

FIBER TYPES

The Definitive Guide

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FIBER TYPES

The Definitive Guide

TYPE:

CELLULOSE

Definition:

INSOLUBLE

Food Category :

Fruits, vegetables, legumes, grains, nuts, seeds

Examples:

Apples, bananas, raspberries, carrots, beets, broccoli, collar greens, spinach, artichokes

Black beans, navy beans, pinto beans, garbanzo beans

Almonds, pumpkin seeds, flax seeds, walnuts



Metabolic by product:

Short-chain fatty acids(SCFA)

Effects on bowel flora:

Increase in Clostridiaceae, Peptostreptococcaceae,
decrease in Coriobacteriaceae

Clinical Benefits:

Increases the length of colon, associated
“with protection against DSS

Dietary fibers have been observed to decrease colitis
severity in acute and chronic rodent models

References:

1, 2

TYPE:

HEMICELLULOSES

(Hexose, pentose)

Definition:

INSOLUBLE

– containing arabinoxylan, glucans, galactans, xylans, mannans, and pectosans

Food Category :

Whole grains

Examples:

Steel cut oats, oat bran, rice bran, wheat bran



Metabolic by product:

Hexose and pentose polymers

Effects on bowel flora:

Decreased beta glucuronidase,
beta glucosidase³

Clinical Benefits:

Increase bowel regularity and hydration,
reduce cholesterol absorption

References:

4

TYPE:

LIGNIN

Definition:

INSOLUBLE

Food Category :

Root vegetables, berry seeds

Examples:

Flaxseeds, sesame seeds



Metabolic by product:

4-methylcatechol, dilignol, and ferulic acid

Effects on bowel flora:

Reduces *E. coli* in broiler chickens

Clinical Benefits:

May improve gut integrity, May reduce the risk of cancer, antioxidant properties

References:

5, 6, 7, 8

TYPE:

PECTIN

Definition:

SOLUBLE

Food Category :

Apples, citrus fruits, legumes, nuts

Examples:

Citrus peels, navel oranges, braeburn apples, gaia apples, dried apricots



Metabolic by product:

Polyamines by gut microbes. Butyrate and other SCFAs

Effects on bowel flora:

Increase in Bacteroidetes in whole fecal communities in anaerobic cultures. Increase in *Clostridium coccoides*, Firmicutes and decrease in Bacteroidetes in rats

Clinical Benefits:

Apple pectin has cholesterol lowering properties in rats and decrease total cholesterol levels in humans. Contradictory studies report no effect on pectin on cholesterol levels

References:

9, 10, 11, 12, 13, 14, 15

TYPE:

HYDROCOLLOIDS (gums)

Definition:

HYDROPHILIC

Food Category :

Thickening agents

Examples:

Xanthan gum, guar gum, gum Arabic, acacia gum, carboxymethyl cellulose, Agar-agar, glucomannan – konjac root



Metabolic by product:

Short chain fatty acids with higher levels propionic acid, putrescine, spermidine and cadaverine

Effects on bowel flora:

Increased Bacteroidetes, reduced *Firmicutes* and *Proteobacteria*.
Increased *Bifidobacteria*

Clinical Benefits:

Cholesterol lowering properties, reduced adiposity and hepatic steatosis, relief of abdominal pain in patients with irritable bowel syndrome

References:

16, 17, 18, 19, 20, 21

TYPE:

OAT BETA GLUCAN

Definition:

SOLUBLE

Food Category :

Oats, barley, rye

Examples:

Gluten free rolled oats, steel cut oats, whole oats, oat bran, pearled barley, while grain rye



Metabolic by product:

Short chain fatty acids

Effects on bowel flora:

Stimulate *Lactobacillus*, *Enterococcus*, *Bifidobacterium*

Clinical Benefits:

LDL reduction up to 16.5% lower postprandial blood glucose
improved wound healing

References:

22, 23, 24, 25, 26

TYPE:

MUSHROOM BETA GLUCAN

Definition:

SOLUBLE

Food Category :

Certain medicinal mushrooms

Examples:

Reishi, shiitake, chaga, maitake, cremini, mushroom sclerotia



Metabolic by product:

Short chain fatty acids

Effects on bowel flora:

Increase in Bacteroidetes and decrease in Firmicutes

Clinical Benefits:

Anti-carcinogenic, antiviral, immunomodulatory lower IL-4 and IL-5 cytokines, increased IL-12 decrease in post- surgical infections

References:

27, 28, 29

OLIGOSACCHARIDES

(short chain carbohydrates)

TYPE:

INULIN

Definition:

NON-DIGESTIBLE' OLIGOSACCHARIDE

Food Category :

Certain root vegetables

Examples:



Metabolic by product:

Lactate and acetate

Flora effects:

Increase in *Bifidobacteria Faecalibacterium prausnitzii*, decrease in *Fusobacterium and Enterococci*

Clinical Benefits:

Reduced tumor incidence initiated by carcinogenic compounds such as azoxymethane (AOM) and dimethylhydrazine,
Lowers plasma triacylglycerol

References:

30, 31, 32, 33, 34

TYPE:

FRUCTO- OLIGOSACCHARIDES

(FOS, fructans)

Definition:

SOLUBLE

Food Category :

Certain vegetables and fruits

Examples:

Onion, chicory, garlic, asparagus, banana, artichoke,
and other vegetables



Metabolic by product:

Short-chain fatty acids, acetate, propionate

FloraEffects:

Increase in *Bifidobacteria* and *Lactobacilli*, *Enterococcus* and *Olsenella* in mice, increased abundance of *Clostridium leptum* in rats and increased growth of *Faecalibacterium prausnitzii* in humans

Clinical Benefits:

May prevent colorectal cancer. Associated with reduced mucosal inflammation and lesion scores in a rat model of colitis, reduction in body weight in human subjects, promotes satiety, increases IL-10 production in intestinal dendritic cells in Crohn's disease patients

References:

35, 36, 37, 38, 39, 40

TYPE:

GALACTO- OLIGOSACCHARIDES

(GOS, galactans)

Definition:

SOLUBLE

Food Category :

Legumes

Examples

Lentils, garbanzo beans, green peas, lima beans, kidney beans



Metabolic by product:

SCFAs, lactate, acetate

FloraEffects:

Increase in Bifidobacteria and lactobacilli, decrease in family Bacteroidaceae

Clinical Benefits:

May play a role in prevent or progression of colorectal cancer.
Increased calcium absorption, may improve IBS symptoms

References:

41, 42, 43

TYPE:

RAFFINOSE OLIGOSACCHARIDES

(ROS, raffinose, stachyose, verbascose)

Definition:

<http://www.nutrientsreview.com/carbs/soluble-fiber-raffinose-stachyose-verbascose.html>

Food Category :

Legumes, cruciferous vegetables

Examples:

Black eyed peas, lima beans, kidney beans

Cabbage, Brussels sprouts, broccoli, asparagus



Metabolic by product:

Lactic acid, propionic acid, d-galactose

FloraEffects:

Bifidogenic, increase in *Lactobacilli* and *Bifidobacteria*[44]

Clinical Benefits:

Alleviation of constipation

References:

44, 45

RESISTANT STARCH

TYPE:

RS1

Definition:

Physically inaccessible or indigestible resistant starch

Food Category :

Seeds or legumes and unprocessed whole grains, coarsely milled grains, seeds or legumes

Examples:

Cracked wheat, red beans, raw steel cut oats, pinto beans, white beans



Metabolic by product:

SCFA, mainly acetate, propionate and butyrate

FloraEffects:

Increases in *Ruminococcus bromii* and *Eubacterium rectale*

Clinical Benefits:

Decreases risk of colorectal cancer by increasing SCFA, decrease in fecal pH and transit time. Increased insulin sensitivity

References:

46, 47, 48

TYPE:

RS2

Definition:

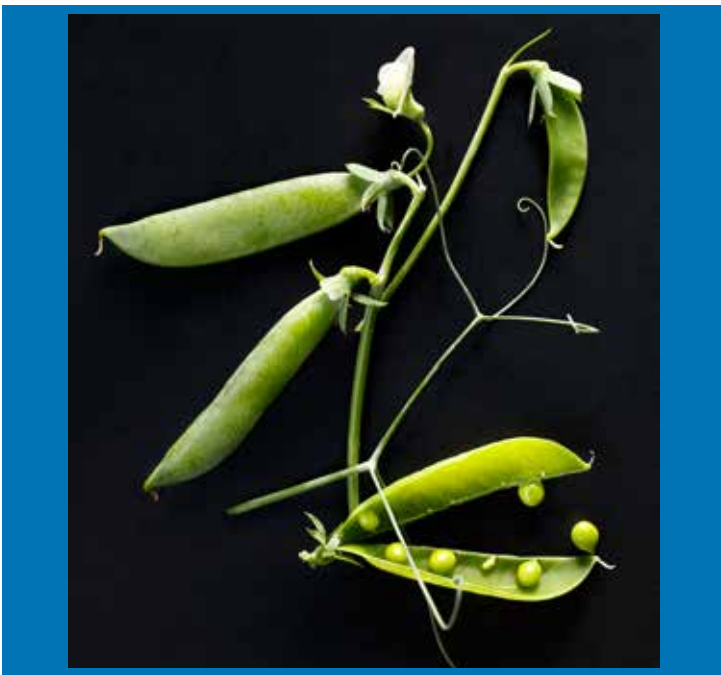
Resistant starch is inaccessible to enzymes due to starch conformation

Food Category :

High amylopectin pea starch, high amylose corn starch, raw potato, unripe banana

Examples:

RS2 Pea starch in Adrenal Reset Shake, Webo banana flour, unmodified potato starch



Metabolic by product:

SCFA, mainly acetate, propionate and butyrate

FloraEffects:

Increase in Bifidobacterium, Lactobacillus brevis,
bifidobacterium subtilis

Decreases Candida, improves SIBO

Clinical Benefits:

Reduces hunger, improves weight loss, lowers glucose levels,
increases metabolism of fat, increase GLP1

References:

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TYPE:

RS3

Definition:

Resistant starch that is formed when starch-containing foods are cooked and cooled

Food Category :

Cooled potato, rice, pasta

Examples:

Boiled and refrigerated potatoes, chilled sushi rice



Metabolic by product:

Acetate and propionate

FloraEffects:

Increase in *Ruminococcus bromii* and *E. rectale*

Clinical Benefits:

Improve basal metabolic rate, improve bowel flora

References:

50, 51

TYPE:

RS4

Definition:

Resistant starch formed by chemical modification to create resistance to enzyme digestion

Food Category :

Cross linked starch with sodium trimetaphosphate or tripolyphosphate

Examples:

Fibersym RW, Midsol, Midsol 46, Pregel 40



Metabolic by product:

Unkown

FloraEffects:

Unkown

Clinical Benefits:

Decrease postprandial glucose and insulin

TYPE:

RS5

Definition:

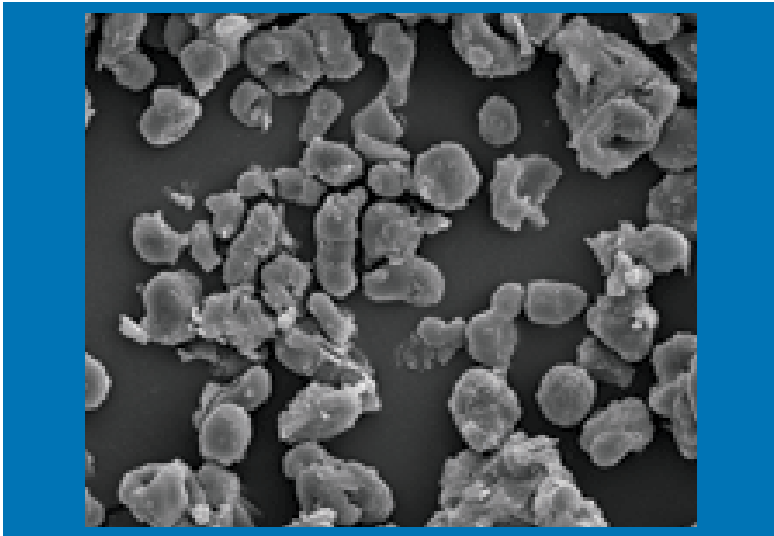
Resistant starch formed by heating starch with fats or lipids into starch-lipid or amylose lipid complexes

Food Category :

Non commercially available

Examples:

None



Metabolic by product:

Unknown

FloraEffects:

Unknown

Clinical Benefits:

Bread from 60% RS5 decreased postprandial plasma glucose and insulin to 55 and 43% of that of white bread.

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