

Alert: Protein drinks

You don't need the extra protein or the heavy metals our tests found

THE PROMISES are enticing. Whether you're looking to shed unwanted pounds, get a quick energy jolt, build muscles, or fight the aging process, protein drinks are being boosted by some supplement makers as a scientifically proven way to quickly achieve your goals.

The products, sold as ready-to-drink liquids or powders that you mix with milk, juice, or water to make shakes, attract not just athletes and body-builders but also baby boomers, pregnant women, and teenagers looking for a shortcut to a buff body.

Some ads say that protein supplements, in flavors such as strawberry and vanilla cream, can be a nutritious and time-saving snack or meal replacement.

Marketing for Energy First Pro Energy Whey Protein Isolate says the protein supplement is "ideal" for pregnant women and growing children, and also offers this

promise for aging adults who use it: "You will rarely if ever be sick and you will begin to look and feel years younger."

In a testimonial for BSN Lean Dessert Protein Shake, "fitness celebrity" Jennifer Nicole Lee says, "Being a busy mom with 12-hour workdays, I rely upon my Lean Dessert Protein to get adequate amounts of protein without wasting time on creating complex meals . . ."

Another product, Muscle Milk, boasts on its website: "Designed after one of nature's most balanced foods: human mother's milk . . ."

But our investigation, including tests at an outside laboratory of 15 protein drinks, a review of government documents, and interviews with health and fitness experts and consumers, found most people already get enough protein, and there are far better and cheaper ways to add more if it's needed. Some protein

drinks can even pose health risks, including exposure to potentially harmful heavy metals, if consumed frequently. All drinks in our tests had at least one sample containing one or more of the following contaminants: arsenic, cadmium, lead, and mercury. Those metals can have toxic effects on several organs in the body.

Hitting the limits

For most drinks we tested, levels of those contaminants were in the low to moderate range, when we could detect them at all. But with three of the products, consumers who have three servings daily could be exposed to levels that exceed the maximum limits for one or two of those contaminants in dietary supplements proposed by U.S. Pharmacopeia (USP), the federally recognized authority that sets voluntary standards for health products. Nutritionists and trainers say they commonly see people who consume three servings a day.

The amount of lead in a single daily serving of eight of the protein supplements we tested would require that the products carry a warning in California. State legislation known as Proposition 65 mandates that manufacturers notify consumers when products contain toxic substances at levels the state says pose even a low cancer or reproductive risk.

But federal regulations do not generally require that protein drinks and other dietary supplements be tested before they are sold to ensure that they are safe, effective, and free of contaminants, as the rules require of prescription drugs.

"Most consumers and even many doctors don't realize that in this country we're left to simply trust the manufacturer to decide what level of quality and safety they'll provide," says Pieter Cohen, an internist at Cambridge Health Alliance and author of a recent *New England Journal of Medicine* article on contaminants in dietary supplements. Even in California, some manufacturers don't comply with the requirements of Proposition 65 to put warnings on supplements, and enforcement seems to be lax. Sometimes warnings appear only after lawsuits are filed.



TEST RESULTS EAS Myoplex Original Rich Dark Chocolate and Muscle Milk Chocolate and Vanilla Crème can expose users to elevated levels of heavy metals when they consume three servings a day.

Pushing an image of fitness

Protein drinks are helping fuel the growing sales of sports-nutrition products, which now top \$2.7 billion.

Teenagers who want to look like the sculpted images they see in fitness magazines are particularly vulnerable to the marketing messages, experts say, because they are easily hooked by the promise of “hope in a can.” They tend to overuse the products, assuming that if one scoop is good, four or five would be even better, says Dave Ellis, of Colorado Springs, Colo., who has 28 years’ experience as a sports dietitian for college and professional athletic teams. A 2005 study published in *Pediatrics*, the journal of the American Academy of Pediatrics, found that protein powders and shakes were the supplements most commonly used by those aged 12 to 18.

Andrew Shao, senior vice president of scientific and regulatory affairs at the Council for Responsible Nutrition, a supplement industry group, says that protein powders and drinks are a safe option for teenagers and even pregnant women. But we found that some products had labels warning that they are not suitable for people under age 18 or that pregnant women should first consult a physician.

Kathy Burns, a toxicologist and founder of Sciencecorps, a Boston-area nonprofit network of science and medical professionals, was concerned about possible health effects of protein supplements her then

▶ DID YOU KNOW?

28%

Sales of ready-to-drink liquid protein supplements climbed by that percentage between 2008 and 2009.

high-school-aged son and his friends extensively used. She and her colleagues sent a small sampling of protein supplements to be screened at an independent lab. Burns said what they found worried them, and she contacted CONSUMER REPORTS.

What our tests found

We purchased 15 protein powders and drinks mainly in the New York metro area or online and tested multiple samples of each for arsenic, cadmium, lead, and mercury. The results showed a considerable range, but levels in three products were of particular concern because consuming three servings a day could result in daily exposure to arsenic, cadmium, or lead exceeding the limits proposed by USP.

We found that three daily servings of the ready-to-drink liquid EAS Myoplex Original Rich Dark Chocolate Shake provides an average of 16.9 micrograms (µg) of arsenic, exceeding the proposed USP limit of 15 µg per day, and an average of 5.1 µg of

cadmium, which is just above the USP limit of 5 µg per day. Concentrations in most products were relatively low, but when taking into account the large serving size suggested, the number of micrograms per day for a few of the products was high compared with most others tested.

The samples of Muscle Milk Chocolate powder we tested contained all four heavy metals, and levels of three metals in the product were among the highest of all in our tests. Average cadmium levels of 5.6 µg in three daily servings slightly exceeded the USP limit of 5 µg per day, and the average lead level of 13.5 µg also topped the USP limit of 10 µg per day. The average arsenic level of 12.2 µg was approaching the USP limit of 15 µg per day, and the average for mercury was 0.7 µg, well below the USP’s 15 µg-per-day limit. Three daily servings of Muscle Milk Vanilla Crème contained 12.2 µg of lead, exceeding lead limits, and 11.2 µg of arsenic. A fourth product, Muscle Milk Nutritional Shake Chocolate (liquid), provided an average of 14.3 µg of arsenic per day from three servings, approaching the proposed USP limit.

Cadmium raises special concern because it accumulates in and can damage the kidneys, the same organs that can be damaged by excessive protein consumption. And it can take 20 years for the body to eliminate even half the cadmium absorbed today.

“This is a highly toxic metal, and while there are some cases where decisions have

Better, cheaper ways to bulk up



Half of a chicken breast
27 grams of protein
62 cents



Three 8-ounce glasses of milk
23 grams of protein
60 cents



Three scrambled eggs
20 grams of protein
46 cents



One scoop of Nitro-Tech
25 grams of protein
\$1.61

Meeting your daily protein requirements through a balanced diet rather than supplements is best for both your health and your wallet.

You can roughly calculate how many grams of protein you need daily by multiplying your body weight by 0.4. For athletes, a general rule of thumb is about 1 gram of protein per pound of body weight per day.

A sandwich with 3 ounces of chicken and an 8-ounce glass of whole milk provides about 40 grams of protein, which is more than half the 72 grams required by the average 180-pound person and most of the 48 grams required by someone weighing 120 pounds. According to federal health survey data, Americans get an average of 82 grams of protein per day from their diet.

You can find the protein content for a wide range of foods at www.nal.usda.gov/fnic/foodcomp/Data/SR18/nutrlist/sr18a203.pdf. Because foods can also be a source of exposure to cadmium or other heavy metals, you can find out the levels in many different types of foods by viewing the Food and Drug Administration’s list at www.fda.gov/downloads/food...totaldietstudy/ucm184301.pdf.

to be weighed against relative risks, accepting that you have to be exposed to any cadmium at all in your protein drink after your workout is definitely not one of them,” says Michael Harbut, M.D., director of the Environmental Cancer Initiative at the Karmanos Cancer Institute in Royal Oak, Mich.

“When these toxic heavy metals are combined in a product that is marketed for daily use, that raises serious public health concerns, especially for pregnant women, children, and young adults,” says Burns, who has been a toxicology consultant to state and federal government agencies.

For most people, protein drinks are not the only possible source of exposure to heavy metals, but they are an easily avoidable one, since most people can meet their protein needs, help minimize exposure to contaminants, and save money by choosing the right foods.

Shellfish and organ meats such as liver can be high in cadmium, and some plant foods such as potatoes, rice, sunflower seeds, spinach, and other leafy greens can also take in significant amounts of the metal from the environment, due in large part to the use of cadmium-containing phosphate fertilizers, according to Bruce A. Fowler, a researcher at the federal Agency for Toxic Substances and Disease Registry. Food and Drug Administration research suggests that foods such as milk, yogurt, eggs, poultry, and red meats are generally good protein sources that seem to contain little or no cadmium, lead, arsenic, or mercury. For perspective about the relative risks exposure to those metals can pose, consider the agency’s list of 275 hazardous substances at toxic waste sites: Arsenic, lead, and mercury rank Nos. 1, 2, and 3, and cadmium is No. 7, based on risks to people around those sites.

Robert Wright, M.D., an associate professor at Harvard Medical School, who is conducting research on the health effects of exposure to toxic metals, says, “Small amounts of exposure are inevitable, but a product that exceeds the USP limit is clearly doing something wrong.”

Being exposed simultaneously to a mixture of toxins can also potentially increase health risks, particularly when they target the same organs or systems, as some metals we detected do, according to Harbut. He says that this is the result of a synergistic effect, meaning the effects of two toxic substances together can be even



OVERLOAD Scott Baker cut back on protein supplements after feeling ill effects.

greater than those of the sum of the two, and not enough research has been done to determine whether that occurs from multiple exposures to even relatively low levels of those heavy metals.

How much protein?

The lure of many of those dietary supplements is the promise of a protein boost, one that many people do not really need.

Labeling for BSN Core Series Syntha-6 is ambiguous and could lead males to consume as many as eight scoops (four two-scoop servings) per day. That would deliver up to 176 grams of protein in the powder alone, plus another 33 grams when mixed with four 8-ounce glasses of nonfat milk. When you add those 209

Consuming too much protein can cause health problems.

grams from the protein drinks to the average 82 grams most adults already get from their daily diet, according to federal data, a 150-pound nonathlete would consume 291 grams of protein, or about five times the amount needed. An athlete could get nearly double.

Only one of the products we tested, Six

Star Muscle Professional Strength Whey Protein, specifies a maximum intake, warning that consumers should not exceed six servings in a 24-hour period. Others use vague language that could encourage a high level of consumption. For instance, labeling on BSN Lean Desert and BSN Core Series Syntha-6 suggests an intake of one to four servings daily but then concludes, “or as needed to satisfy protein or body shaping/muscle building requirements.”

Shao, the industry trade-group official, says there is no such thing as consuming too much protein, as long as you’re getting other nutrients in your diet as well.

Not so, says Kathleen Laquale, a licensed nutritionist and certified athletic trainer. “The body can only break down 5 to 9 grams of protein per hour, and any excess that is not burned for energy is converted to fat or excreted, so it’s a ridiculous waste to be recommending so much more than you really need,” she says.

Roberta Anding, a clinical dietitian and director of sports nutrition at Baylor College of Medicine, agrees. And, she says, “If you ask the average consumer how much protein they need they have no clue.”

Anding says protein drinks might help vegans or some seniors. The American Dietetic Association says proteins could help athletes after strength and endurance training, although it says they haven’t been shown to improve athletic performance and should be used conservatively.

The products can be costly. For example, we paid \$45 for a 2-pound jar of MuscleTech Nitro-Tech Hardcore powder; it yields servings for about five days if you follow directions for maximum results.

Consuming excess protein through supplements can cause health problems. “Often I see clients who are getting plenty of protein in their diets and then drinking three protein shakes on top of that,” says Erin Palinski, a registered dietitian and certified personal trainer who has seen the ill effects. “Cutting back is one of the first pieces of advice I give them.”

Among those she helped is Scott Baker, 24, of Hamburg, N.J., who found that when he was chugging down protein shakes to boost his total protein intake to more than 300 grams daily, he suffered from bouts of diarrhea. That’s a side effect of too much protein, Palinski says. “When I began cutting down my use of shakes and trying to get most of my protein from whole foods instead,” Baker says, “those symptoms went away completely and I also began seeing better results from my workouts at the gym.”

Although protein is needed for bone development, excessive protein intake over the long term might also cause calcium to be excreted from bones, increasing the risk of osteoporosis. And for diabetics or others with kidney problems, it can lead to further complications. “There are a lot of people these days who are undiagnosed pre-diabetics who may not be aware their kidneys aren’t fully functional and they definitely should not be loading up on protein,” says Nancy Clark, an author and certified specialist in sports dietetics.

Athletes complain

Protein powders have been under scrutiny before. In 2005, National Football League running back Michael Cloud filed a lawsuit against MuscleTech. He claimed that after he temporarily substituted MuscleTech Nitro-Tech powder for the protein powder he normally used, he tested positive for the banned steroid nandrolone, because of the presence of ingredients in Nitro-Tech that were not disclosed on the product’s label.

According to Cloud’s legal complaint filed in U.S. District Court in Rhode Island, an independent laboratory analysis of the Nitro-Tech powder he used revealed the undisclosed ingredients norandrostenedione and androstenediol, steroid precursors that would cause the positive

test results. A similar complaint was filed by Olympic bobsledder Pavle Jovanovic.

Both cases were settled out of court. Jamie Moss, a spokeswoman for Iovate, the company behind Nitro-Tech and other MuscleTech dietary supplements, says, “At no time have banned substances been confirmed to be found in any Nitro-Tech branded product.”

In the U.S., supplements aren’t generally required to undergo a pre-market review, as are prescription drugs; health claims are not assessed for validity; and a requirement that makers comply with good manufacturing practices is just being fully phased in as of June. In Canada, supplements undergo pre-market testing.

Consumers Union, the nonprofit publisher of CONSUMER REPORTS, believes that the FDA’s oversight under the Dietary

Supplement Health and Education Act is inadequate to ensure that protein drinks and other dietary supplements are consistently low in heavy metals and other contaminants. Legislation pending in Congress to strengthen the FDA’s oversight of food safety could incorporate language from another bill sponsored by Sens. John McCain, R-Ariz., and Byron Dorgan, D-N.D., to improve regulation of dietary supplements. Those moves are steps in the right direction, but more must be done to ensure that those products are properly evaluated for safety and effectiveness before they are sold to consumers.

“It is foolish to have these and other dietary supplements being sold with practically no regulation,” says David Carpenter, M.D., head of the Institute for Health and the Environment at University at Albany.

What’s in your protein drink

Here are the average amounts of metals we found in three servings of these protein drinks. The maximum limits for them in dietary supplements proposed by U.S. Pharmacopeia are: **arsenic** (inorganic), 15 micrograms (µg) per day; **cadmium**, 5 µg; **lead**, 10 µg; **mercury**, 15 µg. Amounts at or exceeding those limits are in **bold**. Experts said three servings a day is common.

Products are listed in alphabetical order.

Product (powder unless otherwise indicated)	Amount in 3 servings	Protein (g/3 servings)	Test results			
			Arsenic (µg/3 servings)	Cadmium (µg/3 servings)	Lead (µg/3 servings)	Mercury (µg/3 servings)
BSN Core Series Lean Dessert Protein Shake Chocolate Fudge Pudding	105 g	63	3.3	3.7	2.5	0.3*
BSN Core Series Syntha-6 Ultra Chocolate Milkshake	132 g	66	4.2	2.6	5.4	1.1
Designer Whey 100% Whey Protein Chocolate	78 g	54	3.9	1.6	2.4	0.9
EAS Myoplex Original Rich Dark Chocolate Shake (liquid)	1,500 mL	126	16.9	5.1*	-	-
GNC Lean Shake Chocolate	144 g	27	7.0	3.9	4.9	-
GNC Pro Performance AMP Amplified Wheybold Extreme 60 Chocolate	237 g	180	5.4	2.5	2.5	-
Jillian Michaels Natural Whey Protein Vanilla Cream Shake	81 g	45	1.9	-	1.2	-
Muscle Milk Chocolate	210 g	96	12.2	5.6	13.5	0.7*
Muscle Milk Nutritional Shake Chocolate (liquid)	990 mL	66	14.3	-	6.8	-
Muscle Milk Vanilla Crème	210 g	96	11.2	2.0	12.2	-
MuscleTech Nitro-Tech Hardcore Pro-Series Vanilla Milkshake	96 g	75	1.2	-	0.4*	0.9
Optimum Nutrition Gold Standard 100% Whey Extreme Milk Chocolate	96 g	72	2.5	1.7	1.0	0.2*
Optimum Nutrition Platinum Hydro Whey Velocity Vanilla	117 g	90	1.5	-	-	-
Six Star Muscle Professional Strength Whey Protein French Vanilla Cream	117 g	78	2.3	-	-	-
Solgar Whey to Go Whey Protein Powder Natural Vanilla Bean	60 g	48	0.6*	-	-	-

(-) Element was not measurable in all samples tested.

*In some samples of this product, this metal was below measurable levels and could be as low as zero. For those products, the average was calculated using zero as the value for samples in which metal could not be measured by the analytical method used.

How safe is that chicken?

Most tested broilers were contaminated

YOU WOULD THINK that after years of alarms about food safety—outbreaks of illness followed by renewed efforts at cleanup—a staple like chicken would be a lot safer to eat. But in our latest analysis of fresh, whole broilers bought at stores nationwide, two-thirds harbored salmonella and/or campylobacter, the leading bacterial causes of foodborne disease. That's a modest improvement since January 2007, when we found that eight of 10 broilers harbored those pathogens. But the numbers are still far too high, especially for campylobacter. Though the government has been talking about regulating it for years, it has yet to do so. (See Viewpoint, page 6.)

The message is clear: Consumers still can't let down their guard. They must cook chicken to at least 165° F and prevent raw chicken or its juices from touching any other food.

Each year, salmonella and campylobacter from chicken and other food sources infect 3.4 million Americans, send 25,500 to hospitals, and kill about 500, according to estimates by the national Centers for Disease Control and Prevention.

Science lesson: A little bit can make you sick

As few as 15 salmonella or 400 campylobacter organisms can make you ill. The salmonella found in raw poultry, meats, seafood, and produce can cause nausea, vomiting, abdominal cramps, diarrhea, fever, and headache, sometimes followed by arthritis symptoms. Campylobacter is found mainly in raw chicken. It wasn't

But the problem might be even more widespread: Many people who get sick don't seek medical care, and many of those who do aren't screened for foodborne infections, says Donna Rosenbaum, executive director of Safe Tables Our Priority, a national nonprofit food-safety organization. What's more, the CDC reports that in about 20 percent of salmonella cases and 55 percent of campylobacter cases, the bugs have proved resistant to at least one antibiotic. For that reason, victims who are sick enough to need antibiotics might have to try two or

more before finding one that helps.

CONSUMER REPORTS has been measuring contamination in store-bought chickens since 1998. For our latest analysis, we had an outside lab test 382 chickens bought last spring from more than 100 supermarkets, gourmet- and natural-food stores, and mass merchandisers in 22 states. We tested three top brands—Foster Farms, Perdue, and Tyson—as well as 30 nonorganic store brands, nine organic store brands, and nine organic name brands. Five of the organic brands were labeled “air-chilled” (a slaughterhouse process in which carcasses are refrigerated and may be misted, rather than dunked in cold chlorinated water).

Among our findings:

- Campylobacter was in 62 percent of the chickens, salmonella was in 14 percent, and both bacteria were in 9 percent. Only 34 percent of the birds were clear of both pathogens. That's double the percentage of clean birds we found in our 2007 report but far less than the 51 percent in our 2003 report.
- Among the cleanest overall were air-chilled broilers. About 40 percent harbored one or both pathogens. Eight Bell & Evans organic



broilers, which are air chilled, were free of both, but our sample was too small to determine that all Bell & Evans broilers would be.

- Store-brand organic chickens had no salmonella at all, showing that it's possible for chicken to arrive in stores without that bacterium riding along. But as our tests showed, banishing one bug doesn't mean banishing both: 57 percent of those birds harbored campylobacter.
- The cleanest name-brand chickens were Perdue's: 56 percent were free of both pathogens. This is the first time since we began testing chicken that one major brand has fared significantly better than others across the board.
- Most contaminated were Tyson and Foster Farms chickens. More than 80 percent tested positive for one or both pathogens.
- Among all brands and types of broilers tested, 68 percent of the salmonella and



PLAY IT SAFE Use one cutting board for raw chicken (or other meat) and one for other foods. Immediately after preparation, use hot, soapy water and paper towels to wash and dry your hands and anything you or raw chicken might have touched.

60 percent of the campylobacter organisms we analyzed showed resistance to one or more antibiotics.

Dirty birds

As they're raised, chickens can peck at droppings and insects that carry salmonella and campylobacter. The bacteria

settle in their intestines, usually without harm, and the chickens contaminate their environment with infected feces. When the birds are slaughtered, intestinal bacteria can wind up on their carcasses.

To minimize contamination, processors of poultry (and of meat and seafood) follow federally mandated procedures col-

From henhouse to your house

The government's food-safety rules require chicken processors to identify "critical control points" where contamination might occur, then establish procedures for preventing, eliminating, or reducing those hazards. As our tests show, nothing guarantees a clean chicken. The contamination rate can vary with what the birds are fed, the preventive measures used, growing conditions, and the time of year, says Michael Doyle, Ph.D., director of the University of Georgia's Center for Food Safety. The procedures differ among plants; those outlined here are a possible scenario.



Processing plant



On the road Chickens travel to the processing plant in cages. Filth can spread.

In the processing plant Birds are stunned, killed, and bled.



Scalding Hot water loosens feathers for easier plucking. Some bacteria on feathers, feet, and skin are killed, but others float from one bird to another. Carcasses are washed. **Critical control point** Check temperature and pH of water.



Defeathering A machine's rubber fingers pluck feathers and remove the outermost layer of skin. Contaminated fingers can spread bacteria from carcass to carcass.



In the hatchery Some chicks are contaminated with salmonella from their mothers or their own shells during hatching. Others ingest bacteria from their surroundings. Live birds infected with campylobacter or salmonella usually show no symptoms. To reduce the risk to people, some companies vaccinate hens and chicks against salmonella.



In the chicken house Usually a new flock of thousands of chicks is trucked to a house run by a farmer according to the poultry producer's specifications. Chickens habitually peck the ground, ingesting bacteria from litter and feces, and could be exposed to vermin. Companies try to keep germ carriers away and continuously monitor the flocks' general health. Antibiotics are used to prevent or treat illness and might also be given to speed chickens' growth. But treated birds can't be sold as USDA-certified organic.



After processing Companies take steps to ensure their packaged chickens are properly refrigerated during shipping and delivery to market. Federal regulations require transport at a temperature no higher than 40° F.

lectively known as HACCP (pronounced hass-ip), which stands for Hazard Analysis and Critical Control Point. Those measures are in effect in slaughterhouses and processing plants and are the consumer's main protection against contaminated chicken. HACCP, implemented for poultry and meat plants in 1997, requires companies to spell out where contamination might occur and then institute procedures to prevent, reduce, or eliminate it.

Inspectors for the U.S. Department of Agriculture's Food Safety and Inspection Service (FSIS) monitor chicken companies' HACCP plans. They inspect carcasses and viscera for tumors, bruises, and other defects. During testing periods, they also pluck a broiler a day off the line and test it for the presence of salmonella. Plants that produce more than 12 salmonella-positive samples over 51 consecutive days of produc-

tion fail to meet the FSIS-established performance standard, which triggers an FSIS review of the plant's HACCP plan. The plant would be expected to fix any problems; penalties are possible. To further motivate chicken processors to clean up their act, the USDA has begun publicly posting processors' salmonella test results online. (The data isn't archived, making it hard to assess a processor's performance over time.)

With this gentle prodding, poultry plants have improved, FSIS data indicate. Yet only 82 percent of broiler plants demonstrate what the FSIS calls "consistent process control." By the end of 2010, 90 percent of eligible plants should be able to meet that standard, according to FSIS projections.

That still leaves campylobacter. As we went to press in November, an FSIS spokesperson said that baseline data on the prevalence of campylobacter in broiler and turkey

carcasses had been collected and were being analyzed and that draft performance standards based on those findings and a risk assessment would be ready by the year's end. FSIS testing for campylobacter would follow.

Carol L. Tucker-Foreman, distinguished fellow at the Consumer Federation of America's Food Policy Institute and a former USDA official, cited "at least a decade of promises and failures to develop campylobacter baseline data and a standard." But she acknowledged that the FSIS could deliver a report on baseline data by the end of 2009. "It is essential," she added, "to have a performance standard for campylobacter."

Behind the numbers

At 14 percent, the overall salmonella incidence is within the range we've seen in the past 12 years. In previous tests, the incidence



USDA visual inspection

After internal organs are removed, a Department of Agriculture inspector checks carcasses and viscera for signs of disease, bruises, and other defects.



Washing Birds are sprayed with chlorinated water or other washes to reduce bacteria and are checked for visible fecal matter.

Chickens that pass muster are chilled; those that fail are reprocessed or discarded. **Critical control point** Record chlorine level and adjust if necessary.



Chilling To prevent spoilage, carcasses are submerged in icy chlorinated water or air-chilled to lower their internal temperature to 40° F or less. When chickens emerge,

USDA inspectors grade them for quality. At this stage, the USDA conducts salmonella testing, and the plant conducts one test for E. coli per 22,000 birds. **Critical control point** Monitor chlorine level of chiller or temperature of air-chill room; check internal temperature of birds.



Cut-up and packaging area Birds are cut into pieces if necessary, packaged, and shipped. **Critical control point** Check for metal fragments in packaged poultry.



In the store Improper temperature or handling can introduce bacteria or cause them to multiply.



In your kitchen Cooking chicken thoroughly, to at least 165° F, and washing anything that comes in contact with raw chicken greatly reduces risk.

Talk the talk

Certified Humane Raised and Handled.

For starters, the chicken had access to clean food and water, according to third-party inspectors with expertise in animal welfare.

Free-range, free-roaming. The chicken has had access to the outdoors, even if that means only that the door to the chicken house was left open briefly each day.

Fresh. The carcass's internal temperature hasn't dropped below 24° F. Still, the chicken might be partly frozen.

Kosher. The chicken was prepared according to Jewish dietary laws. Salt was added as part of the process.

Natural. The chicken was "minimally processed" in a way that didn't fundamentally alter the raw product. It has no artificial ingredients, preservatives, or added color.

No antibiotics administered. Don't assume this was verified unless you also see the label "USDA organic."

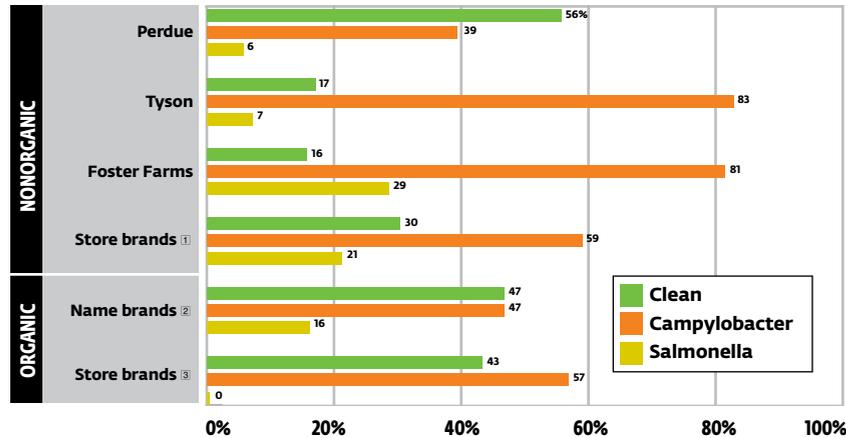
No hormones. Pointless; the USDA prohibits the use of hormones in raising poultry.

USDA organic. A USDA-accredited certifier has checked that the chicken company followed standards: Chickens were raised without antibiotics, ate 100 percent organic feed with no animal byproducts, and could go outdoors (though they might not have). For more about labels, go to our affiliate Web site at www.GreenerChoices.org.

Germ count

Levels of contamination

Below, the percentages of broilers that tested positive for campylobacter, salmonella, or neither (clean). We analyzed 70 chickens from each major brand, 66 from nonorganic store brands, 62 from organic name brands, and 44 from organic store brands. Figures are averages for store brands (both organic and nonorganic) and for organic name brands. Totals may exceed 100 percent because some broilers harbored both pathogens.



① AJ's, Acme, Albertsons, America's Choice, Diebergs, Earth Fare, Fiesta, Fresh & Easy, Giant, Giant Eagle, Harris Teeter, Harry's, Hill Country Fare, Jewel, King Sooper, Kroger Value, Market Pantry, Nature's Promise, Publix, Roundy's, Safeway, Schnucks, Shaws, Shop 'n Save, Sweetbay, Tops, Wegmans, White Gem, Wild Harvest, Whole Foods. ② Bell & Evans, Coastal Range, Coleman, D'Artagnan, Eberly's, MBA Brand Smart Chicken, Mary's, Pollo Rosso, Rosie. ③ Central Market HEB, O Organics (Safeway), Pacific Village (New Seasons), Private Selection Organic Fred Meyer, Private Selection Organic King Sooper, Private Selection Organic Kroger, Trader Joe's, Wegmans, Whole Foods.

Resistance to antibiotics

Some antibiotics important for humans are fed to nonorganic chickens to speed growth or prevent or treat illness. But bacteria may evolve to become immune to antibiotics, at which point the drugs become less effective in treating people. We took 53 salmonella samples and 103 campylobacter samples from chickens and determined what percentage of samples resisted antibiotics that usually work against those pathogens. "Resistant" indicates the percentage of bacteria that could survive a normal dose of the drug. Each color represents a class of antibiotics. Within classes, drugs are in alphabetical order.

Salmonella drug	Resistant ①
Gentamicin	4%
Kanamycin	17
Streptomycin	34
Cefoxitin	28
Ceftiofur	30
Ceftriaxone	0 ②
Amoxicillin/ clavulanic acid	28
Ampicillin	30
Chloramphenicol	2
Nalidixic acid	2
Sulfisoxazole	21
Tetracycline	49
One or more drugs	68

① Tested drugs that were effective against salmonella: Amikacin, Ciprofloxacin, and Trimethoprim/Sulfamethoxazole.

② 17% of samples were somewhat resistant: Ceftriaxone inhibited bacterial growth but didn't stop it. ③ Tested drugs that were effective against campylobacter: Gentamicin, Azithromycin, Erythromycin, Telithromycin, Clindamycin, and Florfenicol.

Campylobacter drug	Resistant ③
Ciprofloxacin	18%
Nalidixic acid	21
Tetracycline	49
One or more drugs	60



THE AIR-CHILLED OPTION These broilers are subjected to cold air, and sometimes mist, to inhibit microbial growth. As a group, the 32 air-chilled birds we analyzed, all of them also organic, proved especially clean.

ranged from 9 percent to 16 percent overall. Campylobacter incidence has varied more. Now it's 62 percent overall; in our previous tests it ranged from 42 percent to 81 percent.

When we took bacteria samples from contaminated chicken and analyzed their resistance to common antibiotics, most bugs could resist at least one antibiotic, and some evaded multiple classes of drugs. If a patient needs treatment, that might leave a doctor with poorer odds of choosing an effective antibiotic to fight infections that might be more stubborn.

The good news: All of the antibiotics were effective against 32 percent of the salmonella samples and 40 percent of the campylobacter samples. Back in January 2007, we reported that those figures were just 16 percent and 33 percent.

It's not surprising that we found antibiotic-resistant bacteria even in organic chickens, which are raised without antibiotics. "Chickens grown under organic conditions are given exposure to the outdoors, which provides contact with vermin such as rodents, insects, and birds that can carry and transmit these bacteria to chickens," said Michael Doyle, Ph.D., director of the University of Georgia's Center for Food Safety. Moreover, once genes for antibiotic resistance are in the gene pool of microbes, they can persist in the soil for years, even after the antibiotics are no longer in use.

The safeguards in place

Despite modest improvement in some numbers, our findings suggest that most companies' safeguards might be inadequate. To tease out what might account for Perdue's and Bell & Evans' relative success, we asked those companies as well as Tyson and Foster Farms whether they have added

any food-safety measures in the past few years. We didn't reveal our test results.

Bruce Stewart-Brown, Perdue's vice president of food safety and quality, and a doctor of veterinary medicine, told us the company has increased its salmonella vaccinations over the past few years. That's designed to prevent chicks from picking up the bacterium from their mothers. Further protections, Stewart-Brown said, include an "all-in, all-out production model." Translation: Flocks are cleared out completely. Between flocks, farmers dry the empty chicken houses (which kills bacteria) and often use a product that temporarily changes the pH of the ground (to make it inhospitable to bacterial growth). Birds on each farm are the same age, so there are no older birds to contaminate newly arrived younger ones. "We also work closely with the farmers that raise our poultry," he said. "We make sure they isolate any other species of animals that might transfer microbiology to our chickens, use footwear and clothing control programs, and closely regulate visitation by outsiders."

Stewart-Brown also says that Perdue has implemented 25 food-safety steps at its processing plants.

Tom Stone, director of marketing at Bell & Evans, which produced those clean chickens, said the company has started packaging its products with a machine that seals the edges with film and shrinks the material, so there's no need for a "diaper" under the chicken to sop up fluids. "Our chickens are air-chilled and carry the 'No Retained Water' statement," he said.

But listen to Foster Farms and Tyson and you'd think they would have been as clean. Robert O'Connor, vice president of technical services at Foster Farms and a doctor of veterinary medicine, cited the company's use of "the most technologically advanced and proven systems available." Tyson spokesman Gary Mickelson said his company's safeguards include keeping hatcheries sanitized, vaccinating some breeder stock against salmonella, and ensuring proper refrigeration during product delivery.

Our own experts say that controlling the spread of bacteria is a matter of being vigilant and taking many small steps, from hatchery to store, rather than relying on one magic bullet. A May 2008 release of USDA compliance guidelines for the poultry industry recommends 37 "best practices," including controlling litter moisture in chicken houses and continuously rinsing carcasses

Sickened by chicken?

Within a few days of eating salad at a Minnesota restaurant in February 2009, Michele Lundell, a supervisor for a company that makes plastic tubing, experienced diarrhea, fever, and headache. "I kept getting sicker and sicker," she recalled. A test confirmed campylobacter. After her doctor prescribed antibiotics, Lundell said, she felt better for about a day, but then "all the same symptoms came back." She

said she was hospitalized for six days. A Minnesota Department of Health investigation found that 10 people who had eaten at the restaurant were stricken with campylobacter and that the lettuce was most likely contaminated by raw or undercooked chicken. Lundell said she hasn't fully recovered. "It's hard to believe," she said, "that a person goes out to eat and gets so sick that it changes your life."



CASE STUDY Michele Lundell, 53, of Apple Valley, Minn., became ill from campylobacter.

and equipment in processing plants. Chicken producers that follow good practices in the hatchery and on the farm and abide by those government guidelines should be able to produce fewer chickens that harbor salmonella, though not necessarily campylobacter.

What you can do

Too often, America's food-safety net has holes. Although Perdue chickens were cleaner than other big brands in our tests, and most air-chilled organic brands were especially clean, our tests are a snapshot in time and no type has been consistently low enough in pathogens to recommend over all others. Buying cleaner chicken may improve your odds if you fail to prepare chicken carefully. If you choose organic, be aware that it cost us up to \$4.55 more per pound than the rest.

Whatever bird you buy, one slipup and you're at risk. Most important is to cook chicken to at least 165° F. Even if it's no longer pink, it can still harbor bacteria, so use a meat thermometer. The Polder THM-360, \$30, and Taylor Weekend Warrior 806, \$16,

were excellent in our tests. Other tips:

- Make chicken one of the last items you buy before heading to the checkout line.
- Choose chicken that is well wrapped and at the bottom of the case, where the temperature should be coolest.
- Place chicken in a plastic bag like those in the produce department to keep juices from leaking.
- If you'll cook the chicken within a couple of days, store it at 40° F or below. Otherwise, freeze it.
- Thaw frozen chicken in a refrigerator, inside its packaging and on a plate, or on a plate in a microwave oven. Never thaw it on a counter: When the inside is still frozen, the outside can warm up, providing a breeding ground for bacteria. Cook chicken thawed in a microwave oven right away.
- Don't return cooked meat to the plate that held it raw.
- Refrigerate or freeze leftovers within 2 hours of cooking.

For more ways to help ensure that your food is safe, go to our Web site at www.BuySafeEatWell.org.