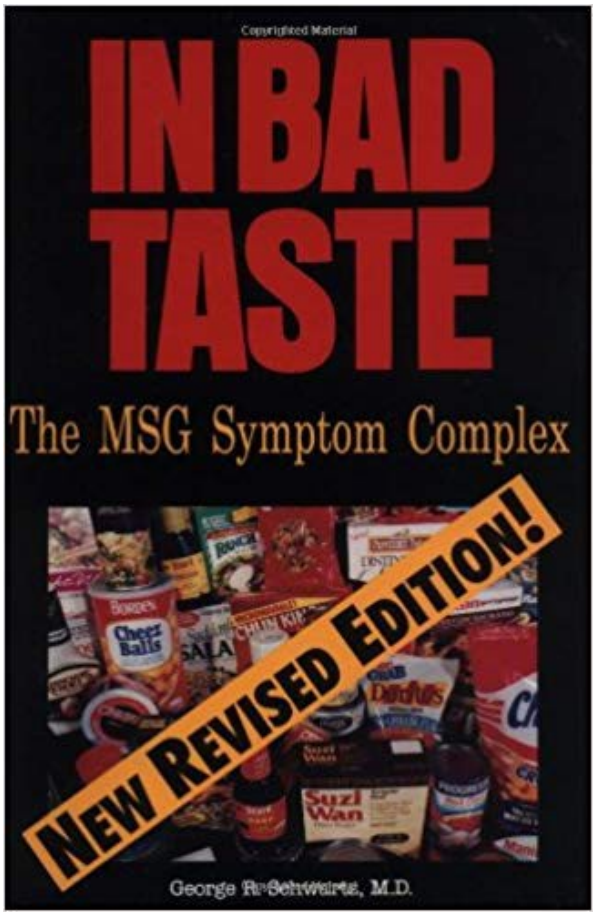

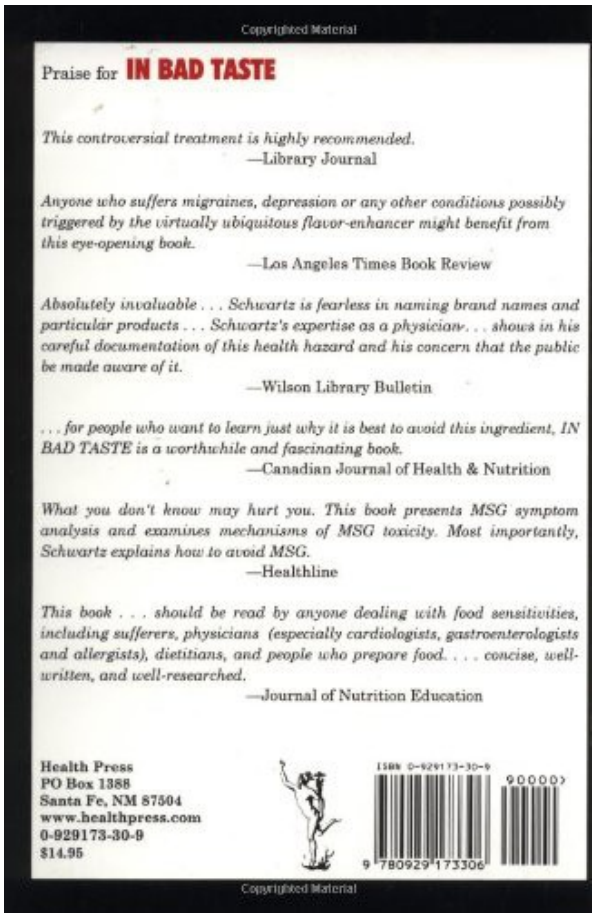

In Bad Taste

The MSG Symptom Complex

How monosodium glutamate is a major cause of treatable and preventable illnesses, such as headaches, asthma, epilepsy, heart irregularities, depression, rage reactions, and attention deficit hyperactivity disorder.

Foreword by Kathleen A. Schwartz, President of NoMSG

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Foreword

After the first edition of *In Bad Taste* was written Dr. Schwartz and the NoMSG group were inundated with more than 20,000 letters and calls from consumers concerned about the toxic effects of MSG in our foods. Many were angry and upset that they had been suffering for so many years without knowing the cause of their symptoms, and once they discovered MSG to be the culprit their lives were forever changed.

The National Organization Mobilized to Stop Glutamate (NoMSG), a not-for-profit consumer group, was founded more than ten years ago to help educate consumers and to provide a networking and support environment. I have worked with them since they were founded, and am currently serving as President of the group. I have spoken with far too many people who have been emotionally shattered, financially devastated, and had their life paths altered by adverse reactions to monosodium glutamate.

I believe that the current epidemic of diseases, such as fibromyalgia, attention deficit hyperactive disorder (ADHD), and chronic fatigue syndrome, and huge rises in reported cases of neurodegenerative diseases, migraine symptoms, asthma, and gastrointestinal diseases are all directly related to the rise in MSG consumption.

This is not only true for the United States, but also for individuals worldwide. Consumers are at the mercy of the glutamate industry with very little protection from their respective government agencies.

In my view change will not come from the governmental authorities, but from the people. People joining together, combining their talents and focus, have already begun to make an impact. Their message is gaining momentum supplemented with the research that is emerging and the new technology, such as magnetic resonance imaging

and positive emission tomography scans (MRI and PET scans), that aids in identification of MSG effects.

Medical professionals such as Dr. George Schwartz, Dr. John Olney, Dr. Russell Blaylock, Dr. Adriene Samuels, Dr. Gary Baker, and many others are placing their own professional credibility at great risk to help make the necessary changes. Unjustified and unscrupulous attacks from the glutamate industry are common occurrences attempting to tarnish reputations of highly educated and skilled physicians, researchers and scientists. *In Bad Taste* carries an important message. It has been written to make a difference in the health and well-being of millions of children and adults.

KATHLEEN SCHWARTZ
PRESIDENT, NOMSG
SANTA FE, NEW MEXICO

Preface to New Edition

Adverse reactions to monosodium glutamate (MSG) are increasing daily as the amount found in our food supply increases yearly. The use of MSG and of MSG-containing substances has more than doubled since *In Bad Taste* was first released in 1988. In the past three decades the amount has risen almost ten times.

We've learned an enormous amount during these years. Consumers, medical professionals, restaurant owners, and food manufacturers alike have started to take notice of the serious nature of MSG sensitivity. Although many people have considered their MSG symptoms to be an allergic reaction, it is usually similar to a drug reaction and often depends on the dosage. While there are those who will have an anaphylactic reaction to MSGa true allergic reactionmost of us will experience unpleasant and even life-threatening symptoms caused by the drug nature of this harmful flavor enhancer.

Since the original *In Bad Taste* was released, we've seen a food industry go from blatantly displaying the use of MSG in its food products to creating a "clean label industry" whose purpose is to design ingredient and food product labels that will appeal to consumers while hiding the presence of MSG. The use of the term "natural flavoring" has increased, as have the patented proprietary reaction flavors, such as beef, chicken, and pork, whose ingredients don't need to be labeled. Companies that create flavorings are extremely concerned with how these will ultimately have to be labeled. Still although the Food and Drug Administration (FDA) has made proposals about labeling changes disclosing glutamate content, nothing has happened in ten years' time.

In 1992 the FDA commissioned an independent review of the literature to determine whether or not it should seriously review the current use of MSG. At the public hearings which were held two

extreme views were offered: Consumers and support groups poured out their touching stories of lives forever altered by severe reactions to the use of MSG, while industry spokespersons touted its efficacy, its usefulness, and its apparent harmlessness. The Federation of the American Society for Experimental Biology's (FASEB) council issued its final report in July of 1995. The executive summary, approximately twenty pages at the beginning of the report, illustrated findings of harmful effects of MSG and defined the term "MSG symptom complex" as connected to symptoms verified to occur after oral exposure to MSG. This landmark report, "Analysis of Adverse Reactions to Monosodium Glutamate," validates the adverse reactions that consumers have been reporting for years. The overall conclusion of the expert panel is that causality by MSG had, indeed, been demonstrated by scientific evidence. The body of the report repeated time and time again that more research was necessary to evaluate the harmful side effects of MSG, such as endocrine disruption, brain lesions, heart irregularities, emotional disorders, and so on. My publisher and I personally were sued for $4 million by a product manufacturer that had appeared on the cover of the first edition of *In Bad Taste*. While the manufacturer claimed that its product did not contain MSG, we proved through the research done in preparation of the book that the company was wrong.

Over the years, I have received threats of lawsuits from other food manufacturers as well. Fortunately, there is great strength in the truth. As MSG is a multi-billion-dollar industry within the United States, the users and manufacturers have created an elaborate web of lobby organizations devoted to promoting the use of MSG. Through the manipulation of facts, data and test results may appear impressive at first glance. Many reporters and consumers alike have initially accepted the industry phrase that MSG is safe because glutamate is naturally occurring in many foods, but the industry's argument does not address quantity; this is much like saying arsenic, too, is safe because it is found naturally occurring. Nevertheless, we've made enormous progress

through unceasing efforts on behalf of those suffering from MSG sensitivity and through researchers who have placed their own credibility on the line in an effort to prove that MSG can be a very dangerous substance with far-reaching ill effects. The startling report"Analysis of Adverse Reactions to Monosodium Glutamate" Life Sciences Research Office of the Federation of American Society for Experimental Biology in Bethesda, Maryland, prepared for the Center for Food Study and Applied Nutrition HHS-1995has raised deep and probing questions and has validated thousands of consumer concerns. However, this report does not have the force of law behind it; thus, the use of MSGdespite the clear warningsis increasing, much to our detriment.

Based on case reports and on the landmark FASEB report to the FDA, we are now dealing with illnesses of epidemic proportions caused by excitatory neurotoxins placed in our food.

Chapter One
Introduction to MSG

After salt and pepper is a third spice, the most widely used flavor enhancer in the world, and truly the spice of our times. In America it is called monosodium glutamate, in Japan Ajinomoto, and it is known by other names in other countries.

The substance was first developed in 1908 in the laboratory of Kikunae Ikeda as an isolate of a flavor-enhancing seaweed known as kombu or "sea tangle." Dr. Ikeda hardly could have suspected then that his work to identify the active substance in a seaweed which Japanese chefs had used for thousands of years would lead to a multi-billion-dollar industry in the twentieth century.

Shortly after he isolated MSG, Dr. Ikeda became a partner in what would become the Ajinomoto Company. In fact, throughout the Orient MSG is known as Aji-no-moto (the "essence of taste"), much as "Xerox" is used as a generic term for copying machines and as "Kleenex" is used for all paper tissues in the United States. In recognition of the importance of his work, Dr. Ikeda's original isolated substance is encased in a monument at Tokyo University.

Today MSG is used in processed foods, in fast-foods and in Chinese food. Found in most commercial soups and soy sauceand hidden on labels under such aliases as hydrolyzed vegetable protein[1]MSG has become a staple of the modern food industry.

1 Hydrolyzing vegetable protein is one of the chemical methods of producing MSG. This mixture, containing up to 40% MSG, is listed among the ingredients of many commonly used processed foods.

Why should we be concerned about a substance that may make foods taste better?

Plain and simpleMSG is a drug added to our foods that causes widespread toxicity.

Reactions range from mild to very severe. Indeed, the symptoms that Dr. Ho Man Kwok reported in the first published study in the *New England Journal of Medicine* in 1968, for example headache and flushing of the skin, were relatively mild. However, later studies have documented more serious and sustained physical problems, such as asthma, acute headaches, and life-threatening heart irregularities. Even deaths have been reported. Other symptoms that might seem to be psychological in origin also have been traced to MSG consumption: extreme mood swings, irritability, depression, rage reactions, and even paranoia. In addition, suicide increases are likely related to this neurotropic drug.

Many cases of severe problems induced by MSG have been documented by physicians, and more have been reported in the medical literature where they may be studied by professionals. Still, the vast majority of MSG-sensitive people are not aware of the problems this substance may be creating in their lives; the continue with the fruitless visits to physicians who cannot explain their complaints. Asthma is a particular concern, with a rising death rate which tracks increases in MSG use in the United States, particularly in children and young adults.

A questionnaire study done by Dr. Liane Reif-Lehrer2 using a large sampling of subjects showed that 30% of adults and between 10% and 20% of children have some reaction to foods containing MSG. This means that many tens of millions of lives are adversely affected by this substancea virtual epidemic.

MSG is found in most of the food prepared by major fast-food chains. With the popularity of these foods among children and teenagers, it may well be the "Agent Blue" factor to which in 1988 the National Institute of Mental Health researchers attributed the rise in child and teen depressive syndromes and suicide. Behavioral and physical problems of children, such as incontinence and seizures, as well as attention deficit disorder (ADD), have been diagnosed and successfully treated as MSG reactions.

MSG was removed from baby foods in the late 1960s without much comment. Dr. Jean Mayer, the noted Harvard food scientist, remarked at a women's meeting of the National Press Club that "with even the slightest presumption of guilt I would take the damn stuff out of baby food." Gerber, Heinz, and Beechnut almost immediately announced that they would stop using MSG in baby foods. *However, infants still get MSG from ordinary table foods and may be ingesting it in various broths added to infant and baby foods. In addition, MSG already present in other ingredients has crept back into some prepared baby foods*.

The body of scientific facts now has reached a level where the findings and case reports must be brought to widespread public attention. At least fifty million people in the United States and more than five hundred million people worldwide react to MSG. This means that many people are being damaged physically and emotionally by the unknowing use of this flavor enhancer that for them has potent drug effects.

This 1999 edition of *In Bad Taste: The MSG Symptom Complex* is the story of the adverse effects of monosodium glutamate on the health and well-being of some consumers. It details the studies of dedicated scientists who have warned against MSG use. It explores an economy partly dependent on MSG production and use and examines how psychologists, physicians, clinics, schools, and lawyers have become involved in the problem due to its widespread effects.

Laboratory and field studies describe a consistent picture: 30% of the population experience some symptoms from MSG in amounts commonly added to foods. Clinical data show that some of these individuals develop symptoms that are not mild or transient but that are intense and dangerous, possibly, although less commonly, developing chronic long-term and disabling problems. More and more individuals will be affected as the use of MSG continues to increase. *MSG intolerance is not an allergic reaction but is a true drug effect*. A high-enough dose can affect anyone; many more people are reaching that symptom-causing dose in MSG consumption. We now know that the MSG symptom complex is not simply a bizarre reaction to some ethnic food, such as Chinese food, as many people still believe.

People who react to MSG must first identify their reactions and then learn to eat food without this additive. This book will serve to guide the consumer through the supermarket aisles on preventive shopping trips and to provide tasty recipes that eliminate MSG from the diet. A discussion of restaurants and dining offers tips on avoiding MSG, which may be found even in the finest kitchens. There is also a review of fast-food chain favorites containing MSG.

People who react severely to MSG experience almost continual distressing and health-endangering physical and psychological symptoms. Knowing how to avoid this flavor enhancer can dramatically change lives. In order to unravel the story of MSG, we must start with the beginning: the history of MSG. However, those readers most concerned with MSG reactions may want to go directly to Chapter 3 and read about the history of MSG at a later time.

Chapter Two
MSG History

Thousands of years ago when the Japanese began using seaweed as a food they discovered that sea tangle or kombu (*Laminaria japonica*) was a good seasoning ingredient. At that time the active flavor-enhancing substance within the sea tangle had not been identified. We now know that it is monosodium glutamate.

In 1860, in Hamburg, Germany, the chemist Rittenhausen was working on the determination of the chemical makeup of animal proteins, particularly the amino acid, glutamic acid. There is no evidence that Rittenhausen (and later another German chemist, Wolff) had any interest in or knowledge of cooking or of flavor-enhancing seasonings. They were pure scientists trying to identify the chemical properties of the various protein substances. Their work was essential, however, to allow Dr. Ikeda's 1908 identification of the active flavor-enhancing substance in seaweed and its eventual manufacture.

Dr. Ikeda, a Kyoto native, was educated at Tokyo University and graduated with a degree in chemistry in 1889. After briefly teaching at a high school, he went to Germany to further his studies. There Dr. Ikeda became involved with the important work Dr. Wolff was doing in protein chemistry. Glutamic acid had been synthesized in 1890, and Dr. Ikeda learned the chemical techniques of identifications and synthesis during his apprenticeship of several years.

Returning to Japan, he took a post in the chemistry department of the Imperial University of Tokyo. An established faculty member, by 1908 he began to investigate the seaweed his wife was using to flavor the family's soup and soon had identified the flavor-enhancing substance.

Dr. Ikeda discovered that the active extract of the flavorful seaweed had the characteristics of glutamic acid and that this active substance was monosodium glutamate, the sodium salt of glutamic acid. His discovery was secured with the British patent number 9440titled "Manufacture of a Flavoring Material"on April 21, 1909. Dr. Ikeda knew he held a food secret with many possible applications. While still at the Imperial University of Tokyo he began filing other patents on commercial manufacturing processes, first using the breakdown of wheat protein and later soybean protein.

In 1909 he teamed up with another enterprising businessman, the former pharmacist Saburosuke Suzuki, and convinced him that they were on the verge of a business that could add a new flavor, Unami, to the world. The Ajinomoto name was chosen as their trademark; this later became the name of the company responsible for the development and distribution of the flavor enhancer throughout the world. "Aji" means the origin, the beginning, or at the foot of; "moto" translates as taste or flavor.

Therefore, Ajinomoto literally signifies "at the origin of flavor." By 1933 Japanese production of the substance we know as MSG had reached ten million pounds yearly. It had become the most important flavoring in the Orient. Today Ajinomoto produces more than half of the world's supply of MSG.

In the early days, only once was the domination of the Ajinomoto Company challenged. In China production of MSG began in the 1920s and reached almost 400,000 pounds annually by 1930. By the mid-1930s the Chinese were offering the Japanese serious competition with their product marketed under the name Vetsin. However, the Japanese invasion of coastal China in 1937 put the Chinese glutamate factories out of commission. Ajinomoto did not find easy acceptance in America, although not for lack of trying, with efforts to gain acceptance beginning in the early 1920s. The story of its arrival made little impact, and the man who helped to stimulate its development has long been forgotten.

In 1925 James E. Larrowe and the Larrowe Milling Company contacted the Suzuki Spice Company for help in the profitable disposal of "wastewater," a residue of the processing of sugar from sugar beets which contains a substantive amount of glutamic acid. Sometimes called "Steffen's wastewater" after the man who developed the process, America in 1925 had a surplus of the liquid, or, more accurately, Larrowe Milling Company had a surplus after World War I.

As a result of the war, the United States was cut off from its major source of potashGermanyfor fertilizer, and it became profitable to extract potassium salts from the wastewater. Many sugar beet processing plants were converted into potash plants, spurred by prices of $400 per ton. But in 1918, with the end of the war, the price of potash fell drastically and Larrowe was left with many thousands of tons of "Steffen's wastewater" in great storage tanks in Mason City, Iowa. Larrowe had expanded his production to meet an anticipated potash demand and now was in financial straits. He had to find a use for the waste water.

Almost every possible use, including antifreeze for automobiles, was tried without success. In desperation he went to the Mellon Institute of Industrial Research in Pittsburgh, Pennsylvania, and presented his problem. By now it was 1923 and the wastewater had been sitting for more than five years. Millions of dollars were tied up in what seemed to be hopeless material.

After almost ruining the engine of his new Packard, Larrowe wanted the Mellon Institute to determine why he couldn't use the material as anti-freeze. Dr. Donald Tressler, a young scientist, was offered a fellowship to analyze and find a use for the wastewater. After two years of research he found that the wastewater contained appreciable amounts of glutamic acid. Upon consulting with his professor, Dr. Elmer McCollum, a well-known vitamin chemist at Johns Hopkins University, in Baltimore, Maryland, he was advised that Larrowe should drop the idea of antifreeze and set out to manufacture glutamate.

Larrowe contacted Dr. Suzuki and Dr. Ikeda and offered them an opportunity to buy his wastewater glutamate, and in 1926 Dr. Ikeda, Dr. Suzuki, and Dr. Suzuki's son arrived from Japan. Laboriously, they made their way to Mason City, Iowa.

The corporate team was convinced that they could manufacture glutamate and sell it in the Orient and in the United States through the Larrowe-Suzuki Company. Financially, the deal was disastrous for Larrowe, but he was determined to manufacture MSG from his wastewater. In 1931 Dr. Ikeda died. Subsequently, in 1936, Dr. Suzuki died and the Larrowe-Suzuki partnership ended. James Larrowe, now in his seventies and in poor health, had never made his wastewater truly profitable despite enormous infusions of his own wealth. Dr. Albert Marshall, a good friend and consultant to Larrowe, was most impressed by his tenacity in finding a use for the wastewater. In fact, he said of Larrowe, "Of him it can be said in the words of Shakespeare, 'For what I will, I will and there an end.'"

Profit or not, Larrowe finally found a use for his wastewater: the manufacture of monosodium glutamate. His company, the Amino Products Corporation, was eventually sold to the International Minerals and Chemicals Company. Despite American manufacture, MSG was still not an accepted ingredient in American food. Ironically, the Japanese use of Ajinomoto in rations was eventually noticed by the U.S. soldiers during World War II. After the war, conferences were held to discuss uses for this flavoring agent, particularly in prepared foods for the army and in field rations, as well as for the fledgling frozen food industry.By 1948 the first symposium about this flavoring secret was held at the Stevens Hotel in Chicago and was presided over by the chief quartermaster of the U.S. Armed Forces.

In order to understand the enthusiasm generated by this meeting we have to return to 1948.Imagine yourself as an influential member of the food industry called to Chicago in 1948 to hear about an apparent wonder

substancean Oriental food secret that even made Japanese army rations more palatable. Entering the symposium hall you are greeted by the erudite Franklin Dove, the chief of the Food Acceptance Branch of the Quartermaster Food and Container Institute of the U.S. Armed Forces. Colonel Charles Lawrence, the commanding officer of the Quartermaster Institute, greets you with pleasure and assures you that like the others called to this symposium he has been awaiting this event with great expectations. "I have enormous curiosity about this strange substance," he says. As you look around the meeting room you see leaders of the food industry and representatives of almost all the major food processors and sellers in America. The name tags emphasize their arrival from all parts of the country, many after an arduous train ride, some after long automobile trips, and a lucky few after a bumpy airplane ride.

Here on your left you recognize Mr. Bowers from Campbell Foods, on your right Dr. Anson from Continental Foods. John Andrews from General Foods is in front with a contingent of people in tow. Behind you is Mr. D'Sinter from Standard Brands and W. Guest from the Continental Can Company. The few women present are Dr. Charlotte Dalphin from Nestles, Inez Jobe from the United Airlines Food Service, and Anna Boller from the National Livestock and Meat Board. As you look around the packed room you see representatives from Borden, Stokeley, Libby, Pillsbury, and even Oscar Mayer.

This meeting marked an American revolution in food, an eight-hour event with eventual adverse consequences for millions and millions of people over many years. What was it that started this food revolution? These are some of the actual excited comments:

"MSG suppresses undesirable flavors"

"MSG gives zest to food"

"Increases flavor and odor appeal"

"Suppresses bitterness and sourness"

"Meaty, chickenlike flavor"

"Flavor appeal improved particularly with meats, seafoods, stews, and chowders". "I wouldn't believe that the same product that could improve the taste of marinated herring would also improve lobster paste, crab cake, and codfish cakes, but it is true and it does"

"Creates a lingering flavor reaction". As you look about the hall you see people taking notes furiously as each speaker gives glowing reports of the wonder substance. All through the hall is a buzz of excitement. MSG has made a hit. The United States MSG food industry is off and runningand if all the remarkable findings aren't enough, then what the last speaker of the day offers is the icing on a marvelous cake.

Dr. Carl Pfeiffer of the University of Illinois College of Medicine, a well-known physician who has taken the time to come to this symposium, now tells the assembled group that scientists are beginning to do experiments to test the effects of glutamate in raising the IQ level in feebleminded people. What he didn't mention were the severe side effects of the substance he encountered when he tested children with MSG. The assembled food people scarcely needed any more incentive, but this news provided a turboboost.

America had truly discovered MSG, or, to be more accurate, MSG had discovered America. Perhaps the cartoonist Al Capp could have been found in that room to be inspired to base his "Schmoo" on MSG. The Schmoo was a wonderful and loving animal that, when you were hungry, would taste like your favorite meal.

Had you been at this symposium you would have emerged from the meeting room into the chilly spring Chicago air with an overall enthusiasm for a very special ingredient.

The U.S. food industry responded with vigor. It is now difficult to find a product without added MSG. Little did these enthusiastic food producers know that their "miracle substance" had a dark side that would eventually result in the MSG Symptom Complex.

Chapter Three
No Laughing Matter

At first many people thought it was a joke when Dr. Ho Man Kwok wrote to the *New England Journal of Medicine* in 1968 reporting on his reaction to MSG.[3] "The syndrome," he wrote, "which usually begins 15 or 20 minutes after I have eaten the first dish, lasts for two hours without any hangover effect. The most prominent symptoms are numbness at the back of the neck gradually radiating to both arms and the back, and general weakness and palpitation." Another letter writer urged the real Ho Man Kwok to come out and admit his practical joke and his real name, "Human Crock," but Dr. Kwok was real and his symptoms were very real.

In 1969 Dr. Herbert H. Schaumberg at the Albert Einstein School of Medicine began a careful scientific study of MSG effects. Nevertheless, in an ironic vein he wrote, "To suppress the mounting hysteria and prevent the wholesale slaughter of Chinese restaurant owners we feel impelled to present a preliminary communication on the etiology, psychopathology and clinical pharmacology of the variously misnamed post-sino-cibal syndrome (Chinese restaurant syndrome)." With tongue in cheek, Dr. Schaumberg thanked the untold numbers of victims who had called him in the middle of the night. He even proposed to write a book titled "Race for the Double Wonton," the proceeds to be used to "improve working conditions for the dedicated [Chinese restaurant] workers."

3 Ho Man Kwok, A Chinese restaurant syndrome. *N Engl J Med* 278:796, 1968.

On July 1, 1968, Franz Ingelfinger, editor on the *New England Journal of Medicine,* wrote, "Whatever its best name, the reaction to 'Kwok's disease' as described in our issue of May 16th has uncovered a legion of hitherto silent sufferers. Many apparently had been sitting all tingling and tormented but not saying anything, each utterly sure that he alone was wretched and never dreaming that the contented-looking co-consumer of bird's nest soup likewise was in agony. Even husband and wife wanted to spare each other."

Yet how funny was it really? As Dr. Schaumberg and his colleagues investigated further they identified some symptoms produced by ingestion of MSGburning, facial pressure, chest pain, and headache. They discovered that one bowl of soup (six to seven ounces) could precipitate symptoms in an MSG-sensitive individual, and this occurred at a dosage of three grams or lessa smaller amount than commonly used for flavor enhancement.

When 56 normal people ranging in age from 21 to 67 years were tested (30 male, 26 female), symptoms of the syndrome occurred in all but one subject, and this individual did develop symptoms when MSG was administered intravenously.

One of the particularly disturbing symptoms that Dr. Schaumberg's study found was pressure throughout the chest area, occasionally radiating to the arm or the neck. This alarming sensation caused one of the test subjects, a physician, to request an electrocardiogram, fearing that his symptom was that of a myocardial infarction (MI) or heart attack. In recent medical literature, emergency medical technicians have been warned to consider differential diagnosis"MI or MSG"when the patient's presenting symptoms include sweating, numbness around the face and neck, chest pressure, burning sensations, palpitations, nausea, and vomiting.[4]

In his 1969 paper in *Science*,5 the official journal of the American Academy of Science, Dr. Schaumberg concluded, without humor, that "MSG can produce undesirable effects in the amounts used in the preparation of widely consumed foods."

Eight years later Dr. Liane Reif-Lehrer, a noted researcher at Harvard Medical School, conducted a questionnaire study of reactions to MSG. Of the 1,529 respondents, almost 30% reported reactions including dizziness, nausea, abdominal pain, visual disturbances, fatigue, shortness of breath, and weakness.6

In Dr. Reif-Lehrer's study the most commonly reported symptoms were headache and tightness around the face. An appreciable number of subjects reported dizziness, diarrhea, nausea, and stomach cramps. Fifty people described eye symptoms ranging from burning eyes and blurry vision to pressure and seeing lights or colors. Many people had emotional reactions ranging from depression or insomnia to feeling "tense." The sample was predominantly of adults, but she also used 14 classes of grade school children, a total of 317 in grades two through six in two different towns. These children were asked about types of feelings after eating various foods. She concluded that 19% of children interviewed had some reaction to MSG, with nausea and stomachache being the most common. While reactions of the questionnaire group generally subsided within three to four hours, 10% reported longer lasting symptoms.

Dr. Arthur D. Colman, a psychiatrist in Sausalito, California, began collecting data in 1978 after he detected two dramatic cases of reactions to MSG. One especially striking case, was reported to him by the child's father, a physician:

5 Schaumberg HH, Byck R, Gerstl R, Mashman JH: Monosodium L-Glutamate: Its Pharmacology and Role in the Chinese Restaurant Syndrome

Noah was nine years old when we noticed that he often developed headaches and stomachaches after fast-foods. He also had a difficult time holding back his urine and his stool. Sometimes he would even go in his pants. This was very difficult for him at the age of nine. He also had periods of hyperactive like behavior, difficulties that came and went with nothing apparently causing or setting off the problem.

His pediatrician was at a loss. In general, Noah was a charming, gentle, smart, and friendly boy, but when he had these periods he became irritable, whining, yelling and unreasonable. The school noticed his changes, and we met with his teacher who described how he was usually very responsive and friendly but had been experiencing periods when he seemed to change into another child. We called it "Devil to Angel" and were very confused. His difficulty with diarrhea and controlling his bowels had an impact on his whole personality because he couldn't play with other children during these episodes. He began therapy with a child psychiatrist after his pediatrician couldn't find any causes for his behavior.

We noticed that his problems became worse after eating Kentucky Fried Chicken and finally discovered that MSG was used in large quantities in the batter and the secret spices. For the next two weeks we tried to keep Noah away from any food containing MSG. His symptoms cleared miraculously, and he had a dramatic improvement in his bowel control

One day the family ate at a Chinese restaurant and Noah had a big bowl of wonton soup. Within five minutes he developed a face flush and within a few minutes felt a terrible cramp and need to rush to the toilet. For the next week his symptoms all returned, including his hyperactivity. We felt that the cause was MSG, and we continued to be very careful with his food.

We didn't tell the child psychiatrist about our discovery and Noah kept going to therapy. At our next month's conference his psychiatrist asked what we had done because Noah seemed to be a different child. The psychiatrist advised terminating therapy if the

> situation continued in improvement. Several weeks later he advised that we stop psychiatric treatment. At our conference with Noah's school the teachers had noticed a tremendous change in his consistency and his personality.
>
> His moods now seem so much more genuine and not driven. There is no way to describe the difference in our sense of joy in the family since we took Noah away from MSG.

Were the symptoms confined to a mild reaction without lasting or serious results one could easily dismiss the effects of MSG, but a reaction like Noah's is seriously life and socially disabling. The anger and rages can be very destructive to future relationships. In some cases, reactions can be life-threatening as well. Dr. Dietmar Gann from the Division of Cardiology at the Mt. Sinai Medical Center in Miami Beach, Florida, wrote in the July 1977 issue of the *Southern Medical Journal*:

> A 36-year-old man came to an emergency room complaining of severe weakness, palpitations and sweating. He had been in good health with no medical problems until he went to a restaurant. Approximately one half hour after beginning his meal with wonton soup he developed a burning and tight sensation in his chest, face and neck. He began sweating and felt weak. A friend who was dining with him also developed some weakness and tingling in the arms, but the symptoms were much milder.
>
> He drove home and shortly after developed chest pain and pressure with the pain radiating to both shoulders and upper arms. The chest pressure lasted about one half hour and then subsided, but the weakness remained and the man was brought to the hospital.
>
> An electrocardiogram showed ventricular tachycardia and he was treated with lidocaine, a medication to reduce the excitability of the heart. Within three minutes the rate and rhythm had returned to normal. Overnight hospitalization showed no further changes and tests revealed no heart damage.

Dr. Gann's conclusion was that MSG can produce not only a feeling of chest pressure and pain but it can cause serious heart irregularities in susceptible individuals.

Dr. David Ratner, Dr. Elyakim Esmel, and Dr. Ehud Shoshani reported on their cases in the *Israel Journal of Medical Sciences* in 1984. One 52-year-old man was admitted twice to their coronary care unit because of severe upper abdominal pain and a burning sensation in his chest. Full medical evaluation failed to show a cause. The physicians tested him with MSG and he developed shortness of breath, numbness of the legs, heat in his face and chest, and abdominal swelling and pressure. Follow-up revealed that since avoiding MSG he has been free of symptoms.

Other examples of the range of MSG reactions show a broad spectrum of problems, from mild annoyances to severe debilitating symptoms, as illustrated in the following case histories.

Case Histories

Migrainelike headaches were experienced by a 40-year-old female, S.B. She relates her story:

> In the 1960s, I was having debilitating migraine headaches two or three times a week. No painkillers got rid of the migraine completelyit just had to wear off. A couple of times a doctor even came to my house and gave me an injection to put me to sleep. I was in my early twenties and living in California. For the most part the doctors were at a loss for a cause and patted me on my back saying, "Now, dear, you have to quit letting things get to you."
>
> One day I read about the "Chinese Restaurant Syndrome." What a revelation! For lunch I was having lunchmeat sandwiches or canned soups. Then I'd use Accent salt when preparing dinner.

Avoidance of MSG brought dramatic results.

I find my efforts to avoid MSG are difficult when traveling or eating at friends' houses. I once ate two sausage patties and was sick in less than an hour. The reaction usually lasts almost 12 hours: flashing lights, nausea, light-sensitive eyes, pounding pain (always in the same spot over the right ear and in my right temple), weakness, and slurred speech.

In 1980 I had surgery. My first food after the procedure was beef broth, which I refused to eat until I reviewed the ingredients. It took the hospital more than three hours to produce the ingredients (which of course contained MSG) and much persuading before they would bring me a different meal. I couldn't believe the hospital dietician hadn't heard of MSG!

L.M., a 49-year-old female, reports the following:

About a year ago I was having a set of symptoms that led me to see two physicians (an internist and a psychiatrist). My symptoms were wide mood swings, headaches, and hot flashes. Being 48 at the time, I thought it might be menopausal symptoms. My doctor put me on a light concentration of estrogen. The hot flashes, headaches, and mood swings were lessened, but I still experience them periodically, and they seem to be related to food and fatigue.

My headaches come about 4560 minutes after I eat things like fast-food hamburgers. Many of my headaches are at the base of my skull where the spine connects. It's a throbbing headache. Other symptoms that I experience are stomachaches and diarrhea, muscle aches all over my body, dizziness, and trouble with vision. I am 49 but feel like I am 80.

In recent years I have suspected I might be reacting to MSG because of an increase in stomach cramps, headache, and diarrhea after eating Oriental food. I have tried to eliminate it from my diet by avoiding foods labeled with MSG but still continue to have occasional

> headaches, stomachaches, and listlessness after eating some foods. I realize now that I must not only avoid MSG, but also ingredients such as hydrolysed vegetable protein and natural flavors.7

MSG reactions can drastically affect peoples' life-styles, their emotional states, and their physical well-being. One of the most drastic, long-term reactions is related by R.E., a 45-year-old woman. A particularly distressing aspect of her reaction was her arthritislike symptoms. The next case accentuates the potentially disabling effects of the joint and tendon symptoms:

> About eight years ago I became ill with a low-grade fever and muscles that hurt so bad that I had trouble moving out of a chair. We thought it was the flu, and I missed an entire week of work. The fever subsided at the end of the fifth day and the muscles were less sore until I used them. Even normal activity like walking up and down stairs caused problems.
>
> I am a very active person. From that time on until now, every time I exercised (even singing more than normal), I would be very sore after a short rest. I could still do activities such as golf but couldn't get out of the car when we returned home from the golf course. My eyes seemed strained after a short time of reading, my singing voice was acting like I was overusing it, and my hands would get sore just holding a knife for a short time or when playing the piano or typing on the computer. What was so strange was that the muscles didn't bother me as long as I was using them, only after I stopped.
>
> I was checked for lupus, multiple sclerosis, muscular dystrophy, and arthritis. The doctor put me on beta blockers along with a diuretic for stress and a borderline high blood pressure.
>
> My present doctor suggested I see a physical therapist to deal with the symptoms. She would give me a massage to relieve the muscle

7 May contain amounts of MSG.

spasms. It helped for only a short whileuntil I did more than just sit or stand. I forced myself to walk approximately two miles a day just to keep up my normal level of exercise so I wouldn't hurt just to move.

One day we went to an Oriental restaurant for dinner. I carried the leftovers home and ate them for lunch the next day. During the 24 hours that I ate the Oriental food I became increasingly sore and had a bad case of diarrhea. In desperation I called my physical therapist and she asked me what I had eaten in the last 24 hours. She suggested that I locate everything in my kitchen that contained MSG and not use it for the next five days. At the end of five days I was not sore for the first time in eight years.

Every time I eat out I can tell within half an hour if I have ingested MSG inadvertently by a return of the diarrhea. Some restaurants are not very good at telling you if they use MSG. If I get a dose it takes exactly five days for it to work out of my system.

I discovered that all my regular seasonings, soup mixes, sauces, salad dressings, meats, etc., were laced with MSG. Needless to say, I don't use them anymore and I am free of the constant pain. We have a hot tub that I used for stress and over-use of muscles, but the hot tub is not needed anymore for me to be able to function normally. Paring vegetables and fruits causes no problems either. Golf and cross-country skiing are again joys. Dancing and singing are again pleasures.

It is a pleasure to be free again and know what is causing a problem when it happens (which is rare now). I have learned what foods contain MSG and ask very pointedly about the contents. Eating, of course, is not a carefree sport anymore, but I feel good.

There is a syndrome involving muscle and joint aches that can be mistaken for arthritis. The next case of a 55-year-old female pediatrician is very similar to that of R.E.:

E.B. had tendinitis and arthritis of all her joints, particularly in her lower extremities. For a period of 15 years she underwent extensive testing, but no cause could be determined. At times it was necessary for her to use a walker to move about her home.

One evening she went with her family to an Oriental restaurant for dinner. The following day she could not move about, even with the aid of the walker, due to extreme swelling and pain.

At this time she suddenly considered MSG as a possible cause. Tracing her symptoms to MSG in Oriental food and also common foods gave her "a new life."

It took a large dose and a 15-year history to uncover the cause of her suffering. E.B. remarked that "because of this symptom I lost so much time and lost out on interviews. My life now might have been very different if I had known [about MSG]."

Also of some interest is the fact that her daughter, a 24-year-old medical student, experiences great lethargy after ingesting MSG.

While ingestion of MSG does not always cause such severe, debilitating reactions, other responses can be very unpleasant. L.P. is such an example:

L.P. is a healthy 40-year-old physicist born in China. He takes no medications and has no known allergies. He developed episodes of a rash over his entire body, with circular areas ranging from quarter-sized circles to large circular areas over six inches in diameter. The rash would clear up in a week or two, but it was so uncomfortable that he consulted a dermatologist, who diagnosed the condition as "atopic dermatitis."

With scientific precision, L.P. began to keep a log of his activities to discover the common rash-causing factor. After several months it was clear that the rash occurred within a day of his eating at Oriental restaurants. After experimentation L.P. determined the cause

of his rash was definitely MSG, as the rash did not reoccur when this additive was eliminated from his diet and would return whenever he inadvertently ate MSG-containing foods.

L.P. also experienced outbreaks of rash after long flights on commercial airlines. This had been diagnosed by another physician as a "altitude rash," but meals served on board planes frequently contain MSG [see Chapter 9]. L.P. had assumed, as many do, that MSG is found only in Oriental cuisine.

Another typical case was reported by D.J., a 39-year-old male:

I'm divorced, living alone in a small apartment, and have been frequenting a new Chinese restaurant. I started out slow in my consumption but have gradually been increasing my visits to three or four days a week. I began to notice in the afternoon after eating there that something wasn't so pleasant.

I would become depressed and my stomach would be churning and a very distinct aftertaste would develop. I've also been having some sharp headaches. They are always centered just above my right temple.

E.S., a 49-year-old woman, works as a physical therapist. Her reaction illustrates how some of the severe symptoms can appear like a stroke:

She first noticed some reaction to MSG after eating soup at a Tahitian restaurant when she was in her early twenties. At that time she found her speech to be slurred, began to shake, and felt as though she would lose consciousness. Approximately ten years later E.S. was eating an Oriental soup on an empty stomach. She experienced these same symptoms along with a tremendous feeding of weakness and depression that took several days to resolve.

She believes that as she has aged her tolerance to MSG has decreased and that she is now much more sensitive. E.S. notices

> bloating and weakness at much smaller doses than were previously tolerable. When she ingests a large dose her speech is slurred and her balance is affected. The reaction always takes several days to clear.

Many of the case reports received contain such vague symptoms as swelling, fatigue and moodiness, tension across the forehead, ache in the jaws and temples, and headaches. One elderly woman reacts with severe hives and difficulty waking after ingesting MSG. Others report diarrhea and vomiting or sneezing and nasal stuffiness.

As stated in a summary by A.S., a 38-year-old man, the reaction to MSG can be momentarily severe and frightening:

> In 1973 in Boston I was out for lunch with three fellow employees and our boss. We chose a Chinese restaurant for our meeting place. As we were leaving the restaurant the boss's face became flushed. He complained of chest pain and felt he was having a heart attack.
>
> All four of us got excited and decided to rush him to a hospital. On the way I noticed that my jaw was particularly locked up. I couldn't open my jaw all the way, a symptom I had heard could be related to MSG overdose.
>
> The delay of time due to heavy Boston traffic allowed us to see that the boss's condition was not as serious as we had thought.
>
> Since that time, I have experienced this locking jaw a few more times after eating at a Chinese restaurant.

Monosodium Glutamate Intolerance in Children

While it has become clear through clinical studies that many adults react adversely to MSG at levels commonly found in processed foods and almost all will react as the dose is increased, children have not been used as subjects for test experiments. However, 19% of the children interviewed by Dr. Liane Reif-Lehrer reported adverse symptoms and

10% of the adults who reported symptoms also remembered having them during childhood.

As a precautionary measure the manufacturers of baby food removed MSG in 1969 when early tests with experimental animals cast some suspicion on its safety. Yet MSG is still found in some baby foods. It is also a common element in the diet of children who eat ordinary canned and processed meals, not to mention fast-foods and school lunches. There is no regulation whatsoever on the use of MSG in school cafeterias despite its possible ill effects. In fact, current trends allow fast-food pizza and hamburger chains to sell their MSG-laden products during the children's lunch hour. Dr. Reif-Lehrer became especially concerned in 1976 when she encountered three children whose serious symptoms were traced to this food additive.

The first case involved a child who developed "shudder" attacks at the age of six months when he was started on adult foods. The attacks continued and the child was thought to have a form of epilepsy. Yet the medications ordinarily used for seizures were ineffective in his case. These symptoms of "shudder-shiver" were finally traced to MSG in the child's diet. The symptoms soon stopped after the diet was changed. They returned during a period of trial feedings with food known to contain high amounts of MSG. I have since discovered several other cases such as this one, in addition to finding children with unexplained true seizures.

Her next case, reported in the *New England Journal of Medicine*,[8] involved a 16-month-old child who developed what were described as "shivers." The symptoms disappeared when her diet was changed to eliminate MSG. This case was confirmed by other physicians

8 Reif-Lehrer, Stemmermann MB: Monosodium Glutamate Intolerance in Children. *N Engl J Med.* 293:12045, 1975.

at the Montreal Neurologic Institute,9 and we have received numerous reports of this phenomenon which mimics epilepsy and convulsions.

Dr. Reif-Lehrer also described a 14-year-old boy who had experienced episodes of intense headaches and vomiting since he was ten. He had been diagnosed as having "a migrainelike syndrome or seizure equivalent." Eventually, his symptoms were traced to monosodium glutamate and the episodes were controlled.

One grateful mother wrote to Dr. Reif-Lehrer:

> Because of your studies on monosodium glutamate, my son Todd has been relieved of severe migrainelike headaches and stomachaches. Todd started this behavior at about age ten and was finally hospitalized at age 11 for all kinds of tests. These showed nothing but a slight electroencephalographic abnormality, not uncommon in children. The neurologist sent him home with a short list of foods to eliminate. Monosodium glutamate was on the list.
>
> Todd has had only one slight case of this behavior since that day and this was because he ate some chicken noodle soup at scout camp. We watch carefully for this ingredient in any foods and avoid it.
>
> Thank you so much for spreading the word.

Many other letters of this sort were receivedbut had the word really been spread? The letter about Todd was written in 1978. Since that time the amount of MSG added to foods has increased at least five times.

The rise in ADDAttention Deficit Disorderin children coupled with the increased use of the drug Ritalin directly parallels the rise in MSG use. Some symptoms of ADD are hyperactivity, lack of

9 Andermann F, Vanasse M, Wolfe LS: Shuddering Attacks in Children: Essential tremor and monosodium glutamate. *N Engl J Med* 295:174,

concentration, and behavioral volatility. It is likely that the performance of millions of schoolchildren in their ability to read, concentrate, and score high on tests is being altered by MSG intake.

Asthma and MSG

Asthma may be precipitated by MSG. Dr. David H. Allen and Dr. Gary J. Baker from Australia published a report in the *New England Journal of Medicine* about two young women who developed severe asthma episodes after ingestion of MSG at Chinese restaurants.[10] Originally, these doctors were skeptical about MSG being the precipitating factor. They gave capsules containing 2.5 grams of MSG to the young women (a bowl of wonton soup contains approximately 3 grams). In both cases there were asthmatic reactions. The first case responded to simple treatment. The other young woman had severe unresponsive asthma, requiring that she be placed on a ventilator.

Not content with their initial experiments because they were carried out on only two people, the scientists decided to expand their study. Working from the department of thoracic medicine in the Royal North Shore Hospital in Sydney, Australia, Dr. Allen, Dr. Baker, and Dr. John Delohery worked for three years to establish the link between MSG and asthma.

Their results were reported in the Journal of Allergy and Clinical Immunology *in October 1987 and are alarming*. Over a three-year period of time they tested 32 patients with asthma. These patients were selected for testing because of either a history of an attack after a Chinese restaurant meal, or "unstable" asthma with sudden severe unexplained attacks. Also, some patients with a past history of being

10 See Appendix 2 for the "first person" account of this important discovery.

sensitive to other chemicals were chosen (for example, prior reaction to sulfites or aspirin). The asthma reactions were not confined simply to mild shortness of breathas the following case illustrates.

A 23-year-old registered nurse was presented to the emergency room as 8 A.M., 1112 hours after ingestion of a 15-course Oriental meal. On awakening that morning her asthma progressed in severity and did not improve with her usual inhaled medications designed to dilate the airways (called bronchodilators). Because of her worsening condition, full intravenous treatment was initiated in the hospital, including giving her adrenaline, cortisone, and bronchodilators, but they did not help. Close to death, she required intubation (a tube inserted into her windpipe), artificial ventilation (by a machine ventilator), and a partial cardiopulmonary bypass. Finally, after five hours of this intensive treatment, she began to improve.

When later tested with a dose of MSG, she developed an asthma attack. She was tested with less than one-half teaspoon of MSG and developed asthma and stomach pain after 12 hours. Naturally, she was very cautious, as were her doctors, and they agreed that only one test dose be administered and the dose be such that she might get it from food. It was critical to determine if MSG was producing her asthmatic attack. In the evening she was given two and a half grams of MSG (less than a half teaspoon). She did not have asthma through the night and the following morning she was well until around 10 A.M. when a sudden severe asthmatic attack occurred. Within a half-hour she again required intubation and ventilator support for five hours.

Dr. Allen and his colleagues placed her on a strict diet to avoid MSG and to report on that regiment. "This patient's asthma is now well controlled. She has stopped oral cortisone, rarely requires admission to the hospital and has not been ventilated in two years." While this patient's case was particularly dramatic, Dr. Allen and his associates presented 13 cases of asthma that they concluded were induced by MSG. All in all, of the 32 patients studied, 16 appeared sensitive to MSG.

Using a "challenge dose" of pure MSG, the scientists then performed tests to measure lung function. As a test dose, they chose one-fourth to one-half teaspoon (1.5 to 2.5 grams)a dose that would commonly be taken from ordinary food. Their results add to the serious questions about MSG and asthma. Of the 32 patients, 13 responded to the test doses of MSG with marked reductions in their air flow. An asthma attack developed in seven people within one to two hours, and in the other six people attacks occurred within 12 hours.

This careful landmark study leaves little room for doubt. The conclusion that MSG can provoke an asthmatic attack is inescapable. The scientists also were able to show that the reaction is worse as the dose increases and that an attack may be delayed as long as 12 hours.

The FASEBFederation of the American Society for Experimental Biologyreport[11] commissioned by the FDA reconfirmed the asthma connection in 1995 with the statement "MSG-induced bronchospasm being demonstrated." The report goes on to identify asthmatics who "may be more susceptible to MSG." Their report is clear: MSG caused bronchospasm in asthmatic patients.

Many asthma sufferers are seen in emergency rooms. How many of these cases are precipitated by MSG has never been analyzed. Rarely are patients with asthma told to avoid MSG or to change their diet, and if severe illness occurs patients are unable to give such histories.

According to government statistics, the overall death rate from asthma has increased between 1980 and 1997. The rise "astonishes medical professionals," according to the *Wall Street Journal,*[12] and in 1998 scientists still admit that the reasons are puzzling. Yet this rise directly tracks the increasing use of MSG, a known asthma precipitant

11 Analysis of Adverse Reactions to Monosodium Glutamate (MSG). Federation of the American Socieities for Experimental Biology, FDA

in foods. More than ten million Americans suffer from asthma, and the National Institute of Allergy and Infectious Diseases terms it "the leading cause of absenteeism among schoolchildren." The incidence in children aged three to 17 is rising rapidly. Some of the increase is related to MSGand MSG asthma can be a difficult condition to treat.

This will be covered more elsewhere. Of great significance is that despite the plethora of new therapies and new inhalers, the incidence of asthma, the hospitalization rate, and the mortality rate for pediatric and adult asthma have increased in the United States during the past two decades.[13] This rise in asthma and asthma deaths directly tracks the increased MSG use in the United States and is the likely cause.

Depression and MSG

In 1978 Dr. Arthur Colman, a psychiatrist in Sausalito, California, identified a depressive reaction in a 38-year-old woman that was traced to MSG. His patient's reaction involved a prolonged psychological effect lasting two weeks:

> Elisabeth was a 38-year-old professional woman and mother of two children who was in good health until she ate food containing MSG. Approximately half an hour after she ate this additive she noticed a feeling of tightness around her neck, pressure behind her eyes, a mild headache, some flushing, and mild nausea and stomach pains. She went to her physician because of her symptoms and an extensive evaluation showed no ulcer or intestinal disorder. These attacks came frequently and, at first, no cause could be established.

13 Centers for Disease Control and PreventionAsthmaUnited States, 19821992. *Morbidity Mortality Weekly Review* 43: 952, 1995.

> Eventually, a more troubling symptom developed. She began to have a short-term depressive reaction. Elisabeth would feel gloomy and then would believe that other people were speaking to her with sarcasm and unpleasantness. Her whole family noticed these episodes with her typical facial expression and downcast spirits. Within a week or two this strange reaction would disappear.
>
> Finally, her husband began to trace her reactions to the food she was eating and discovered the cause to be MSG. When she succeeded in eliminating MSG from her diet, all symptoms stopped. On some occasions the symptoms recurred and in each instance MSG was found in one of the foods she had consumed.
>
> Discovery of the cause of Elisabeth's symptoms made a dramatic difference in her life. As her husband said, "It would be a mild statement to say that life has been better for Elisabeth and our family since the cause of her distress was discovered. The depressive episodes are entirely gone and the emotions she experiences feel to us and to her more natural. It is far easier to become genuinely angry or sad when one does not feel in the grip of a toxic substance. The continual abdominal and stomach distress has entirely gone.

Dr. Colman concluded, "There are obvious neurochemical clinical and social implications of this psychiatric syndrome."

After the case report was published, Dr. Colman received dozens of letters from other people suffering symptoms that were traced to MSG.

Depressive symptoms may vary, but all depressive conditions share certain features: sadness, slowed motor activity, less self-confidence, and what the late Dr. Nathan Kline, a leader in the evaluation and treatment of depression, considered the cardinal symptomanhedonia, that is, lack of pleasure. Put simply, anhedonic people fail to experience the usual satisfaction from their life and activities. The striking case report of Elisabeth aroused enormous interest because there are an estimated 100 million people worldwide

who suffer from clinically recognized depression. Teenage and childhood depression is also on the rise, with increased teen suicide rates.

The rising incidence of depression in younger age groups has resulted in the coinage of a new phrase, "Agent Blue," as reported in the *Atlantic Monthly* in December 1986: "More people are becoming depressed and at much younger ages. The ailment is so prevalent that some National Institute of Mental Health scientists privately speculate that an unknown 'Agent Blue' may be spurring its spread." With the tendency of children and teens to eat processed foods at home and at fast-food restaurants, their dose of MSG is increasing. Symptoms induced by this flavor enhancer are a factor in the rising rate of depressive conditions. Now that antidepressant medications such as Prozac are billion-dollar businesses such depression can be treatedbut at a tremendous financial and medical costnot to mention a wide range of side effects.

One of the greatest dilemmas encountered by physicians is the proper treatment of depression. Most advocate drug therapy along with counseling or psychoanalysis. Still others even recommend shock therapy. How many of the estimated 100 million sufferers are experiencing the depressive symptoms caused by MSG? Just this simple dietary modification of eliminating MSG has caused enormous relief from many symptoms of depression. In how many of these cases is MSG identified as the real culprit? Some physicians and psychologists who treat depressed people are aware of this possible cause but others still need to know. Research leads to the conclusion that many people are experiencing mood changes directly associated with MSG.

Dr. Reif-Lehrer's questionnaire study indicated that 30% of her subjects were aware of experiencing some reaction to MSG. This finding has been confirmed by many other investigatorsthat amounts of the flavor enhancer commonly added to many foods induce MSG-sensitive symptoms. My own studies have confirmed that figure.

Between 25% to 30% of the people I have questioned believe they have had reactions to MSG. In addition, when the question is asked, "Do you react to MSG or know someone who does?" the positive response is almost unanimous. In Chapter 5 there is a symptom checklist which can be used by readers to determine if they belong to this group. Depression is a subtle psychological symptom in its earliest form, but chemical theories support the scientific base for MSG involvement. However, regardless of whether or not the biochemical mechanism can be pinpointed at this stage, sensitive people can react to MSG with a depressive response. Sometimes it is short lived, a matter of hours. In the initial case report of Elisabeth, the 38-year-old woman's depression lasted as long as two weeks and caused marked life derangementsalmost to the point of divorce.

When mood changes occur, people will frequently act upon their mood swings. If they become sad and irritable, those around them suffer. One sensitive reactor I interviewed noticed how he became depressed and angry: "Until I discovered my reactions to MSG I was always getting into arguments after eating at Chinese and fried chicken restaurants. We once went to marital counseling [several days] after such an argument, but by the time we got there . . . the reaction had cleared and I couldn't even remember what made me so annoyed."

Depression is one of the most common psychiatric disorders treated by physicians in office practice. Dr. Nathan Kline stated that "more human suffering has resulted from depression than from any other single disease affecting mankind." From our research and case studies, the conclusion is inevitable that some of the increasing depression in our society is, in fact, caused by the increased ingestion of MSG. Because of these concerns some physicians have begun to uncover and identify cases of MSG reactivity, particularly those with behavioral change and depression as important components.

Many cases. such as that for Dr. A.R., a California physician, have now been reported:

A 44-year-old physician and allergist, Dr. A.R. developed a sensation of dizziness and whirling. This symptom continued until it became disabling and the doctor had to be driven to work every day. He also noticed a feeling of great weakness about an hour after lunch.

Eventually, Dr. A.R. consulted a neurologist. His symptoms at that time were, in addition to a whirling sensation, difficulty in reading, depression, diarrhea, and frequent headaches. The neurologist sent Dr. A.R. to the hospital for a complete neurological workup, including brain scans and electroencephalograms. These proved to be negative.

Dr. A.R. finally traced his symptoms to a seasoning salt he had been using that contained monosodium glutamate. He also was taking in MSG from many other sources. The symptoms disappeared about a week to ten days after elimination of MSG from his diet. In fact, Dr. A.R. reported that after eliminating MSG from his diet he felt better than he had in years. Whenever he accidentally consumes the flavor enhancer, the symptoms reappear.

Dr. A.R. warns, "I have seen many patients with chronic headaches, depression, and fatigue. These patients are most grateful when they find that their symptoms go away when they avoid MSG."

Why do such symptoms occur? In Chapter 6 we will delve further into the human biochemistry and some of the animal experiments that point to the brain sites of the reactions. For the subtle behavioral changes in humans, though, we must study people.

Dr. Reif-Lehrer was an associate professor in the Department of Ophthalmology at Harvard Medical School when she first became interested in glutamate effects. She is what is usually termed a "basic scientist," that is, a scientist who concentrates on research into basic effects in isolated tissue cultures under carefully controlled conditions. Having seen MSG toxicity on an experimental level (after adding it to chick retinas and tissue cultures), she began to wonder if MSG was affecting children. After interviewing 300 children she concluded that about 20% reported reactions that appeared to be MSG related.

Because her questionnaire study of 1,500 adults found that approximately 30% had adverse reactions to foods containing added MSG, she was called to testify on glutamate before the FASEB Select Committee on GRAS (generally recognized as safe) substances. She concluded in her testimony in July 1977 that "because of the results of some of the available laboratory studies and because there is a sizeable amount of information indicating that an appreciable number of people do perhaps react adversely to elevated levels of glutamate, it would seem the better part of wisdom not to have unrestricted use of this material until further research has been done concerning possible subtle and long-range effects of this amino acid in humans."

While acknowledging that "there is evidence that some individuals may respond to relatively small doses" and recognizing that "there should be some constraint placed on the addition of MSG to processed foods," the FASEB Select Committee made no further finding. The principal reason given for their not taking a more vigorous anti-MSG stand was that it did not cause brain damage in experimental animalsbut how do we measure depression or mood change in such an animal? What about headache, flushing, chest tightening, and the myriad symptoms reported by human patients that are difficult or impossible to identify in nonspeaking subjects?

The report further notes that MSG is listed on food labels and so people sensitive to it can avoid it. Right? Wrong!

Hiding MSG

What could be better for us than protein? And everyone knows vegetables are good for us. Thus, "hydrolyzed vegetable protein" sounds safe and even wholesome. However, this is the chemical method of producing monosodium glutamate. A mixture of hydrolyzed protein contains the salts of other proteins as well, and monosodium glutamate may comprise as much as

40% of hydrolyzed vegetable protein (the usual range is 1220%). The flavor enhancement produced by this mixture is almost entirely dependent on MSG.

Few people are aware that products containing hydrolyzed vegetable protein frequently are advertised as "all natural." While MSG must be specifically listed on food labels, hydrolyzed vegetable protein, which contains MSG, may be designated simply as "natural flavorings" or in some cases "spices" or "natural seasonings."

A list of commonly used aliases under which MSG may legally be hidden can be found in Chapter 8, and a detailed description of how hydrolyzed protein is created is in Appendix 4.

Hydrolyzed Protein and Autolyzed Yeast (Yeast Extract)

The use of hydrolyzed protein for its MSG content as a flavor enhancer was discussed in some detail on the 1988 book *In Bad Taste: The MSG Syndrome*. Since the publication date, though, I have discovered some more interesting information relating to hydrolyzed proteins. On its own, hydrolyzed proteins generally have an MSG content of approximately 1220%. However, some flavoring manufacturers add pure monosodium glutamate to the hydrolyzed protein, thus increasing the MSG content to 40% or 50%. There is no way for the consumer to know which kind of hydrolyzed protein has been used in a product.

Another current way food processors are adding glutamate to their products is in the form of autolyzed yeast (sometimes called yeast extract). This substance is less expensive than hydrolyzed protein and has been advertised as a replacement for MSG and hydrolyzed protein. Its MSG content is usually 10% to 20% MSG, but may occasionally be higher.In one chemical company's brochure promoting the use of autolyzed yeast, it was emphasized that when using this substance in meat and poultry products, it can be labeled either as "natural flavoring" or "flavoring."

When hydrolyzed proteins or autolyzed yeast are labeled as flavorings, their protein nature need not be revealed. In this way food processors may add proteins to their processed meat products; these "proteins" may come from old milk, decaying vegetables, or even pork blood. Since the USDA (U.S. Department of Agriculture) requires a certain minimal protein content in meat products, the use of hydrolyzed proteins or autolyzed yeast as "flavorings" is a cheap way of achieving the necessary proportion of protein content.

For those consumers who wish to know if hydrolyzed protein always contains MSG, the answer is in the Code of Federal Regulations, Section 101. 35. If, for any reason, the MSG is extracted from the hydrolyzed protein, the label must read "hydrolyzed protein (MSG content reduced)." If this is not found on the label, the hydrolyzed protein contains monosodium glutamate.

Caseinate

Various other sources of MSG-containing substances include hydrolyzed milk protein labeled as "caseinate" or natural flavorings. This is labeled as sodium caseinate or calcium caseinate. Although this must be labeled on most food items, it is allowed by the FDA to be added to frozen dairy products without specifying so on the label. The MSG content of caseinate is approximately 12%.

Occasionally, a food product will have "No MSG Added" on its package. This only means that monosodium glutamate in its pure form has not been added to the productnot that MSG-containing substances such as hydrolyzed proteins aren't used. The "No MSG" designation on a label requires the manufacturer to abstain from using any product that contains MSG, including hydrolyzed proteins and autolyzed yeast. There have been many cases of mislabeling "No MSG" when the product contained hydrolyzed protein. One such mislabeling led the Union Foods Company in California to recall 135,000 cases of its

Golden Ramen Oriental Noodles and to pay the state of California a $153,000 civil fine. This resulted from several consumer complaints. Any product that is mislabeled can be turned into your state District Attorney's office for prosecution.

Ribonucleotides, Disodium Inosinate, Disodium Guanylate

Most consumers see the terms disodium inosinate or disodium guanylate on an ingredient label and are at a loss to know what they are. These compounds, more technically referred to as 5´-nucleotides, are MSG enhancers.[14]

Rapidly cleared by the FDA in the late 1970s with little testing, we have relied on case reports to see adverse effects. The reports indicate powerful MSG effects with increased neurologic actions when the ribonucleotides are mixed with MSG.

Flavor-enhanced table salt is prepared by blowing a spray mixture of a ribonucleotide (usually disodium inosine phosphate) and monosodium glutamate into salt being agitated.

Headaches and MSG

Headache, including migraine headaches, is a common symptom of MSG sensitivity and has been documented by many physicians and researchers. The following case of a young woman shows that MSG-related headaches may be socially disabling:

> Jackie is a 21-year-old graduate student who had experienced occasional headaches for many years. She had received full

14 Shiga A, Kanemitsu A: US Patent 3,410,695, November 12, 1968; assigned to Kyowa Hakko Kogyo Col, Ltd., Japan.

neurological tests, including EEG [electroencephalogram] and brain scan, but these showed no apparent cause for her complaint. In other respects her health was good.

When Jackie became a graduate student she began to spend more time in study at the library and at home. She also began to eat more frequently at fast-food restaurants. At this time the severity and frequency of her headaches increased and she needed narcotic-type medications to control them. She began using Percodan almost on a daily basis.

Eventually, her physician suggested that diet might be a factor in her headaches and he suggested she avoid Chinese food. The headaches began to lessen frequency after a few days but still they persisted.

At that point Jackie began some investigating on her own. She discovered that the fast-food hamburger chain she frequented added MSG to its hamburger mix and that it also was added to the canned tuna fish she liked and the sauces at her favorite restaurant. Even the onion soup at an exclusive French restaurant in her locality was laced with "protein powder." She discovered that packages labeled "No MSG or preservatives" contained such ingredients as "Kombu-extract," that is, MSG, and "vegetable powder," that is, MSG, in hydrolyzed vegetable protein. In short, these labels were misleading.

Motivated by the continued severity of her headaches, Jackie methodically removed all MSG from her diet and began eating a diet of fresh foods at home. Within two weeks her headache problem of several years had almost completely disappeared.

She still gets occasional headaches when she is upset or under tension, but she says that these are very different in severity and duration from those she formerly experienced She reports that her life has been improved in many areas and her social life in particular.

Children's Headaches: Migraine

Children's migraine headaches can be devastating for school performance. One 1997 article[15] demonstrated the imbalance of excitatory amino acid turnover in children with migraines. These findings are like pieces of a puzzle coming together to demonstrate the profound effect of excitotoxicity in patients (both adults and children) with migraine headaches.

Ritalin and MSG

We are witnessing an astounding increase in Ritalin use for children diagnosed with ADD (attention deficit disorder), ADHD (attention deficit hyperactive disorder), and hyperactivity or behavioral disorders. In fact, as of 1998, the amount being used is up more than seven times compared to the previous decade.[16] By tracking the rise in MSG use, it is apparent that we are in the midst of a societal experiment in treating MSG-induced neuroexcitatory effects in children. There is little question that Ritalin works. Being a potent neurostimulant, it overdrives the ongoing erratic MSG stimulation. Much like Prozac (fluoxetine) is effective for MSG-induced depressive symptoms, Ritalin is effective for a wide range of MSG-induced symptoms.

Should we be using a potent drug, in many cases just to treat another drug reaction from monosodium glutamate? The thousands of cases responding solely to MSG elimination indicate a likely widespread response. Even more distressing to me are the less advantaged children who have their education destroyed by MSG intake.

15 Deufemia P, Finocchiaro R, Lendvai D, Celli M, Viozzi L, Troiani P, Turri E, Giardini O: Erythrocyte and plasma levels of glutamate and aspartate in children affected by migraine. *Cephalalgia*, 1997 Oct, 17:6, 6527.

16 *Time Magazine*, p. 89, November 30, 1998.

Other Symptoms Associated with MSG

Aging

Many people who are sensitive to the effects of MSG have reported that they could eat the additive with impunity when younger but noticed increasing reactivity with age. With decreasing ability to shop for fresh foods, particularly in winter, older people often must rely more on processed, canned, dried, and prepackaged food. With the current level of MSG addition to such foods (either as pure MSG or in an MSG-containing substance such as hydrolysed vegetable protein), this ensures a steady MSG diet, which is a factor in edema and depression. (The frequency of depression in the elderly often has been noted, but the association between such states and diet is rarely made.)

The elderly moving from their homes to an assisted-living environment or nursing home may find the change from homemade meals to commercially prepared foods very stressful to their health. Most elder care facilities are not conscious of the MSG effects upon the frail and elderly.

In addition, there recently has been an enormous media blitz about liquid protein drinks such as Ensure and Boost. Designed originally to be used for feeding disabled persons with gastrostomies (tube feeding directly into the stomach), the market has been increasingly focused on the newly retired aging population. While a good source of protein, vitamins, and minerals for those who cannot tolerate regular foods, these are high sources of hydrolyzed proteins and will cause MSG reactions.

Other symptoms associated with MSG sensitivity include dizziness and balance difficulties, problems common to the elderly. In larger concentrations, MSG is a potent nerve toxin, and it is likely that chronic long-term ingestion may be involved with Alzheimer's and Parkinson's disease, as well as with other nerve cell degenerative diseases, such as amyotrophic lateral sclerosis (Lou Gehrig's disease).

A summary of the experimental evidence linking glutamate and human disease has been documented through hundreds of scientific studies (see Selected References in Appendix 5). Injection of glutamatelike substances can produce many of the abnormalities of Huntington's disease, such as bizarre movements and mental deterioration, and suggests that glutamate neurotoxicity may be involved in the cause of this disease.

Some of the brain cell degeneration found in Alzheimer's disease, a form of senility and dementia, may be caused by increased stimulation of parts of the brain by glutamate. An elevated glutamate level has been associated with one type of brain cell atrophy (olivoponto cerebellar atrophy), causing severe balance difficulties, and the glutamate-Lou Gehrig's disease links are strong.

> With these associations it may be wise for people with a family history of nerve cell degenerative disease to limit their intake of MSG as early as possible. In fact, recent treatments for stroke and brain injury have focused on antiglutamate substances to prevent glutamate-induced nerve cell destruction.

Women's Cycles

Some women of childbearing age who are sensitive to MSG also associate this substance with the worsening of premenstrual syndrome (PMS) symptoms. PMS affects many women in various degrees and generally includes swelling, mood changes, depression, irritability, and general malaise. The reported cases clearly suggest that individual testing is necessary to show which cases of PMS are worsened or possibly even initiated by the use of monosodium glutamate. In addition, there have been some reports of excessive menstrual bleeding that diminished markedly upon elimination of MSG from the diet.

Prostate Symptoms and Urinary Retention

Intermittently, we have received case reports of urinary retention associated with MSG intake. The obvious connection is with the swelling of the prostate gland, but there may be deeper neurological reasons, such as neurostimulation, preventing the relaxation/release needed for urination.

In correspondence received, one MSG-sensitive man wrote:

> I have suffered from MSG for many years. My symptoms are very severe. In my case, it causes severe bladder irritation and urinary retention, starting as soon as half an hour after ingestion of this poison There is a strong urge to urinate with no relief possible. I may have to get up 25 to 30 times at night with little relief. This condition can last for about 24 hours.
>
> Urinary retention is a potentially life-threatening condition by causing eventual kidney failure with all its consequences. I once was anesthetized on the operating table for a prostatic surgery when it was discovered that I had no prostate problem.

Another stated:

> Dr. George Schwartz [and my personal physician] have been informed of my particular problem severely aggravated by MSG. Benign prostatic hyperplasia is definitely made more miserable for its victims because MSG causes a swelling of the prostate smooth muscle tissues, resulting in urgent and frequent severely restricted voiding and "nocturia" that keeps the individual up and down all night long. Dr. Schwartz has indicated that MSG may have a causal relationship to urinary retention, not just create an aggravation.

Glutamate and Schizophrenia

For ten years we have received letters and calls from patients with schizophrenia who control their disease to some extent by avoiding MSG and other neurotransmitters. In 1997, a study[17] from Harvard Medical School lent support to this clinical observation. The observation was made that glutamate receptors in the brain are altered in schizophrenia and that clozapinea potent antischizophrenic drugacts to block glutamate receptors. Agents acting at certain sites on the N-methyl-D-aspartate (NMDA) receptors (glutamate mediated) can produce signs of schizophrenia in normal subsets.

Rage Reactions

Reports of rage reactions induced by MSG become clearer with an understanding of the neuroexcitatory effects of MSG. The 1984 "McDonald's Massacre" in San Ysidro, California, had an MSG-sensitive killer. This situation was analyzed in a scientific journal, the International Journal of Biosocial Research. Dr. Robert Hall from Chaminade University of Honolulu received the data about the "MSG Massacre"[18] and concluded that the data supported a psychotic reaction to monosodium glutamate. The amygdala section of the brain often has been linked to rage reactions and is stimulated by MSG as well.[19]

17 Goff DC, Wine L: Glutamate in schizophrenia: clinical and research implications. *Schizophr Res*, 1997 Oct, 27:23, 15768.

18 Hall RW: MSG=Massacre? An Examination of Possible Factors. *Int J Bios Res* 6:120, 1984.

19 Nishijo H, Uwano T, Tamura R, Ono T: Gustatory and multimodal neuronal responses in the amygdala during licking and discrimination of sensory stimuli in awake rats. *J Neurophysiol,* 1998 Jan, 79:1, 2136.

Obesity

The obesity effect of MSG in animals requires evaluation since unexplained obesity is increasing in our population, along with hypertension and diabetes. MSG-induced obesity in animals may carry long-term significance for humans.[20][21][22]

Particularly disturbing is the later obesity after MSG exposure during the neonatal and infant period even after only a short or limited exposure.[23]

Atrial Fibrillation

The neuroexcitatory relationship of MSG and the heart has been noted for 30 years. Atrial fibrillation as a distinct symptom of MSG toxicity became clear with Dr. John Frost, professor of cytopathology at Johns Hopkins University School of Medicine. He noted the connection himself and provided the FDA with numerous letters and suggested mechanisms.

20 Iwase M, Yamamoto M, Iino K, Ichikawa K, Shinohara N, Yoshinari M, Fujishima M: Obesity induced by neonatal monosodium glutamate treatment in spontaneously hypertensive rats: an animal model of multiple risk factors. *Hypertens Res*, 21(1):16, 1998.

21 Hollopeter G, Erickson JC, Palmiter RD: Role of neuropeptide Y in diet-, chemical- and genetic-induced obesity of mice. *Int J Obes Relat Metab Disord*, 22(6):50612, 1998.

22 Sricker Krongard A, Burlet C, Beck B: Behavioral deficits in monosodium glutamate rats: specific changes in the structure of feeding behavior. *Life Sci,* 62(23):212732, 1998.

23 Lorden JF, Caudle A: Behavioral and Endocrinological Effect of single injections of MSG in the mouse. *Toxicol Teratol* 8:50919, 1986.

One letter we received from a cardiologist in New York stated:

> . . . [my patient] is a 78-year-old male patient under treatment for recurrent atrial fibrillation.
>
> It has become quite evident over the past 5 or 6 years that certain foods tend to aggravate his arrhythmia. The most pronounced are processed foods and meats, . . . and all foods that contain monosodium glutamate.
>
> It is my medical opinion that all foods such as the above mentioned should be strictly avoided

Another woman wrote:

> I found it necessary to retire . . . because the numerous "heart arrests" left me too weak to lecture and conduct classes regularly. But henceforth I shall seize every opportunity to write or speak against the use of MSG by the food industry without identifying it, and against the intransigency of the FDA to do anything effective to protect potential MSG victims.

Genetics

There appears to be a tendency for MSG sensitivity to run in families, although the symptoms provoked may range widely. Many case reports have shown a multigenerational sensitivity in family members.

Parents who are MSG sensitive may well see a similar sensitivity in their children, although the symptoms may vary. For example, a parent with severe migraines may have a child who reacts adversely to MSG with asthma or hyperactivity.

Chapter Four
The MSG Syndrome:
What You Don't Know Can Hurt You

The evidence points to MSG sensitivity of epidemic proportions throughout the general population. The symptoms may be severe or vague: depression, headache, mild nausea, pressure around the eyes, tingling of the face, behavioral disturbances in children, and mood swings, accentuating those already present in adolescents and also in adults. In Chapter 3, some striking cases were described, and the studies of Dr. Reif-Lehrer, Dr. Schaumberg, and others clearly have shown that we are dealing with many sufferers of the MSG syndromeliterally an epidemic. Many reactions can be severe and life threatening while being difficult to detect. For example, the struggling asthmatic trying to breathe is not asked about dietary MSGand for good reason because medical therapy must take precedence. The person with a severe heart irregularity receives treatment and CPR (cardiopulmonary resuscitation) but rarely undergoes an analysis of dietary MSG.

The usual causes of an increase in symptoms are changes in the environment or in human behavior. Recently, we have witnessed important changes in personal habits. Families eat together less often. When they do sit down to a family meal, it usually consists of convenience foods, such as fried chicken, frozen dinners, canned soups, vegetables in sauces, and prepared salad mixes, all of which may contain MSG. When you further consider that monosodium glutamate is an ingredient of seasoning salts, bouillon, hydrolysed vegetable protein, autolyzed yeast, meat tenderizers, most prepared spaghetti sauces, most sausages, some bacon, and even such ethnic foods as gefilte fish and matzo balls, it becomes quite evident that the level of MSG in any family

meal may be quite high. In fact, the giant food company Pillsbury completed a year-long study focusing on American eating behaviors from 1971 to 1986. The results of its study appeared in the *Wall Street Journal* on Tuesday, March 15, 1988 (page 39). The largest and fastest-growing segment of the U.S. population is what Pillsbury calls the "Chase and Grabbits." They were most likely to subsist on fast-foods, frozen dinners and carryout pizza. Betsy Morris, the staff reporter, concludes: "This group which swelled 136% over the 15 years of the study now comprises 26% of the population." These people represent the next generation.

According to a study by the NPD Group, a Port Washington, New York, marketing firm, only 15% of meals required the use of a standard oven. This means that pre-packaged foods are much more prevalent. Linda Smithson, director of Pillsbury's consumer center, said, "The fragmentation of eating has become much more normal than random."

MSG is a standard ingredient in most canned soups, soy sauces, bouillon cubes, soup stocks, and frozen dinners. It is difficult to avoid even in the finest of restaurants, where it is often hidden in protein powders and seasonings. The amount of MSG consumed daily by the average person has risen to a level where more and more people are experiencing harmful reactions. Even the cigarette smoker may get additional MSG since tobacco leaves have been cured with MSG for smell and flavor enhancement.

What is the basis for the popularity of MSG? It is technically termed a "flavor enhancer" and that is indeed what it does. But it can also mask inferior freshness and quality in the foods we eat. The "tinny" taste of canned foods is diminished and its color maintained with the use of MSG. Thus, the advantages of its use for the food industry are obvious. Unfortunately, for the millions of people who experience averse symptoms at the present usage level the problem is serious, and the cost advantages to the industries pale before the magnitude of the resulting illnesses.

Allergic Reactions

In most cases, MSG toxicity is not an allergic reaction. It is instead a classic toxic reaction. The difference requires some explanation.

An allergic reaction, experienced only by some individuals, is usually not dose dependent and involves the body reacting to a substance in a particular way, causing the body to release certain chemicals. This can result in asthma, skin rashes or itching, anaphylaxis, or even obstruction of respiration due to the swelling of structures within the neck and the airway. These are the sorts of conditions where people carry epinephrine injectors, such as with severe bee stings.

However, everybody will react to a toxic substance, and the degree of reaction depends on the dose. Take, as an example, caffeine. Caffeine in coffee will affect everybody who drinks coffee. The only variables are the tolerance level of each person and the amount of caffeine in the coffee bean. One person who is very sensitive will say that one-fourth or one-half of a cup of coffee will make him or her feel jittery or sweaty and perhaps cause some heart palpitations. Others feel the effects of caffeine only when they take a whole cup; still more people will only react to two cups and more at four. As the number of cups of coffee taken over an hour or two increases we will reach a point where almost every human being will experience at least some effects of the caffeine.

The situation is similar with MSG. The intensity of the symptoms produced by MSG and the number of people reacting will increase as the dose is increased. Even when asthma is precipitated by MSG, the reaction tends to be dose related (that is, the higher the dose, the worse the asthma attack). The particular symptoms produced depend on the individual and are remarkably "stereotyped." That is, the MSG reaction at a given dose tends to be consistent for that person. There are characteristic patterns. In one day of eating processed and fast food, an individual can easily consume his or her symptom-causing dose.

Consumption of MSG has doubled in every decade since the 1940s. More than 120 million pounds are used yearly in the United States alone. Despite the widespread nature of the MSG symptom complex, the cause may be hard to trace. Even when the cause is discovered it can take years and even decades for people to act on it. Changes in our society often occur through litigation. However, almost all legal cases involving MSG sensitivity have been quickly settled.

The example of vitamin C and scurvy is illustrative. For example, scurvy began to increase with the growth of sailing and shipping. From the fifteenth to the nineteenth century, more than two million deaths were attributed to scurvy. James Lind, a Scottish physician, demonstrated the cause in the late 1700s as a lack of fresh fruit. Yet, 50 years after his "proof" ships still routinely left port for prolonged sea voyages without a supply of fruit.

Modern medicine accepts the idea of deficiency diseases such as scurvy, but even now we are seeing more patients with initially unidentified vitamin deficiency symptoms. In a similar manner, we are often ignoring the toxic effects of MSG. We now have a substantial body of evidencescientific studies and case reportsthat MSG will cause troublesome reactions for many people and seriously harm their health and well-being.

It has been more than 30 years since the first case report was published in the *New England Journal of Medicine*. It is more than 28 years since Dr. Schaumberg, Dr. Robert Byck, Dr. Robert Gerstl, and Dr. Jan Mashman reported in *Science* that "MSG can produce undesirable effects in the amounts used in the preparation of widely consumed foods." It is more than 20 years since extensive questionnaires showed MSG sensitivity to be widespread. Yet many people are unaware of the cause of their MSG-induced symptoms, and more MSG is being used in foods than ever before.

As the use of MSG has become more widespread, case reports are coming from all parts of the world, including France, Germany,

Australia, and Israel. Even in Japan, where MSG has been a staple of cooking almost since its discovery in 1908, people have been aware of reactions to this substance. The MSG symptom complex is spreading as the dose increases.

Another analogy can be seen with cigarette smoking. From the U. S. Surgeon General's report of adverse effects in 1965, which came after a wealth of scientific studies, we still are seeing cigarette smoking as a major health problem. Clearly education is not enough for many people. However, with MSG there is a very big difference. Lighting up a cigarette or a cigar is a choice. With hidden MSG and widespread use as well as with mislabeling, MSG use is not a choiceparticularly for young children and the elderly.

What we are witnessing is the direct effects and side effects of a powerful neurologic drug.

Chapter Five
MSG Symptom Analysis

Are You Reacting to MSG?

There are three general categories of symptoms resulting from MSG. These are allergic, peripheral, and central (brain).

The allergic symptoms include characteristic allergic responses such as asthma, skin rash, and sneezing. Peripheral responses are flushing, tingling, chest tightness, palpitations, or headaches, and arthritislike symptoms of the joints. The central-type symptoms arise from the brain and include depression, mental confusion, insomnia, and restlessness.

Table 1 categorizes common symptoms, Table 2 shows children's symptoms; and Tables 3, 4, and 5 attempt to divide the symptoms according to type. However, one person can have a mixture of the different types of symptoms of the MSG syndrome.

TABLE 1
Common Symptoms
Gastrointestinal
Cramps
Diarrhea
Nausea
Gas/bloating

General and Chest
Tightness around face
Tingling/burning in face
and chest

Tightness in chest, chest pain
Headaches
Weakness
Dizziness
Palpitations

Eye Symptoms
Blurring of vision
Seeing shining lights
Difficulty focusing
Tingling around eyes

Psychological Symptoms
Depression
Paranoia
Rage reactions
Attention deficit disorder (ADD)
Panic attacks
Confusion
Insomnia

Neuromuscular Symptoms
Muscle aches
Weakness/paralysis
Jaw stiffness (TMJ)
Back pain
Tendinitis
Arthritis

Other
Rash, hives
Chills, shakes
Tenseness

Numbness of face
Water retention
Speech slurred
Sneezing
Thirst
Sleepiness
Asthma
Heaviness of arms and legs
Excessive perspiration
Fast heartbeat
Balance problems,
staggering

TABLE 2
Children's Symptoms
Asthma
Behavioral problems/ADD
Stomach cramps
Chest discomfort
Thirst
Headache
Stomachache
Tiredness, depression
Nausea
Dizziness
Throat symptoms
Loss of bowel or bladder
control
Rage reactions
Hostility to other children

TABLE 3
Allergic Symptoms
Sinus pressure
Rash
Hives
Asthma, shortness of breath
Sneezing
Running nose
Swelling of tongue
and throat

TABLE 4
Peripheral-Type Symptoms
Flushing
Jaw tightness
Headache
Rapid heartbeat
Chest tightening
Diarrhea, stomach
cramps Arthritis

TABLE 5
Central-Type Symptoms
(Brain)
Depression
Insomnia
Confusion
Paranoia
Rage reactions

Foods to which MSG has been added have more effect when taken on an empty stomach. The Chinese restaurant syndrome, better named the MSG syndrome or the MSG symptom complex, often is manifested immediately after the first soup course. The presence of

carbohydrates and bread in the stomach tends to modify and diminish the reactions. It has been misleading and unfair to call MSG reactions "Chinese restaurant syndrome." Chinese restaurants represent only a small fraction of MSG useless than 5%. The result of this improper label has been to unfairly characterize one type of food and to mislead consumers into believing that only the Chinese use MSG.

Symptom Analysis

Glutamic acid is one of the amino acids that make up proteins. In nature, the glutamic acid is linked by "peptide" linkages to other amino acids. When a person eats a protein substance, the linkages are broken apart slowly in the digestive process. When pure MSG is given, a rapid effect occurs from the glutamate. This "free glutamate" is not attached to other amino acids. Thus, the normally slow breakdown process is bypassed because there are no "peptide" linkages to slow the process. The sudden increase in glutamic acid within the body is rapidly absorbed and can raise the normal blood level of glutamate to eight or ten times or even twenty times its usual amount.

Chapter Six
MSG: Bad Taste

We have no problem with a consumer's right to know if the product he or she is buying contains MSG. But then, everything should be labeled, since there are many ingredients that pose a far greater risk than MSG. [Of course, this kind of complete labeling would result] in menus and ingredient lists as long as a roll of toilet paper.
Richard Cristol, Executive
Director The Glutamate
Association
As quoted in *Cooks Magazine*, June 1990

Taste relies primarily on the perception of stimuli through the taste buds located in small depressions on the tongue. When stimulated, these taste buds transmit electrical signals to the brain, which interprets the signals and forms an overall impression. The brain is like a television set receiving a variety of signals. Eventually, an image is formed that is perceived as "taste." MSG placed on the tongue stimulates these electrical discharges, making the "picture" more intense.

The taste effect of MSG has been demonstrated by analyzing nerve responses. MSG solutions have been layered onto the tongue of experimental animals. The results were impressive. MSG on the tongue caused a nervous reaction that went from the tongue through the chorda tympana nerve directly to the cortex of the brain, resulting in a spreading cerebral excitation through nerve synapse connections in the bulbar pontine and thalamic areasessentially through the brain. This finding indicates that ingestion into the stomach and drug effects (as an oral medication) have not revealed an important effect-direct pathways

from the mouth and tongue to the brain cells. This tendency, which has been well documented by numerous investigators[24] offers an insight as to how MSG can play a role in inducing seizures and other abnormal brain conditions. Further, the prolonged taste effect continues as a neurological phenomenon for 30 minutes.[25] The tongue-nervous system-brain response also explains the finding of extreme MSG sensitivity since the concentration in solution may be small, indeed, but have a strong direct nerve effect. The effects of MSG in a solution are also more dramatic, with the monosodium glutamate having a negative rotation in solution. The rotation of the molecule appears to increase its nervous system effects.

There is conclusive evidence that the MSG taste intensity increases are a result of drug-induced nerve-cell discharges. As a result, MSG is a rather unique producta drug to change the nervous system to increase its reaction and not to change the food.

MSG has become popular because it enhances every kind of flavor and increases smell appeal. It has been found to increase saltiness, accentuate sweetness, and reduce sourness and bitterness. It modifies undesirable tastes, such as the "earthiness" and raw peel flavor or the "fishy" taste of lima beans. In addition, MSG has been found to intensify "bloom"the spreading of taste through the mouthand the aftertaste that stimulates the next bite in an almost addictive manner.

A flavor enhancer is different from a seasoning in that it can intensify existing flavors without adding a strong flavor of its own. Although MSG does have a flavor of its own (chickenlike, sweet-salty, soapy, sometimes perceived as bitter), it is a relatively weak and subtle flavor. This aspect makes it very difficult for an MSG-sensitive person

24 Kawamura Y, Kare MR: Umami: A Basic Taste. Marcel Dekker, Inc., 1987, pgs. 441460.

to know when he or she has inadvertently ingested MSG or MSG-containing compounds, such as hydrolyzed vegetable protein.

Actions on Nerve Plexi, GERD Disease (Gastroesophageal Reflux) and Mitral Valve Prolapse

In addition, once ingested MSG has actions on other nervous system plexi. As a local effect it decreases the strength of the esophageal-stomach sphincter leading to a reflux of acid and GERD disease (gastroesophageal reflux disease). One of the common medication types in widespread use (H2 Blockers such as Tagamet and Zantac) are likely treating an epidemic of GERD and heartburn at least partially caused by MSG. Other effects, such as the provocation of asthma and the cardiovascular effects, are not well understood. The mitral valve prolapse connection with MSG sensitivity has been noted. Could MSG cause the condition, which is widespread? It does appear that MSG precipitates symptoms in such people (for example, rapid heart beats and atypical chest pain), and produces almost a panic attack state.

Pharmaceutical Companies Owe a Debt to MSG

In the 1980s one of the largest income-producing medications was Tagamet, and then other similar medications came along to treat indigestion (for example, Zantac, Accid, and Prilosec). Much of their patent action treats MSG side effects. Now these medications often are available as over-the-counter medications for all consumers.

In the 1990s antidepressants such as Prozac and Zoloft have become billion-dollar money-makers. I believe a good part of their popularity results from the ability of these serotonin-increasing medications to treat the malaise and depressive feelings resulting from MSG effects and their aftermath. Like the postcocaine and postamphetamine depressions resulting from continued cerebral nerve

cell discharge, there is a similar scenario with an MSG-induced discharge to the point of nervous system exhaustion, released by anti-depressant neurochemicals. All of this occurred against a background of increasing awareness of MSG toxicity, along with what Dr. John W. Olney, the leading scientist studying neurotoxicity, termed "an industry-arranged whitewash" at the FDA.

The FDA had been established with the Federal Food and Drugs Act of 1906.[26] Its charge was to make sound judgments independent of industry pressures. Prior to its formation, there was an expanding threat of adulterated food, drink, and medicine with serious health effects. In the case of MSG, the perversion of the regulatory process has been apparent with "revolving doors" (from government to high-paying jobs in industry), along with specific grants and consultant jobs. To cite one example, the chairman of the National Academy of Sciences MSG committee was, while serving as chairman, under contract with Gerber Products and International Mineral and Chemical Company, the producer of "Accent".[27]

Glutamate as a Neurotransmitter

Some of the increased recent concern about glutamate stems from the observation that it acts as an excitatory neurotransmitter in the brain. A neurotransmitter is a substance that stimulates brain cell activity.

In 1957 in Baltimore, Dr. D. Newhouse and Dr. J. P. Lucas used glutamic acid in an effort to reduce hereditary retinal degeneration in rats. At that time, they were proceeding on the idea that glutamic acid might have a protective effect. Their findings were just the opposite:

26 Young JG: *Pure Food: Securing the Federal Food and Drugs Act of 1906*. Princeton Univ. Press, Princeton NJ, 1989.

27 Center for Food Safety and Applied Nutrition, FDA, Washington DC

that MSG resulted in rapid, irreversible destruction of the majority of cells in the retina within minutes. After this initial observation was scientifically validated, other scientists, particularly Dr. Olney, determined that glutamate could produce not only retinal damage but damage to other parts of the brain. The earliest evidence of damage is to the "dendrites," which are the filaments that transfer electrical information. Damage to these is widespread. Subsequently, the nerve cells are altered and die. Dr. Olney focused his work on the damage to the hypothalamus, which regulates overall body and glandular function.

MSG Toxicity Killing Dogs

MSG as a potent drug can result in convulsions and cardiac effects. Experimental animals can experience lethal effects from MSG. We were not aware that these potent effects were being used for animal slaughter until Max Ricketts of the Naldo-Ricketts Foundation of the Philippines alerted us to this method.

In a letter he wrote to me from Manila he stated that eating dogs is not uncommon in some provinces of the Philippines:

> *Vetsin (MSG) is actually being used to kill dogs for food here, almost always in the provinces. Stoning is the next most popular method. Male drinkers, especially, have a taste for dogs……Vetsin is placed inside a* pan de sal *(that is, a roll of bread), one to two tablespoons, and given to the dog to eat. The dog salivates and loses consciousness; then involuntary spasms occur until the breathing stops*.

Neuroexcitatory Effects: ALS, Alzheimer's and Treatment with Antiglutamate Substances

Since the early research thousands of scientific articles have dealt with the neuroexcitatory effects of glutamate. The nerve cell deaths produced by elevated glutamate levels have been well established. In fact one of

the most promising areas in reversing the effects of stroke are antiglutamate substances. The glutamate-ALS connectionLou Gehrig's diseasehas been explored. In 1995 Dr. J. D. Rothstein published an article[28] in which he explored the research concerning motor nerve cell degeneration produced by excess glutamateand raised the possibility of protection by antiglutamate substances. The continued neuroexcitatory effect can play a role as well in cell death in other neurodegenerative diseases, particularly Alzheimer's dementia.

Glutamate as a Neuroexcitor

Forty years of glutamate research have uncovered a tremendous variety of excitatory and toxic effects. These effects are presented in an extensive scientific article.[29] The basic mechanisms seem to involve the receptors on the cells affecting the permeability (or leakiness) of the membranes and the integrity of the nerve cell.[30]

Dr. Fernstrom and his colleagues in the Department of Psychiatry in the University of Pittsburgh School of Medicine undertook to see if there was an effect upon people.[31] They took fasting human

28 Rothstein: "Excitotoxicity and Neurodegeneration in Amyotrophic Lateral Sclerosis" in *Clinics in Neuroscience*, 3: 34859, 1996.

29 Michaelis EK: Molecular biology of glutamate receptors in the central nervous system and their role in excitotoxicity, oxidative stress and aging. *Prog Neurobiol*, 54(4):369415, 1998.

30 Raymond LA, Moshaver A, Tingley WG, Huganir RL: Glutamate receptor ion channel properties predict vulnerability to cytotoxicity in a transfected nonneuronal cell line. *Mol Cell Neurosci*, 7(2): 10215, 1996.

31 Fernstrom JD, Cameron JL, Fernstrom MH, McConaha C, Weltzin TE, Kaye WH: Short-term neuroendocrine effects of a large oral dose of monosodium glutamate in fasting male subjects. *J Clin Endocrinol Metab*,

subjects and gave them 12.7 grams of MSG (two teaspoons). The plasma glutamate levels increased eleven times within one hour of the MSG dose. With an 11 times normal concentration, the local level of glutamate and its effects can rapidly occur.

The effect of raising glutamate rapidly leads to extensive visual brain damage in mice (damage that can be seen under a microscope). In this case of experimental mice studies, a rapid rise to 17 times normal caused extensive damage.[32] The 11 times normal levels produced by Dr. Fernstrom and his associates come perilously close to these damage levels, and this is for damage that can be seen; biochemical damage occurs at much lower levels.

NutraSweet (Aspartame)

Dr. Russell Blaylock's unique book *Excitotoxins: The Taste that Kills* (Health Press, 1997) goes deeply into the neurochemistry of aspartame. What is most relevant for the reader of *In Bad Taste* is the following:

1. The chemical constituents of Nutrasweet are involved with cerebral excitotoxicity as well as MSG.

2. Seizures, twitches, and hyperexcitable states have been linked to aspartame as well as to MSG.

3. Other side effects of Nutrasweet include headaches, depression, bladder irritation and feeling as if there is a continual need to urinate. The latter symptoms are often thought to be involved with a urinary tract infection. Visual symptoms appear to be more common with aspartame than MSG and some cases of blindness have been reported. The relationship of these visual symptoms with the methanol content of Nutrasweet has been suggested as a cause. The association

32. Hu L, Fernstrom JD, Goldsmith PC: Exogenous glutamate enhances glutamate receptor subunit expression during selective neuronal injury in the ventral arcuate nucleus of postnatal mice. *Neuroendocrinology*, 68(2):7788, 1998.

with worsening diabetes has been noted and needs more research. The association with neurodegenerative diseases such as Alzheimer's, Parkinson's, and Lou Gherig's disease have also been made relying upon on a scientific basis (see Selected References in Appendix 5).

4. Any person concerned with MSG induced symptoms should also eliminate other excitotoxins, such as Nutrasweet, from their diet.

The Mystery of Free Amino Acids in Human Milk

An argument proposed by the Glutamate Association (and their aliases) for the safety of glutamate is that mother's milk contains free glutamate. Once again, quantity is overlooked by those advocates of excitotoxicity. For example, while arsenic is present naturally in the soil, it doesn't mean 1000 times the amount in soil is safe. One analysis[33] showed free glutamic acid at an average level of 1750 millionth moles/liter, which converts into a total quantity of almost one one-hundredth of a teaspoon of MSG in a quart. Even at the FASEB hearing on glutamate safety in 1994, an industry representative apologized for misrepresenting the actual numbers. The presence of small amounts of free glutamate cannot be compared to the addition of chemically produced MSG in vast quantities.

Alzheimer's, ALS (Lou Gehrig's Disease), Huntington's Chorea, Parkinson's Disease, and Other Neurodegenerative Diseases

Ingesting daily a neurotoxic poison can, over time, lead to nerve cell loss in the central nervous system. We are witnessing a tremendous increase in Alzheimer's disease at least partly related to increased MSG use. Once nerve cells die they cannot regenerate. Possibly the use of a

32 Sarwar G, Botting HG, Davis TA, Darling P, Pencharz PB: Free amino acids in milks of human subjects, other primates and non-primates. *Br J*

nerve growth factor can modify this in the future or an antiglutamate substance, but for the present, our best hope is in the prevention of neurotoxicity. There is no doubt that there is a genetic and biochemical predisposition to cellular loss, and thus once afflicted such people and their caregivers should immediately eliminate excitotoxins from their diet. The bigger problem is that institutional food and supplements often contain multiple sources of MSG and other excitotoxins.

MSG-induced nerve cell degeneration is well established. Counteracting such effects is difficult. Recent experiments with glutamate blockers for stroke victims appear promising in acute injuries where neurotoxic glutamate is released in the brain.

However, this has no current applicability for use in acute MSG reactions. The increased cell death and enhanced oxidation cellular stress may be reduced in other ways under current experimentation for example, antioxidants or increasing the levels of glutathione, which appears to help counter the oxidative effects.

As we witness increasing aging in our population, the problems with neurologically impaired elderly will put a tremendous personal strain on both the individual and the family as well as a serious economic impact on society and the healthcare system.

In fact, some enterprising HMO (health maintenance organization) operator will one day create the "No-MSG" HMO. This money-making idea will ensure a population living with fewer headaches, less asthma, and decreased cardiac arrhythmias. In addition the tremendous healthcare costs of Alzheimer's disease, Lou Gehrig's disease, and other diseases of nerve cell death will be decreased.

Parkinson's Disease

Characterized by tremor, rigidity, altered muscular action, and deterioration in nerve cells, Parkinson's disease affects more than one

million people just in North America alone.[34] Neurodegenerative diseases are expected to surpass cancer as the second most common cause of death among the elderly over the next 40 years. The nerve cell degeneration is striking in specific areas of the brain, including the substantia nigra, the nucleus basalis, and the hypothalamus. Still, what many do not realize is that nerve cells in the intestines also are affected, resulting in gastrointestinal symptoms. Dementia and Alzheimer's disease often accompany Parkinson's disease.

The concept of neuroexcitation in Parkinson's disease is well established, with persistent activation of the glutamate-NMDA (Nmethyl-D-aspartate) receptor leading to excess intracellular production of enzymes and nitric oxide. This literally creates the self-destruction of nerve cells.[35][36]

More on ALS

The glutamateALS connection has been made for five to ten years, but little has been known of the mechanism. One 1998 article from Johns Hopkins University by Dr. Lin and colleagues[37] demonstrated that there is a loss of the glutamate transporter protein in 60% to 70% of cases. The result is an accumulation of glutamate and excitotoxic

33 Beal MF: Aging, Energy and Oxidative Stress in Neurodegenerative Diseases. *Ann Neurol* 38:35766, 1995.

34 Ibid.

35 Lang A, Lozano AM: Parkinson's Disease: Medical Prognosis. *N Engl J Med* 339:10441053, 1998.

36 Lin CL, Bristol LA, Jin L, Dykes Hoberg M, Crawford T, Clawson L, Rothstein JD: Aberrant RNA processing in a neurodegenerative disease: the cause for absent EAAT2, a glutamate transporter, in amyotrophic lateral sclerosis. *Neuron*, 20(3):589602, 1998.

degeneration. These abnormalities in the transport of glutamate were found early in the disease, suggesting a site for therapy as well as early diagnosis. Certainly with glutamate buildup and neuroexcitatory cell death, exogenous MSG can increase the glutamate load at the cell.

Animal Studies of MSG: Implications for Humans

Animal studies are useful in determining the effects of substances on living organisms, but generally such studies use much higher doses, proportionately, than those usually taken by people. Consequently, they do not relate to human symptoms unless the higher dosages lead to observable brain damage.

Obesity, Hormone Changes, Seizures, and Infertility

Dr. John Olney's research showed that the MSG brain injuries in rodents resulted in obesity, behavioral disturbances, endocrine hormone changes, stunted bodies, seizures, and infertility. (See his numerous citations in the Selected References in Appendix 5).

How these powerful effects on experimental animals might relate to possible effects on humans is not known. Dr. Olney and other scientists considered that caution in the addition of MSG, particularly to foods consumed by children, is advisable.

Huntington's Chorea and Alzheimer's

Excesses of glutamate have been linked to a condition called Huntington's chorea, which involves destruction of parts of the brain. Symptoms mimicking those of Lou Gehrig's disease, such as muscle weakness and slurred speech, have been produced by large doses of glutamate. Some scientists have speculated that the rising incidence of Alzheimer's disease may be related to MSG. Because of the known

brain cell neurotoxicity of MSG, they theorize that chronic long-term exposure might lead to neuronal (brain cell) loss.

Although there are likely long-term effects due to chronic hyperstimulation, what is of importance to many people are the myriad of immediate symptoms in humans caused by this substancesome of which can be disabling or even life threatening.

Scientists studying these problems have sometimes run into severe obstacles. As Dr. Gary J. Baker, the Australian asthma specialist, notes, "The story needs to be told. This will include not only the side effects of MSG, but also the discrediting of the people honestly reporting these effects, the frustration many of us have had in finding funds to do the necessary further research and the anger at the regulatory bodies for ignoring this problem."

Neuroendocrine Effects

Growth hormone, hypothalamic abnormalities, and endocrine gland regulation effects have been produced by the administration of MSG in the neonatal period in experimental animals. Similarly, an ability to adapt to circadian rhythms of light and dark has been affected. Experimental animals also lose the ability to regulate appetite and weight. The translation of these effects to humans is still unknown, but there are suggestive studies of endocrine effects on our population. The deeper question is why we are subjecting our population to this toxic experiment.

The effects of MSG extend to the other neurotransmitters of the brain (such as dopamine and norepinephrine) at the synaptic level, where the cells join. These neurochemicals also can relate to and be associated with endocrine effects.

Endocrine Effects and Obesity

There is a long history of endocrine, particularly pituitary and hypothalamic, effects produced by MSG in experimental animals. One review in 199838 shows alterations in hypothalamic-pituitary-adrenal cortical function with likely genetic effects.

The association with thyroid abnormalities, fertility and obesity problems, cortisone abnormalities, and other glandular functions has been suggested by many studies. Long-term human analysis will be necessary to confirm animal effects in humans. The stress-induced abnormalities in blood-brain barrier permeability suggest differing MSG effects dependent on existing states of relaxation or stresses.39 Another 1998 article demonstrates growth hormone impairment in rats that lasts throughout adulthood in experimental animals.40 The suggestive evidence for MSG-induced neuroendocrine effects is substantial, coupled with the observation of increased obesity in children.

MSG, Epilepsy, and Convulsions

The many human reports of increased convulsions due to MSG and the worsening of epilepsy have suggested that the excitatory effect of glutamate will affect this human condition adversely. In addition, there

38 SkultetyovaI, Kiss A, Jezova D: Neurotoxic lesions induced by monosodium glutamate result in increased adenopituitary proopiomelanocortin gene expression and decreased corticosterone clearance in rats. *Neuroendocrinology*, 67(6):41220, 1998.

39 Skultetyova I, Tokarev D, Jezova D: Stress-induced increase in blood-brain barrier permeability in control and monosodium glutamate-treated rats. *Brain Res Bull*, 45(2):1758, 1998.

40 Zelena D, Jezova D, Acs Z, Makara GB: Monosodium glutamate lesions inhibit the N-methyl-D-aspartate-induced growth hormone but not prolactin release in rats. *Life Sci* 62(22):206572, 1998.

are many reports of control of epilepsy with dietary changeespecially MSG removal. The excitatory neurophysiological effect on the nerve cells is well established.4142 Experimentally, MSG can produce convulsions in rats to the point of "status epilepticus," that is, continuous seizures.43 The animal studies and human case reports are an alarming association, and certainly those with epilepsy should avoid MSG in all forms.

One form of severe childhood epilepsy called Lennox-Gastaut syndrome was relieved by MSG elimination, as reported in *The Journal of the American Dietetic Association*.44 Removal of MSG led to normal development of the child in the case reported. The concept of relief of this condition is that large glutamate loads overwhelm the body, resulting in excess stimulation and upsetting normal body regulation.4546

Hypertension and MSG, Hypotension with Syncope

In the human population hypertensionhigh blood pressureis a widespread problem that can be very severe. The findings that there are MSG sites in the brain having to do with the release of substances such

41 Wheless JW, Constantinou JEC: Lennox-Gastaut Syndrome. *Pediatr Neurol*. 17:203211, 1997.

42 Bittigan P, Ikonomodou C. Glutamate in neurologic disease. *J Child Neurol*, 12:471485,1997.

43 Beating the MSG Clock. *Science News* 134:350, 1989.

44*Journal of the American Dietetic Association*

(1997:97:793794)

45 Baylis LL, Rolls ET: Responses of neurons in the primate cortex to glutamate. *Physiol. Behav*, 49:97379, 1991.

46 Hellenkant G, Ninomiya Y: On the taste of unami in chimpanzee. *Physiol Behav* 49:92734, 1991.

as angiotension, that regulate blood pressure have started to make a connection that requires more study. The relationship of MSG and human hypertension has been studied from the perspective of sodium increase. There have been no available double-blind studies of glutamate and hypertension. The case reports are common in reporting that when a person with high blood pressure eliminates MSG from his or her diet, their blood pressure returns to normal or near normal.

However, case reports demonstrated some cases of syncope (fainting), which occurs with rapid standingso-called orthostatic hypotension, or low blood pressure.

Glutamate in Stroke

High levels of free glutamate in plasma and cerebrospinal fluid, that is, brain fluid, are released in patients with stroke. This is the basis for the use of experimental antiglutamate treatments. The first 24 hours seem to be most important if the stroke is progressive while for a stable/contained stroke the first six hours show elevation in glutamate. With the increased awareness of neurotoxic effects of free glutamate, patients with strokes should receive low free glutamate diets to assist in reducing neurologic deterioration.[47]

Helping the Heart, Hurting the Brain

The observation that glutamate infusion may aid in the recovery of the heart from cardiac surgery and ischemia indicates its ability to stimulate the heart.[48] In a normal state this may relate to the precipitation of

47 Davalos A, Castillo J, Serena J, Noya M: Duration of glutamate release after acute ischemic stroke. *Stroke,* 28(4):70810, 1997.

48 Svedjeholm R, Vanhanen I, Hakanson E, Joachimsson PO, Jorfeldt L, Nilsson L: Metabolic and hemodynamic effects of intravenous glutamate infusion early after coronary operations. *J. Thorac Cardiovasc Surg*, 112(6):146877, 1996.

tachycardia and atrial fibrillation often reported and even reports of ventricular tachycardia.[49] We also have had multiple reports of cardiac arrest caused by MSG, probably also related to the overstimulation effect.

At the same time that the infusion of glutamate was stimulating the heart, prior studies show excitotoxicity of brain cells.

Cancer, AIDS and Glutamate

The issue of effects on cancer is still not cleareither as a stimulant of cancer growth or as the initiator of cancer. Some scientists have wondered if the increase in esophageal cancer in Japanese populations might relate to MSG intake. Certainly, the scientific observation has been made that patients with advanced tumors have elevated plasma glutamate levels,[50] including those with gastrointestinal tumors, bronchial carcinomas, lymphomas, breast cancer, and others.[51] The possibility of glutamate damage to the immune system, particularly the lymphocytes, has been investigated and appears to be linked. The elevated plasma glutamate level was correlated with impaired immune responses.[52]

49 Gann D, Ventricular tachycardia in a patient with the Chinese Restaurant Syndrome. *Southern Medical Journal*, 70:879880, 1977.

50 Droge W, Eck HP, Betzler M, et al.: Plasma Glutamate Concentration and Lymphocyte Activity. *J Cancer Res Clin Oncol* 114:1248, 1988.

51 Furst P, Bergstrom J, Hellstrom B, et al.: Amino Acid Metabolism in Cancer in Kluthe R, Lohr GW Eds, Nutrition and Metabolism in Cancer, Thieme Pub, NY, p. 75, 1981.

52 See footnote 50.

This finding is of great importance. From a strictly case report basis, for many years we have received reports of people who develop a range of infections after a severe MSG reaction. We know of elevated glutamate levels in these cases. Could these substances be promoting cancer growth?

These suggestive results warrant consideration for cancer-prone individuals to be extremely cautious in MSG intake, as well as AIDS (acquired immune deficiency syndrome) patients.

The U.S. Food and Drug Administration

The FDA has serious internal problems in regard to MSG. Years of faulty and biased regulation have led to inaction. Tracking the money demonstrates how such faulty decisions were made in the past. It is a scandal.

Through a Freedom of Information Act request of all FDA-consumer correspondence for the past ten years relating to monosodium glutamate and hydrolyzed protein, I obtained several letters from FDA officials advising MSG-sensitive people to avoid hydrolyzed proteins. The standard form letter response that was sent to consumers stated that symptoms of MSG reactions are generally "mild and transient."

In December of 1989, at a meeting with top FDA officials, I informed them of my concerns as a physician about adverse reactions to MSG. At this meeting those present were unaware that substances such as hydrolysed protein could be labeled as "natural flavorings." When asked why they had not followed up on a single case report of an adverse reaction, I was asked if I would accept a plea of "incompetence" on the part of the FDA staff!

On June 8, 1990, the Department of Health and Human Services Clinical Nutrition Assessment Branch sent out a memorandum. This document described 285 case reports, some describing severe adverse reactions to monosodium glutamate.

The FDA broke the reported symptoms down into the following table:

*MSG CONSUMER COMPLAINTS BY REPORTED SYMPTOMS**

Reported Symptoms of Total	Number of Total	Percent of Total
Headache	103	19.9
Vomiting and nausea	43	8.3
Diarrhea	36	6.9
Change in heart rate	30	5.8
Change in mood quality or level	26	5.0
Abdominal pain and cramps	25	4.8
Dizziness or problems with balance	17	3.3
Localized pain and tenderness	15	2.9
Sleep problems	15	2.9
Change in vision	14	2.7
Fatigue, weakness	14	2.7
Change in body temperature	12	2.3
Difficulty breathing	11	2.1
Local swelling	10	1.9
Joint and bone pain	10	1.9
Chest pain	10	1.9
Change in sensation (numbness, tingling)	8	1.6
Change in activity level	8	1.6
Blood pressure changes	7	1.3
Difficulty swallowing	7	1.3
Other	98	18.9

*Multiple symptoms may be associated with each consumer complaint. Reprinted from *MSG Report*, Health Hazards Evaluation Board, Department of Health and Human Services, June 8, 1990.

On many occasions the information provided by the FDA has been confusing or misleading. Part of the difficulty is the "revolving door"as people leave the agency to go to industry positions, new regulators enter who are not up to speed on the issues. For example, the World Health Organization (WHO) in 1987 issued a report of MSG[53] warning against ingestion of large doses of MSG. Naturally, FDA representatives assisted in the WHO report. However, two years later, the new people were ignorant of this report and its warnings. A variety of FDA spokespeople offer enormous inconsistency in their explanations, in the information they provide, and in their responses to consumer questions:

> . . . only a few of the adverse reactions [reported to the FDA] are consistent with the symptom complex known as Chinese Restaurant Syndrome (CRS) The majority of the [adverse reaction] reports
> describe a myriad of symptoms, including those which are very common in the general population.
> *Linda Tollefson, DVM, MPH*
> *Food and Drug*
> *Administration*

A veterinarianher DVM degree means doctor of veterinary medicinecommenting on human symptoms is strange enough, but her review lacks a basic understanding as evidenced by her quote after describing severe problems.

U.S. Department of Agriculture (USDA)

The USDA is considering revising its rules regarding the common name labeling of ingredients. This would ultimately require food manufacturers to name the protein source of hydrolyzed protein (for

53 World Health Organization, Technical Report Series #759, 1987.

example, pork blood) and would not allow the substance to be placed under the classification of "natural flavorings." This rule has been proposed and revised several times.

A not-for-profit group, the Truth in Labeling Campaign (TLC), filed a class-action lawsuit against the FDA requiring that all amounts of glutamate found in a food product be labeled. Unfortunately, the courts did not allow the group to take the case to trial.

Contaminants: The Case of Tryptophan (EMS Syndrome)

In November 1989 a strange new epidemic was reported by a physician in New Mexico. The varied symptoms of what was to be called the EMS syndrome (eosinophilia-myalgia syndrome) included severe muscle pain, an abnormally high number of the white blood cell termed the eosinophil, fatigue, edema, rash, and neurological symptoms. All the victims had been taking supplements of L-tryptophan, an amino acid produced by a fermentation process and used for sleep and sedation. Almost all of the cases were traced back to the manufacturer Showa-Denko, and while the amino acid L-tryptophan may be involved in some way, at present a contaminant is thought to be the primary instigator of the disease condition. Thousands of cases have been reported since its identification, with more than ten deaths attributed to the condition. The latest findings show that the "contaminant" may actually be a dimeror two joined tryptophan molecules. The production is through a process of bioengineering whereby genetic material is added to strains of bacteria that act as tryptophan-producing organisms. The overall safety of bioengineered products is still questionable.

The possible relevance to the situation with MSG is that it is produced in Japan through a similar biochemical mechanism, and the question has been raised as to whether or not some of the reactions may, in fact, result from a contaminant within the food-grade monosodium glutamate. This has not been evaluated. Monosodium glutamate can even be produced from a base of motor oil or kerosene.

Some people also have wondered why the FDA was so quick to look into the problems caused by tryptophan but have neglected problems caused by MSG. Whether the economic power represented by the Glutamate Association, the years of lobbying and false or deceptive "scientific" studies, and the entrenched, close-minded position of many in the FDA are the reasons is a matter of opinion. In my view, the foregoing factors begin to explain the years of neglect. In fact, until recently, the FDA sent out Glutamate Association propaganda to consumers requesting information about monosodium glutamate.

A contaminant cannot be the cause of all reactions, though, since MSG is pharmaceutically active, and pure MSG has been used in neuroscience research and has been shown to cause many physiological changes in experimental animals.

Food Manufacturers

I have received responses to *In Bad Taste: The MSG Syndrome* ranging from angry attacks to expressions of great concern. The director of toxicology and scientific affairs at General Mills felt strongly enough to offer a personal attack: "The title of your book is ironic since it is indeed in very bad taste when an educated person . . . ignores an overwhelming preponderance of scientific fact and gives preference to personal testimonials." I did not respond in the same insulting manner but instead offered to meet with this person at a national scientific meeting so that we might review my data and new studies on the subject. I received no response.

The head of public relations at Campbell's Soup termed me an "opportunist" and offered the statement that "we are proud to promote the use of monosodium glutamate in our foods." I subsequently discovered that Campbell's Soup was at that time a member of the Glutamate Association. Also, the company refused to tell me how much additional profit it had made by using fewer quality ingredients and relying on flavor enhancers.

Other company officials were more cordial. One of them called to tell me they were trying to remove MSG from some of their products. Pepperidge Farm advised that it was removing the hydrolyzed protein from its stuffing mixes. One of the biggest offenders is the "health food" industry, which tried to deceive the health-conscious consumer. We have discovered that these companies often show more closed-mindedness when it comes to the MSG issue.

Some companies, such as Kraft, took a straightforward approach; they sent a letter that said that MSG-sensitive people should be aware that they use hydrolyzed vegetable protein in some of the products with "variable amounts of MSG." In contrast, representatives of Chicken of the Sea Tuna were completely unaware at the customer service level that hydrolyzed protein contained MSG. Only after detailed discussion with one of their chemists was I told that they "use it because it makes our tuna taste more like chicken."

As I spoke with more and more company representatives, I was discouraged to learn that many people in the customer service area have little idea of the components of their products. The quality-control department, though, appears to be the place to go for more detailed information, although occasionally even the people in the various quality-control offices did not know what the bulk shipments contained, particularly those from foreign companies.

The Ajinomoto Company is still the dominant world producer of MSG, although it accounts for only half of the world's production. Its sales are now in the multibillions of dollars, with a trend toward yearly increases.

Lobby Organizations

Realizing the number of major American companies that are using large quantities of MSG and the multi-billion-dollar nature of the MSG industry, it is not surprising that there are lobby groups churning out daily propaganda. One is the previously mentioned Glutamate

Association of the United States and is based in Washington, D.C. Another is the International Glutamate Technical Committee, and yet another is the International Food Information Council (IFIC). Unfortunately, the truth about MSG can be clouded by their distortions and lobbying efforts. Rarely do these associations that they are funded by the food industry. Instead, they pretend to be an impartial group. Originally, when *In Bad Taste: The MSG Syndrome* was first published the Glutamate Association (then based in Atlanta, Georgia) was the key lobby group. Its executive director, Richard Cristol, publicly debated the issue of MSG safety with me on several television and radio programs. During the early 1990's we learned from an anonymous inside source the membership of this outspoken association. At that time their members included:

Lipton
Campbell's
Ajinomoto
Archer Daniels Midland
Corn Products International

as well as other large users and suppliers of MSG. As the years have gone by, the lobby groups seem to have changed their strategy, keeping a fairly low profile and refusing media interviews.

In 1991 the CBS "60 Minutes" program profiled the MSG controversy using the National Organization Mobilized to Stop Glutamate (NoMSG) group and myself as the main anti-MSG sources of information; however, the program neglected to give any credit to the consumer group. The commercial immediately following the segment was about Campbell's Healthy Request new line of soups, which the company claims contain No MSG. Although many people were helped by this program, we were quite disappointed at the "no new news" approach shown that refused to use information that exposed industry deception. While the "60 Minutes" producers assured us that they could withstand pressure from the food industry and their advertisers, apparently the industry tamed them from tiger to pussycat.

The International Food Information Council (IFIC), also located in Washington, D.C., was one of the most outspoken organizations that fought the airing of the "60 Minutes" segment. It currently offers propaganda materials that attest to the "safety" of MSG. In addition, IFIC has created affiliations in producing written materials with the American Academy of Allergy and Immunology and the FDA. The IFIC Foundation's mission is to be a force that helps the media, educators, health professionals, and scientists effectively communicate science-based information on health, nutrition, and food safety for the public good. The IFIC Foundation is a nonprofit organization supported by food, beverage and agricultural companies. Because it is industry supported, its information is biased to protect whatever product the IFIC chooses to promote.

Anti-MSG Organizations

Also since the publication of the first edition of *In Bad Taste*, there have arisen several not-for-profit anti-MSG organizations.

NoMSG

The National Organization Mobilized to Stop Glutamate (NoMSG) is a not-for-profit consumer/support group. The NoMSG mission is to educate consumers regarding the dangers of Monosodium Glutamate and the ways in which it is hidden; to encourage MSG-free products; to support MSG-sensitive individuals; and to promote independent MSG research. Its main focus is on education and networking. Free information can be received by sending a self-addressed, stamped envelope to: NoMSG, P.O. Box 367, Santa Fe, New Mexico, 87504 or call 1-800-232-8674 (1-800-BEAT-MSG) or visit its website at www.nomsg.com.

Truth in Labeling Campaign

The Truth in Labeling Campaign (TLC) is concerned that MSG is a toxic substance hidden in ingredients that are listed on food labels. It is the campaign's goal to have the FDA require food processors to measure all processed food, postproduction, for free glutamic acid, and to state the amount of MSG in milligrams on food labels. For more information contact: Truth in Labeling Campaign, P.O. Box 2532, Darien, Illinois 60561, (312) 642-9333, or visit its website at www.truthinlabeling.com.

Chapter Seven
Living Without MSG:
MSG-Free Cooking at Home

For the MSG-sensitive consumer an obvious question arises: How do you prepare nutritious meals, within a reasonable amount of time, and still avoid MSG?

The increasing availability of natural foods provides one answer, but many consumers are intimidated by natural food stores. Not only are many of their products more expensive, but the ingredients themselves may be unfamiliar.

There are a growing number of convenient, prepackaged natural foods available. However, not all products sold in health food stores, or all those labeled "natural ingredients," are free from MSG or MSG-containing substances such as hydrolyzed vegetable protein. Also, in several Oriental products the kombu seaweed or extract used for flavoring is high in natural MSG.

The prepackaged and prefrozen foods which generally contain substantial amounts of MSG are undeniably convenient, but cooking without MSG doesn't have to be a time-consuming life vocation. You can prove this for yourself by trying out the following time-saving techniques that include easy substitutes for your favorite recipes that may contain products with MSG and numerous make-ahead recipes that may be used in small portions over a period of time (see Appendix 1).

Avoiding MSG may take a little more time and attention, but your own well-being and that of your family surely are worth a little effort. As for the consumer who is very sensitive to the substance, an MSG-free diet can changeor even save your life.

Easy Food Shopping Tips

1. Think fresh! The more fresh ingredients you can incorporate into your meals, the more likely you are to avoid products containing MSG. Check into local farmers' markets or cooperative food markets. These can be a good source for fresh foods at inexpensive prices. Be aware: Fresh fruits and vegetables often are sprayed or coated with a variety of chemicals; fresh fish may be sprayed with an MSG solution; and freshly cooked seafood may be boiled or breaded with an MSG mixture. Ground beef is sometimes mixed with fillers such as carrageenan, a substance from seaweed designed to give food a slippery feel, which may contain MSG.

2. Read labels carefully (see Chapter 8 for tips on reading labels). If the ingredients include hydrolyzed vegetable protein, natural flavoring, flavorings, vegetable protein, or vegetable, chicken, or beef broth, proceed with caution. If you are unsure if a listed ingredient in one particular product includes MSG, check other products of the same manufacturer to see how they label. The words "spices" and "seasonings" are catchwords that are consumer-friendly and a way to hide MSG. Despite labeling, for example, we have not found an MSG-free sausage due to "spices" containing MSG.

3. Before purchasing any delicatessen or smoked meat products check the label. Most sausages and some luncheon meats will contain some form of MSG. Do not hesitate to ask your butcher or delicatessen clerk to let you read the labels. 4. Avoid processed or dried foods with "flavor packets." These packets almost always contain MSG to improve the flavor. They are most commonly found in boxed rice and pasta dishes, powdered salad dressing mixes, and dried soups. Also keep in mind that food that has been dried has lost a good deal of its nutritional value.

5. Canned gravies, chili, stews, and sauces frequently contain large amounts of MSG and other additives. Read these labels carefully.

6. Check the ingredients in your favorite canned fish or meat

products. Tuna packed in "vegetable broth" may contain hydrolyzed protein or hydrolyzed milk protein, called caseinate. Caseinate is a substance with no real chemical identity, but it refers to a mixture of hydrolyzed milk proteins. In this form it is often found in cakes and pastries.

4. Dairy products used to be fairly free of MSG until the widespread use of caseinate, a hydrolyzed milk protein, was introduced. Caseinate use may not be labeled. Also, carrageenan, is often packaged in a carrageenan-caseinate mixture.

Substitutions

Using MSG-free products in your favorite recipes can be an interesting challenge. In the recipe section in Appendix 1 you will find many of the old-fashioned basics that were used for generations before the processing and frozen food revolution.

These easy recipes will substitute for many of the prepared items we have come to depend upon, such as canned or condensed soups.

Canned Mushroom Soup: Use the same amount of the Quick White Sauce with mushrooms.

Catsup: Homemade catsup (see recipe) or the same amount of tomato sauce. If using tomato sauce you may want to add some seasoning since prepared catsup is generally spicier than plain tomato sauce.

Canned Chicken Stock or Bouillon Cubes: Several stock recipes are included in Appendix 1. The herb stock is much faster, but the others have a richer flavor. Plain water also can be substituted, especially in soup recipes. Spices and herbs will round out the flavor.

Barbeque Sauce or Chili Sauce: Either homemade catsup or tomato sauce with added spices or chili powder will provide a substitute. Recipes also are included for homemade barbeque sauce or chili sauce.

Monosodium Glutamate: If a recipe calls for the addition of MSG there are easy alternatives. Fresh lemon juice works well on salads, soups, tomato products, sauces, vegetables, meat, and fish dishes. Herbs and spices are a wonderful addition to most foods and will easily replace MSG.

Soy Sauce and Worcestershire Sauce: Tamari (available in many health food stores) is lower in salt and MSG than soy sauce but is not completely MSG-free. Look carefully at the ingredients in Worcestershire saucesthey vary greatly from one brand to the next. When stir-frying vegetables or meats a liquid of ginger, lemon juice, and water can be substituted for the soy sauce liquid. This will give the dish a lighter and fresher taste.

If you must use canned products, favor the low-sodium variety. They may not be free from MSG, but the likelihood is that it may be used in smaller quantities. Products that are termed "lowfat" may contain more MSG than their "regular" counterparts. Most flavor is found in the fat. If the fat is removed, it only makes sense that the manufacturers will increase the flavor-enhancing chemicals to improve taste.

When using spices for seasoning, avoid the premixed combinations of spices, garlic salt, and onion salt. Some companies add MSG to these products. Another laborsaving idea is the Food Preparation Network: a group of friends that get together and divides up a week's cooking chores. One prepares enough homemade bread for everyone for one week, another prepares two varieties of salad dressing while yet another makes soup, and so on.

Just imagine a Monday morning when you give four couples or individual friends a large jar of homemade barbeque sauce that you spent two hours making on Sunday afternoon and you receive five loaves of whole grain bread, one gallon of soup, two quarts of salad dressing, and half a gallon of tomato sauce along with a jar of catsup. Not bad for two hours' work and a lot of fun among friends.

Chapter Eight
Shopping Smart and Reading Labels

As a general rule, the more processing a food undergoes, the more likely it is to contain MSG in some form. It also is true that the ambiguities of labeling requirements can make it difficult to determine whether or not a food product contains MSG.

Some foods are better complemented by MSG than others. Listed below are foods grouped in order of their likelihood of containing monosodium glutamate.

Most Likely

Flavored potato chips and prepared snacks

Canned soups and dry soup mixes

Canned meats, box dinners, and prepared meals

Frozen dinners (seafood, chicken, and dinner entrées)

International foods

Poultry injected with broth

Very Likely

Diet foods

Salad dressings

Cured meats and lunch meats

Less Likely

Cookies, crackers (unless seasoned), and candy. Dairy products (may contain caseinate or carrageenan-caseinate mixtures)

Frozen vegetables

Breads, pasta, baking supplies (unless MSG is added to the dough)

Ice cream (may contain caseinate and carrageenan-caseinate mixtures)

Frozen juices

Canned fruits and vegetables

Cereals, pancake mixes, and syrups

Fresh meat, pork, and fish (unless sprayed or coated with flavoring mixtures)

MSG and Food Labeling

The Food and Drug Administration (FDA) regulates the labeling requirements of food products in the United States. Packaged food products are required by law to have their ingredients printed on the package, with the ingredients listed in descending order of predominance.

If MSG is added to a food product during its processing it will be listed on the label. However, it is permitted to list "hydrolyzed vegetable protein" on the label without mentioning that it may contain up to 40% monosodium glutamate. Hydrolyzed vegetable protein or protein hydrolysate (as it is sometimes called) is classified by the FDA as a natural flavoring. Therefore, a packaged food item might specify "natural flavoring" in its list of ingredients without mentioning that the natural flavoring consisted of hydrolyzed vegetable proteinwhich contains MSG. This method of labeling applies to any compound substance that may contain MSG.

Monosodium glutamate is on the GRAS (generally recognized as safe) list of the FDA. It is not considered a food additive but an unregulated seasoning classified by the FDA as a flavor enhancer. Due to its adverse effects, it would likely not be allowed into foods if introduced now.

Federal Code of Regulations

Section 101.22 of the Federal Code of Regulations deals with labeling requirements for spices, flavorings, coloring, and chemical preservatives. Part H(5) states: "Any monosodium glutamate used as an ingredient in food shall be declared by its common or usual name monosodium glutamate." Thus, if monosodium glutamate is used as an ingredient in the processing of a food it must be labeled as such. Hydrolyzed vegetable protein, though, need not have its MSG content listed.

The Federal Code of Regulations Section 101.22, defining natural flavorings, states that "natural flavoring" be applied to: "the essential oil, oleoresin, essence or extractive, *protein hydrolysate,* distillate or any product of roasting, heating or enzymolysis which contains the flavoring constituents derived from a spice, fruit, or fruit juice, vegetable or vegetable juice, edible yeast, herb, bark, root, leaf or similar plant material, meat, seafood, poultry, eggs, dairy products or fermentation products thereof whose significant function is flavoring rather than nutritional" [italics added]. This definition paves the way for labeling protein hydrolysate and autolyzed yeast as "natural flavoring," a designation that will mislead the average consumer trying to avoid MSG.

In 1981 Sonia Delgado, assistant to the director of the Division of Regulatory Guidance Bureau of Foods at the FDA, stated in a letter that I obtained through a Freedom of Information Act request to the FDA:

> When MSG is "added" to food or to an ingredient of the food, it would have to be declared on the label. However, when MSG is not an added ingredient, such as in the case of hydrolized [sic] vegetable protein, it does not have to be declared. Therefore, if you wish to avoid the so-called "Chinese restaurant syndrome," you should also avoid foods which contain hydrolized [sic] vegetable protein.

The Federal Code of Regulations Section 101.35, while fairly lengthy, is critically important because this is the regulation that food manufacturers most often abuse:

> Notice to manufacturers and users of monosodium glutamate and other hydrolyzed vegetable protein products.
>
> Following a review of various statements submitted by manufacturers and distributors of monosodium glutamate and various hydrolyzed plant protein products, the following conclusions have been reached:
>
> (a) The facts submitted established that there are three classes of products to be considered:
>
> (1) Purified monosodium glutamate.
>
> (2) Hydrolyzed proteins (amino acid salts) from which none of the monosodium glutamate has been removed.
>
> (3) Hydrolyzed proteins (amino acid salts), a by-product in the manufacture of purified monosodium glutamate but from which a substantial proportion of the monosodium glutamate has been removed.
>
> (b) [Reserved]
>
> (c)(1) The substance described in paragraph (a)(2) of this section has long been designated as "hydrolysed vegetable protein."
>
> (2) The substance covered by paragraph (a)(3) of this section should have a distinctive name, since one of its original constituents has been partially removed. Manufacturers have suggested that this substance be described as "hydrolyzed vegetable protein with reduced monosodium glutamate content." This designation appears acceptable.

This is important because one of the most common responses I have received from food manufacturers is that their hydrolyzed protein does not contain MSG. According to the Federal Code of Regulation Section 101.35 all hydrolyzed proteins contain MSG unless they use

phrase "hydrolyzed vegetable protein (glutamate reduced)" on their ingredient list. You can read about hydrolyzed protein and its manufacturing process in more depth in Appendix 4.

Commonly Used Aliases

The national consumer group NoMSG has compiled a list of the most commonly used aliases to hide the use of MSG in food:

Definite Sources of MSG

Monosodium glutamate

Hydrolyzed protein (vegetable or plant)

Sodium caseinate or calcium caseinate

Autolyzed yeast or yeast extract

Gelatin

Possible Sources of MSG

Textured protein

Carrageenan or vegetable gum

Seasonings or spices.

Flavorings or natural flavorings

Chicken, beef, pork, smoke flavorings

Bouillon, broth or stock (may be listed as chicken stock or chicken broth). Barley malt, malt extract, malt flavoring. Whey protein, whey protein isolate or concentrate. Soy protein, soy protein isolate or concentrate. Soy sauce or extract.

This list is periodically updated by the networking membership of NoMSG. It is not an all inclusive list because new labeling deceptions are invented to confound the consumer.

Labeling Requirements for Imported Foods

According to the FDA, imported food items are required to comply with the same labeling standards as food products manufactured in the United States. However, FDA officials are quick to say that the enforcement of labeling standards is very difficult. They cannot easily check manufacturing plants in foreign countries. One FDA official's advice, when asked about MSG-sensitive persons purchasing imported food products, was to proceed with extreme caution and to be especially cautious with products from the Orient since those products were likely to have a higher MSG content.

Many U.S. food manufacturers buy bulk quantities of imported products, such as tomato paste. Unfortunately, it is impossible for these manufacturers to know exactly what the bulk products contain. American food manufacturers assume that tomato paste is pure; it is labeled as suchbut without testing there is no way to be certain. In addition, a common method of storing bulk tomato paste is to create a highly acidic solution that preserves the paste better. Unfortunately, the chemical environment that is obtained by this storage method leads to protein hydrolysis and the production of some MSG.

Alert Regarding Fresh Vegetables and Fruits

Within recent months the U.S. Environmental Protection Agency (EPA) approved the experimental use of a substance called Auxigro to be sprayed on crops throughout the country. This substance, considered a biopesticide, is designed to improve plant growth, yield, and quality.

The danger is that the product contains the amino acid L-glutamic acid, which will be left in residue on the fruits and vegetables and, eventually, if used with enough frequency, may leach into the water supply. While the amount left on the produce may be low, this can potentially be devastating for severely MSG-sensitive individuals.

The manufacturing company, Auxien, and the EPA deny that there is any problem with this product. In a letter from the EPA Biopesticides and Pollution Prevention Division, the director, Janet L. Andersen, states: "L-glutamic acid . . . at the level used when eaten on or in food, will not cause the problems associated with the food additive MSG". MSG, because of its direct neurologic effect, doesn't rely on total dosage. The best analogy is with lye, which is commonly used to unclog household drains. A small amount may have enormous local effect. At the same time, the "total dose" is very smallperhaps a few crystals. Thus, looking at the total dosage misses the local neuroexcitatory actions that can affect the brain.

MSG and the Supermarket

For those who are MSG sensitive, shopping in a supermarket can be a challenging experience. There is a wide range of food items that can contain MSG. As stated above, some of those food items have MSG marked clearly on their labels while the MSG content of others will be more ambiguously labeled "hydrolyzed vegetable protein" and/or "natural flavorings". The labels of some spices list "monopotassium glutamate" instead of "monosodium glutamate." They usually are advertised as "sodium free." However, the glutamate ion they contain affects the taste buds and the nervous system. Those with adverse reactions to MSG are therefore cautioned against using these products as well. The following list was compiled from food products sold in five representative supermarkets.

All of these food products contain some form of MSG or hydrolyzed vegetable protein. This list was compiled for the first edition of *In Bad Taste: The MSG Syndrome*. So many new MSG-containing products have appeared and even more with confusing labeling (natural flavoring, for example) that we decided not to compile a new list. Many food products containing MSG in some form are not listed. Still, this sampling should give some idea of the range of products that contain monosodium glutamate. Beware now of the increased use of "flavorings" and even “spices”.

Chapter Nine
Restaurant Guide to Food Containing MSG

For those who react adversely to MSG, eating in restaurants can be a risky matter. An unwise choice can lead to hours, or even weeks of uncomfortable symptoms.

Meats, vegetables, seafood, seasonings, and soups served in any restaurant may contain MSG. Colonel Paul Logan of the National Restaurant Association has quoted an association survey indicating that "three out of four of all good restaurant operators are now using Glutamate" (*Glutamate Manufacturers' Technical Committee Publication: The Value of Glutamate in Processed Foods*).

Inquiries by my staff in 1987 to hundreds of franchised restaurants, cafeterias, and individual restaurants about their use of MSG brought a variety of responses. Many were vague in their answers, citing "trade secrets," while others listed foods they served that contained MSG while still not knowing it was an element in hydrolyzed vegetable protein. Some who answered my questions were genuinely concerned about the widespread adverse reactions to MSG. However, frequently the chefs did not know which sauces contained MSG or hydrolyzed vegetable protein (HVP). Huge amounts of MSG are still used. I have discovered that in the "finer" restaurants, the "soup bases," clam broths, and breadings are all places to find MSG.

Fast-Food Restaurants

The food items listed below are only a sample from selected restaurants that we prepared for the first edition of *In Bad Taste*. This kind of information is becoming more difficult to obtain. Some large chain restaurants will provide booklets upon request detailing the contents of their foods. Remember: If contents include MSG or HVP, MSG is present. Beware of foods with "natural flavorings" since they may contain HVP. Although some changes may have taken place regarding nutrition labeling and ingredients, these should still be representative of the fast-food ingredients in general.

In addition to this list, a simple set of guidelines can be used to help avoid MSG whenever dining out:

1. Request that your food be prepared without any salt or seasoning salts. Often these are added at the discretion of a particular restaurant manager or owner. On meat especially, be sure that the meat has not been marinated or seasoned in any way. Some meat may be mixed with carrageenan. Be sure that the meat is pure beef.

2. Avoid foods with gravies or sauces.

3. Avoid those foods that are breaded and deep fried.

4. Request that French fries be salted only with table saltnot with a premixed seasoning salt. (Now that foods are no longer fried in lard due to the "fat conscious" movement, some frying oils are flavored with bouillon or other substances to increase the flavor.)

5. Ask for oil and vinegar as your dressing rather than the premixed dressings. Avoid croutons and bacon bits.

6. Be sure that real cheese is used rather than an imitation substitute.

7. Avoid foods prepared with dairy products, such as cream or sour cream, unless you are familiar with the brand.

Restaurants and Cafeterias

Adverse reactions to MSG first came to the attention of the American public in 1969 when the Chinese Restaurant Syndrome was reported. Patrons of Chinese restaurants noticed tingling feelings and tightness in their chest after eating. Their reactions were traced to the MSG in the food. Due to the connection the public made between Chinese food and MSG, many Chinese restaurants began to advertise their food with "No MSG." Today many Chinese restaurants in cities such as Los Angeles and New York have signs in their establishment windows proclaiming their food free of MSG. While they may avoid adding pure MSG to their dishes, most often it is still contained in ingredients used or in the soy sauce, and particularly in the oyster sauce that is a component of many entrées.

Both publicly and privately owned cafeterias serving large numbers of people are likely to use MSG. Not only does it improve the taste of food prepared in large quantities, but it is economically wise since it prevents large trays of food from tasting old or stale. Millions of such cafeteria meals are served to children in elementary and high schools each day. H. H. Pullium of the USDA stated that "there are no federal regulations or policies which prohibit or limit the use of monosodium glutamate (MSG) in the National School Lunch Program or any of the U.S. Department of Agriculture's (USDA) federally funded programs." This lack of any regulation has allowed the fast-food industry access to school cafeterias. The MSG-related results, such as declining test scores, increased absences, increased ADHD and Ritalin use, and increased violence, has been disasterous.

Cafeterias serving students in universities and colleges also are likely to serve meals containing MSG although they generally provide a wider range of food choices, including some fresh fruits and salads. One restaurant owner we interviewed stated that MSG was indispensable in preparing certain dishes. According to him, the time and

skill required to achieve the same taste that a dash of MSG immediately produces would make the cost of that meal prohibitive. Many restaurants that use MSG claim that they do not. They are not necessarily being dishonestthey just may not know or care what prepared products or additives contain MSG, hydrolyzed vegetable protein, or other MSG-containing compounds. Because of this, all restaurants must be suspected of using MSG.

One important legal case involved a Marie Callender's restaurant serving MSG-containing soup after allegedly advising the patron that it was not present. The resultant severe asthma, cardiac arrest, and brain damage suffered by the patron caused enormous deterioration in quality of life and great emotional trauma. There are restaurants that use monosodium glutamate knowingly as a spice. Meals are liberally dosed with it because it "perks up" the flavor of food.

Then there are those who are unaware that they use it. They do not know that it is in their brand of seasoning salt or soy sauce. MSG has been integrated into so many convenience foods used by large and small kitchens alike that it is very difficult to cook commercially without encountering some ingredient to which MSG already has been added. The same distributors that supply the supermarkets with small containers of food for home use also supply the restaurants with large institutional-size packages. The ingredients are not changed because of quantity. Therefore, the chicken broth base that you avoid in the grocery store may be innocently added to a dish in your favorite restaurant.

The "clean label" uses aliases and confusing terms to attempt to hide MSG and MSG-containing substances on an ingredient label. This practice has hurt the ability of consumers and restaurateurs to accurately ascertain the presence of this toxin. One restaurant breakfast buffet had MSG present in nearly every food served: The scrambled eggs had added sour cream to prevent them from becoming runny; the bacon and sausage contained MSG; the French toast had been covered with margarine; and the muffins

contained caseinate. Even those who are extremely MSG conscious may still experience an adverse reaction from eating out in restaurants.

The only way to avoid MSG when dining out is to know the restaurant, inspect the kitchen, and interview the chef. Sometimes waitresses or waiters will have experience with the menu and MSG, but often they do not. The previously mentioned legal case involving asthma and cardiac arrest from MSG ingestion at a Marie Callender's restaurant alleges that the waitress provided false information that had been provided to her by the kitchen staff, leading to the MSG-caused collapse with serious, long-lasting neurological symptoms.

Information about where foods are preparedwhether in the restaurant kitchen or received prepackagedwill eliminate many of the MSG-containing foods. For example, shrimp breaded in a commercial breading mixture has a high probability of containing MSG or HVP. However, if the chef takes time to mix his or her own breading mixture, it is possible that it will not contain MSG. If the person who serves you does not know where or how the restaurant's food is made, request this information from the chef or restaurant owner. If you are still unconvinced about the true ingredients of a dish it would be wise to choose another. Also, it may be wise to call the restaurant first and inquire about the ingredients used.

Frequently, if you will take the time to explain your food sensitivity, it is possible to work with a restaurant chef to modify a meal so it will be free of MSG. Baked potatoes, eggs, plain meat or chicken, and salads are usually safe bets. Still, recent flavoring sprays, injected flavorings at the time of slaughter, and marinating solutions can result in deception for even the most careful consumer.

Airplanes and Trains

The prepared meals offered to passengers on airplanes or trains are likely to contain MSG unless the individual in charge is very knowledgeable.

My interview with the chief dietitian of Amtrak showed that he aware and cautious about the use of MSG. The same cannot be said of other corporations, such as the Marriott Catering Services, which provides a good deal of airline food. In fact, one legal case against the Marriott Food Services involved its college catering unit. Despite claims of "No MSG" a college student became severely ill and needed to drop out of school for a year due to MSG toxicity.

To avoid MSG when traveling (especially by air), it is wise to order low-salt meals and check the ingredients in salad dressings carefully. Seafood dinners may not be free of MSG due to the sauces or boiling solutions used in preparation, as well as the sprays sometimes used to maintain freshness. The peanut snacks and chips on airlines can be other offendersbe sure to check the ingredients. Remember too that the cold cuts provided in the snack sandwiches also may contain MSG.

Chapter Ten
MSG Symptom Complex and MSG as a Drug

This is a time in which families rely on processed, precooked food, often frozen, freeze dried, or in cans. The freezing of food dates back to prehistoric man, and even now many families in Alaska utilize winter temperatures to keep their meat frozen. To combat heat, which leads to the growth of food-spoiling bacteria as well as to natural breakdown reactions, people have used running streams, cold caves, and even ice storage. This desire to preserve one's food in the best state led to the death of at least one epicure. History shows that the English philospher Sir Francis Bacon was out of doors stuffing snow into his chickens to preserve them the day before he came down with fatal pneumonia.

In America the development of a practical refrigerator in the 1930s led directly to the frozen food industry. The United States had two million refrigerators in use by 1937, and by 1953 90% of American homes had refrigerators. Now it is very difficult to find any home without one. In Europe the movement was slower with less than 10% of French and English homes having a refrigerator in 1954, but they, as well as Japan, have since caught up.

As the frozen food industry developed, it encountered certain problems. Prolonged freezing altered the taste of foods and reduced consumer acceptance. In 1947 the industry held its first symposium on MSG and heard enthusiastic reports of its flavor-enhancing effects. Soon this substance was widely adopted by food manufacturers. Now it is difficult to find a frozen prepared food to which MSG has not been added in some form. While the frozen food industry was flourishing, the canning of

food continued. The canning industry had started in the early 1800s after a French storekeeper had developed a way to extract air from jars and to heat the food inside the sealed jars. Nicolas Alpert won a medal from the Emporer Napoleon for this work. Shortly after, an Englishman obtained a patent for Alpert's process, but he used tins instead of glass jars.

In 1850 America began its canning industry with fish products. By 1858 Gail Borden, an enterprising dairyman, was canning condensed milk. During the Civil War, armies were fed from canned foods, and by 1870 more than 30 million cans of varied foodstuffs were sold. During World War I the can opener had become a staple of most kitchens in America, and by World War II the number of cans sold yearly was in the multibillions.

Once MSG was "discovered" by Americans it was widely used by canned food manufacturers to reduce the "tinny" taste of their products, especially canned soup. The dried food industry also favored MSG for its flavor-enhancing properties. Nobody could have anticipated that as MSG was added to more and more canned and frozen foods eventually adverse effects from this drug would begin to develop and become a major source of modern ailments and illnesses.

MSG as a Drug

A drug is a substance that, when taken into the body, causes changes in the physiology and functioning of tissues and/or organs. We often use the terms "drug" and "medicine" interchangeably, although, in a stricter sense, a medicine is a "drug" that is used for some therapeutic purpose, to treat some disease or malfunction. Drugs do not necessarily have a therapeutic function.

MSG is a drug that acts directly on the taste buds, altering their sensitivity and causing nerve cell and spreading central nervous system excitation. It acts peripherally on blood vessels and the lower esophageal sphincter, and it acts also on the brain and central nervous

system. It is properly termed a "drug" since it has no apparent therapeutic purpose. Because MSG alters a sensory modalitythe taste budsand the overall gustatory apparatus of the mouth, it modifies reality and produces or intensifies sensations. MSG may be used to mask unpleasant flavors, disguise spoilage, and provide a sense of freshness to food that is old. By fooling the taste buds, it can be responsible for our eating food that may produce harmful upsets.

Our society has become one in which drugs are used to enhance human activities and the functioning of human organs beyond their natural limits. For example, the widespread use of anabolic steroids by weightlifters and other competitive sports participants to enhance muscular strength is well known. Similarly, cocaine is used to artificially heighten mental alertness and athletic performance. For decades amphetamines and also caffeine have been used by students and night workers to heighten mental performance. The newly approved drug Viagra has ended impotence for many men.

Against this background, it becomes easier to understand how the widespread use of MSG is so carelessly and casually accepted, even by many who recognize the ailments produced by this drug. Part of the acceptance is due to the widespread perception that MSG is a preservativethat it somehow prevents harmful bacteria from growing and is therefore an essential part of food. Nothing is farther from the truth, but this myth is promulgated by the MSG lobbying industry.

There is no question that the corporate health of many companies depends on the use of MSG. Also, many of them do not see taste enhancement in quite the same light as we see the enhancement of other functions by drugs. Because of the fast-paced world and the need to prepare "quickie" meals in microwave ovens, we have accepted a trade-off. This trade-off could ordinarily be rationalized as just another accommodation to "life in the fast lane" were it not for the widespread illness caused by this substance. Millions of children and adults are experiencing adverse reactions to MSG and many do not know the

cause. With deceptive labeling, the ability to self-identify MSG reactions has become impaired. Even more difficult, though, is the alarming increase in MSG-containing foods in populations where label-reading rarely occurs, such as on Native American reservations, in the urban ghetto, and in enclaves where English is not the primary language. In such cases, use of the MSG drug is widespread and often unappreciated. In one inner-city hospitalin a busy "asthma room"a vending machine dispenses MSG-containing snacks. As the asthma increased in this room, the connection was not made and many children needed endotracheal intubation.

MSG-sensitive people must recognize their sensitivity and reactivity to this flavor enhancer and then learn to live without it. It will dramatically improve their lives.

With rising MSG-induced asthma, migraine headaches, ADD, childhood disorders, neurodegenerative diseases, and possibly even cancer, we are witnessing enormous human illness caused by this drug. Is it worth it? Can society continue to pay for it? Perhaps litigation similar to the tobacco lawsuits will start to result in payment for the enormous costs of MSG-induced illness and death.

There are similarities to asbestos, to lead-based paints, to mercury contaminations, and even to silicone breast implants. Diseases and degenerations are produced by toxic substances until a critical mass occurs where the damage can no longer be hidden. We are at the threshold of that time with MSG toxicity.

Appendix 2.
Account of Our First Observations of MSG Asthma

By Dr. Gary Baker. Our discovery of MSG asthma was both fortuitous and dramatic. It happened in 1981, whilst I was completing my training as a Respiratory Physician with Dr. David Allen at the Royal North Shore Hospital, Sydney, Australia. We were conducting a study into the clinical importance of a number of food additives as precipitants of acute asthma. The additives that we had initially selected to study were metabisulphite, tartrazine, salicylate and benzoates. MSG was not included in the early studies as we did not expect it to be a precipitant. A number of people suffering from asthma that was severe enough to cause them to be admitted to hospital agreed to participate in the study. Essentially, they agreed to adhere to a strict diet, which excluded the above food additives, for two weeks, and then to ingest a capsule containing either a food additive or sugar, and to be observed for 6 to 12 hours with repeated tests of air-flow rates, which is an objective test for asthma.

One patient with chronic asthma, who was found to be sensitive to a number of the food additives, had a marked improvement in controlling her asthma, when she continued to exclude those particular additives from her diet. However, one evening she broke her diet by having a Chinese meal at a restaurant. During the night her asthma was similar to previous nights, but, in the morning, 10 to 12 hours following the meal, she became increasingly breathless despite using her medications. She went to hospital and was admitted for intensive inhalational and intravenous therapy. Her asthma attack was unresponsive to even this treatment and continued to worsen. She was placed on a ventilator and required cardiac support. Thankfully, her asthma finally relented, she recovered and was able to leave hospital. We were very concerned over this life-threatening episode, which seemed to be related to the ingestion of the Chinese meal. Although the meal may have contained additives to which this patient was know to be sensitive, the severity of her reaction raised the question

whether there were additional substances in the Chinese meal to which she was reacting. This is when we first considered the possibility that the addition of MSG to food may be a precipitant for asthma in particular people.

This possibility was strengthened by our observations when the patient agreed to take MSG according to our protocol for other food additive testing. A capsule containing 2.5 grams of MSG, which is an amount that can be ingested during a Chinese meal, was administered. No other additives were ingested and the patient was on her food additive exclusion diet. There was no change in her ability to breathe until after approximately 12 hours. The asthma quickly became severe and again, was relatively unresponsive to normal hospital asthma therapy and required ventilatory support. Thus, this challenge appeared to reproduce both the severity and the delay that had been seen following her earlier experience with the Chinese meal.

The severity of this asthma attack following the MSG challenge surprised and worried us. When another patient, whom we were currently investigating for food additive asthma, also reacted to a MSG challenge with a marked decrease in her air-flow rate, we wrote letters to alert the medical community of the potential dangers of MSG in asthmatic patients (*New England Journal of Medicine*, 1981, 305: 11541155; *The Medical Journal of Australia*, 1981, 2: 576). Dr. Jack Delohery joined us to undertake a larger clinical study. These studies have supported and further characterized our initial observations of MSG as a precipitant of asthma in some asthma in some asthmatics, and have been reported in the *Journal of Allergy and Clinical Immunology*, 1987, 80: 530537.

Appendix 3
Responses to the First Edition of In Bad Taste: The MSG Syndrome

After publication of *In Bad Taste: The MSG Syndrome* in 1988 we received thousands of calls and letters from people who were grateful to find the cause of their problems. A representative selection of those letters follows. These letters offer an idea of the kind of response the book generated. Many people were so outraged that their responses didn't stop with a letter. Based on consumer concern, the legislature of the state of Maine passed a landmark bill, the first of its kind in the nation. Public Law 115 required all restaurants and food vendors to post notice of the use of MSG in any food product that was being served. The vendors were required to list the MSG content on the menu or to make a separate directory that listed the contents of packaged foods available to the consumer. Unfortunately, I believe the law has since been repealed.

Although this didn't deal with the issue of hydrolyzed protein, autolyzed yeast, or other hidden sources it was a great start. The state of Oregon proposed a similar bill that would have affected restaurants and bed-and-breakfast facilities, but the bill was "killed" in committee, meaning it was never presented for debate. Other states have proposed similar bills. The city of San Francisco's supervisors voted on a proposed ordinance to require restaurants to list the use of MSG on their menus. The Glutamate Association lobbied long and hard against this measure, pouring great sums of money into its efforts. Concerned consumers could not match the effort, and the city's supervisors voted to return the matter to committeeusually a prelude to killing an ordinance.

Another defeat for consumers! Certainly, it was one area where the multi-billion-dollar industry prevailed in diverting the supervisors of San Francisco from priority health concerns.

Letters from Readers

Dear Dr. Schwartz:

By just a lucky chance I heard you on a radio talk show last year, went to the nearest book store, ordered your book and, to put it mildly, you have saved my life! At last, there was an explanation for the periodic debilitating headaches/nausea that completely put me to bed until they wear off. Now, the bouts occur only when my soooo careful investigation into what I am eating is sabotaged by poor labeling or well meaning cooks who don't know what this all means to those of us who really suffer!

I recently read an article in the LA times (with a by-line by Malcolm Gladwell of the Washington Post) entitled "Debate Over the Safety of MSG Heats Up Again." Basically, Mr. Gladwell seemed to feel that we sufferers were "activists" who are not even sure they have a legitimate problem. I tried calling Mr. Gladwell in Washington, left a message with the newspaper but never got a response. He did mention in the article that "MSG sufferers have formed a lobby group the National Organization Mobilized to Stop Glutamate (NOMSG)."

. . . Words cannot express how grateful I am that I happened to "find" your book. I have given many copies away and continue to tell every health food store about it. I am most anxious to hear from you, particularly regarding the organization and any new information you may have.

Big Bear City, CA

Comment: Many readers have written about their headaches caused by MSG. The association has been confirmed by the major headache clinics in our country. A recent radio show stated that 45 million Americans suffer headaches, costing industry $50 billion annually in absenteeism and medical costs. Headache sufferers are well advised to sharply limit their ingestion of MSG and MSG-containing substances.

Dear Dr. Schwartz:

I am very allergic to monosodium glutamate (MSG). I have been hospitalized at least four times with an MSG reaction. Two and one half years ago I was in the hospital from Mexican Food I had eaten in a restaurant. I was in the hospital for two weeks, then home on oxygen for six weeks following. My next reaction was last October 1989 to a turkey cooked at home, my last reaction was from gravy while I was still in the hospital, which was made from a gravy mix.

My reactions consist of throat constrictions, suffocating feeling in my throat, bronchial tubes and lungs. I have very severe asthma attacks with this. I have had reactions to MSG for at least four years now. At first it gave me severe stomach cramps, instant diarrhea, and very severe migraine headaches. I was taken to the hospital for a shot several times until my physician decided it was a MSG reaction. Then two years later it affected my throat, bronchial tubes, and lung areas. All of my reactions start within ten minutes after eating MSG and within less than half an hour am in the ambulance on my way to the hospital. To get me out of trouble, breathing, and well again, I have to have a tremendous amount of medications such as oxygen, Seldane, Theodur, medicated breathing treatments every four hours, inhalers, and Prednisone, which leaves me with ulcers and various side effects, which results in more medication. It also effects my heart, as each time I have been in CCU for three days.

My doctors have convinced me that the accumulation of MSG in my system and in those like me who are affected from MSG, in time causes out reactions to be more severe, which I feel is unknown to the general public. For me this has become life threatening, as do not dare have any amount of MSG.

There are many people having illnesses and strange reactions and a lot of doctors are not aware what is wrong. Many times it turns out to be MSG reactions. I am hearing of more and more people having these reactions.

I have had a complete change of lifestyle as it is very difficult to eat in restaurants, at friends and relative's homes, and at church functions. I never know when to really feel safe or if I am really being told the truth in restaurants. It is also very difficult at home as it takes me hours to shop at a grocery store, reading labels on almost everything. I understand it can be hidden in labeling as "natural flavors" . . .

I also feel and know all the medications I have to have from a MSG reaction certainly are not good for me, not at all fun to go through, and certainly should not be necessary. All of this just due to MSG.

I do feel very serious thought and action should be taken on this matter and make it a law to label items with a statement NO MSG if they truly do not have any or better yet ban it completely for all of our human safety. I truly feel that the Food and Drug Administration should take immediate action on this.

As I am a widow living on a limited income, the required drugs and oxygen bottles for all these treatments have amounted to hundreds of dollars being paid out of my savings account since my medical policy does not pay for my medications.

I shall be very interested in reviewing any legal sources that will reimburse me for damage to my health as well as the expense of the medications from companies who are aware of this chemical action source of MSG. I really do consider this on the same level as the asbestos being hidden from the public for so long.

Port Orchard, Washington

Comment: Asthma is an increasing condition within our country with a rising death rate. There is no question that monosodium glutamate and MSG-containing substances are associated with severe asthmatic episodes. Cases of MSG-related asthma are being increasingly reported, and with the rising death statistics, MSG is likely accounting for hundreds of asthma deaths.

Dear Dr. Schwartz:

I have known I have a problem with monosodium glutamate for at least eight years. Approximately two years ago, I spent five days at N.I.H. (National Institute of Health) on an MSG protocol. This protocol was funded by the Glutamate Technical Association.

I have a file at least four inches thick of letters and answers received to my queries, from many agencies and researchers. When reviewing this material, all of the answers to my questions were found in publications released by the Glutamate Technical Association.

Of course, the ultimate solution is abstinence, any fool could figure that out. It has been disheartening to be a subject to the disbelief, the nonacceptance of symptoms and general attitude of all of the agencies and people have corresponded with over the years. Then, finally, along comes your book, In Bad Taste: The MSG Syndrome. Thank you, I really don't think I can tell you how much. Just to read a positive approacheven if there is "no" solutionyou know there is problem. You have taken a stand. Thank you.

I do, have a definite "chemical reaction" to this substance. Each time my symptoms are worse. I have managed to avoid MSG for a year. The last time I ingested monosodium glutamate I tasted my husband's dinner (no more than a tablespoon). The clams were not fresh, but canned, and MSG was in the juice. Later that evening, suffered from vomiting, diarrhea, gas, and my skin turned red from head to toe (no individual hives), plus discomfort in the throat. This was a mild reaction compared to the time prior to this, simply because of the amount I'm sure.

One thing that I have noticed, that I have not read, thus far, is that upon elimination of MSG from my diet I have found that I am no longer tired all of the time and I do not need as much sleep. Since this happened in conjunction with the elimination and I do feel that MSG was having this particular long term effect on my system.

Anyway, it is not as if I think you can do anything specifically to help me personally, it is just that I would like you to know how much I appreciate the fact that you have written your book and that I hope it will help to eliminate this substance from the market by making the general public more aware. I would be happy to help you in any way that I could if there is anything I can do to be of service.

Davidsonville, MD

Comment: In this case there appears to be a combination of symptoms of drug reaction and those usually termed "allergic" symptoms. The intestinal symptoms can be extremely severe. We have received reports of people who have attended "irritable bowel clinics" for many years who experience complete relief with the elimination of MSG. The symptom of fatigue is prominent in some people who describe it as an overwhelming need for sleep. There have been individuals who felt that their reactions were part of a chronic fatigue syndrome; however, their symptoms resolved with the removal of MSG from their diets.

Dear Dr. Schwartz:

Thank you for taking the time to talk with me regarding the MSG dilemma. My experience with MSG made me feel drunk and fuzzy and I was tested for Lyme's Disease, arthritis and Lupus. My lab profile showed a slightly elevated sed rate but nothing conclusive. All other blood work was negative. I also experienced asthma symptoms basically overnight with no prior history of asthma. I was treated with potent drugs such as steroids and antibiotics with no relief. I consulted a doctor and he tested me for food sensitivities and learned that I was sensitive to wheat, rye and MSG.

After modifying my diet, I have been successful at losing weight and I feel like a new person. I am somewhat dismayed that my medical doctors, which included specialists, did not question a sensitivity.

Minneapolis, MN

Comment: This letter is very important because it demonstrates the many people we have heard from who suffer from unexplained symptoms. MSG sensitivity is rarely suspected. In attempts to treat these symptoms patients are subjected to many medications, as well as procedures, including one woman who even had all of her teeth extracted. Brain scans, CT (computerized axial tomography) scans and NMR (nuclear magnetic resonance) scans are frequently employed to diagnose vague, neurological symptoms. These expensive tests usually reveal nothing in the MSG-sensitive person, although we have detected cases of brain damage proven by MRI (magnetic resonance imaging) and caused by monosodium glutamate.

Dear Dr. Schwartz:

I heard you on the radio talking about MSG. I went to the library and got your book to read. Thanksgood information.

. . . I am not allergic to MSG (that is, not that I know of). However, I buy much of my food from health food stores and stick to non-processed foods and fresh vegies and fruits. I felt pretty good that I was doing the right thing. I have always stayed away from foods I thought might contain MSGonly because: I don't NEED it, so why have it?

I was angry to find out that MSG may be in my foods via HVPparticularly canned tuna. What a ruse! Now, I am on a mini-campaign to straighten that out. I am writing letters and calling vendors.

. . . Every time I think about HVP and "natural flavorings" I get mad. Funny, I always wondered why products used the term "natural flavorings" when everything else seemed to be on the label. Finally, I decided it was just to hide that "special something or other" that made their product taste just right. But I always thought hydrolyzed vegetable protein was another okay ingredient (just as you mentioned

of your book: "What could be better for us than protein? And everyone knows vegetables are good for us.")

. . . What I loved about the history of MSG and the person responsible for having it taken out of baby food. I've always thought: we are all babiesjust grown up some. . . . Why is it okay to poison us when we get bigger, but try to keep baby food clean. What makes people think we lose our right to be treated especially well just because we've grown over 24´´ tall?

What a life!

San Francisco, CA

Comment: When monosodium glutamate is a component of hydrolyzed protein (and it may be up to 40%), it can be labeled as "natural flavoring." This confuses people's self-identification of MSG sensitivity. We have seen industry information advising producers and manufacturers to disguise their use of hydrolyzed protein by using this wholesome-sounding name.

Dear Dr. Schwartz:

At one time I seemed to have no energy problems. In the 1970's my first reaction became obviousthat was the severe three-day headache mostly in the eyeballs. Horrible! I now have, within two hours of ingestion of MSG, a lack of emotional control. About ten hours later, a collapse of energy which puts me in bed for two days.

During a one day MSG test the nurse told me that my blood pressure was up-down, up-down, up-down each of the two hour times it was taken. The doctor did not tell me this and was, in fact, not open in discussing it. Are there centers testing it?

Soup bases are used without people realizing their content. For me it is terrorizing to know I may be administered this DRUG against my will.

Salem, Oregon

Comment: The psychiatric and behavioral symptoms of MSG use can be extremely severe and incapacitating. We have many cases of individuals being referred to psychiatrists because of symptoms of depression, anxiety, rage, and panic attacks. Their symptoms have been markedly reduced, or in some cases eliminated, by removal of MSG from their diet. What is particularly alarming is the widespread use of monosodium glutamate in institutions that may treat emotionally disturbed persons. It is probable that much time, energy, medication, and money are being used on unnecessary psychiatric treatment of MSG reactions.

Dear Dr. Schwartz:

I read with interest your book, In Bad Taste. I'd like to pass on to you a description of my MSG-induced symptoms which can be produced with as little as one or two bites of the food that contains the offending substance, though more often they will occur after about five minutes into my meal MSG will trigger in me an esophageal spasm causing intense internal discomfort, accompanied by markedly increased salivation. Although I am able to swallow, swallowing only worsens the symptoms. Before I learned what my problem was, I would usually find myself in a restaurant when the reaction started. As symptoms increased, I would sit motionless in severe distress with a mouthful of saliva. Eventually it would reach the point where I had to leave the table (without explanation, since I could not talk without drooling) and head for the men's room. Sometimes the symptoms would last only five or ten minutes, but on many occasions, one to two hours. Often I was unable to return to work from lunch.

Although I have had many very bad episodes, the one remember most vividly involved a long-planned overnight with my wife to an inn whose restaurant was given a 4-star rating by both AAA and Mobil. The combined cost of the room and the dinner came to almost $200. I spent

about five minutes eating, then abandoned my wife for most of the next hour, which I spent in the men's room. We then quit the restaurant and went to our room where, after two hours of sheer agony and totally exhausted, finally fell asleep until morning.

Never one to seek professional medical help unless actually dying, I self-diagnosed my symptoms as being caused by some type of hiatal hernia. Fortunately, I had an occasion a few years ago to hear someone on TV mention those allergic to MSG could experience significant GI symptoms. Now that I'm aware, except for a few occasions when I have been caught off-guard, my symptomatolog has completely disappeared. In all seriousness and honesty, I have never experienced symptoms from any other physical disorder that could even approach the degree of discomfort attributable to my ingesting MSG.

Shepherdstown, WV

Comment: These esophageal reactions can be extremely severe, as in this letter. However, there are all ranges of discomfort. Millions of people have frequent "heart burn" or indigestion or GERD (gastroesophageal reflux disease) in epidemic proportions. We have seen many of these cases completely relieved with the elimination of all forms of MSG. Pregnant women, in particular, who are prone to indigestion appear to suffer an increased response to MSG. Billions of dollars are spent yearly on antacids and other remedies, not to mention lost work time and decreased job performance. Removal of MSG from a person's diet who has these sort of symptoms can make a major difference in their use of medication.

Dear Dr. Schwartz:

Over one and a half years ago, I read an article in our local Sunday paper promoting your book *In Bad Taste: The MSG Syndrome*. This month I finally acquired the book and read it! Thank you!

When our daughter was seven years old (four years ago) she started experiencing flu-like reactions during late night-early morning sleep. We discovered, after many episodes of reactions that she is MSG sensitive.

During her first reaction, her symptoms included headache, severe stomach cramps, vomiting, diarrhea, red rash over entire bodyespecially hands and feet with intense itchingbloodshot eyes, shakes and chills, and at one point seemed to be almost unconscious. In panic, we summoned the rescue unit to our home for help. We were told that it appeared to be the flu. The intense itching continued, so our pediatrician was consulted during the late hours of the night. We were advised that the allergic reaction was most likely to be food related, and. to administer Benadryl if available, and a baking soda bath. The doctor also mentioned that in noting the foods our daughter had consumed that day may aid in pin-pointing the cause. Within 1520 minutes after the dose of Benadryl was given, most of the symptoms disappeared and she slept soundly for the remainder of the night, and appeared very normal the next day.

There were many reactive episodes that first year after her initial reaction, with always similar symptoms, although some episodes were less intense than others (perhaps indicating the dose of MSG she consumed). I am a registered Medical Technologist, and at the time was employed in the Pathology Department of a major medical center. One day at work, a friend complained of stomach cramping after a lunch at a local Chinese restaurant. She mentioned that this sometimes occurred when she had eaten food containing MSG.

It clicked!! When I arrived home from work immediately began checking bottles, packages, seasoned salt, etc.and found MSG listed on most everything. I even had a bottle of pure MSG! The inside of me felt like jelly . . . I felt like I had been poisoning my daughter.

I contacted her doctor with my discovery, and to my disappointment he was not familiar with specific MSG allergic reactions.

He suggested that an allergist could be consulted if her problem continued to arise. We were convinced that MSG was the culprit and started educating ourselves in checking packages, bottles, snacks, etc., and to express her possible MSG allergy when visiting friends, school, etc. At times it is very discouraging for all of us, as parents . . . especially after reading your book and becoming aware of other products that MSG can be disguised infor example HVP . . .

I hope that our documentation along with that of other afflicted people will help convince the FDA that MSG should possibly be removed from the market or certainly manufacturers should be required to print a warning message on packaging when the additive is present in the food.

. . . Dr. Schwartz, thank you for the time, research and effort you devoted in writing your book. It helped confirm our suspicion of MSG sensitivity, to watch for other food related reactions, and we know that our daughter is not alone!

Windham, ME

Comment: The dose of MSG that many children ingest can exert potent effects. Of extreme concern is the multiple doses of MSG that a child can receive over the course of one day. From the breakfast cereal in the morning to school lunches, which are usually laden with MSG, to afterschool microwave snacks and then to dinner in a pleasant family restaurant where MSG use is frequently not suspected, a child can get a continuous dose of MSG and experience chronic symptoms. A parent cannot easily detect this reaction because of the myriad sources. We have received many letters from parents who have reduced behavioral disorders, hyperactivity, sleep disorders, stomachaches, headaches, and asthma and who have improved overall the well-being of their children with removal of MSG. The recent studies demonstrating immune impairment and a relationship with cancer are further reasons for long-term caution.

Dear Dr. Schwartz:

I am writing to thank you for your book *In Bad Taste* which I probably would never have found except for noticing it on the "New Books Out" shelf at the Santa Monica Library. It took about two years before a doctor at Kaiser Permanente Hospital diagnosed my problem as an allergy reaction when I would need excessive sleep, get red spots on my hands, feel depressed, unable to think clearly and feel irritable and upset. In the diagnostic tests by injection I was told of allergies to dust, feathers, etc. but only by being alerted to this did I trace the problem to MSG myself, as no food tests were conductedand no chemical reaction tests.

It is only recently that I became aware of MSG in foods that I had never suspected such as those mentioned in your book, and as you say, I wonder how many more people there are who do not relate MSG to many of the items listed and continue to suffer. Also, have you noticed how obscure the labels are in so far as the print is minute and the colors used (ie., maroon on black and vice versa) seem deliberately difficult to read.

It takes so many years for poisons in the environment to become apparent and an effort made to prevent them but surely there is something the individual can do? I have intended for a long time to write to the food companies and the Food and Drug Administration and will certainly do so now I know I am not an isolated case. Is there any group or organization endeavoring to state "No MSG" or change the situation? If so, I would appreciate the address.

There is hardly anything I can eat but your recipes will help!. One other symptom that occurs with me is that if I have an MSG severe allergy reaction, I find myself transposing letters in words, or leaving them out. Although this is during the worst attacksand may be a combination of allergy as I also get severe reaction to soap powders and liquids in seemingly all detergents I have triedeven the "biodegradable" ones.

Thank you again for having the courage to speak-out and not be intimidated by the corporations involved. You are a warrior, indeed.

Santa Monica, CA

Comment: A particular symptom demonstrated here is the neurological reaction usually described as fuzzy thinking, difficulty in concentration, or confusion. These neurological reactions are of great concern in view of the rising associations of glutamate metabolism with neurological conditions such as Alzheimer's disease. This is a migraine-related confusional state that may appear prior or even in place of the characteristic headache. These neurological impairments may be accompanied by evidence of brain damage which may be seen on the MRI (magnetic resonance imaging) of the brain. Metabolic changes in such cases can be seen on the PET scan (positive emission tomography).

Dear Dr. Schwartz:

My husband and I are writing you to thank you for the answer to years of waking at 5:00 A.M. to devastating, sickening headaches and other associated symptoms that would put him in a dark room suffering for at least eight to ten hours.

I would like to give you some background information on Tony's years of headaches. He is a 39-year-old self-employed plumbing contractor. He has since childhood suffered with hay fever allergies, sinus problems and migraine headaches. He has been treated with allergy shots, pain relievers as strong as Percodan and Caffergot PB, all of which did absolutely nothing but compound the pain. Doctors never found the root of his problem.

Before knowing about MSG my husband would substitute a healthy vegetable juice drink for morning coffee but his symptoms got worse. At lunch time he would have a can of good old-fashioned chicken soup with a tuna sandwich and by suppertime he thought of going to the Emergency Room for the pain would be so severe.

In February of 1989 I was watching TV . . . and saw you. I was starting to cook dinner when I put everything down and for one hour could not believe what I was hearing. Everything you described as MSG reactions was exactly what Tony was suffering from. Getting your book was like trying to obtain an illegal substance. It was hard to find. After both of us reading and re-reading and outlining information we knew what had to be done: a complete review of our dietary products. It revealed large amounts of the poison, sometimes double doses in all our favorite foods. We began our quest to try to eliminate MSG from our diet, an almost impossible task.

I cannot believe the FDA can make a cigarette manufacturer put warnings on their packages, [yet] MSG can be hidden under a barrage of alias names, that cannot be easily identified. It is obvious that the Food Mafia is keeping the public from finding out about this good tasting poison. What can we do as victims of the FDA and food companies to stop the unnecessary poisoning of family and friends?. After one year of trying to avoid MSG and its aliases, have noticed a remarkable difference in Tony.

a) He has been through springtime blooms without reaction and fall time defoliation without reactions.

b) After eating a meal that is MSG free he doesn't suffer from stomach cramps and doesn't have to run to the bathroom.

c) Most of all, 5:00 A.M. headaches are eliminated. Lost workdays were also eliminated.

d) Cooking habits have gone back to the basics. Your recipes were very helpful.

We would like to tell you about Thanksgiving Dinner this year. Having two turkey gravies, one MSG free and one containing a full gamut of MSG, we could see the reaction of people fighting for the bathroom, falling asleep after our meal, mood swings, etc. Tony, on the other hand, had the first holiday dinner that did not cause a headache the next day.

In closing, we would like to extend our complete gratification to everyone involved in putting this valuable book together. And to you, Dr. Schwartz, for bucking the established Food Mafia. Thank you again.

Monroe, CT

Comment: I would like to point out that Tony observed that his other allergies were reduced in intensity by removal of MSG. We have heard this now from many sources. Many days of lost work and educational opportunities as well as a decrease in quality of life were caused by monosodium glutamate. A student who suffers from MSG sensitivity may prematurely drop out of school or not attain the highest educational level he or she is capable of due to a toxic, disabling reaction to MSG. Migraine headaches are rapidly increasing in frequency due to widespread MSG use and mislabeling.

The following letter was addressed to the National Organization Mobilized to Stop Glutamate (NoMSG), and forwarded to Dr. Schwartz.

Dear Gentlemen:

Regarding the article in the *New York Times*, by Sandra Blakeslee, March 6, 1990, about MSG sensitivity:

I had dinner at an Oriental restaurant and later took a walk with my wife. Within an hour I was in the hospital with large hives (1′′ to 2′′ in length) on my face, neck and the top and sides of my head. In addition to the hives, my throat was closing and I felt very weak and ill. I was taken to the hospital and given an injection of Benadryl. The symptoms then started to subside and were gone within a few hours.

Furthermore, I was left with a residue of fluid which hung in the skin under my chin and this remained for about a week. The doctor at the emergency room said my condition was caused by the MSG in the

food that I had eaten. About eight months later I made the mistake of eating at another Oriental restaurant and had a similar but less severe reaction.

Maybe you can forward this letter to (Dr.) George R. Schwartz mentioned in the *N. Y. Times* article as an MSG critic. It might serve as some more "ammo" for him. I applaud your efforts and hope you can convince the FDA to either stop the use of MSG as a food additive or at least label all foods containing it, so that those of us that are allergic to MSG will not have to play Russian roulette when we eat.

Yonkers, New York

Comment: Even when restaurants put up signs saying "No MSG" the toxic substance may still be present in various prepackaged soup mixes and sauces. One continual offender in Chinese foods is oyster sauce. This usually contains either monosodium glutamate or hydrolyzed vegetable protein. The latter type frequently has "No MSG Added" written on the bottle's label.

Appendix 4
More about Hydrolyzed Protein

There has been so much discussion and industry defense of hydrolyzed protein as being "natural" and therefore harmless that it is time to put this matter at rest. In the journal *Food Trade Review*[54] Dr. Prendergast reviewed the production of hydrolyzed protein and demonstrated the steps of manufacture. These are:

1. Protein sourceanimal or vegetable.

2. Add hydrochloric acid and elevate temperature for extensive time.

3. Pump into new chamber and add sodium hydroxide.

4. Sediment or black sludge (humin) is filtered off.

5. Pump filtrate into new chamber and add bleach to decolorize and pass through activated charcoal to debitter.

6. Filter the bleached liquid into a new chamber for drying or concentrate to a paste in vacuum pans.

Reviewing this process, it is clear that using the term "natural" disguises extensive chemical processing and misleads the health-conscious consumer.

Fermented flavor enhancers, such as autolyzed yeast, have gained some use partly due to the finding of carcinogens in hydrolyzed protein.[55] These alternatives to hydrolyzed protein contain MSG as well and are commercially produced in ways that I do not see as "natural," prepared from hydrolyzed yeast protein, salt, and monosodium glutamate. Industry "spec sheets" go on to advise companies to declare

54 Prendergast K: Protein Hydrolysate - a Review. *Food Trade Review*, 44:1421, 1975.

55 Fermented flavor enhancers can replace HVPs, *Food Engineering*, 1989.

this substance as "natural flavor."

Hydrolyzed proteins are commonly used to help food processors develop more seasoned foods while retaining a "healthy image."[56] In 1988 Takeda USA, a major manufacturer of MSG-containing products, released a hydrolyzed protein named *Amiflex*. This product offered a high concentration of glutamic acid, but can be labeled as "seasoning." *Amiflex* contained just under 40% sodium glutamate.

56 HPP Provides Seasoning, *Food Engineering*, p. 29, 1988