

# TASTE

APRIL 2003

raising awareness  
nourishing understanding

# THE FUTURE

**EXCLUSIVE**

## Feed Your Knowledge and Taste the Future

### Beauty and the Bean:

Versatile soybean provides healthier skin, hair care innovations

### HIGH-OCTANE FOODS:

Are more nutritious foods coming to your grocery store?

### Eat Yourself Young:

Do stronger plants mean stronger bodies?



Could you bake your mom's secret banana bread recipe without the bananas? Of course not. Would a tropical fruit salad be quite so tropical without the sweet, mild taste of papayas? No, not quite.

But the world's banana supply is under attack and, until recently, Hawaii's papaya industry was being wiped out. But there is good news.

Researchers say biotechnology provides powerful tool for saving both the papaya and bananas. It is a race against Mother Nature's clock as deadly plant diseases threaten these important food crops.

Biotechnology may give scientists a way to save the banana industry in India and Asia where it is threatened by a disease called Black Sigatoka. Earlier this year, researchers at Crop and Food in New Zealand predicted the disease could wipe out conventional banana varieties within 10 years. The good news is, using biotechnology, researchers are working on the development of a disease-resistant variety of banana.

## BYE-BYE, BANANAS? PLUM OUT OF PAPAYAS?

**How biotechnology can ensure the survival of some of our favorite foods**

The Hawaiian papaya industry survives today, thanks to a biotechnology innovation — a plant that is resistant to the ringspot virus. By 1997, this virus had decimated Hawaii's fifth-largest crop. Production had fallen by approximately 40 percent, farmers were going out of business and Hawaii's \$17 million papaya industry was threatened with collapse.

Fortunately, that same year, the U.S. government approved a papaya variety developed through biotechnology to be resistant to the ringspot virus. These varieties produced immediate results. Within four years, the genetic improvement had not only stopped the rapid decline of the Hawaiian papaya industry, but production had actually rebounded to levels close to those seen before the invasion of the ringspot virus.

These are only two examples of how biotechnology can be used to help combat plant diseases and ensure a steady supply of these healthier fruits.

For more information:

**Delan Perry**, president, Hawaii Papaya Industry Association

**Kenneth Rohrbach, Ph.D.**, plant pathologist, Department of Plant and Environmental Protection Sciences, University of Hawaii at Manoa

# TASTE

raising awareness  
nourishing understanding

# THE FUTURE

## In this issue:

### The latest beauty news

Beauty and the Bean . . . . . 1  
*Versatile soybean provides healthier skin, hair care innovations*

### Our health & nutrition special section

High-Octane Foods . . . . . 2  
*Are more nutritious foods coming to your grocery store?*

Allergies — What Allergies? . . . . . 4  
*Could food allergies become a thing of the past?*

Eat Yourself Young! . . . . . 6  
*Do stronger plants mean stronger bodies?*

Foods of the Future . . . . . 4  
*A better way to fight disease?*

Dental Health for Kids . . . . . 6  
*Brush, floss, munch?*

Big Allergies to Little Shellfish? . . . . . 6  
*Help may be on the way!*

### Cooking & entertaining

Bye-Bye Bananas?  
Plum Out of Papayas? . . . . . Left  
*How biotechnology can ensure the survival of some of our favorite foods*

Stop Crying! . . . . . 6  
*A tear-free onion could be on the way!*

### Special report on biotechnology: what consumers need to know

Biotech 101: How This Multi-Faceted  
Technology Touches Our Lives . . . . . 8  
*Answers to consumers' questions about biotech*

Today's Biotech Foods: . . . . . 12  
*Flavorful, flexible and more common than you think!*

From the Lab to  
the Grocer's Shelf . . . . . 16  
*Safety and regulation of biotech foods*

More Facts About Biotechnology  
and Biotech Foods . . . . . 19

### Meet the experts

Bruce Chassy, Ph.D. . . . . 21  
*University of Illinois*

Mary Lee Chin, R.D., M.S. . . . . 21  
*Dietitian, Nutrition Edge*

Judith Fertig . . . . . 21  
*Culinary Expert, Cookbook Author*

Terri Lomax, Ph.D. . . . . 22  
*Oregon State University*

Alan McHughen, D. Phil., FACN. . . . . 22  
*University of California — Riverside*

Martina Newell-  
McGloughlin, Ph.D. . . . . 22  
*University of California — Davis*

Linda Thrane . . . . . 23  
*Executive Director, Council for Biotechnology Information*

Donna Winters . . . . . 23  
*Farmer*

### Nutrition facts and recipes

Papaya Smoothie . . . . . 24

Roasted Root  
Vegetable Napoleon . . . . . 24

Plum Port Glazed Shrimp  
with Plum Papaya Salsa . . . . . 24

Chocolate Almond  
Toffee Parfait . . . . . 25

# Beauty AND THE BEAN

Versatile soybean provides healthier skin, hair care innovations



Looking for ways to protect your skin against wrinkles and skin cancer — and still enjoy the sun? Scientists say it is actually possible to reduce wrinkles and protect yourself against skin cancer with a new soybean-based sunscreen expected to hit store shelves next year.

SoyScreen, a soybean oil-based sunscreen, was created by Joe Laszlo and Dave Compton, chemists for the U.S. Department of Agriculture's Agricultural Research Service (ARS) in Peoria, Ill. In tests, SoyScreen offered the best overall skin protection compared with other commercially available products. The soybean oil, in combination with ferulic acid, an antioxidant found in rice and oat bran that absorbs ultraviolet (UV) light, was the best protection against harmful rays. Test samples of the water-resistant, all-natural product are expected to be available this year, with the product on shelves by 2004.

While soybean oil is helping protect our skin from the harmful sun, it also is showing its advantage in the latest hair care products.

The new hair care products, made from safflower and soybean oilseed by-products, were developed by ARS chemical engineer Sam Kuk. Kuk's research shows that soapstock, a by-product of oilseed processing, can be used for the same purpose as the synthetic polymers currently used in many hair care products.

Kuk says the gel he developed works with a variety of hair types and is less expensive than the commonly used synthetic polymers. The new gel gives consumers a natural way to keep those trendy styles.

Farmers are planting biotech soybeans to keep up with the increasing demand for soy products. In the United States, 80 percent of soybeans grown are enhanced through biotechnology. Farmers plant biotech varieties because they fend off weeds and require less plowing, according to a Conservation Technology Information Center study.

## FOR MORE INFORMATION:

SoyScreen developers

**Joe Laszlo and Dave Compton**, chemists, USDA Agricultural Research Service, National Center for Agricultural Utilization Research, Peoria, Ill.

Soybean-based hair gels developer

**M. Sam Kuk**, chemical engineer, USDA Agricultural Research Service, Southern Regional Research Center, New Orleans, La.

## Additional information about soybean-based gel products:

Kuk has used the same technology to create transparent and translucent coatings for freshly harvested produce. His work shows that the biodegradable films can extend the shelf life of produce, such as bell peppers and cucumbers, by at least 30 percent. The films easily wash off and are less expensive than the wax coatings currently used.



# ARE MORE NUTRITIOUS FOODS COMING TO YOUR GROCERY STORE?

Imagine a day when your family can eat vitamin-enriched foods, such as apples, instead of taking a vitamin pill to get the extra vitamins and minerals they need. This unique and convenient way to better nourish growing kids and busy adults may be closer to grocers' shelves than you think. In fact, University of Nevada researchers are now finding ways to help us get more nutritional value out of foods.

For example, tomorrow's generation of cooking oils will be healthier than ever before, thanks to research conducted today with canola and soybean oils. Even though these two oils are already some of the best sources of vitamin E, researchers, through biotechnology, are developing new varieties of soybeans and canola that will yield oils containing up to 10 times the amount of this important vitamin than is found in today's conventional varieties.

Found only in plants, vitamin E improves our immune function, lowers our risk of cardiovascular disease and has beneficial antioxidant properties. Approximately 60 percent of our vitamin E dietary intake is from vegetable oil, primarily soybean oil. The U.S. Recommended Daily Amount (RDA) for the micronutrient function of vitamin E is 10-13.4 International Units (IUs). But researchers have found that a daily intake of vitamin E in excess of the RDA (for example, 100-1,000 IUs) lowers the risk of heart disease and some cancers, improves immune function and slows the progress of a number of degenerative diseases such as Alzheimer's disease. However, it is difficult to obtain these therapeutic levels of vitamin E from the average diet, which is why researchers at the University of Nevada began studying ways to boost vitamin E levels in what we eat.

In addition to increasing vitamin E levels, researchers are using biotechnology to develop soybean oil with more oleic acid, a type of fatty acid. The advantage of oleic acid is its ability to be processed at high temperatures without producing trans-fatty acids, a type of fat that may raise cholesterol levels. With oleic acid-enhanced soybean oil, consumers will be able to prepare more heart-healthy meals and baked goods for their families.

Researchers are even coming up with innovative ways to battle the common cold through more nutritious foods. One way consumers have learned to help prevent a runny nose and cough is to load up on vitamin C, which is known to benefit our immune system. However, it also positively affects cardiovascular health and is used to regenerate vitamin E. While many citrus and green leafy vegetables contain high levels of vitamin C, University of California biochemists are using the foods of biotechnology to develop ways to increase existing levels of the vitamin in foods, including grains, where natural levels are very low.

## FOR MORE INFORMATION:

### Healthier oils

**Dean DellaPenna, Ph.D.**, *Department of Biochemistry and Molecular Biology, Michigan State University, East Lansing*

### Vitamin C-enhanced foods

**Daniel Gallie, Ph.D.**, *University of California-Riverside*

# HIGH-OCTANE

# FOODS



# ALLERGIES— *What Allergies?*

Could food allergies become a thing of the past?

Worldwide, food allergies affect 4 to 6 percent of all children and 1 to 2 percent of adults. But, what if scientists could help reduce allergy suffering caused by foods such as peanuts, wheat and soy?

Scientists hope that through biotechnology, they can rid some crops of common allergens, thereby improving the health and well-being of those who suffer from food allergies.

One of the most common allergy concerns for moms around the world is peanuts. Approximately one in every 30 children is thought to suffer from peanut allergies. Scientists at the University of Arkansas are attempting to modify peanut allergens, using biotechnology. Their goal is to reduce the potency of these peanut allergens and use these modified allergens to develop vaccines and other therapies. This could help millions of peanut allergy sufferers.

## FOODS OF THE FUTURE

### *A better way to fight disease?*

Around the world, scientists are working to find new and better ways to treat and prevent disease. Interestingly enough, tomorrow's most effective disease-fighting tools may be on grocery shelves, not in prescription medicine.

Biotechnology offers researchers an important new tool in the battle against diseases. In fact, researchers today have made huge strides by creating fruits and vegetables with the potential to fight some of the most common kinds of cancer, as well as administer life-saving antibiotics

and offer new ways to vaccinate people against communicable diseases.

Field tests are underway on a new cancer-fighting tomato that has been under development for a decade by Purdue University and the U.S. Department of Agriculture's Agricultural Research Service (USDA ARS). The tomato provides more than three times the amount of an antioxidant called lycopene than conventional tomato varieties.

Lycopene traps harmful molecules that damage human body tissue. This important antioxidant can lower the risk of breast and prostate cancer, as well as coronary heart disease. Almost 900,000 people die every year from heart disease, 44,300 women die each year from breast cancer, and 37,000 men die each year from

prostate cancer — facts which make this research invaluable. The high-lycopene tomato variety was voted the top development in food biotechnology, according to a 2002 Roper survey of 1,000 American adults.

Future foods also have the potential to fight one of the most devastating diseases among women — cervical cancer. Some 13,000 women are diagnosed with cervical cancer each year, and 5,000 women die. Bananas and potatoes have been developed with a vaccine for human papilloma virus (HPV), a prevalent sexually transmitted disease and the cause of most cases of cervical cancer in women. Researchers at the University of Rochester have tested bananas

But peanuts are only one of many foods that produce allergic reactions. Wheat is one of the most prevalent ingredients in snack foods. Thousands of people allergic to wheat never get the chance to snack on crackers or cereals. Instead, they are forced to spend hours reading labels and researching which foods are safe for them or their children to eat. Thanks to biotechnology, scientists in California now have a way to combat the problem. Researchers are testing allergen-free grains and are hoping to eliminate the effects of wheat allergies by using biotechnology to rid crops of allergy-causing proteins.

Soybeans also are a concern for moms with newborn babies. Soy formula is one of the most nutritious, easily digestible foods babies can eat; but it can be dangerous, or even fatal, for babies allergic to soybeans. Eliot Herman, a scientist at the University of Arkansas School for Medical Science, hopes to provide an option for sufferers. Herman and his colleagues have been able to suppress one of the major allergy-causing proteins in soybeans. While there are other proteins in soybeans that also cause allergies, this research represents a major step forward in discovering ways to help ease soybean-related allergic reactions. The suppression of this major allergen in soybeans may allow babies with specific allergies to this protein to avoid unpleasant allergic reactions such as hives, itching and diarrhea.

One of the most uncomfortable allergies for millions of people is hay fever. Almost 30 million people suffer from hay fever

around the world, and 9 million people visit the doctor's office to find relief from their symptoms. However, that might soon change.

In Tokyo, researchers have developed biotech rice that may help prevent hay fever caused by allergic reactions to certain kinds of pollen. The rice has the potential to save allergy-ridden people thousands of dollars in prescription drug costs. It would work like an allergy remedy — by slowly providing small amounts of allergens to patients, which desensitizes them to certain allergies.

By eliminating, altering or reducing allergens through biotechnology, millions of food-allergy sufferers will be able to enjoy much more diverse, healthful and safe diets.

## FOR MORE INFORMATION:

### Peanut information

**A. Wesley Burks, Jr., M.D., FAAAAI**, director, Division of Allergy and Immunology, Department of Pediatrics, University of Arkansas for Medical Science

### Wheat information

**Bob Buchanan**, professor of plant and microbial biology, University of California, Berkeley Soybean information

**Dr. Eliot M. Herman**, molecular biologist, University of Arkansas School for Medical Science

**Rick Helm**, immunologist, Arkansas Children's Hospital Research Institute

equipped with the vaccine, and work is now entering the third stage of clinical evaluation.

There is no telling what the future holds for disease-fighting food. Someday, taking medicine may be as simple as biting into a fresh banana or enjoying a baked potato.

## FOR MORE INFORMATION:

**Avtar K. Handa, Ph.D.**, Department of Horticulture and Landscape Architecture, Purdue University

**Robert Rose, Ph.D.**, assistant professor of medicine and of microbiology and immunology, Department of Medicine, University of Rochester

### Edible vaccines

**Charles J. Arntzen, Ph.D.**, Florence Ely Nelson Presidential Chair, Department of Plant Biology, Arizona State University





## STOP CRYING!

A tear-free onion  
could be on the way

Imagine chopping and slicing onions for your favorite recipes without a waterfall of tears and stinging eyes. Although the technology is still years away, scientists at the House Foods Corporation in Chiba, Japan, are working to make it a reality. Researchers have identified the onion enzyme that sparks those tears. The good part — the enzyme is not tied to flavor, so your signature dish will not lose its flavor. So take the box of tissues away from your cutting board and chop away!

For more information about the tear-free onion:

**Shinsuke Imai**, *food researcher, House Foods Corporation, Chiba, Japan*



## BIG ALLERGIES TO LITTLE SHELLFISH?

Help may be on the way!

Shellfish are one of the leading causes of food allergies. Reactions can include a tingling sensation in the mouth or tongue, dizziness, nausea or even anaphylactic shock and possibly death.

But a new science may soon bring relief for thousands of shellfish allergy sufferers. Researchers at Tulane University report they have made significant strides in the development of an allergen-free shrimp through biotechnology. According to lead researcher Samuel Lehrer, these studies could lead to a revolution in food safety by allowing scientists to create allergen-free versions of foods that are most likely to cause reactions.

For more information about the allergen-free shrimp:

**Samuel B. Lehrer, Ph.D.**, *professor, Tulane University, New Orleans, La.*



## DENTAL HEALTH FOR KIDS:

Brush, floss, *munch*?

Do your kids cringe every time they hear the word D-E-N-T-I-S-T? Wouldn't it be great if biting into a delicious apple could help prevent tooth decay? It might be closer to reality than you think. Scientists at Horticultural Research International in Kent, United Kingdom, are planning to convert apples into decay-fighters. New apples, developed through biotechnology, will contain ingredients to prevent germs from sticking to plaque and eating away at tooth enamel. Soon moms may have another, easier way to help kids maintain healthier teeth. That is worth smiling about!

For more information about the tooth decay-fighting apple:

**David James, Ph.D.**, *professor, Horticultural Research International, Kent, U.K.*

# eat yourself young!

## Do stronger plants mean stronger bodies?

We have all heard that old adage, “You are what you eat.” But according to two University of Colorado researchers, there may be more truth to this than any of us realize.

In fact, studies by the husband and wife team, William Adams and Barbara Demmig-Adams, have found that foods, even more than drugs, can help strengthen the very fiber of our bodies and help protect us from diseases such as cancer, heart disease, depression, schizophrenia and dyslexia.

The study showed that proteins added to plants in order to protect them from devastating sunlight, drought and poor soil also can strengthen human cells. Our bodies can literally benefit from the extra strength and resiliency of these modified plants.

On the flip side, plants without these proteins will not thrive when they undergo environmental stress. When consumed, these less hardy plants provide less nutritional value and lack the protective qualities of the protein-enhanced crops. When the protein-enhanced biotech plants are eaten by humans, they produce higher levels of antioxidants that protect us from many diseases.

“If we had diets more enriched with the right plant foods, we would likely live longer,” Demmig-Adams said. “More importantly, we would maintain a higher quality of life as we age.”

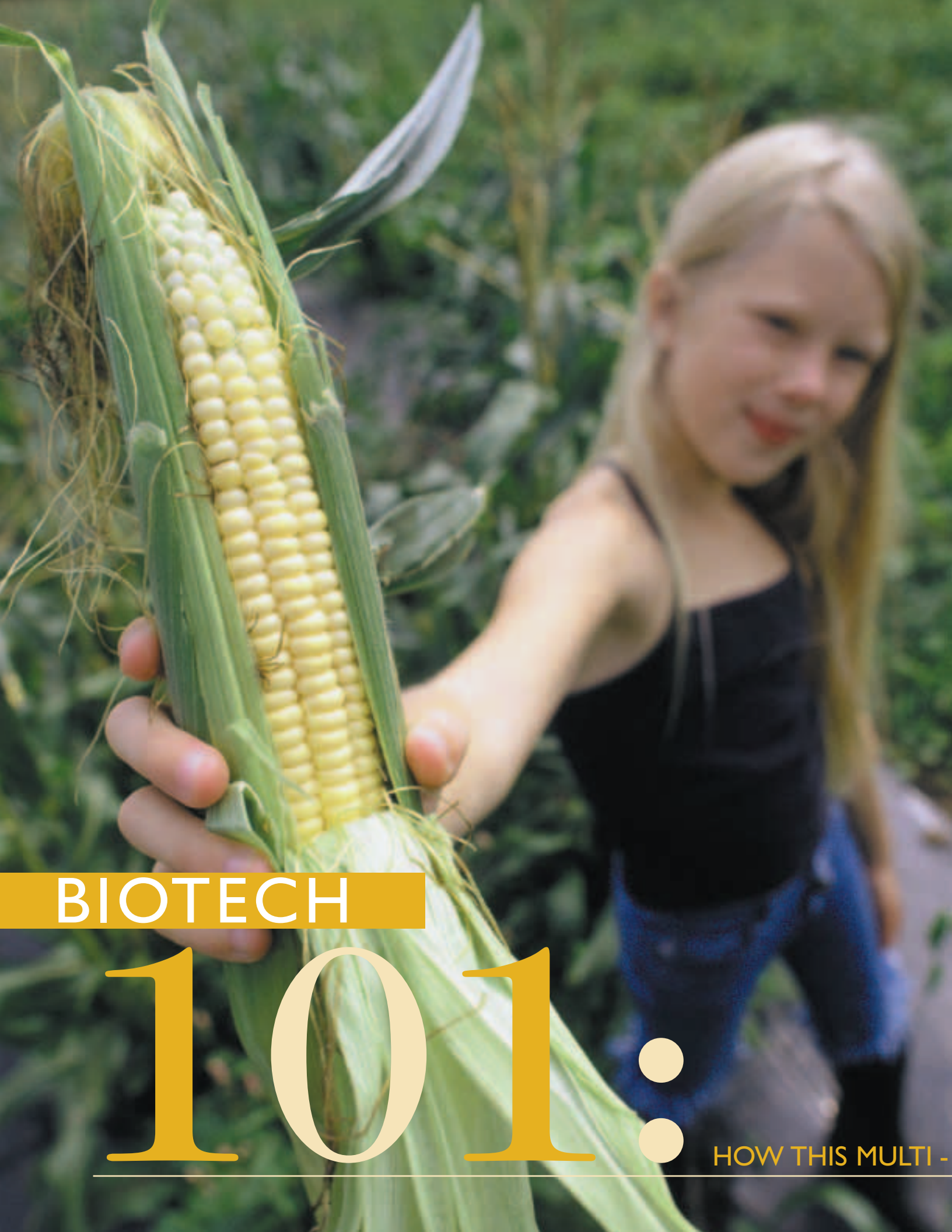
Demmig-Adams hopes that, with encouraging findings such as these, consumers will realize the many benefits of biotech foods and become more curious about them. In fact, recent studies have indicated a growing interest among consumers regarding biotech foods and their benefits. As consumers continue to demand foods with more nutritional and health benefits, biotech foods will more and more become the “improved health foods” of the future.

### FOR MORE INFORMATION:

**Barbara Demmig-Adams, Ph.D.**, *professor, Department of Environmental, Population and Organismic Biology, University of Colorado, Boulder*

**William W. Adams, III**, *associate professor, Department of Environmental, Population and Organismic Biology, University of Colorado, Boulder*





BIOTECH

# 101:

HOW THIS MULTI -

**W**ith more than 70 percent of food on grocery shelves containing biotech ingredients, consumers need to understand what biotechnology means to them and their diets. Below are answers to commonly asked questions about biotechnology.

### What is plant biotechnology?

Plant biotechnology is a tool used to make seeds with special qualities that can allow farmers to grow plants that are more nutritious, more resistant to pests and more productive. It is used to identify a special trait in one source, such as taste or hardiness, and incorporate that trait into a plant.

Plant biotechnology is part of a continuum — a refinement of genetic enhancement techniques begun thousands of years ago with the domestication of wild plants. A major step forward occurred when 19th century researchers learned how to crossbreed plants to add new traits such as color. This led to the development of hybrids a half century ago — one of the greatest achievements of modern agriculture.

The tools of biotechnology allow researchers to achieve the same kind of genetic exchange, but more precisely, which eliminates the need to crossbreed plants for several generations in order to breed in desired qualities and breed out those unwanted qualities.

While biotechnology takes traditional crossbreeding to a new, more precise (and more promising) level, the National Research Council said in a 1989 report that “no conceptual distinction exists between genetic modification of plants and microorganisms by classical methods or by molecular techniques that modify DNA and transfer genes.” In fact, the word “biotechnology” first appeared in print back in 1919.

### How does plant biotechnology work?

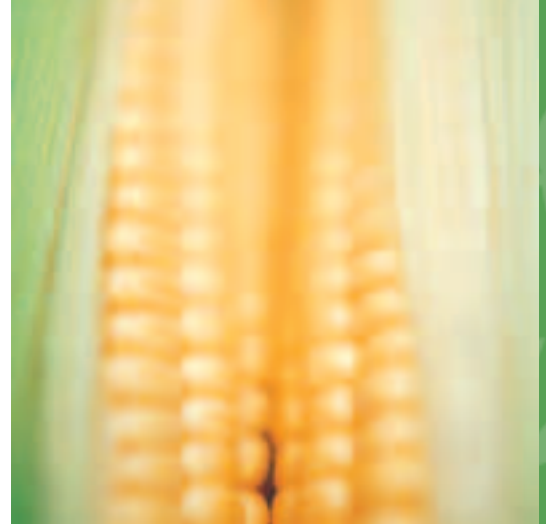
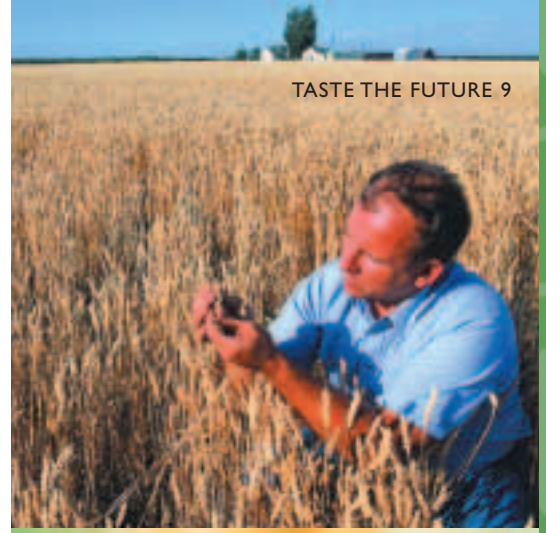
Every living thing, from the most simple to the most sophisticated, carries a genetic code, or “blueprint,” that determines precisely what traits it will have. Genes carry the code that tell a plant what color it will be or how it will taste.<sup>1</sup> Biotechnology allows scientists to identify beneficial traits in one plant — qualities like added nutrition, increased flavor or greater ability to fight pests or diseases — and incorporate them into another.

### Is it natural to move a gene from one plant to another?

The transfer of genes between plants is normal and occurs naturally all the time — usually with the help of wind or insects. Gene flow typically occurs between sexually compatible plants that are flowering at the same time and are close together.

### What about transferring a gene from one plant species to another? Is this OK?

Different plants share many of the same genes, which are the basic building blocks of life. For example, when researchers unlocked the secrets of the rice genome in 2002, they discovered a nearly perfect, yet smaller, model for several other cereal grains — namely barley, corn, oats, rye and wheat. These plants all evolved from one cereal plant about 70 million years ago. So, even though these grains outwardly appear different, their genetic makeup



on the inside is very similar. The same gene that allows a certain variety of rice to resist drought, for example, could be transferred to wheat so it, too, could be made drought-resistant.

### If people have been modifying food for years, why do some people object to biotechnology?

A lot of concern about biotechnology has been focused in Europe, which has been beset by a number of food scares in recent years.<sup>2</sup> But in the United States biotechnology is not a top-of-mind issue with most people. It is best to look at plant biotechnology along a continuum — as the next step in the refinement of genetic enhancement techniques that began thousands of years ago with the domestication of wild plants for food production.

### Are foods developed with biotechnology in supermarkets now?

Yes. In the United States, an estimated 70 percent or more of all food contains at least some ingredients derived from biotech crops. A soft drink sweetened with fructose — which is made from corn — would be on the list, for example, as would all kinds of products, including some candies, that contain soybean oil.

### How many different biotech crops have been approved for use in the United States?

About 55 different types of crops have been approved for commercial use in the United States. The most prevalent crops are soybeans (three varieties), cotton (six varieties), corn (13 varieties) and canola (11 varieties). Biotech papayas and squash also are available. Biotech flax, potatoes, sugar beets, sweet corn, tomatoes and rice have been approved by regulators but, so far, have not been widely planted.

### How long have biotech foods been on the market in the United States?

In 1994, the FlavrSavr® tomato became the first biotech food product on the market. In 1995-96, products such as biotech cotton, soybeans and corn first became available to farmers.

### Have farmers embraced biotech crops?

Yes. Biotechnology is considered by many to be the most rapidly adopted technology in the history of agriculture. In the United States, in 2003, the USDA estimates that 80 percent of U.S. soybeans will be planted with biotech soybeans; 70 percent of U.S. cotton acres will be planted with biotech cotton; and 38 percent of all U.S. corn will be planted with biotech corn. Globally, the amount of land planted with biotech crops increased by 12

percent in 2002 — the sixth straight year global farmers have adopted biotech crops at a double-digit pace, according to the International Service for the Acquisition of Agri-biotech Applications (ISAAA).

### Why are biotech crops so popular with farmers?

Farmers are able to make more money by planting biotech crops while, at the same time, helping to preserve the environment. Between 1998 and 2001, cotton farmers globally reaped an additional \$1.7 billion in income by using Bt cotton, according to a December 2002 report from ISAAA.<sup>3</sup> Yield increases for Bt cotton ranged from 5 to 10 percent in China, 10 percent or more in the United States and Mexico and 25 percent in South Africa. A separate study showed that six biotech crops planted in the United States — soybeans, corn, cotton, papaya, squash and canola — produced an additional 4 billion pounds of food and fiber on the same acreage, improved farm income by \$1.5 billion and reduced pesticide use by 46 million pounds.

### Are these products safe for me and my family?

Yes. Biotech foods on the market today are as safe as those developed through conventional breeding.<sup>4</sup> Since the first biotech food product came on the market in 1994, there has not been a single documented case of an illness caused by biotech foods.<sup>5</sup> Hundreds of studies have confirmed the safety of biotech crops and food, including a 15-year study by the European Commission that involved more than 400 research teams. Scientific organizations and regulatory agencies around the world have declared their confidence in the safety of biotech foods, including the World Health Organization, and the Food and Agriculture Organization of the United Nations, the Organization for Economic Cooperation and Development, the U.S. National Academy of Sciences and the Royal Society of London, as well as national academies in France, China, Brazil, India and Mexico and international scientific groups. More than 3,300 scientists, including three Nobel Prize winners, have signed a statement in support of biotechnology.

### Can a biotech food contain a gene to which I'm allergic?

Assuring that biotech foods do not cause allergies is an important part of the regulatory approval process. About 90 percent of food allergies are caused by a handful of foods.<sup>6</sup> So the potential for causing allergies can be easily reduced by not using genetic material from these foods. In addition, any genetic material that is used is carefully studied to see if it has anything in common with known allergens. Then, once it is inserted into a plant, the plant is studied to see if new

allergens are created. Rather than causing allergies, many people are looking to plant biotechnology as a new tool to remove allergens from food.<sup>7</sup>

### Who ensures the safety of biotech foods?

In the United States, the safety of biotech food is overseen by three separate agencies: The Food and Drug Administration (FDA), the Department of Agriculture (USDA) and the Environmental Protection Agency (EPA). See page 17 for details on how these agencies regulate biotech food safety.

Before foods developed with biotechnology can be approved in the United States, there are nine separate steps in the regulatory process that typically take seven to 10 years to complete — a far more rigorous process than is required for conventional foods, says Bruce Chassy, a professor of food microbiology at the University of Illinois. “Crops produced through biotechnology have proven to be as safe, or safer, than crops produced by conventional breeding,” he says.<sup>8</sup> Academics, third-party scientists, consumers, growers and the public at large all have multiple opportunities to participate in the process.

### What organizations have expressed support for biotechnology?

Several leading health organizations have voiced support for biotechnology, including the American Medical Association, the American Dietetic Association, the Institute of Food Technologists and the World Health Organization. For more information on these associations’ positions on biotechnology, see page 18.

### Are biotech foods or ingredients labeled?

A few countries, such as Japan and members of the European Union, have special labeling policies in place. In the United States, the Food and Drug Administration requires labeling only if a biotech food is “significantly different” from its conventional counterpart — that is, if there is a change in its nutritional content. If the products are “substantially equivalent,” a label is not required. The theory behind this approach is that a label should not be based on the *process* to grow a crop and should, instead, be focused on food’s nutritional content. The American Medical Association has concurred, saying “there is no scientific justification for special labeling of genetically modified foods as a class.”<sup>9</sup> If a biotech food is “significantly different” from its traditional counterpart — such as an orange with higher-than-normal levels of vitamin C — a label would be required.

### What about consumers’ right to know?

Consumers need relevant and meaningful safety and nutritional information to make sound food safety decisions. Today’s foods produced using biotechnology are tested and reviewed repeatedly by researchers to make sure they are safe, free of allergens and the same as their conventional counterparts. As a result, there is no need for special labeling. If the food product is changed in some material way nutritionally, or that may affect health, then labels are required.

### What is the environmental impact of biotechnology?

Several studies have confirmed the environmental benefits of biotech crops. The benefits include improved habitat for birds and other wildlife, cleaner drinking water and a reduction in harmful greenhouse gases and fuel use. One study by the Conservation Tillage Information Center, published in 2002, showed that environmentally friendly no-till conservation practices increased 35 percent since biotech seeds came on the market in 1996, while another NCFAP study showed how biotech crops reduced pesticide use by 46 million pounds in one year.

### What about the potential long-term risks of biotechnology?

Biotechnology may seem like a new technology, but it has been under development and tested for 20 years. There is no scientific evidence showing that biotech foods are any less safe than conventional foods. In fact, biotech foods undergo more extensive testing than their traditional counterparts. More than 25,000 field trials have been conducted on more than 60 crops in 45 countries, and scientists have detected no long-term effects on consumers, animals or the environment.<sup>10</sup> “Many consumers in North America, Europe and China have been eating GM (genetically modified) food for several years, without any demonstrated adverse effects on human health,” said Ismail Serageldin and Gabrielle Persley of the Consultative Group on International Agricultural Research. Per Pinstrup-Andersen of the International Food Policy Research Institute summed up the safety issue this way. He said, “Condemning biotechnology for its potential risks without considering the alternative risks of prolonging the human misery caused by hunger, malnutrition and child death, is as unwise and unethical as blindly pursuing this technology without the necessary biosafety.”<sup>11</sup>

## FOR MORE INFORMATION:

**Frequently Asked Questions** — U.S. Department of Agriculture, [www.usda.gov/agencies/biotech/faq.html](http://www.usda.gov/agencies/biotech/faq.html)

For sources, turn to page 23

# today's biotech

FLAVORFUL, FLEXIBLE AND MORE COMMON



# foods

THAN YOU THINK!

The following foods offer a *Taste of the Future* and feature unique blends of tastes and textures. What may be the biggest surprise is that each dish features at least one biotech ingredient. Some dishes include a variety of biotech foods.

But you won't be able to tell which foods were developed through biotechnology and which foods were conventionally grown. And that's a key point. Biotech foods are just as safe, in some cases more nutritious, and in every case more thoroughly regulated by government organizations than conventional foods today, according to the U.S. Department of Agriculture. Biotechnology is just one critically important tool we have for making foods more wholesome, nutritious and plentiful.

Here is a course-by-course description of some unique dishes.



## APERITIF: PAPAYA SMOOTHIE

This tantalizing, non-alcoholic cocktail consists of fresh papaya, fresh orange juice, low-fat vanilla yogurt and fresh lime juice. Blended smooth and garnished with a ripe strawberry, it makes a refreshing start to any meal or a tempting meal replacement.

### Featured biotech ingredient

**PAPAYA** The key ingredient in this drink is a variety of papaya developed to protect itself against a plant disease that threatened to wipe out Hawaiian papaya growers, an industry worth more than \$17 million to producers in that state.



## THE FIRST COURSE: ROASTED ROOT VEGETABLE NAPOLEON

This dramatic and flavorful dish combines layers of roasted beets, potatoes whipped with herbed Montrachet cheese and grilled yellow squash and zucchini. The stacked layers of vegetables are then drizzled with a vinaigrette made of beet juice, garlic, lemon juice and corn oil. The dish is served within a nest of mixed salad greens.

# BIOTECHNOLOGY IS JUST ONE CRITICALLY IMPORTANT TOOL WE HAVE FOR MAKING FOODS MORE WHOLESOME AND NUTRITIOUS.

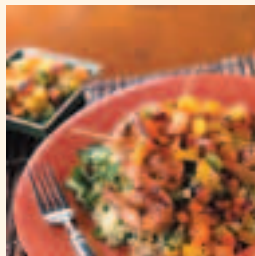
## Featured biotech ingredients

This dish features potatoes, yellow squash, zucchini and oil processed from U.S.-grown corn, all of which come from biotech crops either grown commercially now or that will soon be available.

**POTATOES** Researchers are developing a new, high-starch potato using biotechnology. These potatoes absorb less oil during frying and can be used to produce potato chips and crisps that contain less fat.

**SQUASH AND ZUCCHINI** Several varieties of biotech squash and zucchini are available today. These biotech varieties were developed to be resistant to plant diseases that can cause tremendous damage to these delicate vegetable crops.

**CORN** Several varieties of biotech corn are grown in the United States. Some varieties are tolerant to specific herbicides, which reduces herbicide use and allows farmers to plant more acres using environmentally friendly conservation tillage practices. Other varieties are resistant to damaging insects, which can reduce pesticide use and prevent pest-caused plant diseases.



## SECOND COURSE: PLUM PORT GLAZED SHRIMP WITH PLUM PAPAYA SALSA

This delectable “East Meets West” entrée features succulent grilled shrimp brushed with a rich plum port glaze. The skewered shrimp are served on a bed of coconut rice tossed with unsalted peanuts, coconut flakes and cilantro, complemented with a tart plum and papaya salsa.

## Featured biotech ingredients

**SHRIMP** Scientists at Tulane University are researching ways to counter allergic reactions to shellfish by removing the allergens through biotechnology. Researchers have successfully found a way to alter the effects of a protein in shrimp that is responsible for 80 to 85 percent of all allergic reactions.

**PLUMS** Researchers have developed a biotech variety of plum that is resistant to plum pox virus. This virus has severely impacted stone fruit production in the eastern United States and elsewhere. A variety developed through biotechnology to have built-in resistance to the disease could allow these regions to remain as major stone fruit producers.

**RICE** Several varieties of biotech rice are currently being developed, including varieties with built-in resistance to pests and disease, as well as increased nutritional value such as iron-rich rice and vitamin A-rich rice (“golden rice”).

Genetically altered “golden rice” produces beta-carotene, a compound that is converted to vitamin A in the human body. Vitamin A deficiency is the world’s leading cause of blindness in developing countries and affects more than 250 million children.

**PEANUTS** Biotechnology is producing peanuts with improved protein content. And moms with peanut-sensitive children should know that scientists at the University of Arkansas are using biotechnology to create new strains of peanut proteins to be used in developing revolutionary vaccine treatments for peanut allergies and removing allergens from peanuts.



## FOR DESSERT: CHOCOLATE ALMOND TOFFEE PARFAIT

Finally, a treat for the sensible chocolate lover in you! This dreamy decadence combines silky white and dark chocolate mousse with crunchy, buttery toffee. What’s the catch? The mousse is made with silken tofu, giving this dish a healthier nutritional profile than traditional mousse.

## Featured biotech ingredients

The white and dark chocolate chips used in making this dish may contain corn sugars derived from biotech corn. The silken tofu is made from soybeans, of which there are many biotech varieties grown in the United States.

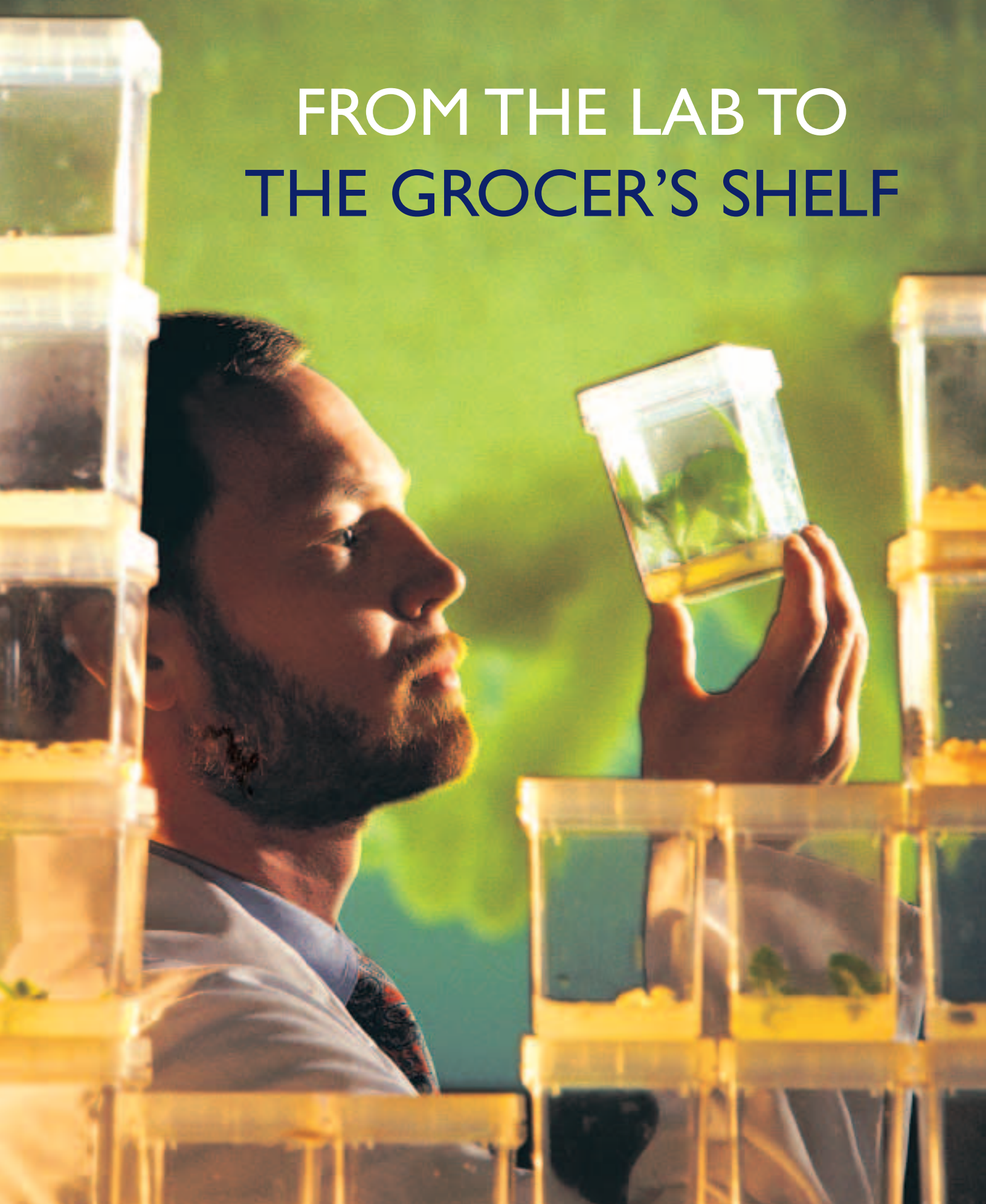
## SOYBEANS

- Soybeans that produce more stable oils are currently being developed. Today, soybean oil must be partially hydrogenated to increase its stability, which increases levels of trans-fatty acids that are associated with atherosclerosis and other nutrition-related chronic diseases. The new oil does not require chemical hydrogenation, which eliminates the production of trans-fatty acids.
- On another front, scientists with the USDA’s Agricultural Research Service are working to develop a biotech soybean variety with reduced allergenicity. They already have identified the key soybean protein that causes the majority of soybean-related allergic reactions.

This is just a small sampling of biotech foods and ingredients that demonstrate how biotechnology may improve consumers’ diets and eating experiences now and in the future.



# FROM THE LAB TO THE GROCER'S SHELF



Safety and regulation of biotech foods

According to a survey by the Accenture Institute for Strategic Change, more than half of consumers indicated that food products that benefit their health and well-being are most important to them. This is just one of many studies showing that American consumers are more curious than ever about coming dietary innovations and the impact these products will have on their lives.

In the case of biotech food, consumers also are curious about how it's different and what's done to ensure its safety.

Before they ever reach a farmer's field, biotech crops undergo rigorous scrutiny for several years to examine their nutritional content and possible environmental impact. In fact, biotech varieties in North America are tested more thoroughly than conventional crops.<sup>1</sup> One type of biotech soybean alone was studied 1,800 separate times.<sup>2</sup>

And, in the seven years since the first food biotech product came on the market (the FlavrSavr<sup>®</sup> tomato in 1994), there hasn't been a single documented case of an illness caused by biotech foods.<sup>3</sup>

Meanwhile, the benefits of plant biotechnology — now and in the future — are being documented.

### THOROUGH REVIEW PROCESS

In the United States, the safety of biotech crops and food is overseen by three separate agencies:

- The Food and Drug Administration (FDA) assesses the safety of all foods and animal feeds, including those produced through plant biotechnology.
- The Department of Agriculture (USDA), through its Animal and Plant Health Inspection Service, oversees field testing of biotech seeds and plants to make sure their release causes no harm to the environment, especially native plants.
- The Environmental Protection Agency (EPA) evaluates biotech plants' environmental safety, such as their pesticide properties and their possible effect on wildlife, as well as how these plants break down in the environment.

Many products come under review by more than one agency. Bt corn, for example, which is enhanced to protect itself against damaging insect pests, is overseen by the USDA to ensure it is safe to grow, by the EPA to confirm it is safe for the environment and by the FDA to make sure it is safe to eat.<sup>4</sup>

This process involves several years and at least nine stages of review. Academics, third-party scientists, consumers, growers and the public all have multiple opportunities to participate.

Every developer of biotech foods has, without exception, consulted with the FDA on a voluntary basis to preemptively address any safety or nutrition-related concerns before the



product reaches the marketplace.<sup>5</sup> In 2001, the FDA proposed new guidelines (not yet officially approved) that will make that consultation mandatory. The agency also posts biotech food information on its Web site.<sup>6</sup>

Review does not stop once products reach farm fields and dinner plates. Post-approval monitoring by the product developer, independent researchers and government scientists helps ensure biotech crops are safe for consumers and the environment.

## HEALTH AND FOOD EXPERTS AGREE

Several leading health organizations have voiced support for biotechnology, including:

- The American Medical Association, which recognized the “many potential benefits offered by genetically modified crops and foods ... and encourages ongoing research in food biotechnology.”<sup>7</sup>
- The American Dietetic Association, which said, “Biotechnology techniques have the potential to be useful in enhancing the quality, nutritional value and variety of food available for human consumption and in increasing the efficiency of food production, food processing, food distribution and waste management.”<sup>8</sup>
- The Institute of Food Technologists, which said plant biotechnology “offers the potential to rapidly and precisely improve the quantity and quality of food available,” and added that the precision of biotechnology will lead to “more predictability and an easier safety assessment process.”<sup>9</sup>
- The World Health Organization, which stated, “The benefits of biotechnology are many,” including improved production and reduced pesticide use, and promise “major improvements in both food quality and nutrition.”<sup>10</sup>

This system of regulatory checks and balances is a good example of how regulatory agencies, public health organizations, consumers and business can work together to produce technology that holds tremendous benefits for consumers around the world.

## FOR MORE INFORMATION:

### Resources

**Regulatory Oversight in Biotechnology** — U.S. Department of Agriculture, [www.aphis.usda.gov/biotech](http://www.aphis.usda.gov/biotech)

**Regulatory Framework** — AgBioSafety Education Center, [www.agbiosafety.unl.edu](http://www.agbiosafety.unl.edu)

**Evaluation of the U.S. Regulatory Process for Crops Developed Through Biotechnology** — Council for Agricultural Science and Technology, [www.cast-science.org](http://www.cast-science.org)

**Safety & Regulation Links** — Council for Biotechnology Information, [www.whybiotech.com](http://www.whybiotech.com)

**Are Bioengineered Foods Safe?** — U.S. Food and Drug Administration, [www.fda.gov](http://www.fda.gov)

**Bioengineered Foods: Will They Cause Allergic Reactions?** — U.S. Food and Drug Administration, [www.cfsan.fda.gov](http://www.cfsan.fda.gov)

**Case Studies of Environmental Regulation for Biotechnology** — U.S. Office of Science and Technology Policy, [www.ostp.gov](http://www.ostp.gov)

**Ecological Impact Assessment** — Council for Agricultural Science and Technology, [www.cast-science.org](http://www.cast-science.org)

**Genetically Modified Foods: Experts View Regimen of Safety Tests as Adequate, but FDA's Evaluation Process Could Be Enhanced** — U.S. General Accounting Office, [www.gao.gov](http://www.gao.gov)

**EPA Calls Biotech Corn No Threat — Farmers Can Keep Growing Genetically Engineered Crops** Associated Press; October 17, 2001; Page A8; Section: A, [www.washingtonpost.com](http://www.washingtonpost.com)

**Biotechnology Corn Approved for Continued Use** U.S. Environmental Protection Agency, [www.epa.gov](http://www.epa.gov)

**Conditional Registration of Bt Cotton Reaffirmed** U.S. Environmental Protection Agency, [www.epa.gov](http://www.epa.gov)

For more detailed URLs and further links to sources, please call (202) 467-6565.

## SOURCES

- <sup>1</sup> “Foods from Genetically Improved Crops in Africa,” a brochure produced by the San Diego Center for Molecular Agriculture and AfricaBio, [www.sdemol.org/GIFoodsAfricaBrochure.pdf](http://www.sdemol.org/GIFoodsAfricaBrochure.pdf)
- <sup>2</sup> Trewavas, Anthony. Business Week, Dec. 20, 1999, “Are bio-foods safe?” Institute of Cell and Molecular Biology, University of Edinburgh, Scotland
- <sup>3</sup> The Alliance for Better Foods, “In Support of Biotechnology (Expert Views)” [www.betterfoods.org/expert/expert.htm](http://www.betterfoods.org/expert/expert.htm), April, 2000
- <sup>4</sup> “Regulatory Oversight in Biotechnology,” United States Department of Agriculture, [www.aphis.usda.gov/biotech/OECD/usregs.htm](http://www.aphis.usda.gov/biotech/OECD/usregs.htm)
- <sup>5</sup> “The U.S. Regulatory System,” University of Nebraska Ag Biosafety Education Center, [www.agbiosafety.unl.edu/faq/regfoodfaq.htm](http://www.agbiosafety.unl.edu/faq/regfoodfaq.htm), 2001
- <sup>6</sup> “FDA Announces Proposal and Draft Guidance for Food Developed Through Biotechnology,” Food and Drug Administration press release, Jan. 17, 2001 [www.fda.gov/bbs/topics/NEWS/2001/NEW00747.html](http://www.fda.gov/bbs/topics/NEWS/2001/NEW00747.html)
- <sup>7</sup> “Genetically Modified Crops and Foods,” American Medical Association (AMA), [www.ama-assn.org/ama/pub/article/2036-3604.html](http://www.ama-assn.org/ama/pub/article/2036-3604.html), 2000
- <sup>8</sup> “Biotechnology and the Future of Food,” American Dietetic Association, [www.eatright.org/abiotechnology.html](http://www.eatright.org/abiotechnology.html), December, 2000
- <sup>9</sup> “IFT Expert Report on Biotechnology and Foods,” Institute of Food Technologists, [www.ift.org](http://www.ift.org), 2000
- <sup>10</sup> “Report of a Joint Consultation of the U.N. Food and Agriculture Organization and the World Health Organization,” [www.who.int](http://www.who.int), 1996

# MORE FACTS

## ABOUT BIOTECHNOLOGY AND BIOTECH FOODS

Biotechnology touches many areas of our lives and consumers around the globe are asking for more information about its safety and benefits

**Consumers worldwide are curious about biotechnology and want more information about new food products.**

- According to a survey by Accenture Institute for Strategic Change, one of the world's leading management consulting and technology service organizations, U.S. consumers say the most valuable product innovations are those which improve their physical health and sense of well-being. This is according to the study entitled, "*Stimulating Consumer Demand Through Meaningful Innovation*," published by Accenture in November 2002.
- According to a study by the Food Standards Agency (FSA) in the United Kingdom, British consumers are less concerned about biotech food issues than ever before. The FSA's survey of more than 3,000 British consumers shows that, over the past five years, concern about biotech food issues has dropped approximately 7 percent, from 43 percent to 36 percent.

**Planting of biotech crops continues to increase worldwide.**

- Biotechnology continues to be a growing choice among farmers worldwide as global acreage of crops enhanced through biotech increased by 12 percent in 2002, according to a new report released by the International Service for the Acquisition of Agri-biotech Applications (ISAAA).
- More than one-fifth of the global crop area of soybeans, corn, cotton and canola acres is now biotech.
- Nearly 6 million farmers in 16 countries planted biotech crops in 2002, up from 5 million farmers in 13 countries in 2001. More than three-quarters of these farmers were resource-poor farmers in developing countries.
- While biotech cotton maintained its global acreage of 16.8 million, biotech corn acreage grew 27 percent to 30.6 million acres, biotech canola acreage increased 11 percent to 7.4 million, and biotech soybean acreage grew 10 percent to 90.2 million, exceeding more than 50 percent of the global soybean crop area for the first time.
- The United States, Argentina, Canada and China continued to be the leading growers of biotech crops. In the United States, biotech acreage grew by 9 percent to a total of 96.4 million acres, mainly due to significant increases in biotech corn and soybean acres.
- In 2001, U.S. farmers grew an additional 4 billion pounds of food and fiber and generated an additional \$1.5 billion



in income by planting six biotech crops, according to a June 2002 study by the National Center for Food and Agricultural Policy.

- The ISAAA study reported that biotech crops are contributing to a reduction in pesticide usage. According to the study, Bt cotton alone is estimated to eliminate the need for 33,000 tons of insecticide globally, or 40 percent of the current global use. In 2001, six biotech crops planted in the United States reduced pesticide use by 23,000 tons.
- Between 1998 and 2001, global cotton farmers reaped an additional \$1.7 billion in income by using Bt cotton, according to ISAAA. Yield increases for Bt cotton ranged from 5 to 10 percent in China, 10 percent or more in the United States and Mexico and 25 percent in South Africa. The report noted that the increased income allows families to spend more on food, which reduces hunger.
- In 2001-2002, planting of Bt corn in Spain produced yield increases of 10 to 15 percent — and an average income gain of 12.9 percent — in areas with high levels of insect infestations, according to a study funded by Agricultural Biotechnology in Europe.

**Biotech products can help improve the health, nutrition and well-being of people around the world.**

- Field tests are underway on a cancer-fighting tomato with three times more lycopene than conventional varieties. Lycopene is an antioxidant that protects human tissue and could help prevent breast and prostate cancers as well as heart disease.
- Several research teams are working to improve rice, a staple food for half the world's population, by putting more nutrition into each grain. Enhanced "golden rice" may help reduce childhood blindness, while a new iron-rich rice can help one in three people worldwide who don't get enough of the nutrient.
- Researchers working with cassava, a staple food in many parts of the world, have boosted protein levels by 35 to 45 percent and increased the levels of essential amino acids, according to "Harvest on the Horizon," a report prepared by the Pew Initiative on Food and Biotechnology.

**Plant-based vaccines could help protect the health of children and adults worldwide more cost effectively than ever before.**

- Research is underway to use staple foods to deliver inexpensive, effective vaccines for specific illnesses — literally, "edible vaccines" — which could save some of the 15 million children who die each year from preventable diseases.
- Researchers are experimenting with developing an edible banana vaccine for hepatitis B, which attacks the liver. When eaten, the vaccine is absorbed through the intestine into the bloodstream, producing antibodies in the same way as an injected vaccine. But the banana vaccine is expected to cost about 2 cents a dose, rather than \$125 for an injection. Plus, it could be easily administered without the need for refrigeration.

# meet

## THE EXPERTS



### BRUCE M. CHASSY, PH.D.

*Associate Executive Director,  
Campus Biotechnology Center,  
Assistant Dean, Biotechnology and  
Outreach University of Illinois*

238 NSRC, 1101 West Peabody  
Urbana, IL 61801  
Tel: (217) 244-7291  
Fax: (217) 244-1707  
E-mail: bchassy@uiuc.edu

Bruce Chassy has dedicated his professional life to advancements in science benefiting human nutrition and health. As a result, he has become recognized as one of the country's leading experts on the safety and regulation of biotech foods. He was appointed the assistant dean for biotechnology outreach, Office of Research in the College of Agricultural, Consumer and Environmental Sciences and executive associate director of the Biotechnology Center at the University of Illinois at Urbana-Champaign in May 2000.

In 1966, Chassy earned his doctorate in biochemistry from Cornell University after receiving his A.B. in chemistry from San Diego State University. For 21 years, he worked as a research chemist for the National Institute of Dental Research, National Institute of Health (NIH). He joined the faculty of the University of Illinois in 1989 as head of the Department of Food Science. He focused his research on molecular biology and biotechnology of lactic acid bacteria used in food and dairy applications. Chassy's research led him to an interest in food safety and the safety evaluation of biotech foods.

Through his extensive research background, Chassy has been involved with numerous professional societies. Most notably, he served on the Food and Drug Administration Advisory Committee, as counselor for the Institute of Food Technologists (IFT) and chair of the IFT Biotechnology Division. Chassy has served as a NIH visiting professor, received the U.S. Public Health Service special award and held a Fulbright Distinguished Lectureship in Spain.

Chassy also has been a member of the New York Academy of Science.

Recently, Chassy served on the World Health Organization and the Food and Agricultural Organization expert panel on the safety of foods derived through biotechnology. He also chaired the writing of a report for the Council for Agricultural Science and Technology that described and evaluated the regulatory system that applies to biotechnology.



### MARY LEE CHIN, M.S., R.D.

*Nutrition Edge Communications*

2225 Dahlia Street  
Denver, CO 80207  
Tel: (303) 333-6854  
Fax: (303) 780-0751  
E-mail: maryleechin@msn.com

An experienced nutrition and health communications consultant, Chin is regularly consulted by local and national television, newspaper and radio outlets on nutrition trends and health and food issues. She informs consumers on healthy eating, based on sound nutrition principles, and is a well-known expert on nutritional topics and health-related issues.

Chin is on the Board of Directors for the Center for Human Nutrition at the University of Colorado Health Sciences Center and the Health Advisory Committee of the Denver Foundation; she also has served on the Food and Nutrition Advisory Board of the University of Northern Colorado. She chaired the Marketing Committee for the Colorado Women's Health Campaign, a major public health initiative of the National Governors' Spouses Association. Chin formerly held a six-year term as a national spokesperson for the 70,000-member American Dietetic Association.

Chin received her bachelor of science degree in foods and nutrition from Purdue University, a master's degree in clinical nutrition from Case Western Reserve University and her dietetic internship at the Cleveland Veterans Administration Hospital. Her honors include Recognized Dietitian of the Year from the Colorado Dietetic Association, Colorado Nutrition Educator of the Year from Western Dairy Council and Alumni of the Year from the Case Western Reserve University School of Nutrition.

At the University of Colorado Health Sciences Center, Chin served as clinical nutritionist for the Pediatric and Adolescent Clinic Outpatient Department; chief dietitian at the Barbara Davis Center for Childhood Diabetes; and clinical instructor in the Departments of Nursing, Dentistry and Child Health Associate Programs.



### JUDITH M. FERTIG

*Food Writer, Cookbook Author  
and Culinary Instructor*

9451 Connell Drive  
Overland Park, KS 66212  
Tel/Fax: (913) 492-3313  
E-Mail: jfertig299@aol.com

Food writer and cookbook author Judith M. Fertig loves to find what is compelling and interesting about food — then make it come alive for readers, viewers or culinary students.

As a food writer, Fertig's work has appeared internationally in publications such as *Saveur*, *Cooking Light*, *Cooking Pleasures*, *Better Homes & Gardens*, *Country Home*, *The London Sunday Times*, *Country Living*, *The New York Times*, *Sante*, *The San Francisco Chronicle* and *The Kansas City Star*, for whom she writes a weekly column, "Come Into My Kitchen."

Fertig also has written several award-winning cookbooks, including *Pure Prairie* and *Prairie Home Breads*. Her 1999 cookbook, *Prairie Home Cooking*, was featured in *People* magazine, the *Chicago Tribune* and on CNN, while also being nominated for the 2000 James Beard Foundation and International Association of Culinary Professionals cookbook awards in 2000. Fertig's and co-author, Karen Adler's, *Fish and Shellfish, Grilled and Smoked*, was published in 2002, and their latest cookbook, *American Desserts*, will be published this year.

As a culinary instructor, Fertig gives cooking classes, seminars and food presentations across the country. Her professional culinary training includes the Cordon Bleu in London and La Varenne École de Cuisine in Paris. Fertig has appeared on local and national radio and television programs.

In addition to developing recipes for her cookbooks, Fertig creates recipes for companies, publications and organizations. She also is a member of "Que Queens," an all-female barbecue team, that competes and raises money to benefit local food banks.

Currently, Fertig is president of the Kansas City Chapter of Les Dames D'Escoffier, an international organization of professional women in the culinary arts, and a member of the International Association of Culinary Professionals.



## TERRI LOMAX, PH.D.

Department of Botany and  
Plant Pathology  
Oregon State University

2082 Cordley Hall  
Corvallis, OR 97331  
Tel: (541) 737-5278  
Fax: (541) 737-3573  
E-mail: lomaxt@bcc.orst.edu

Furthering the development and education of science and technology is at the forefront of the work Terri Lomax does with Oregon State University (OSU) and with the numerous organizations to which she devotes much of her time. Lomax has made significant contributions in plant science research and continues to provide direction and leadership in the classroom.

Lomax, a professor of botany and plant pathology and member of the Center for Gene Research and Biotechnology at OSU, teaches cell and molecular biology, as well as issues in agricultural and natural resources biotechnology. Since 2000, she has directed the Program for the Analysis of Biotechnology Issues at the university and previously served as interim director of the Molecular and Cellular Biology graduate program.

Lomax's outreach efforts include the Science Connections Program, which brings together faculty and students from OSU, along with Portland public school students and teachers, to enhance science learning through classroom visits, e-mail connections, lectures and workshops.

Lomax's research and expertise spreads far beyond the classroom and the lab. She was a foundation board member and treasurer of the American Society for Plant Physiology (ASPP) from 1997-2000 and a member of the Executive Committee of the ASPP for eight years. Lomax has served for three years on the Board of Governors of the American Society for Gravitational and Space Biology and was on the Editorial Advisory Board of *The Plant Journal* from 1994 to 2002. She was a Fulbright Fellow at the University of Freiburg, Germany; a National Science Foundation Plant Biology Postdoctoral Fellow at the Carnegie Institution of Washington, Stanford, Calif.; and is currently a National Aeronautics and Space Administration Institute for Advanced Concepts Fellow.

Lomax earned her bachelor's degree from the University of Washington, her master's degree from San Diego State University and her doctorate degree from Stanford University.



## ALAN MCHUGHEN, D.PHIL., FACN

CE Associate Plant Biotechnologist  
University of California–Riverside

Riverside, CA 92521-0124  
Tel: (909) 787-7532  
Fax: (909) 787-5717  
E-mail: alanmc@citrus.ucr.edu

Alan McHughen is a public sector educator, scientist and consumer advocate. He helps the non-scientific community understand both environmental and health impacts of modern and traditional methods of food production. His award-winning book, *Pandora's Picnic Basket: The Potential and Hazards of Genetically Modified Foods*, uses understandable, consumer-friendly language to exonerate myths and investigate the genuine risks of biotechnology.

A molecular geneticist with an interest in crop improvement, McHughen has helped develop Canada's regulations covering the environmental release of plants with novel traits and U.S. regulations governing biotech plants.

McHughen recently served on the Organization for Economic Cooperation and Development (OECD) panels investigating the health effects of genetically modified foods. He has firsthand experience with issues from both sides of the regulatory process — recombinant DNA and conventional breeding technologies. He also served on the Canadian National Expert Committee on Variety Registration, including several years on the executive panel as secretary of the Oilseeds Subcommittee.

McHughen's agricultural research focuses on all aspects of biotechnology, with an emphasis in molecular genetic technology and contributing to more environmentally sustainable cropping systems. He also is interested in analyzing biotech products for their effects on the environment and on health.

He earned his doctorate degree at Oxford University and worked at Yale University as a lecturer and research fellow. McHughen also spent 20 years as a professor and senior research scientist at the University of Saskatchewan in Saskatoon, Canada. He is currently a professor at the University of California–Riverside.



## MARTINA NEWELL- MCGLOUGHLIN, PH.D.

Director, Systemwide Biotechnology  
Program, University of California–Davis

301 Life Sciences Addition  
Davis, CA 95616  
Tel: (530) 752-8237  
E-mail: mmmcgloughlin@ucdavis.edu

Martina Newell-McGloughlin is an internationally recognized authority on biotechnology and its social implications. She directs the University of California–Davis Systemwide Biotechnology Research and Education Program.

Newell-McGloughlin is known for her early research on the development of methods to stabilize plasmids in *Bacillus subtilis* for industrial fermentation and for her work in developing virus-resistant potatoes. She also is well known for her encyclopedic knowledge of biotechnology, developing biotechnology training and education programs, and experience in managing the University of California–Davis Systemwide Grants Program.

Newell-McGloughlin has published numerous papers and encyclopedia submissions and has written three books dealing with biotechnology issues. She serves on several committees and organizations, including the Genomics Committee, the International Life Sciences Institute, the International Food Information Council Expert Panel and the Institute of Food Technologists Advisory Committee on Biotechnology. In the past, Newell-McGloughlin also has been a member of a World Trade Organization Panel on Technology and the United Nations Technology Discussion Panel on Sustainable Agriculture.

Newell-McGloughlin is currently an advisor for the development of technology organizations here and abroad. For the past 10 years, she has worked with the University of California–Davis Biotechnology Program and has been largely responsible for the program's development and success. She holds an adjunct faculty position in plant pathology and was involved in initiating the popular course, "Agricultural Biotechnology: Issues, Ethics and Public Policy."



## LINDA THRANE

Executive Director  
Council for Biotechnology Information

1225 Eye Street, N.W., Suite 400  
Washington, DC 20005  
Tel: (202) 467-6565  
Fax: (202) 589-2549  
E-mail: lthrane@whybiotech.com

Linda Thrane serves as executive director of the Council for Biotechnology Information, a comprehensive communications effort to help people better understand the importance and benefits of agricultural and food biotechnology. Sponsored by the major biotechnology companies, CBI is focusing on communications activities to inform key audiences in North America, which includes Canada and Mexico. It also is working with similar efforts in Europe, Japan, Brazil, Africa and other parts of the world to improve communication and education about biotechnology.

Prior to CBI, Thrane served as vice president of public affairs for Cargill, Inc., where she led the company's internal and external communications and issues management efforts. Cargill is an international agriculture, food, industrial and financial company with some 80,000 employees in more than 60 countries around the world. Thrane also has served as an editorial writer for the Minneapolis Star Tribune, as associate director of the Minnesota Petroleum Council and as a reporter for United Press International.

She lives in Independence, Minn., with her husband, John, and has two children in college. Her work with CBI is based in Washington, D.C.

## DONNA WINTERS

Biotech Cotton and Soybean Farmer

3560 Hwy 134  
Lake Providence, LA 71254  
Tel: (318) 282-5210 (Cell)  
E-mail: dbwd@yahoo.com

Donna Winters, a grandmother and a third-generation farmer in Lake Providence, La., considers her farm a heritage that she and her husband, Major, want to protect and pass on to their children and grandchildren. She lives in the same farmhouse where she grew up and holds many of the same ideals passed down from generation to generation in her family.

Winters and her family run a diversified farm operation, growing Bt cotton, Bt corn and herbicide-tolerant soybeans. Winters plants biotech crops because she says they help her family be better farmers and more effective stewards of their land.

Like many other Louisiana farmers, Winters is taking advantage of the benefits of Bt cotton to reduce pesticide usage. Bt cotton contains a protein (Bt or *Bacillus thuringiensis*) that kills bollworm and budworm, two common cotton pests that have plagued cotton farmers for hundreds of years. With Bt cotton, she is spraying only about three times each crop season to control insects, compared with the eight to 10 sprays per year she averaged with conventional cotton. This means Winters can spend less money on production and grow more cotton because of less insect damage.

Winters and her family save money by planting biotech soybeans as well. The soybeans allow for environmentally friendly conservation tillage which preserves wildlife habitat and promotes the return of beneficial insects. She says she has seen the return of red foxes, quail and ladybugs to her farm for the first time in 20 years. The Winters have not plowed some of their fields in five years, thanks to the herbicide-tolerant soybean variety they plant. Less plowing also means less impact on the farm — the family uses less fuel and controls soil erosion more effectively.

Winters considers herself a businesswoman and a proponent of biotechnology. "Biotechnology is an indispensable tool," she says. "I can show my grandchildren how technological progress is helping our farm. I can show them the grouse near the corn crop down by the bayou and the hawks circling our fields."

## BIOTECH 101 SOURCES (CONTINUED FROM PAGE 11)

- <sup>1</sup> "Agricultural Biotechnology: What Are the Issues," University of California at Davis, College of Agricultural and Environmental Sciences
- <sup>2</sup> Alvarez, Lizette. "Consumers in Europe Resist Gene-Altered Foods," New York Times, February 7, 2003
- <sup>3</sup> James, Clive. "Global Review of Commercialized Transgenic Crops: 2001. Feature: Bt Cotton," International Service for the Acquisition of Agri-biotech Applications, Dec. 13, 2002, [www.isaaa.org/kc/CBTNews/ISAAA\\_PR/briefs26\\_exeng.htm](http://www.isaaa.org/kc/CBTNews/ISAAA_PR/briefs26_exeng.htm)
- <sup>4</sup> "Foods from Genetically Improved Crops in Africa," a brochure produced by the San Diego Center for Molecular Agriculture and AfricaBio, [www.sdcmol.org/GIFoodsAfricaBrochure.pdf](http://www.sdcmol.org/GIFoodsAfricaBrochure.pdf)
- <sup>5</sup> The Alliance for Better Foods, "In Support of Biotechnology (Expert Views)" [www.betterfoods.org/Expert/Expert.htm](http://www.betterfoods.org/Expert/Expert.htm), April 2000
- <sup>6</sup> Thompson, Larry. "Are Bioengineered Foods Safe?" U.S. Food and Drug Administration —FDA Consumer, January-February 2000, [www.cfsan.fda.gov/~dms/fdbioeng.html](http://www.cfsan.fda.gov/~dms/fdbioeng.html), March 18, 2002
- <sup>7</sup> American Medical Association (AMA), "Genetic Enhancement Guards Against Food Allergies," October 4, 2001, [www.ama-assn.org/ama/pub/article/4197-5330.html](http://www.ama-assn.org/ama/pub/article/4197-5330.html)
- <sup>8</sup> Chassy, Bruce M., Ph.D. "Food Safety Evaluation of Crops Produced Through Biotechnology," Journal of the American College of Nutrition, Vol. 21, No. 90003, 166S-173S (2002)
- <sup>9</sup> American Medical Association (AMA), "Genetically Modified Crops and Foods," December 2000, [www.ama-assn.org/ama/pub/article/2036-3604.html](http://www.ama-assn.org/ama/pub/article/2036-3604.html)
- <sup>10</sup> "Foods from Genetically Improved Crops in Africa," brochure produced by the San Diego Center for Molecular Agriculture and AfricaBio, [www.sdcmol.org/GIFoodsAfricaBrochure.pdf](http://www.sdcmol.org/GIFoodsAfricaBrochure.pdf)
- <sup>11</sup> Pinstrip-Andersen, Per. "The Developing World Simply Can't Afford to Do Without Agricultural Biotechnology," Washington Post, Oct. 27, 1999; article is also posted on the International Food Policy Research Institute (IFPRI) Web site, [www.ifpri.cgiar.org/themes/biotech/102899.htm](http://www.ifpri.cgiar.org/themes/biotech/102899.htm)

# RECIPES

## AND NUTRITIONAL INFORMATION



### APERITIF: PAPAYA SMOOTHIE

#### INGREDIENTS

- 3 cups peeled, diced ripe papaya
- ¾ cup fresh orange juice
- ¾ cup low-fat vanilla yogurt
- 6 tablespoons fresh lime juice
- 1½ cups cracked ice

#### PREPARATION

Place all ingredients in a blender and process until smooth. Serve well chilled. Garnish with fresh strawberries or raspberries.

Nutritional Analysis (per serving)

72 calories; 0.5 g fat; 1 mg cholesterol; 21 mg sodium; 16 g carbohydrates; 1.5 g fiber; 2 g protein; 11 g sugar



### THE FIRST COURSE: ROASTED ROOT VEGETABLE NAPOLEON

Go on ... try it! Napoleons may look tricky to make, but they actually are an easy and visually pleasing way to serve a variety of foods and raise the "wow!" factor at your next dinner party!

#### INGREDIENTS

##### Vinaigrette:

- ¼ cup fresh beet juice
- ¼ cup corn oil
- 1½ tablespoons fresh lemon juice
- 1 clove roasted garlic (jarred)
- ½ teaspoon salt

##### Napoleon:

- 1 pound beets, trimmed and scrubbed
  - 1 pound baking potatoes, scrubbed
  - 3 ounces soft herbed goat cheese, cut into bit-sized chunks
  - 1 tablespoon butter
  - ¼ teaspoon salt
  - ½ teaspoon white pepper
  - ½ cup warm milk
  - 1 medium zucchini, thinly sliced
  - 1 medium yellow squash, thinly sliced
  - corn oil
- 3 cups mixed salad greens

#### PREPARATION

##### To prepare the Vinaigrette:

Place vinaigrette ingredients in a blender. Blend on high until well blended. Refrigerate until ready to use. (Makes about ½ cup.)

##### To prepare the Napoleons:

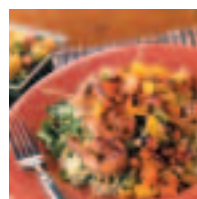
1. Roast beets and potatoes in a 400°F oven. Vegetables are done in about an hour when a fork can be easily inserted into them. When the vegetables have cooled slightly, peel.
2. Place potatoes in a medium-sized mixing bowl. Mash potatoes with a potato masher. Using a hand mixer, begin to whip the potatoes, while adding the goat cheese, butter, salt and white pepper. Slowly drizzle in enough warm milk to reach desired consistency. Taste and adjust the seasonings.
3. Thinly slice the beets and set aside.
4. Brush the zucchini and yellow squash with corn oil. Grill or sauté until golden, about 1 to 2 minutes per side.
5. In a 3-inch food ring, stack the vegetables by layering the beets, the whipped potatoes, and finishing with a layer of alternating rounds of zucchini and yellow squash. Repeat to create 6 vegetable stacks.
6. Using a spatula, transfer the napoleons to an ovenproof dish and keep warm at 200°F until ready to serve.

##### To serve:

Place a warmed napoleon in the center of a salad plate and carefully remove food ring. Scatter salad greens around the outside edge. Drizzle the beet vinaigrette over the greens.

Nutritional Analysis (per serving)

267 calories; 16 g fat; 17 mg cholesterol; 26 g carbohydrates; 330 mg sodium; 5 g fiber; 7 g protein; 7 g sugar



### SECOND COURSE: PLUM PORT GLAZED SHRIMP WITH PLUM PAPAYA SALSA

#### INGREDIENTS

##### Plum Port Glaze:

- 1 cup non-vintage port
- ¾ cup plum jam
- ¾ cup fresh orange juice
- ¼ cup fresh lime juice
- 2 teaspoons soy sauce
- 2 teaspoons grated fresh ginger

##### Papaya Plum Salsa:

- 1 cup peeled, seeded and diced papaya
- 1 tablespoon fresh lime juice

- 1 cup pitted and diced plums
- 1 cup diced fresh pineapple
- 1 kiwi, peeled and diced
- 2 tablespoons minced red onion
- 1 tablespoon fresh lemon juice
- 1 tablespoon fresh orange juice
- 1 tablespoon chopped fresh mint

**Shrimp:**

- 2 pounds shrimp (16-20 shrimp per pound)
- 12 eight-inch bamboo skewers
- corn oil
- salt and pepper, to taste
- Cilantro sprigs to garnish

**PREPARATION****To prepare the Plum Port Glaze:**

Simmer all ingredients in a saucepan until syrupy and reduced by two-thirds. Strain and keep warm. (Makes 1 cup.)

**To prepare the Papaya Plum Salsa:**

1. Toss papaya with lime juice. Add the remaining ingredients, except mint, and stir to combine. Cover and refrigerate until ready to serve.

2. Add mint just before serving. (Makes 3 cups.)

**To prepare the Shrimp:**

1. Clean shrimp, tails on.
2. Soak bamboo skewers in water for 15 minutes. Prepare grill or heat broiler.
3. Thread 3 to 4 shrimp per skewer, brush with corn oil and season to taste with salt and pepper.
4. Cook the shrimp on the grill until desired doneness, about 2 minutes per side. During the last 30 seconds of grilling, brush on the glaze. Transfer to a baking pan and brush generously with the glaze.

**To serve:**

Mound coconut rice (see instructions below) in the center of a plate. Lay 2 skewers of shrimp over rice. Spoon plum papaya salsa over the shrimp. Garnish with cilantro sprigs.

**Nutritional Analysis (per serving)**

368 calories; 3 g fat; 230 mg cholesterol; 348 mg sodium; 46 g carbohydrates; 2 g fiber; 32 g protein; 37 g sugar

**To prepare the Coconut Rice:**

1. Choose desired amount of medium-grain white rice.
2. Cook according to directions using  $\frac{1}{2}$  water and  $\frac{1}{2}$  canned light coconut milk.
3. Sprinkle in a small pinch of turmeric.
4. Before serving, fluff with a fork and toss in chopped scallions, toasted coconut flakes, chopped toasted unsalted peanuts and chopped cilantro.



## AND, FINALLY, FOR DESSERT: CHOCOLATE ALMOND TOFFEE PARFAIT

**INGREDIENTS****White Chocolate Almond Mousse:**

- $\frac{3}{4}$  pound silken tofu, well drained
- $\frac{1}{4}$  cup plus 2 tablespoons white chocolate morsels, melted
- $\frac{3}{8}$  teaspoon pure almond extract
- $1\frac{1}{2}$  cups frozen whipped topping, thawed

**Dark Chocolate Mousse:**

- $\frac{1}{2}$  pound silken tofu, well drained
- $\frac{1}{2}$  cup semi-sweet chocolate morsels, melted
- 1 tablespoon maple syrup
- 1 tablespoon molasses
- 1 teaspoon pure vanilla extract
- 1 teaspoon pure orange extract
- 6 tablespoons chopped chocolate-covered toffee (e.g., Heath Bar)
- Fresh mint to garnish

**PREPARATION****To prepare the White Chocolate Almond Mousse:**

1. Place tofu in a blender or food processor and purée until smooth.
2. Add melted white chocolate morsels and almond extract. Continue to process until smooth and creamy. Transfer to a mixing bowl.
3. Gently fold in whipped topping by hand. Cover and refrigerate until ready to use.

**To prepare the Dark Chocolate Mousse:**

1. Place tofu in a blender or food processor and purée until smooth.
2. Add remaining ingredients and continue to process until smooth and creamy. Cover and refrigerate until ready to use.

**To assemble the parfait:**

1. Spoon 2 tablespoons of the white mousse into a 4- or 5-ounce martini glass and sprinkle with toffee.
2. Spoon in 2 tablespoons of the dark chocolate mousse and sprinkle with toffee.
3. Finish with 2 tablespoons of the white mousse; garnish with a generous sprinkling of toffee and fresh mint.

**Nutritional Analysis (per serving)**

422 calories; 24 g fat; 5 mg cholesterol; 67 mg sodium; 38 g carbohydrates; 5 g fiber; 16 g protein; 23 g sugar

# COUNCIL FOR BIOTECHNOLOGY INFORMATION



**good ideas are growing**

The Council for Biotechnology Information communicates science-based information about the benefits and safety of agricultural and food biotechnology. Its members are the leading biotechnology companies and trade associations.

1225 EYE STREET, NW, SUITE 400 • WASHINGTON, DC 20005  
(202) 467-6565 • [WWW.WHYBIOTECH.COM](http://WWW.WHYBIOTECH.COM)