterified oil, 8, 52
chemical, 8
enzymatic, 8
high oleic oils, 8
low linolenic oils, 8
104 IV PHSBO, 121
kettle cooked, 121
regional potato chip
manufacturers, 121
leukotrienes (LTs), 173
linoleic values, 117
liposome thermodynamically
stable, 185
lipoxins (LXs), 173
long chain omega-3 benefits and
consumption, 82
low density lipoprotein (LDL), 5
cholesterol, 129
low erucic acid rapeseed (LEAR) 2, 96
low linolenic acid
A5, 61
A16, 61
A23, 61
A29, 61
A89-144003, 61
environmental stability, 61, 65
soybean oil, 1, 35
sunflower oil, 34
low linolenic (LL) canola, 165
low linolenic (18:3 n3) oil, 72
expanded 1 billion pounds
annually, 166
low linolenic (LL) soybeans, 60, 165
extended frying, 60
FAD3 mutants, 61
gene silencing of FAD 3, 61
mutagenesis, 60
N78-2245, 60
PI361, 088B, 61
selection for oleic acid, 62
shelf life, 60
low saturated sunflower oil, 117
total saturates with under 4%, 123
low saturates
C1726, 64
environment, 65
FATB, 64
reduced palmitic acid
concentration, 64
margarines, 137
market segregation—significant shift
of acres, 116
medium stability trait-modified oils, 165
metabolism of omega 3s, 171
methylene interrupted double bonds, 180
methylmercury, 176
microalgae oil, 170
microencapsulation, 184
mid oleic/high oleic sunflower oil market opportunities, 122
mid oleic soybean oil, 35
mid oleic sunflower oil, 34, 40, 116, 123
conventional breeding 1995, 116
vs. olive oil, 125
in place of cotton oil, 120
minor components, 103
free and esterified forms, 103
10M, National Academy of Science, 5
modified composition oil basis for oil selection, 215
definition, 214
evolution of oils, 220
oxidation, 228
modified plant sources of long chain omega-3, 83
desaturation of ALA, 83
modulator of gene expression, 170
molecular biology, 93
molecular distillation of fish oil, 178
dioxins, 178
furans, 178
herbicides, 178
PCBs, 178
pesticides, 178
monounsaturated fatty acids, 9
erucic, 15
oleic, 15
nanoemulsions from salmon oil and marine lecithin, 185
nanoencapsulation systems, 186
nanoparticles, 185
emulsions with edible oils, 183
National Council of Scientific Research, 117
National Health and Nutrition Examination Study (NHANES), 81
National Heart, Lung and Blood Institute, 9
National Sunflower Association, 118, 122
New York fries, 119
nondairy creamers, 119
NuSun, 118, 136
food service frying medium, 121
sunflower oil, 34
Nutrient Content Claims and Health Claims, 19
Nutrient Content Claims and Health Claims: Final Rule Jan, 2006, 5
Nutrition Education Labeling Act of 1990 (NELA), 146, 198
Nutrition Labeling and Education Act of 1990, 5, 19
health claim, 5
oils melting points, 15
monounsaturated, 15
saturated, 15
unsaturated/polyunsaturated, 15
oleic acid, 37
70% oleic acid oil, 116
oleodilinolein, 207
omega 6
- linoleic (LA), 171
- rich oilseeds, 171
omega 3, ALA, 171
omega 3 fatty acids, 62
- sources of oils with, 171
omega-3 index, 84
omega 3 metabolism
- LA, 172
omega 3 oils
- antioxidants to stabilize omega 3 oils, 179
- blends, 186
- protection of PUFA against rancidity and off flavors, 179
- refined, bleached, winterized and deodorized fish oil, 177
Omega-9™ sunflower cultivars, 21
- options for trans fractionation, 47
- interesterified oil, 47
- stable oils, 47
- trait-modified oils, 48
- tropical oils, 47
oregano, 181
organoleptic and texture properties, 169
OSI high-stability soybean oil, 27
- supply, 27
oxidation stability
- active methylene groups, 39
- AOM, 37
- AOM stability, 39
- fatty acid composition, 39
- OSI, 37
- phytosterols oxidation, 42
- tocopherols, 39
oxidative stability, 104
oxidative stability index (OSI), 21, 106, 160
- ranges, 164
- seed breeding, high performance frying oils, 165
- values, 161, 163, 165
oxidative stability of canola oil, 104
- alcohols, 104
- carboxylic acid, 104
- chain cleavage, 104
- function of fatty acid, 104
- headspace analysis, 106
- hydrocarbons, 104
- metal ions, 104
- mixture of minor components, 104
- oils blend, 107
- photooxidation, 104
- short chain aldehydes, 104
- TAG, 104
- tocopherol depletion, 106
- volatile oxidation products, 105, 106
packaging, 151
- palm based shortenings, 153
- palmitic acid, 66
- palm kernel oils, 132
- palm oils, 151
- health, 73
- solutions, 153
- supply, 23, 72
- sustainability of, 20
palm plantations, 14
- partially hydrogenated soybean oil (PHSBO), 20, 21
performance of canola oil in food applications, 108–9
- modified canola oil without hydrogenation, 108
- sensory of used frying oil, 108
Index

performance trials with trait-modified oils, 128
chemical traits important for nutrition and utilization, 129
extended fry life, 128
implementation of label regulation, 130
phosphatidylcholine (PC) in cell membranes, 173
phosphatidylinositol-4,5-bisphosphate, 173
phospholipase A, 173
phospholipase treatment, 97
phospholipids
as free radical scavengers, 182
improved brain function and prevention of cerebral apoplexy, 189
latest generation of specialized blends with omega 3-phospholipids, 189
phytosterols
brassicasterol, 103
campesterol, 103
sitosterol, 103
polar components, 133
polyglycerol monostearate (PGMS) emulsifier, 152
polymer formation, 133
polysorbate 60, 151
polyunsaturated fatty acids (PUFA), 128
18:2, 15
18:3, 15
potato chips, 116
preparation of trans free all purpose shortening-blends, 140
prostaglandins (PGs), 173
reduced linolenic acid
specialty canola, 100
refining, bleaching and deodorization (RBD) processing, 165
refrigerant based solvent, 97
BioExx process, 97
regional chains, 206
Researchers Penn State University, 125
rosemary, 181
Russian genetic work, 114
saturated fatty acid
long chain, 2
monounsaturated, 2
polyunsaturated, 2
short chain, 2
Schaal oven test, 104
serum cholesterol, 9
shelf life, 2
shortenings, 137
silica powders, 185
snack foods, 51
Solazyme, 24
solid fats, 138
sources of fats and oils, 199
spray oil, 119
stearidonic acid (18:4n3) (SDA), 83, 171
nutrition benefits, 84
stearoyl-acyl carrier protein, 65
sunflower oil, 37, 40
for biodiesel use, 124
sources vitamin E/α-tocopherol, 124
sustainable oil crops, 5
canola, 5
palm, 5
soybean, 5
table margarines and spreads, 235
TAG structure, 5, 52
tert-butylhydroquinone (TBHQ), 107, 178, 181
thermal degradation, 229
thromboxanes (TXs), 173
tocopherols, 39, 103, 162
  alpha, 42, 103
  beta, 103
  delta, 103
  gamma, 103
  and phytosterols, 103
selecting frying oils for food serviced, 164
taste, texture and performance, 164
tocopherol, 42
total saturates, 119
trait modification, 10, 34
  health claims, 19
trait-modified oils (TMO), 1
  in baking applications, 207, 231
  blended with hardstock, 149
breeding, 2
costs, 53
food service, 48
  antidusting/anticaking, 50
  carrier for minor components, 50
  hydrogenation and fractionation, 49
liquid oil blends, 52
lubricating/release, 50
moisture barrier, 50
nondairy creamers, 50
nut roasting, 50
sensory test vs. hydrogenated oil, 50
spray oil, 49
in Frying, 49
functional properties, 15, 48
future research, 11, 87
genetic manipulation, 2
hydrogenation, 18
identity preservation, 53
increasing oleic content, 159
industry evolving, 147
low linolenic, 147
with low melting points and high oxidative stability, 159
low saturate high oleic soy, 147
markets for
  bakery shortenings, 11
  consumer, 10
  food services, 10
  fry stability, 11
mid/high oleic soy, 147
modification of linoleic content, 161
mutation, 2
overview of, 13
pan grease with, 234
processing of, 48
salad dressing with, 232
spray oil on crackers with, 233
studying specifications, 160
sustainability of supply, 18
utility
  frying fats, 18
  margarine, 18
  shortening, 18
trans fat replacement oils, 45, 72
shift from hydrogenated to liquid oils, 45
trans fats
  chemistry, occurrence and functional properties, 201
  and coronary heart disease, 5
  labeling, 34
  processing to reduce trans fats on food fats, 203
trans fatty acids (TFA)
  availability, 129
cost, 129
  formation of, 98
  hydrogenated oils, 130
  in nutrition labeling, 5
trans free donut frying oils, 154
transgenic plant breeding methods, 128
triacylglycerols (TG)
  lubricity, 138
  puff pastry/roll in applications, 138–9
tricalcium phosphate, 185
trilinolein, 207
triunsaturated and diunsaturated (UUU/SUL) TG ratio, 138
tropical fats
  palm, palm kernel, 201
ultra low linolenic soybean oil, 35
unilamellar vesicles, 185
University of Illinois, 121
unsaturated fatty acids, 163
USDA ARS National Center for
  Agricultural Utilization Research, 123
U.S. Department of Agriculture
  2014, 14
US sunflower Industry, 113
  first major oilseed to be trait-modified, 114
  linoleic acid content, 114
  seed declined, 113
  utilization of high oleic sunflower, 119
vegetable oils, 13, 146, 200
  nonfood applications of for, 236
  oleic enhancement, 21
4-vinyl-2, 6-dimethoxyphenol
  antioxidant in canola, 103
World Health Organization (WHO), 175
  zero trans, 123
  zero trans claim, 147