Humans are at the top of the food chain. As a result, we’re vulnerable to pathogens, drugs, and contaminants consumed by the animals we eat. And we eat a lot: an average of 137 pounds of beef, chicken, fish, and shellfish per American in 2002, the latest year for which figures are available.

Food animals used to eat what grew naturally—grass and grain for cows and chickens; small fish or other sea life for big fish. But life on today’s farm—often a 30,000-cow feedlot or a 60,000-chicken coop—isn’t so simple. The need of such facilities for huge quantities of high-protein rations and the need for slaughterhouses to find a cheap, safe way to dispose of waste gave rise to a marriage of convenience between renderers and food producers, and to the inclusion of animal by-products in animal feed.

The pairing was seen as a boon: Waste was recycled into needed protein and other nutrients for animals. But the addition of the rendering industry to the animal-feed mix has meant more trouble controlling and monitoring feed production, more vulnerability to problems, and another layer of regulation.

To assess the safety of the nation’s animal feed and implications for consumers, we interviewed feed-industry experts and critics; reviewed recent research and spoke to scientists who conducted it; and tested chicken for arsenic, an approved additive in an antiparasitic drug given to many healthy birds to make them grow faster.

We asked feed-company executives to talk with us, but only representatives of fish-feed makers and the heads of four feed trade associations were willing.

Our investigation raises concerns that the federal government isn’t doing enough to protect the feed supply and that as a result, the food we eat may not be as safe as it could be: Regulatory loopholes could allow mad cow infection, if present, to make its way into cattle feed; drugs used in chickens could raise human exposure to arsenic or antibiotic-resistant bacteria; farmed fish could harbor PCBs and dioxins.

WHAT THEY EAT, AND WHY

Cattle and chickens are still given plant-based feed: Corn (for carbs) and soybean meal (for amino acids) make up 70 percent to 90 percent of most commercial animal feed. But the remaining 10 percent to 30 percent of feed can differ radically from what cows and poultry would eat in their natural habitat.

Processed feathers are an acceptable source of protein in cattle feed, according to the U.S. Food and Drug Administration, as is poultry litter—floor wastes from coops, including feces. Plastic pellets are permitted as roughage. Chickens can be fed meat and bone meal. And in addition to their main diet of fish meal and fish oil, farmed fish may be given rendered meat, bone, and feather meal. The goal: to fatten animals as fast and as cheaply as possible.

Also included in feed: medications, given routinely even to healthy cattle and chickens to boost growth and keep infections at bay. (It’s illegal for U.S. fish farmers to use drugs for those purposes.) Whatever the animal, a range of feeds is available. In the U.S. alone, 14,000-plus companies sell as many as 200 basic feeds, plus custom-made mixes. In all, the companies produce more than 308 billion pounds of animal feed annually.

The relative percentage of feed ingredients varies with price and availability. “Last April, soybeans cost twice as much as they did the year before, and feed suppliers turned more aggressively to rendered animal protein and by-products,” says Chris Hurt, Ph.D., an agricultural economist at Purdue University. “In October, soybean prices were back to previous levels, which gives them less incentive to use meat and bone meal.”

When a feed producer proposes a new ingredient, it must petition the FDA to approve it. The FDA gives a thumbs-up or thumbs-down or, in rare cases, leaves the decision to the states. Once an ingredient is approved, its name and description appear in an ingredient list published by the Association of American Feed Control Officials. AAFCO comprises FDA officials, state feed officials, and feed-industry representatives (who can’t vote on matters such as requiring product labeling).

The FDA can’t blanket the country with inspectors, so it delegates much enforce-
ment responsibility to the states, which conduct 70 percent of feed-company and renderer inspections.

**THE BENEFITS, THE RISKS**

Try to put aside any squeamishness when "waste" and "feed" are used in the same sentence. The waste is processed until it bears no resemblance to its former self. Thomas Cook, president of the National Renderers Association, told us that after the rendering process thoroughly heats, presses, and grinds animal tissue, it "looks like a pile of brown sugar."

**The benefits.** "Animal-protein products, meat and bone meal, and blood meal are very nutritional feed ingredients," says David Fairfield, director of feed services for the National Grain and Feed Association. Philip Petry, president of AAFCO, speaks of the merits of chicken waste. "There's a yuck factor because it doesn't sound at all appetizing," he says, "but the nitrogen level in poultry litter is real high, so they get a real good protein jump out of that."

Richard Sellers, vice president for feed control and nutrition at the American Feed Industry Association (AFIA), points out that some of the 50 million tons of animal and plant by-products generated by the food industry might have ended up in landfills. "We turn them into valuable sources of protein to feed a hungry world," he adds.

**The risks.** What the feed officials say is true, but what consumers need to know is whether those processed feed ingredients pose risks to them.

Industry officials cite the approval process. "All the feed ingredients are approved by the government," says David Bossman, recent president and chief executive of AFIA. "FDA is part of that process. It's the most scientifically sound food-safety organization in the world."

Yet even Bossman acknowledges that accidents can happen: Feed can become contaminated, for instance, simply by being stored in the wrong bin. "People make honest mistakes," he says.

Indeed. According to a recent report from the federal Centers for Disease Control and Prevention (CDC), "There is considerable potential for contaminated animal feed or animal-feed ingredients to move between and within countries. This could result in the widespread and rapid dissemination of a pathogen to geographically dispersed animal herds—and, in turn, to a range of human food products."

Jean Halloran, director of the Consumer Policy Institute of Consumers Union (publisher of Consumer Reports), thinks the FDA's rules are not stringent enough. "There needs to be rigorous analysis of the health impact of what's fed to food animals," she says.

Other consumer advocates agree. Caroline Smith DeWaal, director of food safety for the Center for Science in the Public Interest, notes, "I think the yuck factor is huge. But we have actual concerns when things like clay are mixed in and other by-products that can increase the exposure of humans who eat those animals to toxic chemicals." Clay can be contaminated with dioxins; in fiscal year 2003, dioxin contamination led the FDA to recall 479 feed products from 17 companies.

Robert Lawrence, M.D., chairman of a National Academy of Sciences committee that recently examined dioxin exposure, says that dioxins and PCBs, which accumulate in animal fat, are being recycled into the food supply. "I was shocked to learn that every year in the U.S., 11 billion pounds of animal fat is recycled into animal feed," he says.

Even if rendered material starts out clean, it can become contaminated with bacteria. Whether that happens during processing, storage, handling, or shipping isn't clear. But tests by the Animal Protein Producers Industry, a nonprofit renderers group, found salmonella in about one-fourth of rendered feedstuffs, on average, from 1996 through 2000. The good news: That's down from about half in 1990.

The FDA is aware of only a handful of incidents worldwide in which salmonella...
infections in humans were linked to animal feed. The most recent was in the U.S. in 2003. But connecting human illness to contaminated feed is difficult, says Fred Angulo, chief of the CDC’s foodborne and diarrheal diseases branch.

It would help to have a “farm to fork” surveillance system such as those in Europe, he says, where contamination is looked for in feed, animals, the marketplace, and humans. In the U.S., Angulo says, that might mean requiring a Hazard Analysis and Critical Control Points (HACCP) system for feed processing, like those already in place for animal processing. It would make feed manufacturers spell out where contamination might occur during processing, then build in procedures to prevent it.

Stephen Sundlof, Ph.D., director of the FDA’s Center for Veterinary Medicine, which regulates drugs, devices, and food additives for food animals, says the agency is “engaged in discussions with the feed industry” to put a HACCP-like system in place. An FDA spokeswoman called the system a priority, but it may not be fully implemented until 2007. AFIA has launched a voluntary system that incorporates HACCP-like measures.

If all animals were raised organically—on feed lacking pesticides, animal by-products, and antibiotics—would our food supply be safer? Yes, in some ways. There would be less risk of mad cow disease, little or no arsenic in chicken, and fewer bacteria able to resist antibiotics. But there’s no guarantee that organic feed is free of garden-variety bacteria, including salmonella.

Richard Sellers of AFIA sees another roadblock, at least for now: “There are not enough organic-grain suppliers to go all organic.” Currently, about a dozen brands each of organic chicken and beef are sold, and far fewer organic fish (many are imports; USDA organic standards don’t yet apply to seafood).

On the other hand, price might not be a big barrier. If the organic-feed industry grew, Chris Hurt, the Purdue economist, estimates that organic beef or chicken might cost only 10 percent to 20 percent more per pound, on average, than meat from conventionally raised animals.

American consumers are willing to pay more for greater safety guarantees, according to a national online survey of 1,085 adults conducted last January by Consumers Union. Of the 95 percent of respondents who said they eat beef, 77 percent said they would pay more at the supermarket for beef certified as free of mad cow disease.

What you can do

Any problems involving animal feed would most likely occur before beef, chicken, or fish reaches your refrigerator. But consumers can still take action. To start, you can visit www.notinmyfood.org, a public-policy Web site of Consumers Union. Click on Feed-Rule Action to urge the U.S. Food and Drug Administration to act on issues raised in this report.

To avoid meat from animals fed animal by-products, drugs, or grain grown with synthetic pesticides and fertilizers, look for beef or chicken certified organic by the U.S. Department of Agriculture. You might have to shop around: Organic beef and chicken account for less than 1 percent of U.S. sales, according to the Organic Trade Association. Don’t spend extra for fish labeled organic: The USDA has not established standards for fish.

The claims “no antibiotics administered,” “no hormones administered,” and “no chemicals added” are unverified. So are claims by some beef brands that their cattle are raised on an all-grain or all-grass diet. For more about meat labels, visit the CU Web site at www.eco-labels.org.

As of April 4, 2005, unprocessed fresh and frozen seafood sold in U.S. markets must be labeled “wild” or “farm-raised” and marked with its country of origin. Salmon from open waters is sold for as much as $15 per pound, three times as much as farmed, but it may be worth looking for in season: Studies show that wild salmon tend to have lower levels of some contaminants; and wild salmon (and shrimp) are likely to be free of antibiotics.

Although the FDA stresses that salmon contains heart-healthy fatty acids and says that contaminant levels in farmed fish don’t warrant eating less, it’s sensible to limit exposure to any potential carcinogen if possible.
In 1997, the U.S. Food and Drug Administration required that most protein derived from ruminants (cud-chewing animals) be kept out of feed given to other ruminants. The goal was to keep the feed supply free of infectious prions, proteins thought to spread bovine spongiform encephalopathy (BSE, or mad cow disease), which has been linked to a fatal brain disease in humans. Although the rendering process can kill viruses and bacteria, it doesn’t eliminate all prions.

That feed ban was designed to prevent cattle from eating tainted feed, becoming sick, being slaughtered before showing symptoms, and being eaten by a person who then becomes infected.

But loopholes still allowed certain risky feedstuffs to be fed to cattle and other ruminants. Ruminant remains—even from “downer” cows, which are unable to walk and at higher risk of BSE—could still be fed to chickens, pigs, and fish. And their remains, in turn, could be fed back to ruminants, creating a cycle that some worry could transmit mad cow disease. There’s also concern that nonruminant feed containing infectious prions could accidentally become mixed with cattle feed.

Even enforcement of the existing ban has been lax. A January 2002 report by the Government Accountability Office found that more than four years after the feed ban took effect, the FDA still had “not acted promptly to compel firms to keep prohibited proteins out of cattle feed and to label animal feed that cannot be fed to cattle.”

GAO investigators identified some noncompliant feed operations that had not been reinspected for two or more years and cases in which the FDA had not cracked down on companies found noncompliant on multiple inspections.

“FDA does not know the full extent of industry compliance,” the report said, because its data on inspections are “severely flawed.”

We do know that industry compliance with the feed ban has been imperfect. From August 1997 through 2003, 47 companies recalled 280 feed products that were in violation of the federal rules. During that time, the FDA issued 63 letters warning of noncompliance. And in July 2003, the FDA announced a consent decree with one feed manufacturer in which the company officers admitted liability for adulterated and misbranded animal feed and agreed to take corrective measures. With that announcement, the FDA stated that compliance with the feed ban exceeded 99 percent. But last year, our research showed, the agency was still sending warning letters. By March, it had recalled an additional 130 products from five more firms for violating the ban.

In January 2004—shortly after the first mad cow, of Canadian origin, was discovered in the U.S.—Health and Human Services Secretary Tommy Thompson and then-FDA Commissioner Mark B. McClellan promised two new rules to bolster the firewalls against mad cow disease. The steps were to take effect immediately upon publication in the Federal Register, the daily government publication of federal regulations. The rules did the following:

• Banned downer cows and animal parts known to harbor the highest concentrations of infectious prions from human food, dietary supplements, and cosmetics.
• Banned the use in ruminant feed of mammalian blood and blood products, poultry litter, and meat leftovers from restaurants. Those ingredients were used in ruminant feeds in the United Kingdom before that nation’s mad cow outbreak and contributed to the epidemic. The FDA also mandated steps to keep ruminant feed and nonruminant feed from mixing.

Last July, the FDA put the first rule into effect. But it unexpectedly put the other rule on hold. Instead, it called for public comment, including comment on a new proposal to remove particularly risky cow parts—“specified risk materials” (SRMs), such as older cows’ brains and spinal cords—from all animal feed. Such a ban would be stricter but, like any proposal in the public-comment stage, might not result in final regulations.

The delay has been widely criticized by consumer groups, including the Consumer Policy Institute of Consumers Union, publisher of CONSUMER REPORTS. “The FDA should have taken immediate action on the promises it made,” says Jean Halloran, director of the institute. “In what appears to be a guise of considering a bigger step, they did nothing.”

Caroline Smith DeWaal of the Center for Science in the Public Interest says, “They have been studying this action since 2002, so the idea that we need more study prior to taking such commonsense action seems absurd.”

Carol Tucker-Foreman of the Consumer Federation of America called the delay “inexplicable and irresponsible.”

Stephen Sundlof of the FDA’s Center for Veterinary Medicine suggests the FDA is postponing a small step while considering a bigger one. He says the agency was swayed by an international expert panel report in February that suggested steps well beyond those the agency had announced weeks earlier. “The one thing that would have the biggest impact would be getting the SRMs out of the animal-feed system altogether,” Sundlof says.

James Hodges, president of the American Meat Institute Foundation, which represents the meat and poultry industry, counters that “there needs to be a risk-benefit analysis and cost-benefit analysis,” adding that there’s no evidence of BSE among domestic cattle. “Spending millions or hundreds of millions of dollars for no practical risk-reduction benefit is not good public policy,” he says. He agrees with testing high-risk animals, which must occur after slaughter: There’s no way to check whether asymptomatic, live animals harbor mad cow disease. “We’ve heard every opinion,” Sundlof says. “I would say that in the animal-feed industry there is not unanimity.” However, the agency has tentatively concluded that it agrees with the expert panel and will propose banning all risky materials from all animal feed. When will that ban take effect? Maybe this year, maybe not, according to Sundlof. “These things unfortunately do take a lot of time,” he says.
Chicken Arsenic and antibiotics

Chickens eat mostly a corn-and-soy mix, plus rendered animal by-products. Since chickens do not appear to contract mad cow disease, the main issue with their feed is drugs that are intentionally added to kill microbes and fatten birds faster.

Conventional poultry farmers often give chickens Roxarsone (3-Nitro), one of many drugs approved by the Food and Drug Administration for those purposes. Roxarsone contains arsenic, though in a form less toxic to humans than the form linked to cancer.

The USDA monitors arsenic levels in food animals. Agency researchers ruffled feathers last January when they reported in Environmental Health Perspectives that young chickens contain three to four times more arsenic than other poultry and meat.

The data were based on analysis of chicken livers. Consumer Reports decided to test both liver and muscle, the part most people eat. We took 116 samples from widely sold brands of conventional and organic chickens bought in stores around the U.S. and from a mail-order company.

We found no detectable arsenic in the 15 liver samples from Foster Farms, a conventional chicken brand, and none in the organic chicken samples. The rest averaged 466 parts per billion (ppb) of total arsenic. That’s still far less than the FDA’s 2,000 ppb chicken-liver tolerance limit—the amount allowed in a food product.

There was no way to tell whether the arsenic came from drugs or was taken up from the environment, where it’s found naturally. But the lack of arsenic in organic chickens is suggestive: USDA standards do not allow arsenic in organic-chicken feed.

The FDA’s tolerance limit for arsenic in chicken muscle meat is 500 ppb—lower than in liver, the FDA says, because people eat more muscle than liver. We found no detectable arsenic in our samples of muscle.

The U.S. Environmental Protection Agency, which regulates arsenic levels in drinking water, has more stringent limits than the FDA. A few of our chicken-liver samples had an amount that according to EPA standards could cause neurological problems in a child who ate 2 ounces of cooked liver per week or in an adult who ate 5.5 ounces per week.

Critics ask why arsenic is allowed in feed at all. “We’re trying to do everything we can to get levels lower in drinking water at very great cost,” Ellen Silverfeld, Ph.D., professor of environmental health sciences at the Johns Hopkins University’s Bloomberg School of Public Health, told us. “And yet we’re deliberately adding it to chicken.”

Asked to comment on the use of arsenic-containing drugs, Richard Lobb, a spokesman for the National Chicken Council, said, “There simply does not appear to be a human health problem of any kind resulting from the use of arsenicals in poultry production.”

Like Roxarsone, human antibiotics are fed to chickens to speed growth. But bacteria in the birds’ intestines can develop resistance to them. People who eat chicken harboring those bacteria can fall ill if they don’t handle and cook meat properly, and they may not be cured by the drugs typically used to get rid of their illness.

In October 2000, the FDA concluded that two antibiotics used in poultry had spawned drug resistance. The maker of one drug pulled it off the market quickly. Bayer, maker of the other drug, challenged the FDA’s proposal to withdraw approval of its drug, Baytril, for use in poultry. Last March an FDA administrative law judge ruled in the agency’s favor. Bayer appealed, and as of November, the FDA had not acted.

On Capitol Hill, proposed legislation would phase out the “nontherapeutic” use of medications in healthy flocks. • The solution Cut back on the use of medications in healthy flocks.

Seafood Farmed vs. Wild

The FDA is responsible for ensuring the safety of imported seafood. And there’s a lot of ensuring to do: About 80 percent of seafood sold in the U.S. is imported. Yet the FDA tests only about 2 percent of those imports, mainly for drug residues. Last January, the GAO reported that despite an earlier recommendation, the FDA had not established agreements with other countries to document that their seafood-safety systems are as stringent as the U.S. system.

Salmon are one of the major imports. They’re high in heart-healthy omega-3 fatty acids, but their fat also tends to accumulate toxins consumed in the wild or on fish farms. In the wild, a salmon’s meal of choice is smaller fish. On farms, salmon are typically fed concentrated fish meal and fish oil.

Results of a study led by Ronald Hites, Ph.D., an environmental chemist at Indiana University, and published in the Oct. 1, 2004, issue of Environmental Science & Technology showed that farmed salmon tended to have higher levels of PBDEs, flame retardants used in polyurethane foam, than wild salmon. PBDEs have become ubiquitous in the environment and appear to have found their way into farmed-fish feed. They have posed neurological problems in animals; their toxicity in humans isn’t known.

The Hites team also reported in the journal Science in January 2004 that compared with wild salmon, farmed salmon had more PCBs and dioxins, likely carcinogens. On its own, each contaminant was well below the FDA’s tolerance level. But some samples had combined concentrations high enough to trigger local consumption advisories. The data indicated that farmed salmon from Europe were more contaminated than those from North and South America.

Two major international fish-feed producers, EWOS Ltd. of Norway and Nutreco Aquaculture of the Netherlands, test their feed for contaminants, and spokesmen say they’ve taken steps to reduce levels of PCBs and dioxins. Nutreco Aquaculture, for example, has increased the substitution of vegetable oil for fish oil, says Viggo Halseth, managing director of the company’s research center.

The FDA is concerned, however, that some foreign fish and seafood producers are adding unapproved drugs to feed, leaving traces in food that could pose human health risks. Since 2003, foreign shipments of farmed salmon reportedly tainted with maldichite green, a fungicide not approved for aquaculture use in the U.S., have been...
stopped in the United Kingdom and the Netherlands, according to press reports. This fiscal year, the FDA plans to test catfish—80 samples of domestic, 80 of imported—for malachite-green residues. Tests from fiscal years 2001-03 have found no residues. Plans to test salmon are on hold, an FDA spokeswoman says, while the agency assesses detection methods.

Chloramphenicol, a potent antibiotic and suspected carcinogen, is another cause for concern. Although federal regulations prohibit its use in animal feed, chloramphenicol has been found in shrimp imported to the U.S. The Louisiana Department of Agriculture & Forestry began testing imported shrimp in 2002. Ten percent of its samples to date have been tainted with the drug.

This and other incidents here and abroad led the FDA to announce increased testing of imported seafood for chloramphenicol. Currently, the agency collects just eight samples of imported shrimp each week, according to an FDA spokeswoman.

“We are concerned about chloramphenicol and malachite green and other veterinary drugs that are not allowed in the United States because there are serious health concerns,” says Stephen Sundlof at the FDA. The agency is trying to work with other countries to help them resolve problems with medications unapproved in the U.S., he adds.

The issue
Contaminants

- What they are PCBs, dioxins, and flame retardants.
- How they could get in feed Farmed-salmon feed can contain oil and meal from fish caught in polluted waters.
- The danger PCBs and dioxins are likely carcinogens in humans.
- The solution Industry should use feed fish from cleaner waters and find substitutes for fish oil.

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