

Science vs. Media:

The story of glutamate (Glu) and monosodium-glutamate (MSG)

MIRO Smriga, PhD

The Glutamate Association of the USA (TGA)



Sweet

Glucose, sucrose, fructose, ▪ ▪



Salty

Sodium chloride



Sour

Acetic acid, citric acid

Bitter

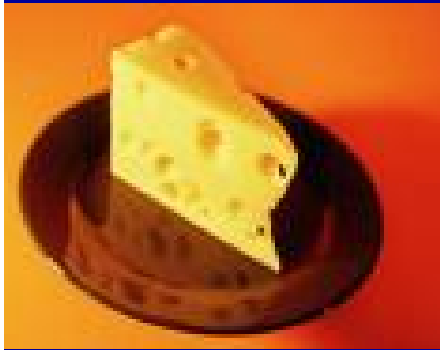


**Alkaloids, calcium chloride
in vegetables.**



Caffeine in coffee

Umami



Glutamate
(one of 20 amino acids that make protein)



Inosinate



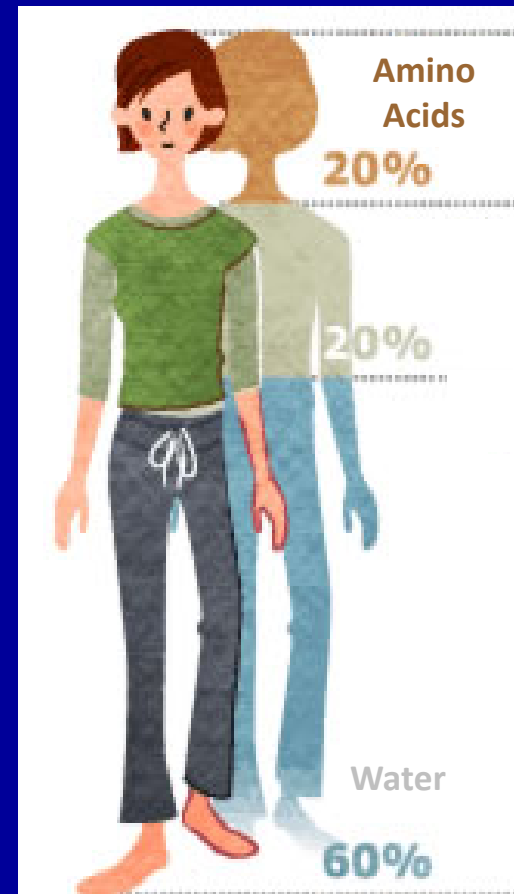
Guanylate

What is Umami ?

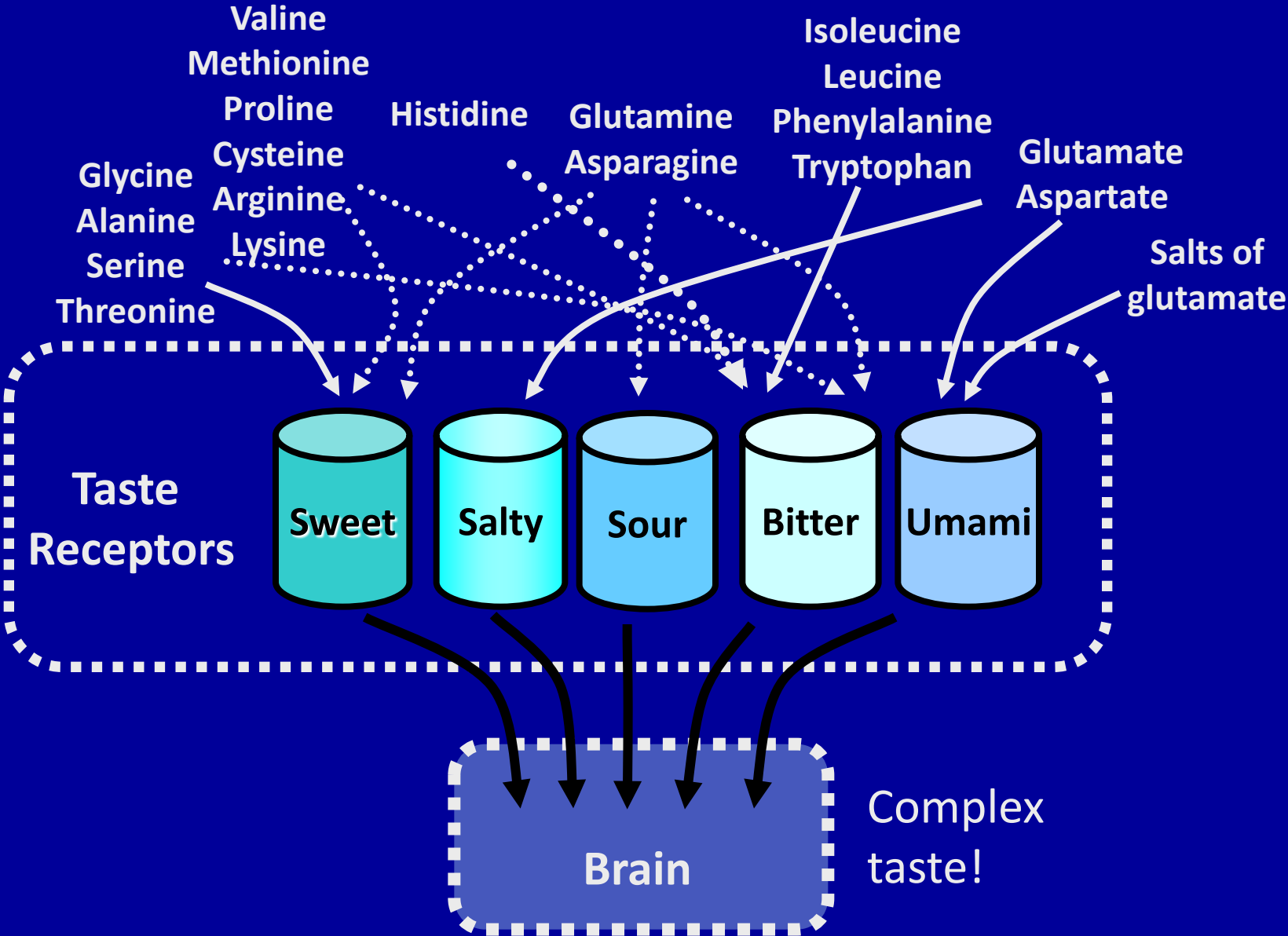
A basic taste of glutamate. It is an important taste element in natural foods. It is usually described as meaty, brothy in English.

Glutamate:

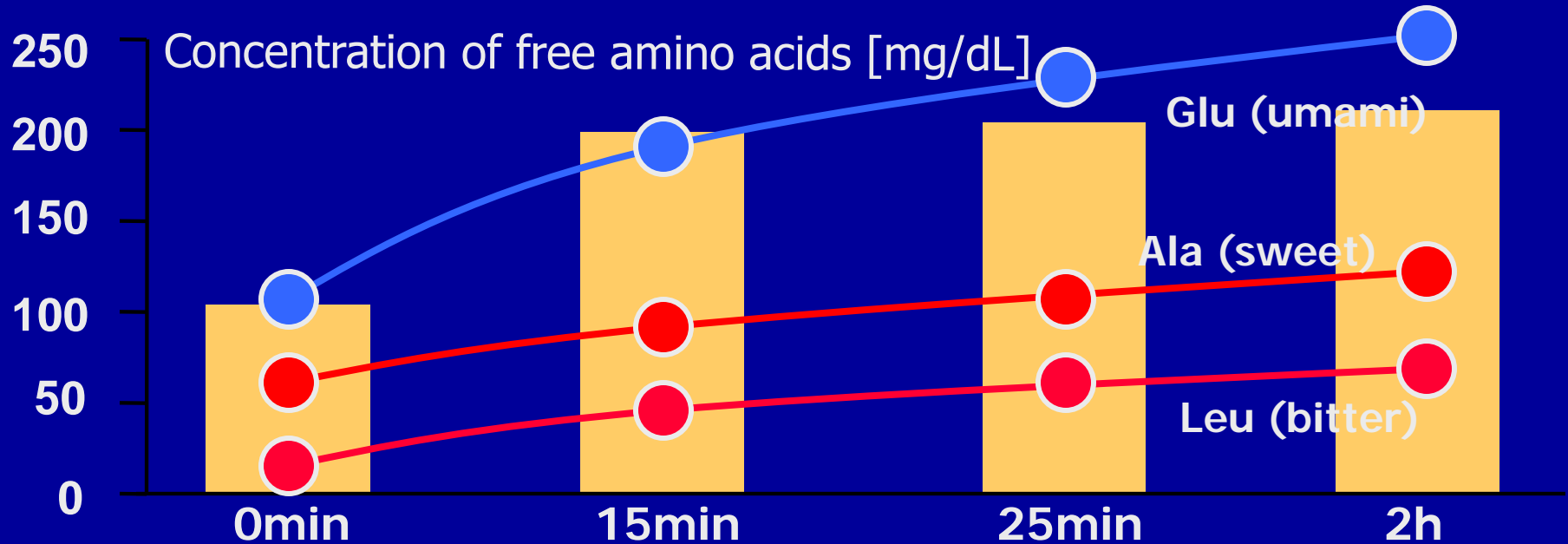
One of 20 amino acids that make up proteins



Amino Acids have Complex Taste



Amino acid content in chicken stock

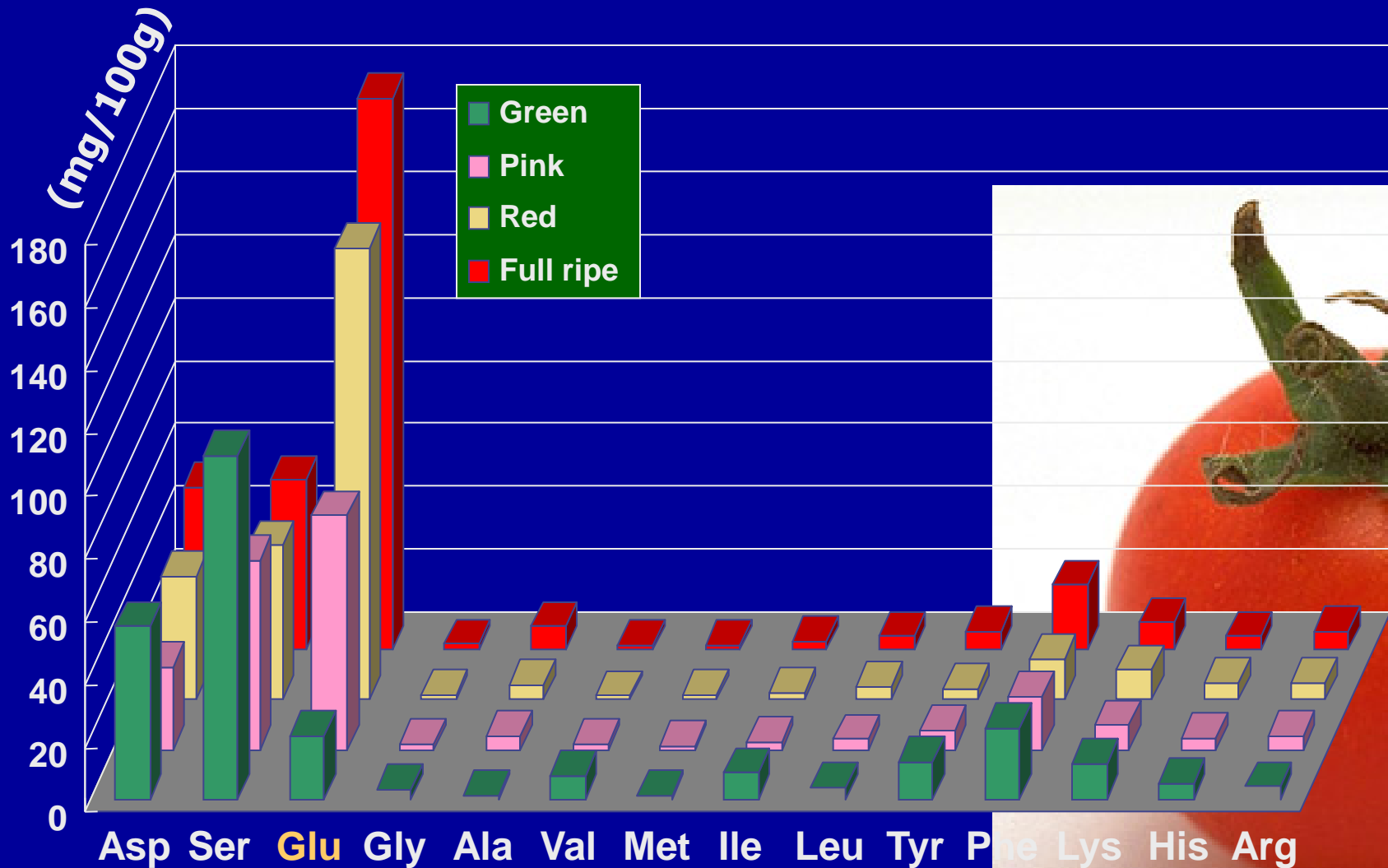


Parmesan cheese is one of the world's most popular cheeses, often used as a seasoning in Italian cuisine. It has been produced in Parma already before the 10th century.

**Glutamate content (g/100g):
1.4 – 1.6**



Tomato's full, rounded 'meaty' flavor comes from its heavy load of glutamates



Stocks, Seasoning and Sauces of today: richness in glutamate



Free glutamate
(g/100g):
0.8 – 1.3

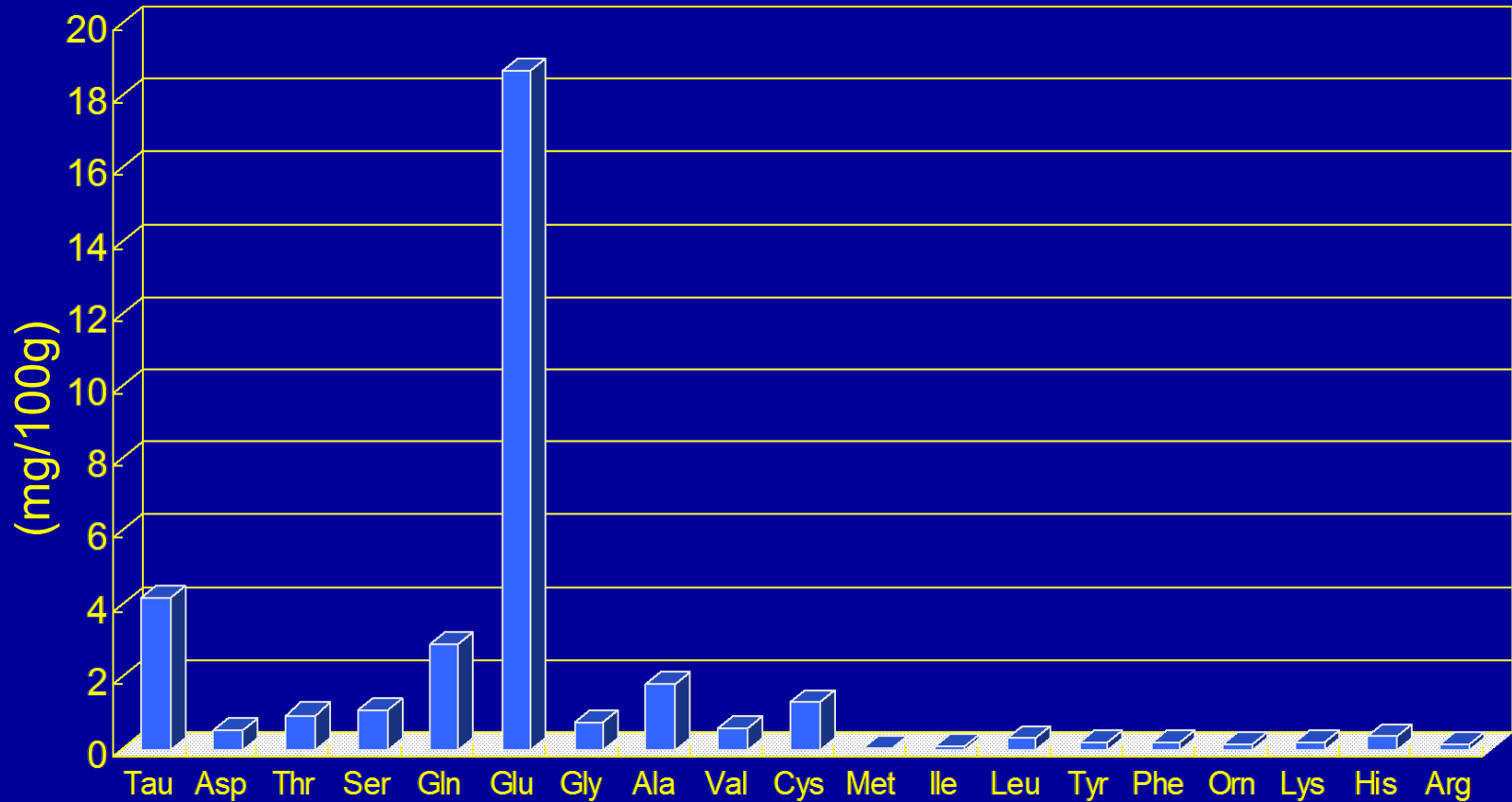


Free glutamate
(g/100g):
9 – 12



Free glutamate
(g/100g):
app. 1

Free amino acids in mother's milk



(Rassin et al, Early Hum. Dev. 2: 1-13, 1978)

What kind of taste does baby like?



Sweet



Sour



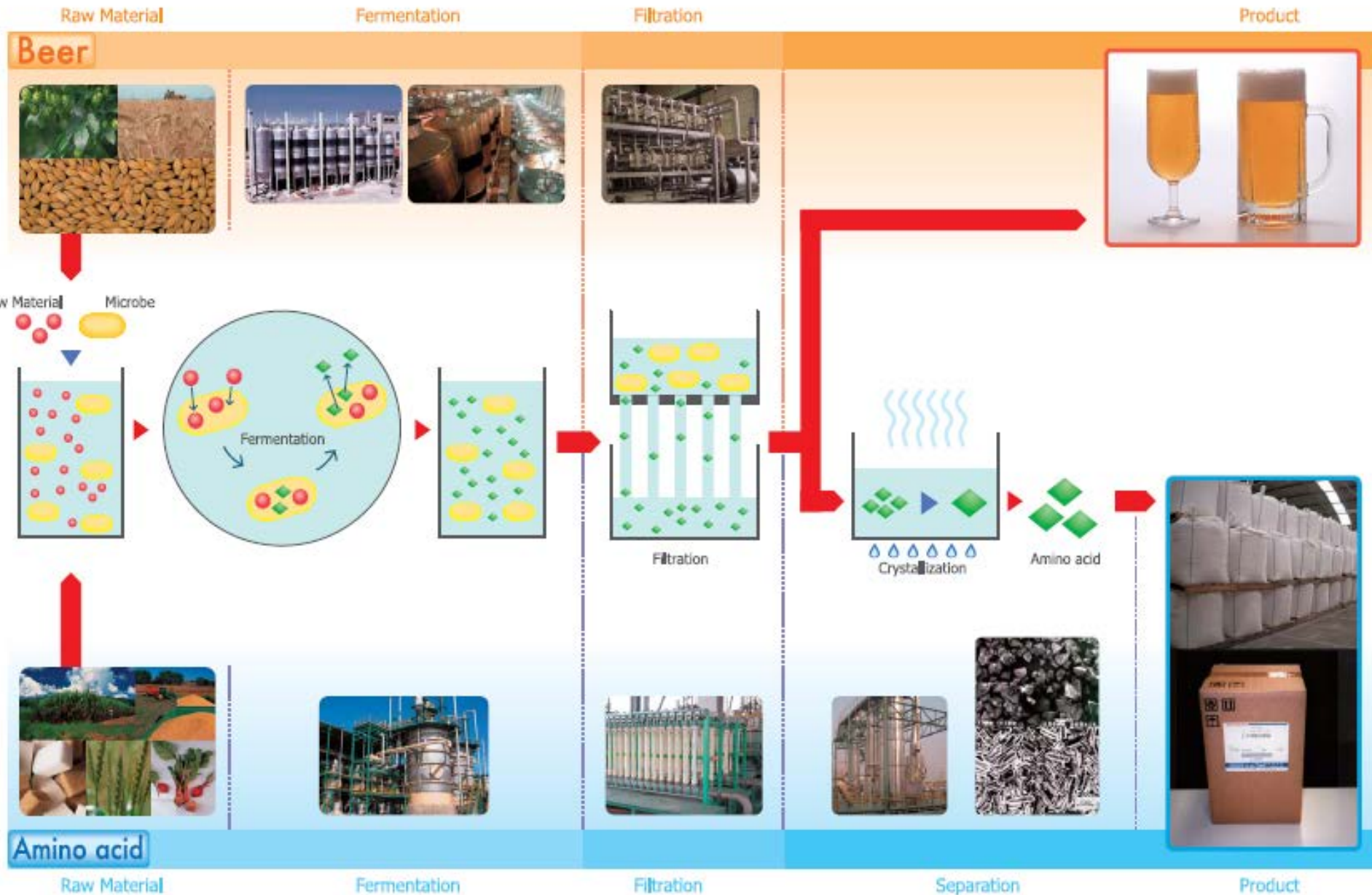
Umami

0.4% Glu in vegetable soup



Bitter!

Production of Beer and amino acid



MSG is natural (USDA ruling)

The USDA agreed that MSG, produced by fermentation, is natural (Dec. 2011)



United States
Department of
Agriculture

Food Safety and
Inspection
Service

Office of Policy,
Program & Employee
Development

Washington, DC
20250-3700

December 2, 2011

Mr. Martin J. Hahn
General Counsel
The Glutamate Association
P.O. Box 14266
Washington, D.C. 20044-4266

Dear Mr. Hahn,

This letter is in response to your letter dated May 23, 2011, which you submitted on behalf of The Glutamate Association (TGA) appealing the Food Safety and Inspection Service (FSIS), Labeling and Program Delivery Division's (LPDD), decision to deny the use of monosodium glutamate in meat and poultry products bearing "natural" claims.

LPDD has reconsidered its decision and will permit the use of monosodium glutamate derived from natural materials, containing no artificial flavoring, coloring, chemical preservative, or any other artificial or synthetic ingredient, and that is a product of fermentation and other physical treatments that FSIS has considered "minimally processed" in meat and poultry products bearing "natural" claims. This includes monosodium glutamate manufactured through acid hydrolysis or chemical synthesis in meat and poultry products bearing "natural" claims.

As described in your original request and clarified in your appeal, monosodium glutamate was first produced by the acid hydrolysis of vegetable proteins. Later, monosodium glutamate was produced by chemical synthesis using acrylonitrile as the starting material. FSIS considers these traditional production methods to be more than "minimal processing." However, the process by which the majority of monosodium glutamate is now produced begins with fermentation. Specifically, the fermentation process begins using bacteria from genera such as *Brevibacterium*, *Arthrobacter*, *Microbacterium*, and *Corynebacterium* or various species of yeast. Carbohydrate sources (e.g., corn and tapioca) are used as starting materials with other nutrients. When the glutamate levels reach the target level, the fermentation process is stopped and the glutamate is combined with sodium chloride to produce monosodium glutamate.

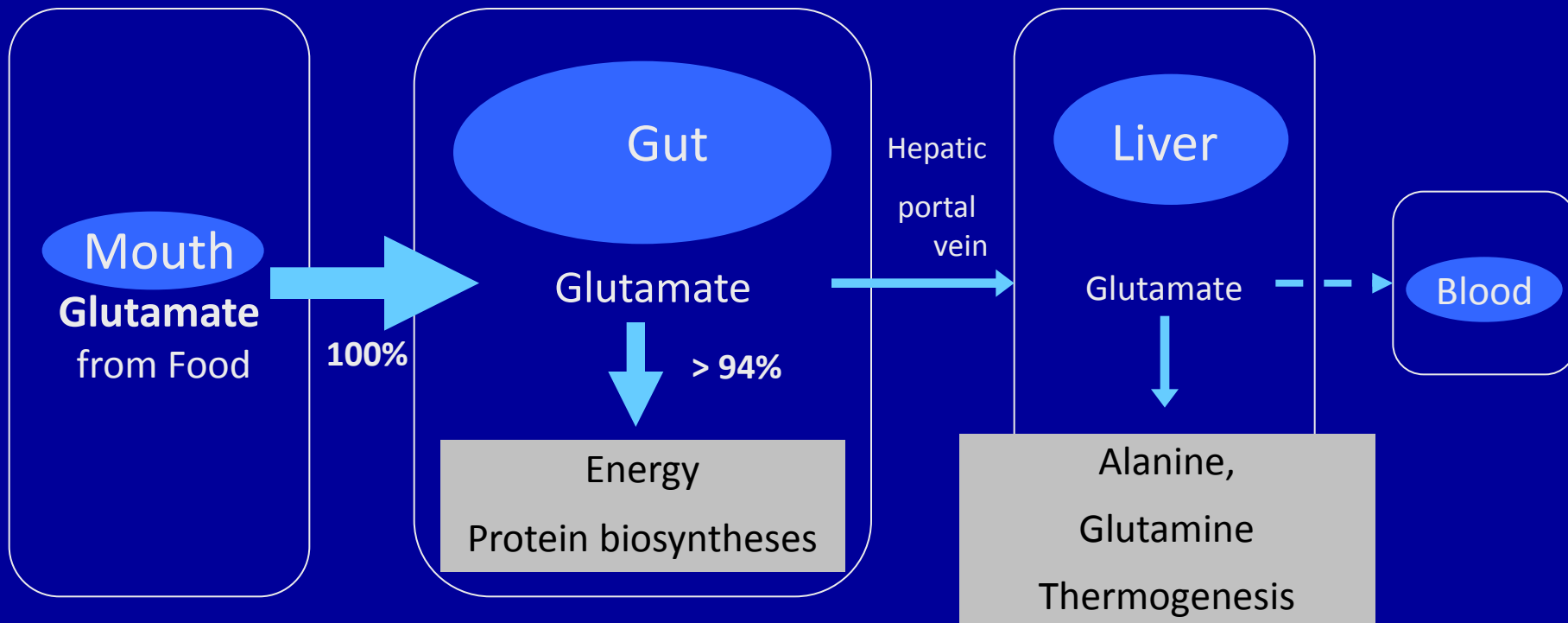
LPDD: Labeling & Program Delivery Division

... will permit the use of MSG derived from natural materials, containing no artificial flavoring, coloring, chemical preservative, or any other artificial or synthetic ingredient, and that is a product of fermentation and other physical treatments that FSIS has considered "minimally processed" in meat and poultry products bearing "natural" claims. . .

Glutamate is the major energy source for the gut

Studies utilizing stable isotopes have shown that:

>94% of dietary glutamate is metabolized in the intestine where it serves as THE energy source



Regulatory Status of Glutamate in the USA

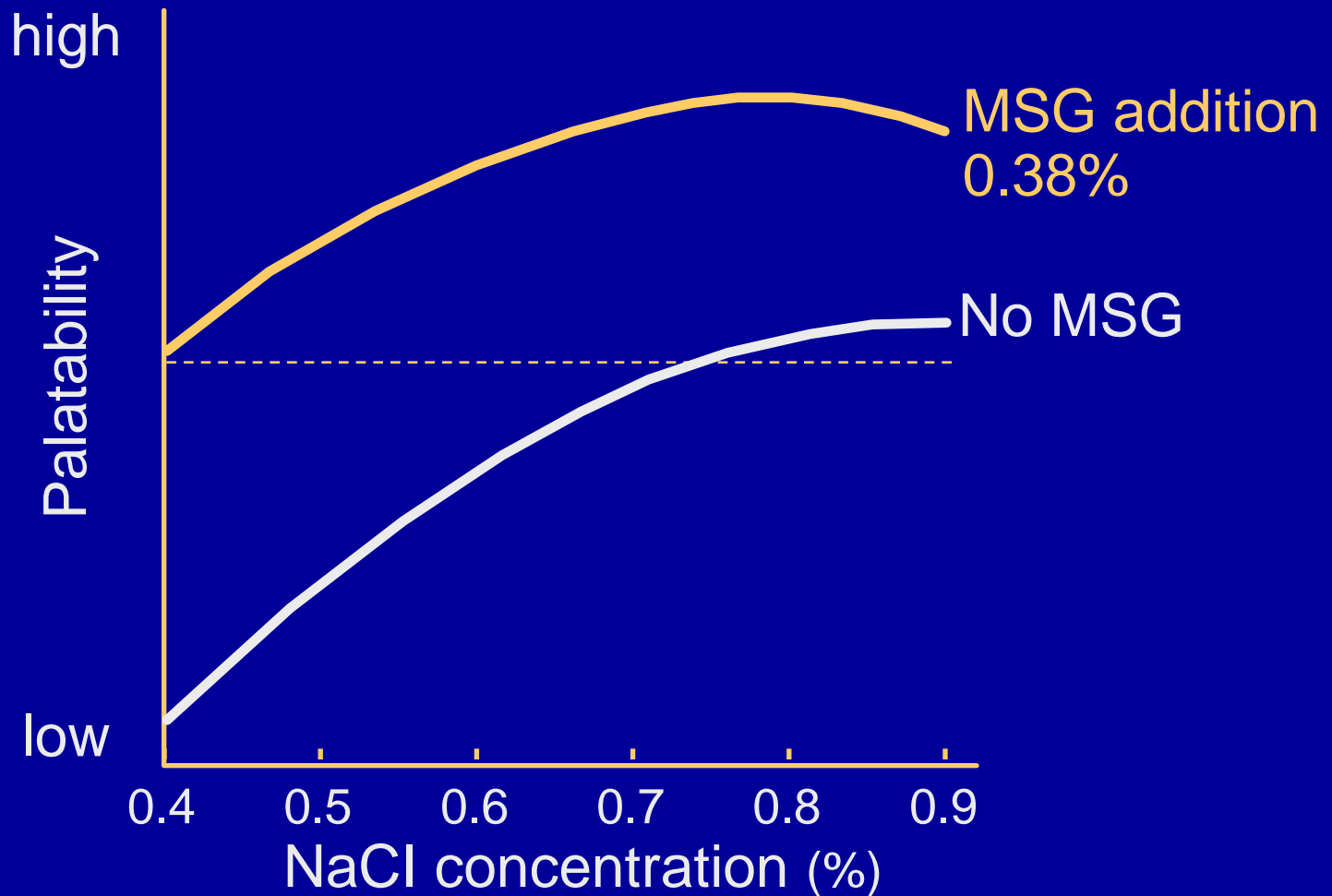
The US Food and Drug Administration (FDA) recognizes food-added MSG as GRAS (generally recognized as safe) (CFR 21, part 182.1; Ref. 3).

Substances such as salt and pepper are all classified in the same section as MSG. No food-specific restrictions on their use are instituted.

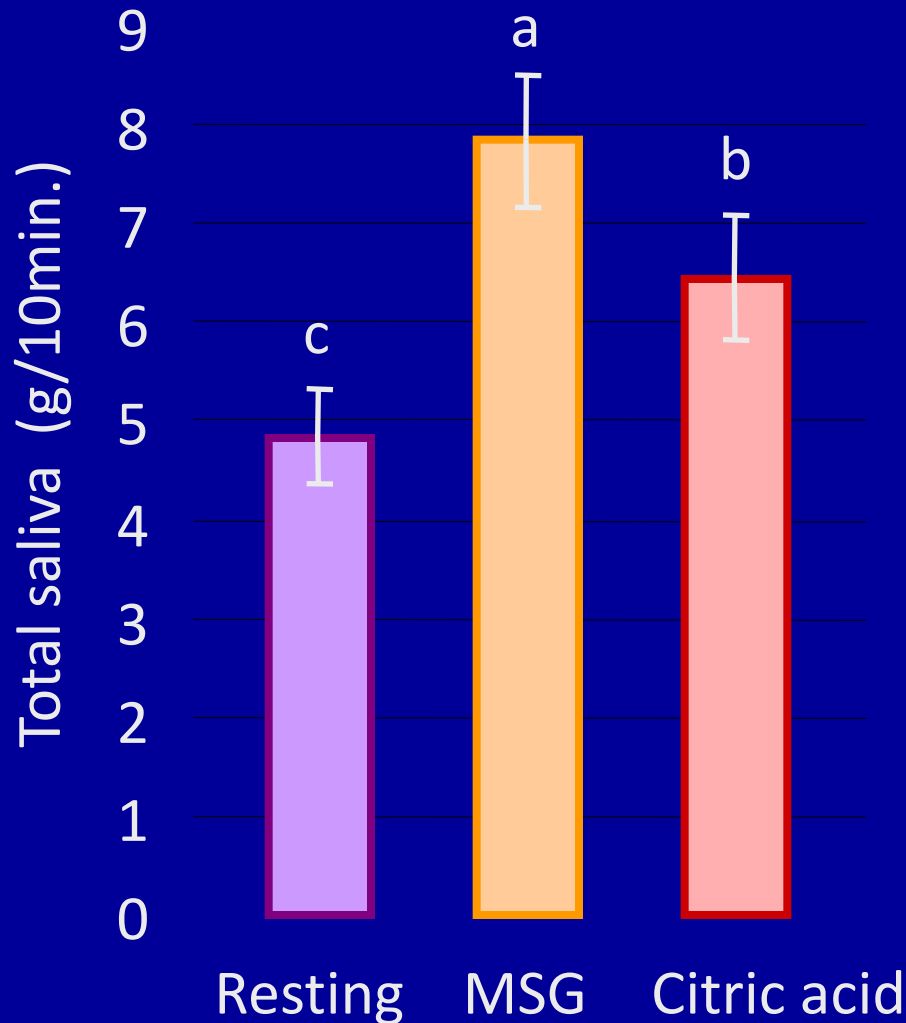
New science of glutamate

Physiological importance...

Salt Intake Reduction by MSG



Mouth: Saliva release with MSG



- Digestive enzymes (Amylase, Protease, Lipase, DNase, RNase)
- Anti-Bacterial (Immunoglobulins)
- Taste (Water, Zn^{2+})
- Bolus Formation (Mucins)
- Buffer (Bicarbonate, Phosphate, Proteins)

Why is MSG perception still negative

1. Protracted scientific resolution & weak media communication

Lack of effective science communication

2. Short history of umami

One hundred years vs. several thousand years for salt, sugar

3. Unfair industry competition

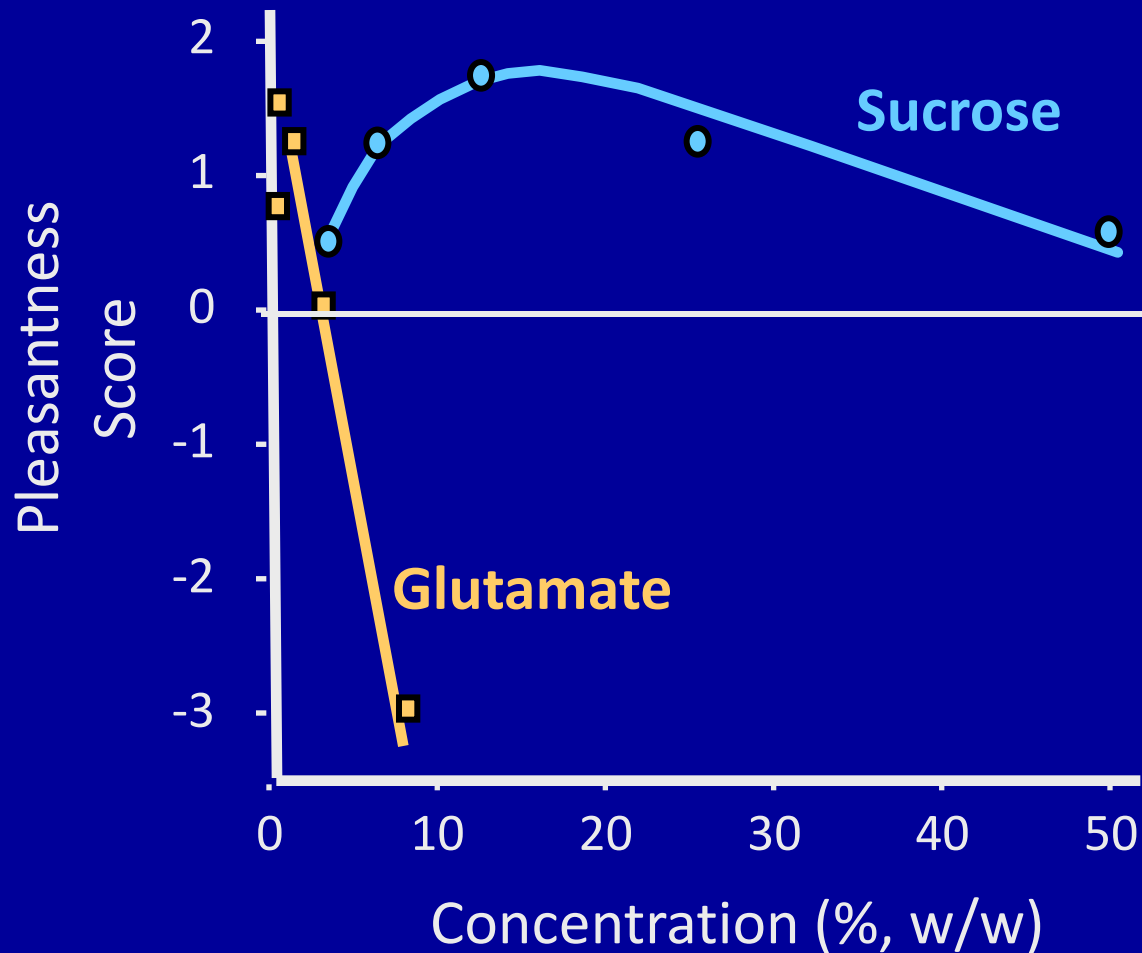
Food companies accused of hiding glutamate in Hydrolyzed Vegetable Proteins and Yeast Extracts

No MSG labeling

4. Perception of not being “natural”

...in spite of fermentation being considered as a natural production process

Safety (1): Glutamate taste: self-limiting



Safety (2)

Brain Effects

- New born mice most sensitive
 - Blood brain barrier which protects brain not fully developed in new born mice
- MSG in food does not cause problems even in mice
 - No blood glutamate level rise when used in food
 - Greatly reduced blood glutamate rise when ingested in soup or infant formula
 - Glutamate in the body: specific pools

Safety (3)

Chinese Restaurant Syndrome

- Symptoms not reproduced in Double Blind Clinical Studies
 - Symptoms seen a range of foods (non-specific)
- MSG in food does not cause problems
 - Symptoms not seen in studies where MSG is given with food.

Safety (4)

Allergies:

“Despite concerns raised by early reports, decades of research have failed to demonstrate a clear and consistent relationship between MSG ingestion and the development of these conditions (allergy)”.

Williams & Woessner

Monosodium glutamate 'allergy': menace or myth?

Clinical & Experimental Allergy 39(5), 640-646 2009

Problems with No MSG Labeling

US FDA

While technically MSG is only one of several forms of free glutamate used in foods, consumers frequently use the term MSG to mean all free glutamate. For this reason, FDA considers foods whose labels say "No MSG" or "No Added MSG" to be misleading if the food contains ingredients that are sources of free glutamates, such as hydrolyzed protein.