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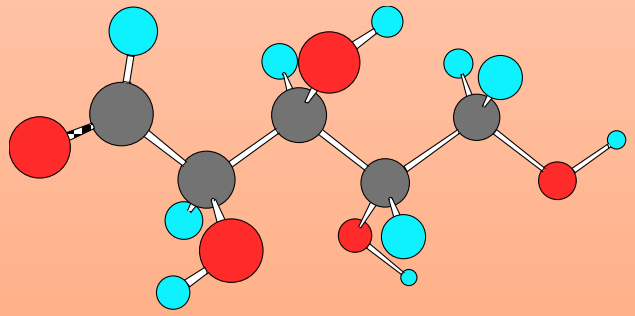
統合医療予防医院

L-Arabinose

L-Arabinose

- L-Arabinose a Pectin Sugar is a monosaccharide widely existing in plants
- L-Arabinose is approved to be used as a safe food additive by the United States Food and Drug Administration and Japan.
- L-Arabinose is a non-calorie natural compound sweetener
  - US Medical Association approves the use of L-Arabinose as the nutritional supplements or non-prescription drugs for anti-obesity.
  - Japan approves L-Arabinose to be the special health-care food additive for adjusting blood sugar.



L-arabinose, A natural sucrase inhibitor

A naturally occurring Arabinose is an L-form, and because it is not metabolized in humans it has no caloric value.

L-arabinose has been used as an intermediate ingredient in the Flavor Industry to produce Flavors,

Pharmaceutical Industry for product of L-Ribose, L-Carnitine and Biological Culture medium.

L-arabinose, A natural sucrase inhibitor

L-arabinose strongly inhibits the absorption of Sucrose from the small intestine. Adding 2-3% of L-arabinose with Sucrose causes an approximate 60% reduction of the digestion of Sucrose in the small intestine.

The undigested Sucrose and L-arabinose produces a short-chain Fatty Acid and thus functions similarly to dietary fiber.

L-arabinose has great merits as a sweetener and food additive to help regulate blood sugar levels, combat obesity, and to maintain good health.

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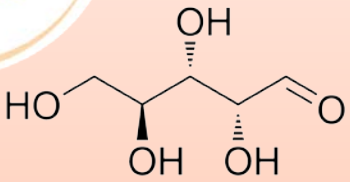
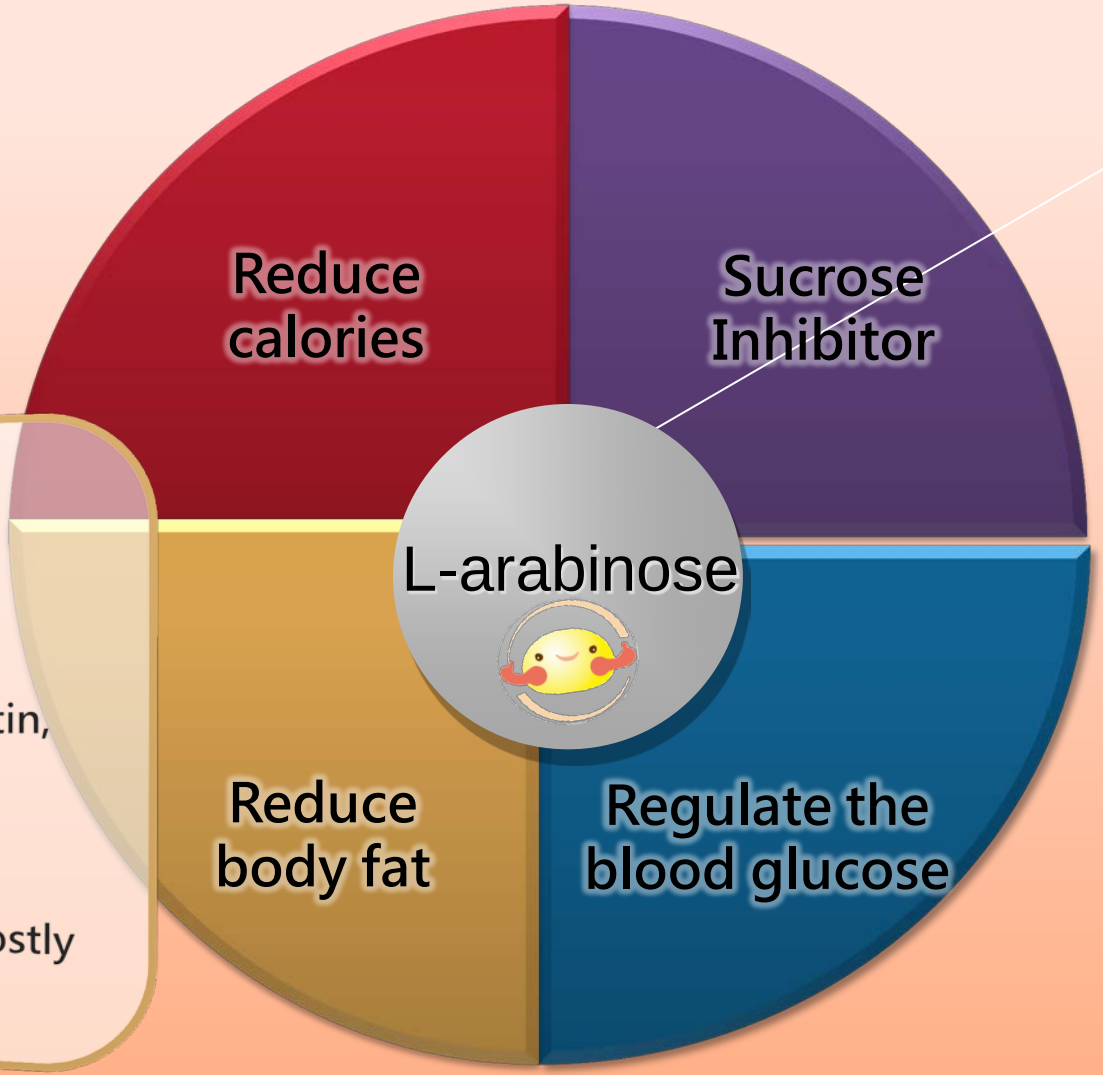
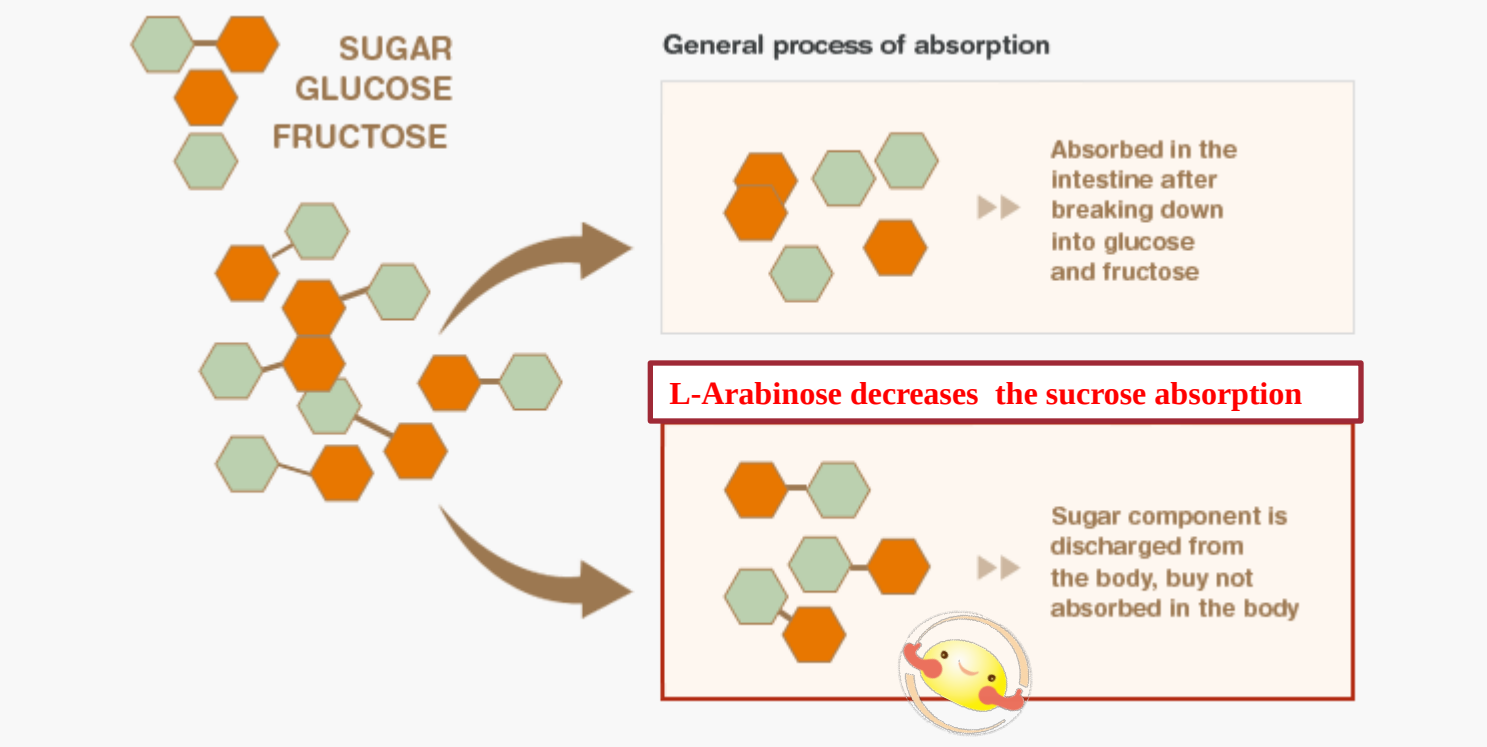
L-Arabinose Benefits



- Widely found in fruits and vegetables, but not much
- Always form in Hetero-polysaccharide present in pectin, hemicellulose, pectin acid, bacterial polysaccharides
- Early process is difficult and costly



L-Arabinose Reduce the absorption of sucrose



L-Arabinose target on α- glucosidase→ Inhibit the sucrose break down → Reduce the absorption of sucrose

Normally, the sucrose absorbed by the human body is catabolized and produces Carbon Dioxide, which is excreted through exhalation. When L-Arabinose is taken together with sucrose, the level of Carbon Dioxide excretion becomes moderate compared to when sucrose is taken alone. In other words, when sucrose is taken with small amount of L-Arabinose, it will effectively suppress the digestion and absorption of sucrose.

L-Arabinose is calories-free sugar

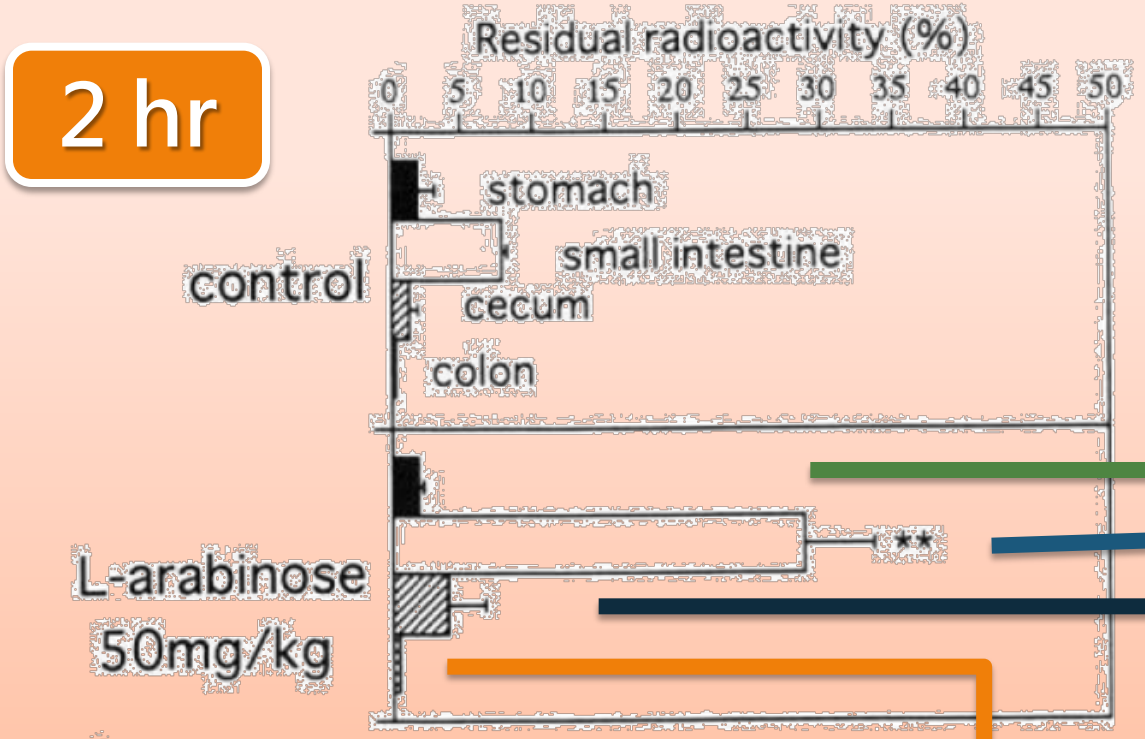
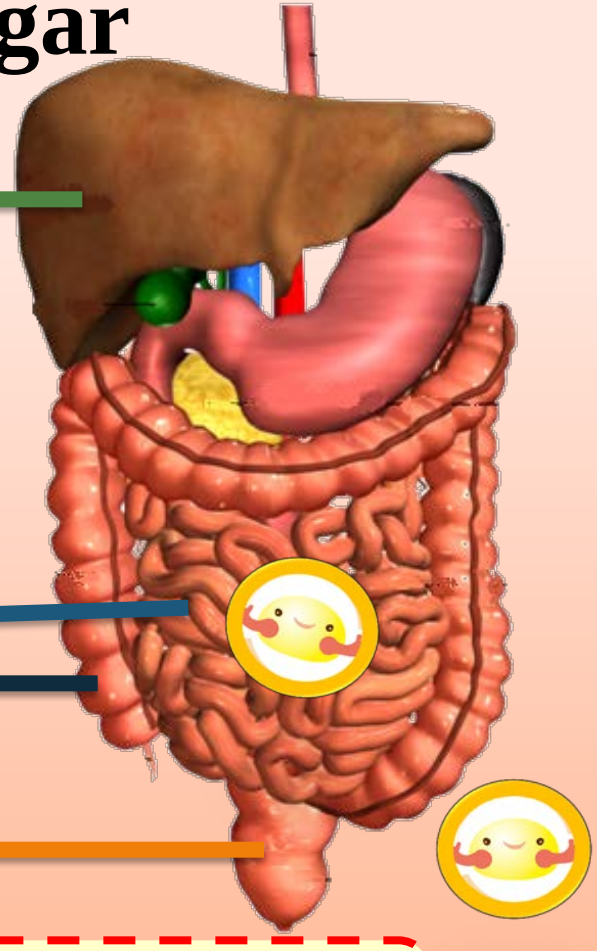


Fig. 3. Residual radioactivity of gastrointestinal



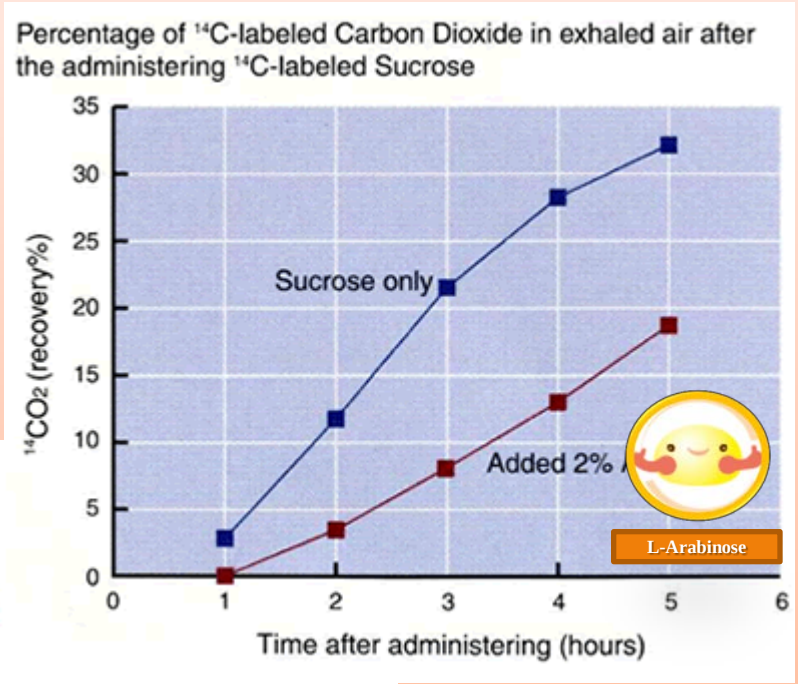
- Use the isotopes to detect carbohydrate content in the gastrointestinal of rats
- **Result: Arabinose is not absorbed by the small intestine**

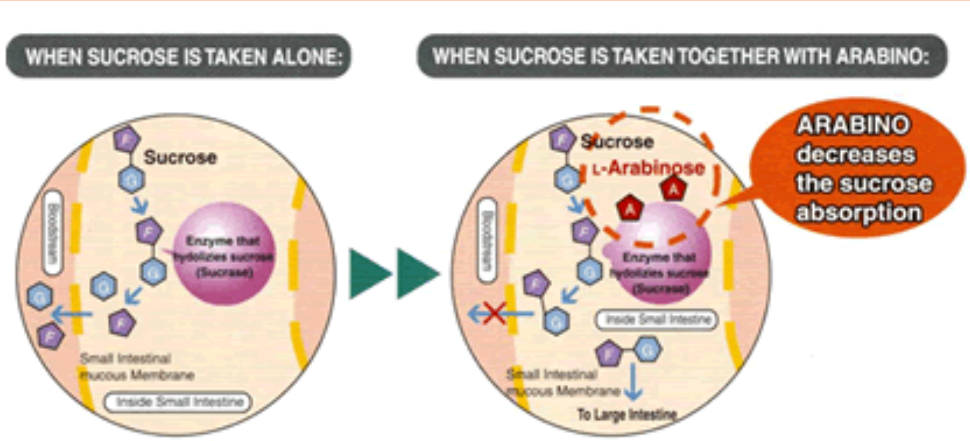
(Osaki *et al.*, 2000)

L-Arabinose Reduce the absorption of sucrose

Sucrose Absorption is suppressed to approximately 60% of Normal

Sucrose digestion and absorption by the body after metabolism to carbon dioxide emissions. By adding L-arabinose can significantly reduce carbon dioxide emission, which means significantly reducing the digestion and absorption of sucrose.



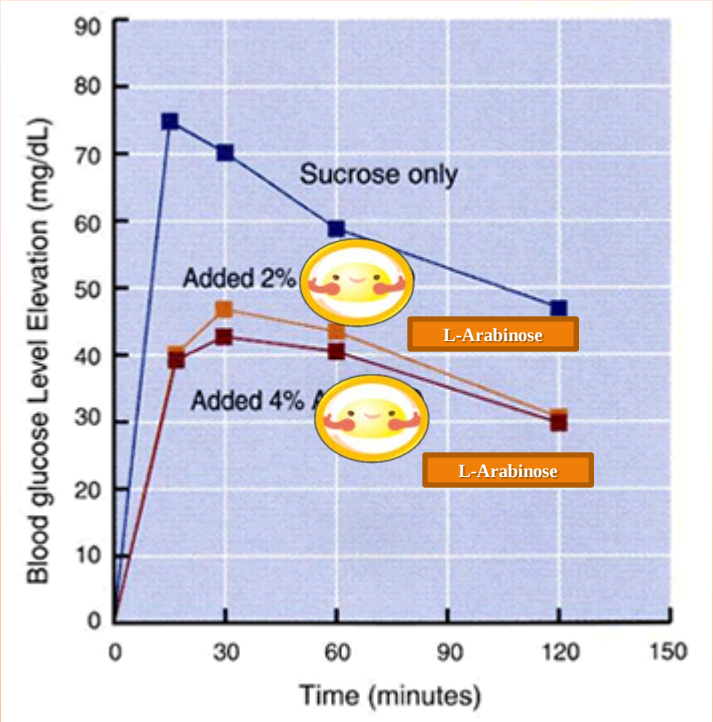


Sucrose is hydrolyzed into Glucose (G) and Fructose (F) by sucrase and absorbed by the small intestinal mucous membrane and into the bloodstream.

ARABINO inhibits the sucrase activity and the unabsorbed sucrose moves into large intestine.

L-Arabinose can inhibit the blood glucose increased

Under normal conditions, uptaken sucrose is digested and absorbed in the small intestine, resulting in the elevation of blood glucose levels. When L-Arabinose is taken together with sucrose, its digestion and absorption is suppressed. As a result, the elevation of blood glucose level is suppressed.



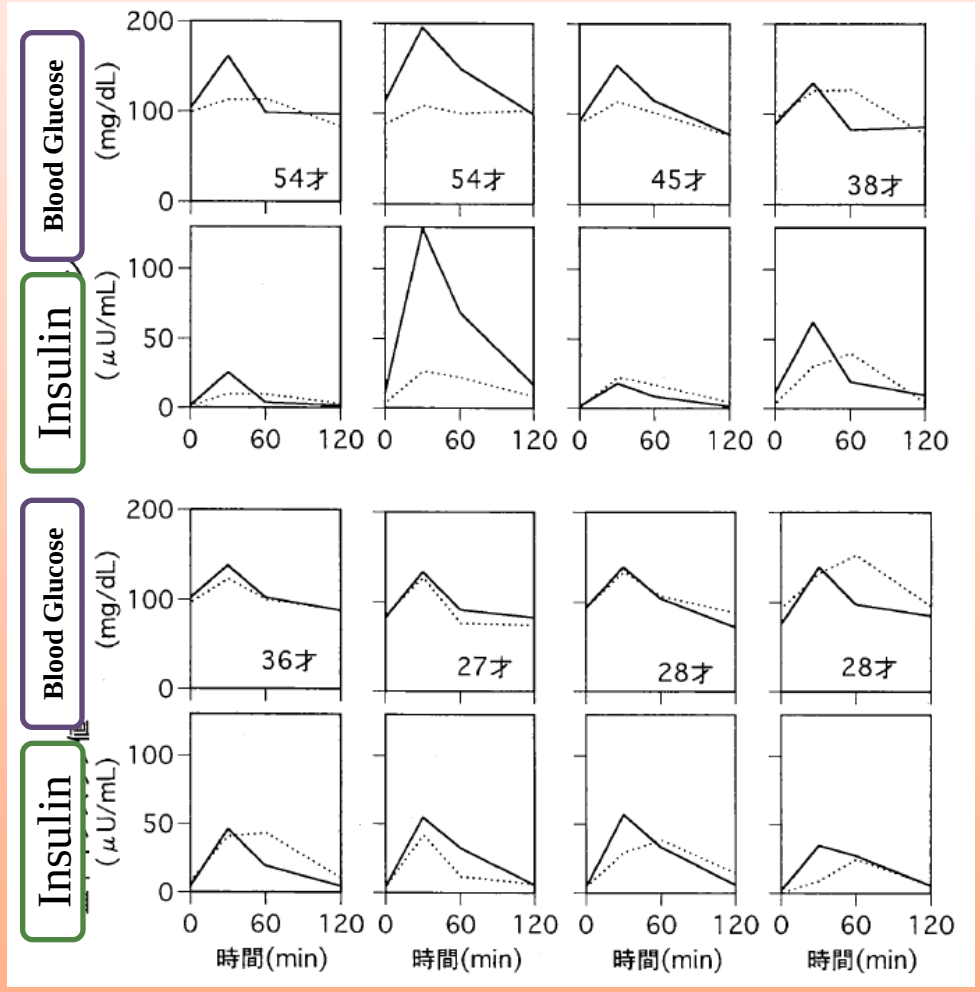
L-Arabinose can inhibit the blood glucose increased

8 healthy subjects (27-54 years old), cross-test in blood glucose and Insulin

____Solid line: sucrose
... ... Dotted line: sucrose +4% arabinose

Taking 4% L-arabinose:
- Slow down the rate of increased of blood sugar
- Reduce the blood glucose concentration
- Reduce the insulin concentration

50g glucose	Add 4% L-Arabinose
First Group 4 peopole	Second Group 4 people
Second Group 4 people	First Group 4 peopole

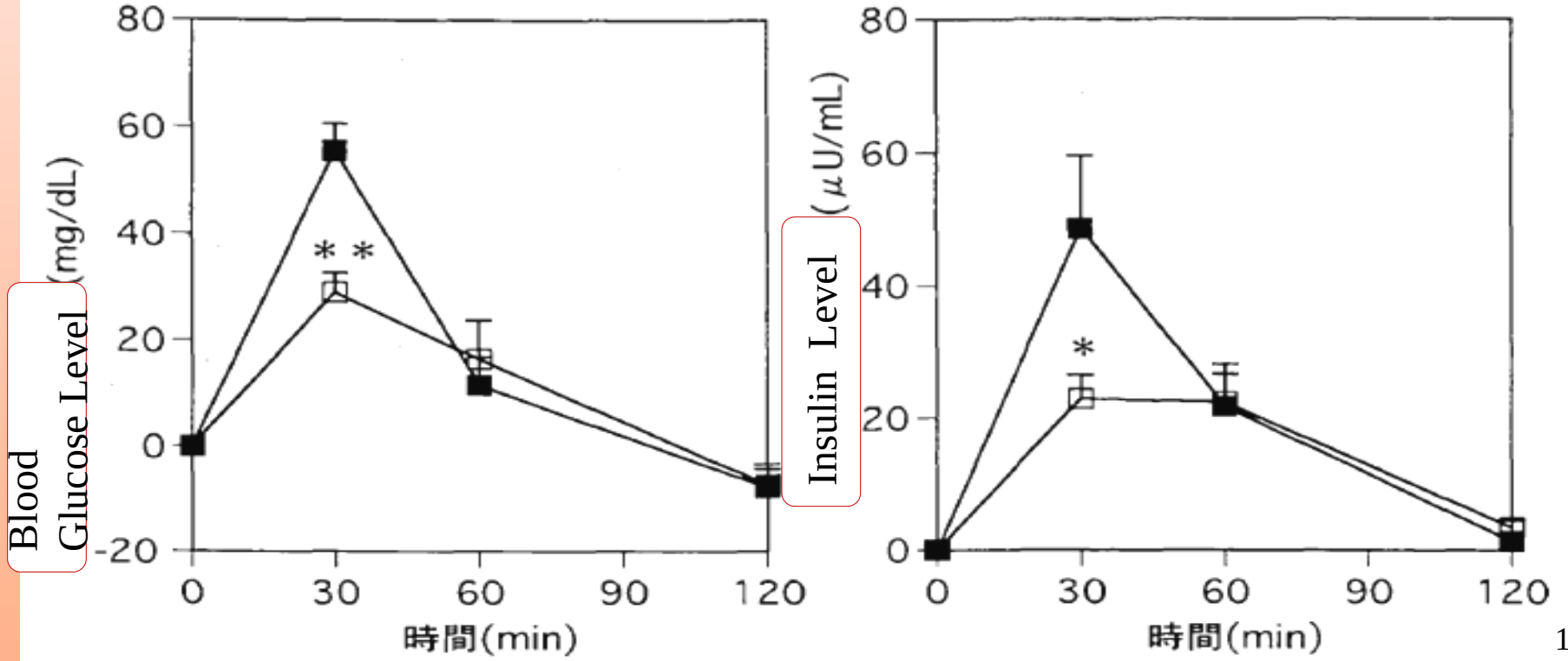


(Inoue *et al.*, 2000)

L-Arabinose can inhibit the blood glucose increased

■： sucrose (50g)
□: sucrose +4% arabinose
n=8 (27-54 years old)
*p<0.05，**p<0.01

Taking 4% arabinose after 30 minutes, blood glucose and insulin are significantly reduced.



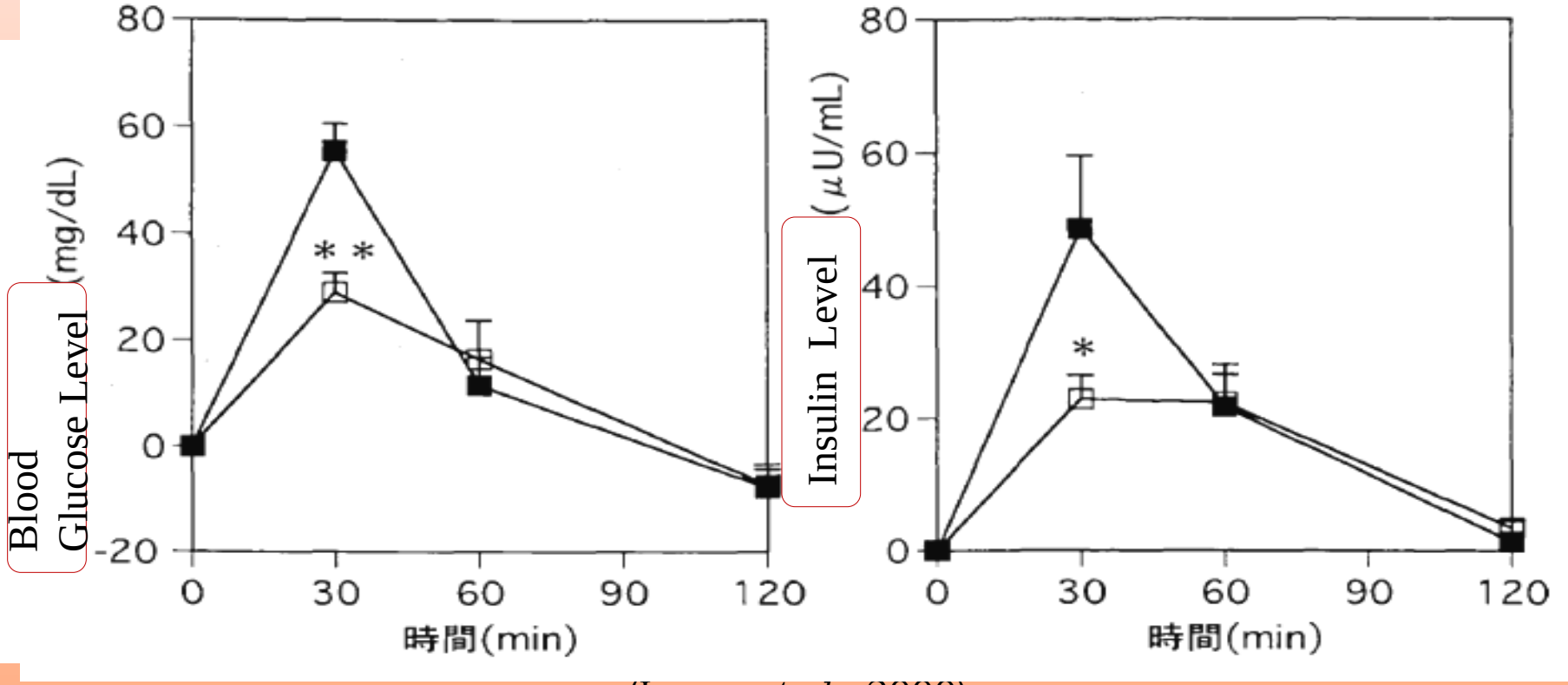
(Inoue *et al.*, 2000)

L-Arabinose can inhibit the blood glucose increased

■ : sucrose (30g)
□: sucrose +3% arabinose
n=10 (48-75 years old and have Type 2 Diabetes)

*p<0.05

Take 3% of the L-Arabinose After 60 minutes , blood glucose and insulin are significantly reduced.

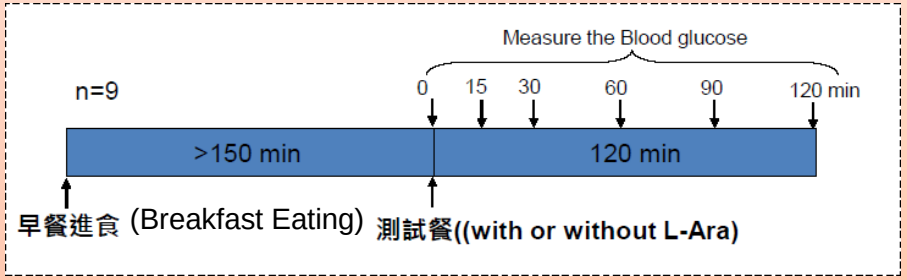


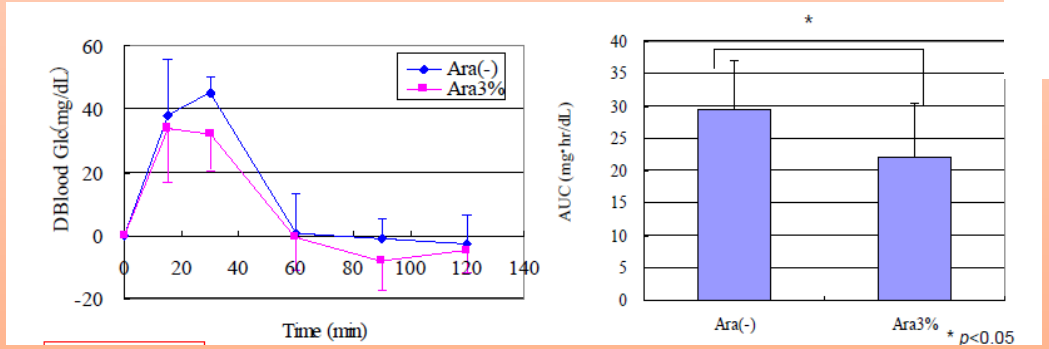
(Inoue *et al.*, 2000)

3% L-Arabinose can effectively reduce the blood glucose even after two hours

Healthy subjects:n= 9

- **test meal is divided into:**
  - **•experimental group -coffee with15g Sucrose +0.45g arabinose (3% of the Sucrose)**
  - **•control group - containing Sucrose 15g in the coffee**

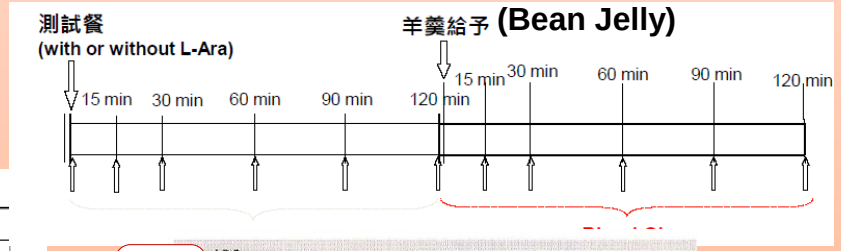


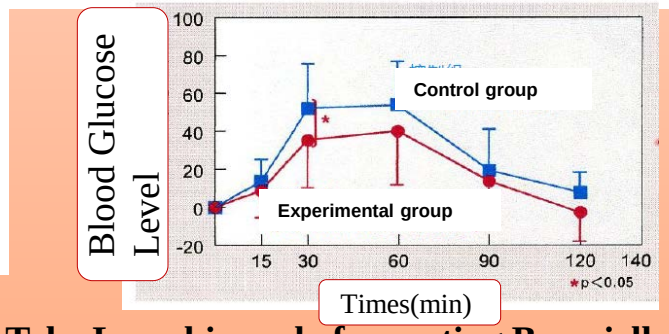


The area under the curve AUC (Area under the curve) of a significant reduce the increased of blood glucose level.

Healthy subjects: 21 males and three females, aged 40.9 ± 10.7, BMI 22.8 ± 3.6

- **Test meal is divided into:**
  - **•Experimental group - Sucrose 40g + arabinose 2g (5% of sugar)**
  - **•Control Group - sucrose 40g**
- **Sucrose-Load meal:**
- **Bean Jelly 90g (including sugar 40g)**





Take L-arabinose before eating Bean jelly, the blood glucose levels increased is easy to control

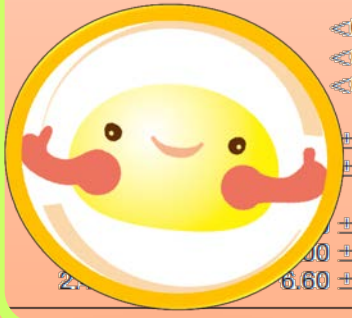
L-Arabinose helps intestinal microbial activity

TABLE 1

Effects of arabinose feeding on the weights of body, liver, adipose tissue, cecum with wet content, pH of cecum contents and plasma glucose concentration in rats fed CS30, CS20, CS10, C or CGF20 diet[1,2]

Diet and L-arabinose content, %	Body	Liver	Epididymal adipose tissue	Cecum with wet contents	Cecum contents pH	Plasma glucose
	g				*pH*	*mmol/L*
CS30						
				2.12 ± 0.17	7.55 ± 0.36	13.2 ± 0.33
				8.68 ± 2.14	5.00 ± 0.37	11.3 ± 1.05
				13.4 ± 2.65	4.90 ± 0.10	12.0 ± 0.55
				2.28 ± 0.28	7.80 ± 0.22	11.4 ± 0.74
				6.50 ± 1.22	5.32 ± 0.11	11.6 ± 0.95
				10.8 ± 1.42	4.60 ± 0.22	10.9 ± 1.29
				3.03 ± 0.56	7.87 ± 0.25	10.8 ± 0.19
				4.54 ± 1.47	6.40 ± 0.14	10.9 ± 0.44
				6.67 ± 1.09	5.28 ± 0.47	11.5 ± 1.25
				3.06 ± 0.57	7.87 ± 0.19	11.0 ± 1.00
				2.91 ± 0.03	7.30 ± 0.10*	10.9 ± 0.27
				3.05 ± 0.81	6.70 ± 0.10*	11.0 ± 1.25
					<0.001	<0.05
					<0.001	0.256
					<0.001	0.554
2	215 ± 1.5	10.1 ± 1.04	1.70 ± 0.23		± 0.17*	10.0 ± 0.31
5	212 ± 6.2	10.2 ± 0.68	1.41 ± 0.10*		± 0.15*	10.9 ± 0.96
CGF20						
0	214 ± 13	10.4 ± 0.61	1.79 ± 0.22		± 0.10	11.7 ± 0.55
0.5	212 ± 12	10.9 ± 1.10	1.98 ± 0.12**		0 ± 0.14**,***	11.8 ± 1.07
1	211 ± 26	10.6 ± 0.72	1.74 ± 0.09**	2.	6.60 ± 0.14**,***	11.6 ± 0.87

- 2% and 5% L-arabinose fed in 10 days, were increased stool weight and decreased pH value in rats.
- pH value decreased can helps intestinal microbial metabolic activity

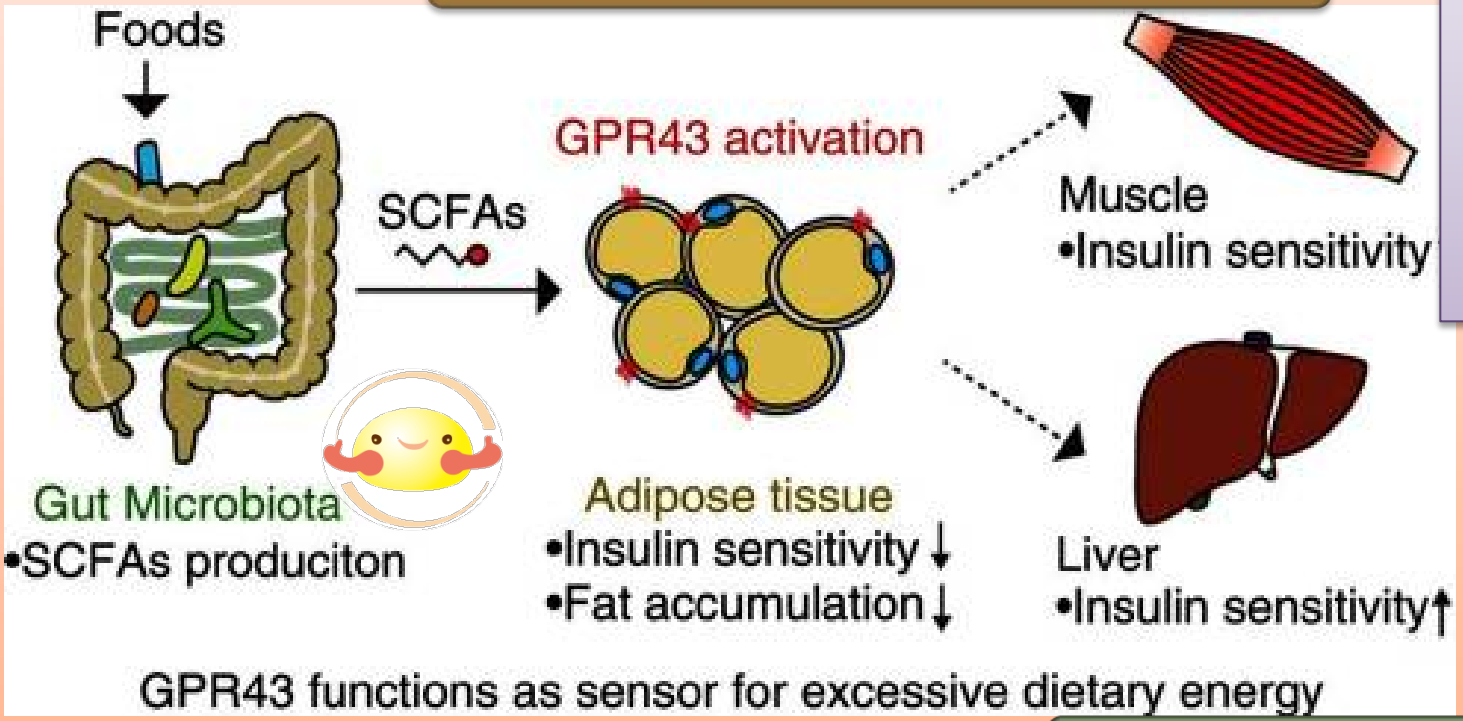


(Sanai *et al.*, 1997)

L-Arabinose helps intestinal microbial activity

Intestinal bacteria produce short chain fatty acids
→reduce body fat accumulation SCFA

→ reduce body fat accumulation



SCFAs

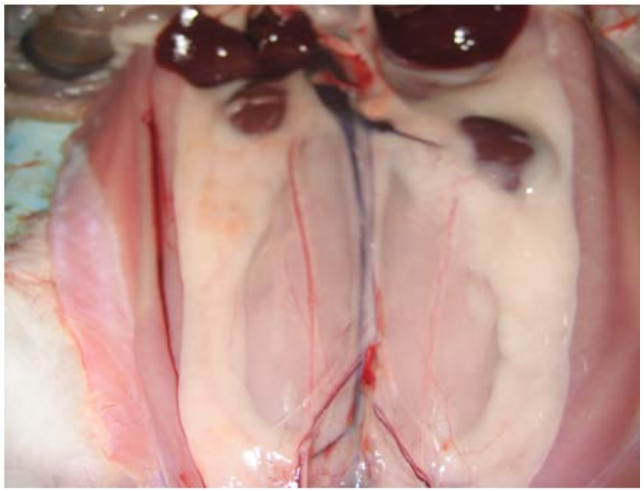
SCFA：Saturated fatty acids of five or fewer carbon atoms

→ SCFAs produce

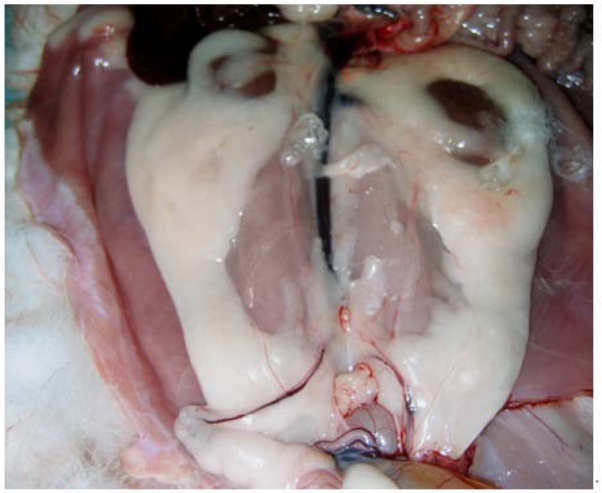
→ liver, muscle burns calories

(Tremaroli *et al.*, 2012)

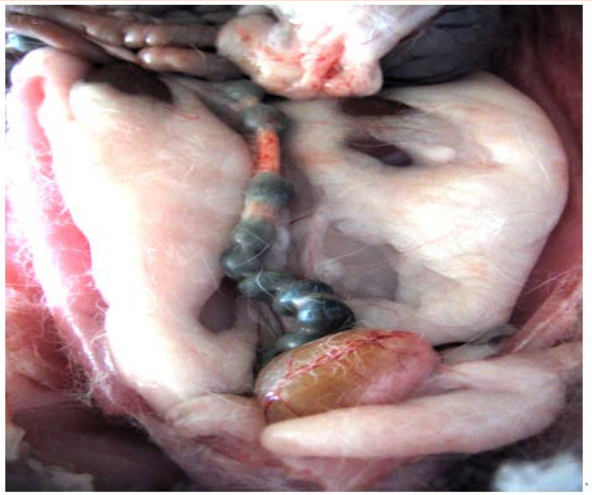
L-Arabinose reduction body fat accumulation in rabbits



A组（高剂量干预组）脂肪指数：0.485±0.095（g/100g体重



B组（低剂量干预组）脂肪指数：1.185±0.149（g/100g体重）



C组（对照组）脂肪指数：3.19±0.3（g/100g体重）

High Dose：1.24 g/day
Fat rate： 1.185±0.149
（g/100 body weight)

Low dose：1.11 g/day
Fat rate： 1.185±0.149
（g/100 body weight)

Control：PBS
Fat rate：1.185±0.149
（g/100 body weight)

Arabinose Certification

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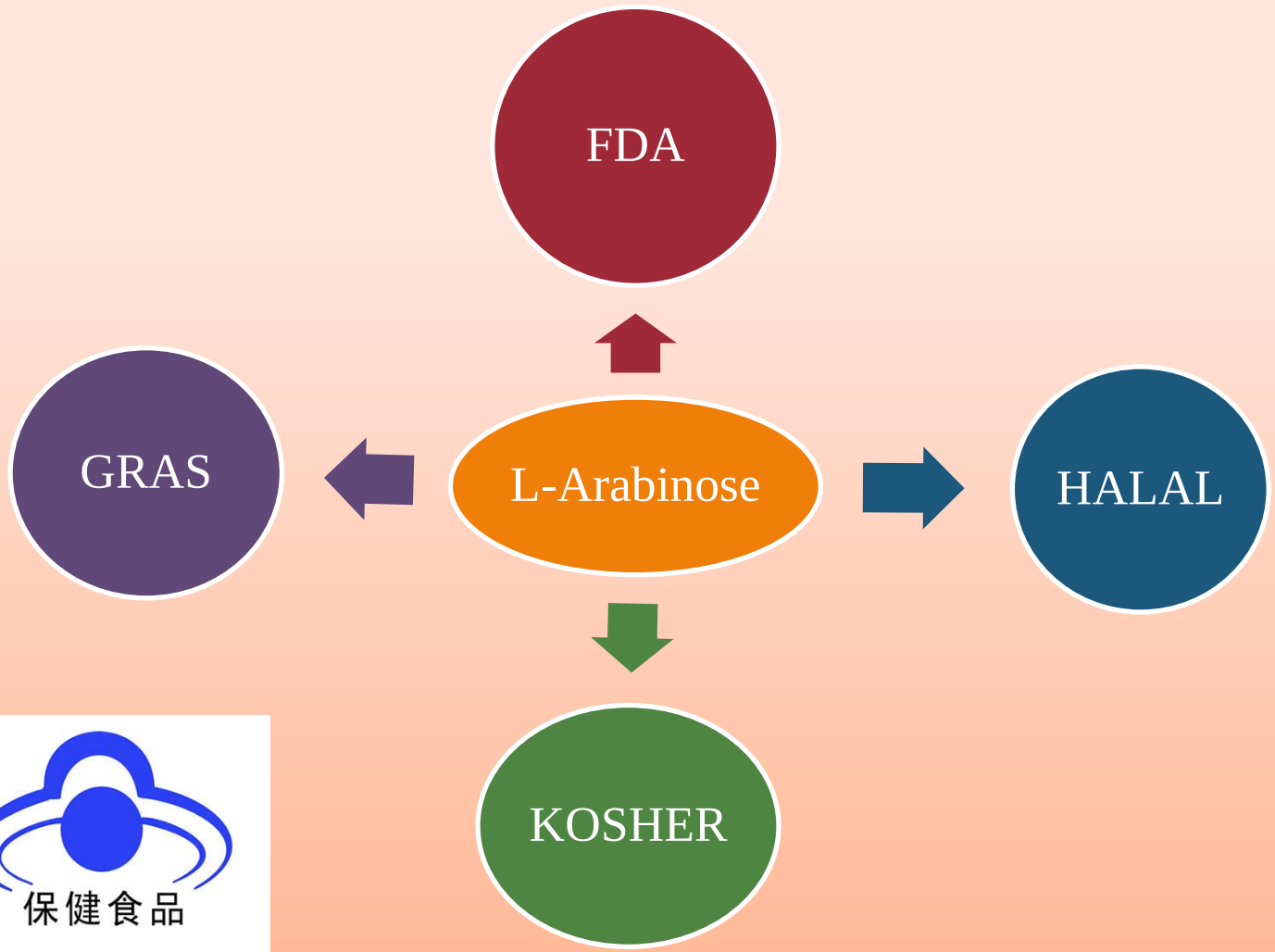

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特定保健用食品

保健食品

FDA EAFUS GRAS

FDA U.S. Food and Drug Administration Department of Health and Human Services
CENTER FOR FOOD SAFETY AND APPLIED NUTRITION

EAFUS: A Food Additive Database

This information is generated from a database maintained by the U.S. Food and Drug Administration (FDA) Center for Food Safety and Applied Nutrition (CFSAN) under an ongoing program known as the Priority-based Assessment of Food Additives (PAFA). PAFA contains administrative, chemical and toxicological information on over 2000 substances directly added to food, including substances regulated by the U.S. Food and Drug Administration (FDA) as direct, "secondary" direct, and color additives, and Generally Recognized As Safe (GRAS) and prior-sanctioned substances. In addition, the database contains only administrative and chemical information on less than 1000 such substances. The more than 3000 total substances together comprise an inventory often referred to as "Everything" Added to Food in the United States (EAFUS).

EVERYTHING ADDED TO FOOD IN THE UNITED STATES

DOC TYPE	DOC NUMBER	MAINTERM	CAS RN OR OTHER CODE	REGNUM
ASP	1711	ANNATTO, SEED (BIXA ORELLANA L.)	977157-28-0	
EAF	3078	ANOXOMER	060837-57-2	172.105
NUL	1712	ANTHRACITE COAL, SULFONATED	069013-20-3	173.25
ASP	86	BETA-APO-8'-CAROTENAL	001107-26-2	73.9
ASP	1713	APPLE ESSENCE, NATURAL	977090-73-5	
ASP	1715	APRICOT KERNEL, OIL (PRUNUS ARMENIACA L.)	072869-69-3	182.2 182.4
ASP	87	ARABINOGALACTAN	009036-66-2	172.23 172.61
ASP	**88**	**L-ARABINOSE**	**005328-37-0**	
ASP	89	L-ARGININE	000074-79-3	172.32
EAF	1716	ARNICA FLOWERS (ARNICA	977000-27-3	172.51

ARABINO IS A FUNCTIONAL NATURAL SWEETENER WHICH HAS A POTENTIAL TO BE USED FOR WIDE RANGE OF NEW PRODUCT DEVELOPMENTS

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Sweets

Others

Health Food

Thanks For Your Attentions