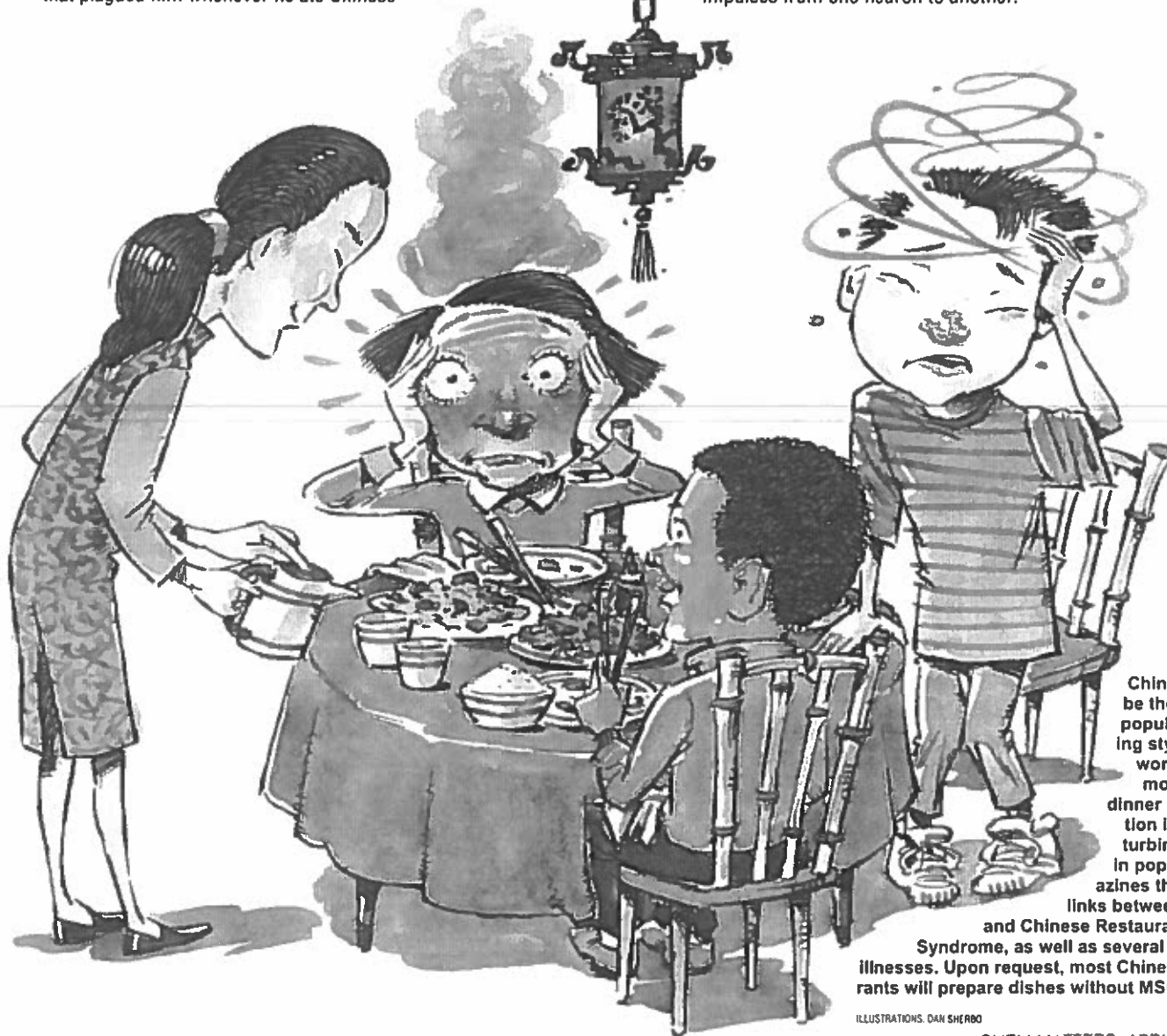


# Chinese Restaurant SYNDROME

You're out with friends at a new Chinese restaurant. You start with a large bowl of wonton soup, have the mu shi pork, then sample some of the other dishes on the table. Gradually, your face flushes, your heart pounds, you feel dizzy, shaky, and numb. Are you in love? No. You've got Chinese restaurant syndrome (CRS), so named in 1968 by the *New England Journal of Medicine* when its editors printed a letter from Robert Ho Man Kwok in which he described the symptoms that plagued him whenever he ate Chinese

food. Shortly after that letter appeared, blame for the problem settled on the food additive known as monosodium glutamate (MSG).

MSG, shown in Figure 1, belongs to a family of compounds called glutamates, which occur naturally in foods such as tomatoes, meat, and cheese. Glutamates are vital to human biochemistry. Several amino acids (the small units that make up proteins) are synthesized from glutamate, and glutamic acid appears to function as a neurotransmitter — a molecule that carries nerve impulses from one neuron to another.



Chinese may be the most popular cooking style in the world. A common topic of dinner conversation is the disturbing articles in popular magazines that allege links between MSG

and Chinese Restaurant Syndrome, as well as several serious illnesses. Upon request, most Chinese restaurants will prepare dishes without MSG.

ILLUSTRATIONS: DAN SHERBO

## Flavor enhancer

The reason MSG is added to food is not nutrition, but flavor. MSG is a "flavor enhancer" because it makes the regular flavors of food more intense. Since CRS was identified, controversy has swirled around MSG because diners at Chinese restaurants may tell the cook, "Hold the MSG!" and still experience irritating dizziness, hot skin, or other symptoms. Some have questioned whether MSG is the real cause of the syndrome. Although the Food and Drug Administration has given a GRAS (generally regarded as safe) rating to MSG, this category includes many compounds that have been in use for decades but may not have received much formal testing. Many packaged foods we buy at the grocery store contain MSG, and their manufacturers regard it as perfectly harmless. In contrast, the activist group NOMSG is dedicated to banning the substance.

First question: Does MSG actually cause CRS? Second question: At what dose? A question about dosage is important because many chemicals necessary for human nutrition become poisonous at high doses. Vitamin A is a good example. You'll get sick without it, but you'll also get sick by ingesting too much. Medical researchers have good reason to be concerned about the dosage of MSG. Research done on mice indicated that large doses of MSG could damage brain tissue, particularly in very young animals. The results have not been reproducible in monkeys or other primates whose physiology is close to that of human beings, but baby food manufacturers removed MSG from their products voluntarily, just in case.

Recently, research conducted in Australia has shed light on the question of whether MSG causes CRS. L. Tarasoff and M. F. Kelly, at the University of Western Sydney, began by reviewing the previous studies of MSG and CRS. They found serious flaws in all 19 studies (including one of their own). Designing a good study is particularly difficult when the symptoms are not directly measurable by test instruments but are characterized by patients' subjective descriptions. In some cases, the previous researchers had not adequately disguised the taste of MSG, and the volunteer test subjects may well have detected its distinctive, unpleasant flavor. In other cases, investigators asked questions that hinted at the symptoms they expected the volunteers to experience. In many of the early studies, the MSG was administered in high doses and without food, which is not the way it is taken in real life. Tarasoff and Kelly decided to remedy as many of these shortcomings as possible. Here's what it would have been like to be a participant in their recent study.

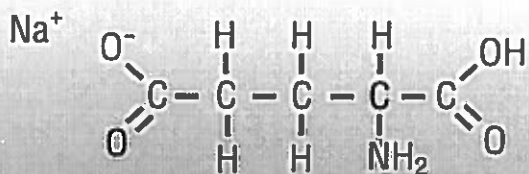
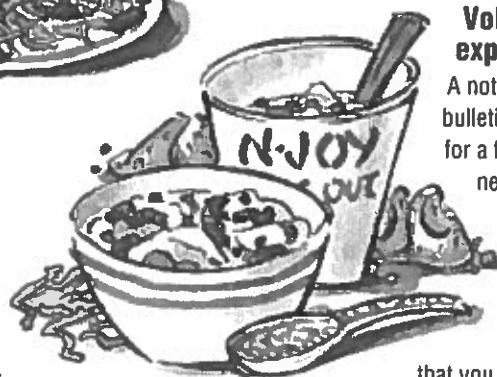
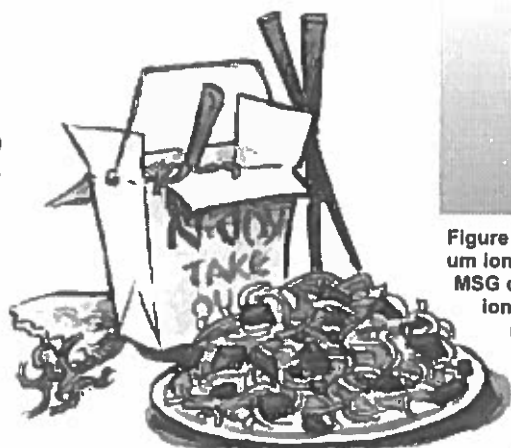


Figure 1. Monosodium glutamate, shown here, has a positive sodium ion that balances the negative oxygen, shown in red. When MSG dissolves in water, the  $\text{Na}^+$  separates, freeing the glutamate ion. If a hydrogen ion,  $\text{H}^+$ , attaches at the same oxygen, the result is glutamic acid — a vital nutrient.

## Volunteer for the experiment

A notice appears on the university bulletin board asking for volunteers for a five-day study to evaluate a new soft drink for flavor and other sensations. When you call, they ask you several questions about allergies, illnesses, and medications. You answer

that you have none of the listed allergies or illnesses, take none of the medications,

and are generally in good health, so you are selected for the study along with 70 other volunteers. You are then asked to read and sign a consent form that describes the study in outline as "three days of treatment with capsules followed by two days of treatment with drinks that might contain flavor enhancers."

Following instructions, you have nothing to eat after 11 p.m. Sunday; then, on Monday morning, you skip breakfast and report to the research office at 9 a.m. You swallow six gelatin capsules, then eat a light breakfast of two granola bars and a glass of flavored milk. To make the test a little more appetizing, you are permitted to choose an apricot-, coconut-, or tropical fruit-flavored granola bar, and you can select strawberry-, vanilla-, chocolate-, or coffee-flavored milk.

You leave the office and follow your normal daily schedule until, two hours later, one of the researchers calls and asks three questions: "Did you taste anything unusual after breakfast this morning? Did you experience any sensations other than taste after breakfast this morning? Have you experienced any



sensations other than taste after eating previous meals?" If you answer "yes" to any of these, further questions follow about the sensations, their intensity, and when they occurred. On Tuesday and Wednesday the procedure is the same, but on Thursday and Friday a drink is substituted for the capsules.

Notice that the ad for the study did not even mention MSG or CRS. The questions contained no hints of what reactions were expected. The doses always were accompanied by food. Furthermore, only some of the capsules and drinks you consumed contained MSG. The others were placebos — controls that had no active ingredient. You didn't know which capsules contained MSG and which were placebos, and neither did the researchers. A pharmacist who was not one of the researchers had prepared the capsules and drinks, assigned each a random code number, then scrambled the samples before delivering them to the researchers. The pharmacist kept the codes until the research was complete. This guarantees that the researchers could not have inadvertently influenced the subjects' answers. This is called a "double-blind" study because both the person who volunteers to take the test and the person who administers it are "blind" to the contents of the samples.

### Negative results

When the researchers retrieved the codes and analyzed the results, they found no relationship between MSG and any of the symptoms of CRS, as summarized in Figure 2. Volunteers who had drunk or swallowed the actual MSG reported symptoms that were not significantly different from those volunteers who had taken placebos.

Is this the final word — that MSG doesn't cause CRS? No. Simi-

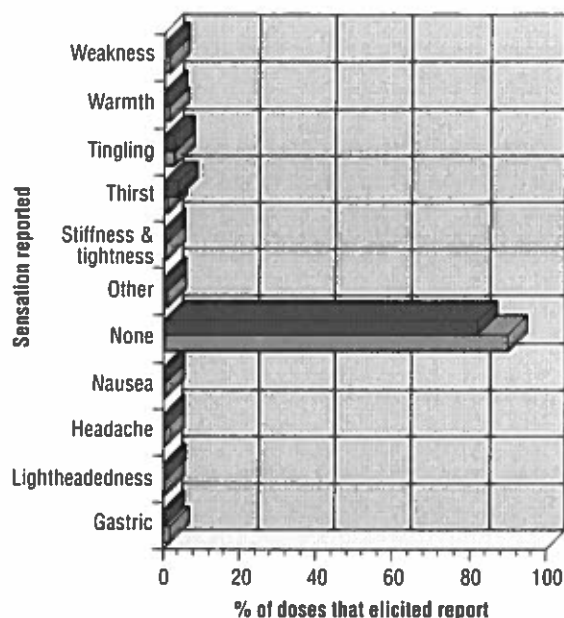


Figure 2. People who volunteered for the study were given several doses that contained either MSG (red bars) or a placebo (blue bars). Two hours later, they were asked to report any sensations. Some subjects reported gastric distress, lightheadedness, or other symptoms, but these reports were few and there was no significant difference between the experimental group and the placebo group. By far, the most common response was "no sensation," reported by approximately equal numbers of subjects who took MSG or a placebo.

lar, carefully controlled studies must be conducted by other research groups to confirm the results. Also, the design of this study does not rule out the possibility that a small group of people may be especially sensitive to MSG, and it takes more than 71 people to include these rare individuals. Likewise, people with asthma or other chronic conditions could be sensitive to MSG, but they were excluded from the present study. For most of us, however, the study by Tarasoff and Kelly appears to weaken the alleged link between MSG and CRS.

So if not MSG, then what? The authors of the study propose that something else in Chinese food may be causing CRS. It could be any of thousands of natural chemicals, additives such as preservatives, or dyes. Tarasoff and Kelly are especially suspicious of biogenic amines such as histamine, tyramine, and phenylethylamine. These potent compounds are known to cause headache, skin flushing, and heart palpitation. Can you simply tell the cook, "Hold the biogenic amines"? If you did, you wouldn't get much of a Chinese meal, because these compounds are fermentation products formed during the preparation of black beans, shrimp paste, and soy sauce.

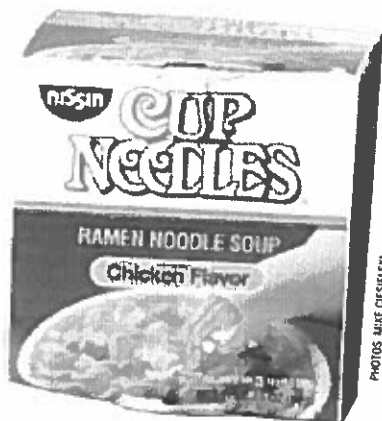
*Gail B. C. Marsella is a science writer who lives in Allentown, PA. She is a frequent contributor to Chem Matters magazine.*

#### FOR FURTHER INFORMATION

Barinaga, M. "Amino Acids: How Much Excitement Is Too Much" and "MSG: A 20-Year Debate Continues"; *Science* 1990, 247(4938), 20.  
 Tarasoff, L.; Kelly, M. F. "Monosodium L-Glutamate: A Double-Blind Study and Review"; *Food and Chemical Toxicology* 1993, 31(12), 1019.  
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Accent™ brand MSG, second from left, can be purchased at the grocery store for use in home cooking. The other food products shown here contain MSG as a flavor enhancer. Observers who are skeptical that MSG is the cause of Chinese restaurant syndrome point out that consumers do not have similar complaints about other foods that contain MSG. There is no "chicken broth syndrome" or "bread stuffing syndrome."



PHOTOS: MARK CHESEBURN