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Introduction

Yes, we finally did it! Here is another issue after a fairly irregular interval. As usual, this issue contains a variety of topics which should satisfy the toxicological information needs of any reader. There are three things which I would like to highlight for you in this issue. The first is an article about EPA decision making with regards to carcinogens, written by Dr. Allan Felsot, Extension Toxicology Specialist for Washington State University. It is an excellent review of the whole process. The second is a "tidbit" related to "Miraculous Pesticide Chalk." This was brought to our attention after a colleague mentioned he knew someone who had been using this "organic" pesticide chalk which contained no active ingredients, with great results! It is far from "non-toxic" and far from "organic"!

Last is an announcement of a new book which was authored by a good friend and colleague, Jim Riviere, from North Carolina State University. A couple of years ago, in the midst of a "food safety crisis", Jim wrote a letter to Newsweek (which was published), in which he said "don't worry and eat your vegetables!" I think many readers will find his book interesting and useful.

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CDC: WATER IN PEST SPRAY LIKELY SOURCE OF *CYCLOSPORA* IN OUTBREAK

Water used in pesticide solutions is the most likely source of the parasite that caused a multistate outbreak of foodborne illness caused by the parasite *Cyclospora cayetanensis,* according to a Centers for Disease Control and Prevention (CDC) report on its field investigation in Guatemala in July and August 1996.

Based on epidemiological investigations and tracebacks, CDC concluded that Guatemalan raspberries caused the outbreak that sickened thousands in the U.S. and Canada last summer. Not all farms were equally likely to be implicated: as few as two farms could account for 21 (84%) of 25 clusters of *Cyclospora* infection traced to a single source, and as few as five farms could account for all 25.

The CDC report also describes growing practices in the Guatemalan berry industry, which exports 98% of its harvest to the U.S. Growers in Guatemala use fungicides, insecticides and growth regulators. "Pesticides (fungicides and insecticides) are applied to raspberry plants after mixing with water by either spraying the mixture onto the soil or directly onto the plant throughout both the growing and harvest seasons. The water that is used for mixing includes water from wells, reservoirs, or water from rivers or springs in a few cases," according to the report, which stated that pesticides are generally mixed with water in 50-gal. plastic containers and are sprayed either by workers wearing a sprayer on their backs or by a motorized pump.

Two of the ten farms implicated in tracebacks obtained water from a river and underground spring. Three other implicated farms stored water in reservoirs, some of which were open and could easily become contaminated. Although water was filtered, the filters used were not small enough to filter out *Cyclospora* oocysts, which are 8 to 10 microns in diameter.

Water was suspected because previous investigations of outbreaks caused by the parasite have reported water as the transmission vehicle. Although the report concluded that water sprayed on berries during pesticide application is the most likely mode of transmission of the parasite, it concedes that investigators cannot completely rule out other possible modes of transmission.

Potable Water Recommended For Pesticide Solutions, Handwashing

Nevertheless, the report recommended that any water used to mix pesticides for application to berries should meet the standards for potable water as defined by World Health Organization guidelines.

Other recommendations to prevent contamination include having toilet paper and handwashing facilities near all latrines and toilets for farm workers. Potable running water should be used in handwashing facilities, rather than providing communal washing basins, according to CDC.

The report outlines steps that would improve packing procedures, including making sure that retail packages (plastic baskets or clamshells) are clean before packing them with fruit and changing blotting paper frequently to prevent cross-contamination. It also suggests that exporters apply an identification sticker or barcode on each flat so the farm of origin can be identified immediately in case of a problem.

Department of Agriculture inspectors should not use one table for simultaneous inspection of food and other items such as flowers that may contain soil, the report recommended.

Laboratories should develop better isolation techniques and a subtyping method for *Cyclospora* to aid in linking the epidemiologic and distribution data, according to the report, which also urged continued cooperation between CDC and the Guatemalan exporters' association, GEXPRONT.

REF: *Food Chemical News*, **38**(51), February 10, 1997. ✓

E. COLI O157:H7 CAN SURVIVE FOR MANY WEEKS IN COLDEST WATER, RESEARCHERS FIND

Recent experiments conducted by University of Georgia researchers confirm that *Escherichia coli* O157:H7 is "a hardy pathogen" that can survive for many weeks in municipal water, reservoirs and lakes, especially at cold temperatures.

In addition, "results suggest that cells can enter into a viable but nonculturable state and survive for long periods of time at room temperature," according to the November issue of *At a Glance*, a research summary published by the university's College of Agricultural and Environmental Sciences/Center for Food Safety and Quality Enhancement.

A number of O157 outbreaks have been associated with drinking either reservoir or well water, or swimming in lakes. The Georgia researchers inoculated a five-strain mixture of O157 into samples of autoclaved, filtered municipal water, municipal reservoir water, and two recreational lakes. Survival was monitored for 91 days at 8°, 15° or 25°C.

The pathogen's survival was greatest at 8°C in all samples. After five to 12 weeks, it was not detectable in three out of four samples maintained at 25°C.

Surface Affects Sanitizer Efficacy

Cleaning and sanitizing equipment is crucial to controlling microbiological contamination. In other experiments conducted at the University of Georgia, researchers found that the type of surface being cleaned makes a "significant difference in sanitizer efficacy."

Various surfaces contaminated with *Staphylococcus aureus* were treated with quaternary ammonium (QAC) and chlorine sanitizers. While both sanitizers were found to be effective, stainless steel and polycarbonate surfaces harbored the lowest staphylococci levels, and mineral resin surfaces indicated the highest.

"This research shows the importance of matching cleaning and

sanitizing systems to surface type. Food contact surfaces other than stainless steel, if present at critical points in a process, should be evaluated for their ease of proper cleaning and sanitizing under real operating conditions."

Salmonella on Sprouts Persists

Salmonella on alfalfa sprout seeds is difficult to eliminate, the Georgia researchers found, noting recent outbreaks of the organism on alfalfa sprouts. Alfalfa seeds inoculated with *Salmonella* were treated with solutions of calcium hypochlorite or sodium hypochlorite, hydrogen peroxide or ethanol.

While all of the treatments reduced concentrations of *Salmonella* by more than 1,000-fold, populations of up to 7,900 per gram of seed remained. The researchers believe that the *Salmonella* cells are harbored in crevices between the cotyledon and testa of seeds. Additionally, they noted that substances such as hydrogen peroxide may be of limited use because they "can be difficult to handle, especially by workers unfamiliar with its ability to cause skin irritation."

REF: *Food Chemical News*, **38**(37), November 4, 1996. ✓

SURVEY DATA SHOW REGIONAL DIFFERENCES IN HIGH-RISK FOOD CONSUMPTION BEHAVIORS

A 12-question food safety survey administered in six states in 1995 suggests that being well-off, educated, white and male may put you in the group most likely to eat undercooked hamburgers and eggs, not to mention raw oysters. In fact, where and how you live may have a considerable impact on what kinds of food you consider "safe."

According to the 1995 Food Safety Module of the Behavioral Risk Factor Surveillance System (BRFSS), eating undercooked hamburgers is most common among middle-aged, middle income, educated white males. But the pattern varies from state to state: 31% of Colorado respondents had eaten an undercooked hamburger in the past 12 months, as opposed to 21% of New Yorkers and Missourians. And in Washington state, where memories of the 1993 Jack in the Box *E. coli* O157:H7 outbreak still linger, only 10% of the population would consume the undercooked meat.

Washington also broke the pattern of education: only 1% of Washingtonians with at least a college education had tried an undercooked hamburger recently, as opposed to 11% of the less educated residents of the state. In New York, on the other hand, only 12% and 17% respectively of the grade school- and high school-educated would eat undercooked hamburger, while a whopping 67% of the college-educated had done so. Other states were closer to the New York pattern than to the Washington one.

The survey found a clear distinction between the sexes on the hamburger front: 38% of Colorado men liked their hamburgers rare, as opposed to only 27% of Colorado women. On the subject of eggs, the Colorado figures revealed 66% of men versus 56% of women eating them undercooked or raw.

The most common high-risk consumption behavior overall was eating undercooked eggs: around half of all those questioned admitted having done so within the last year. ***Salmonella enteritidis*, which is often contracted through consuming undercooked eggs or egg products, is the leading cause of foodborne illness in the U.S.**

The Food Safety Module was developed through collaborative efforts of the Centers for Disease Control and Prevention (CDC), the Food and Drug Administration's (FDA) Center for Food Safety and Applied Nutrition, and several state health departments. Five of its 12 categories deal with high-risk food consumption behaviors; the other questions treat food handling practices. In 1995, the survey module was administered as a part of the 1995 BRFSS in Colorado, Florida, Missouri, New York, Tennessee and Washington. The raw data on consumption behaviors were presented at last spring's BRFSS conference in Atlanta, Ga.

The Food Safety Module also asked about raw oysters, raw milk, and home-canned vegetables in its respondents' diets. The numbers for oysters and milk were below - in most cases well below - the 10% mark, although raw oysters did show up a little more frequently on the plates of the relatively wealthy (yearly income over $50,000). Home-canned vegetables were particularly popular in Missouri (38% had eaten them in the last year), but undercooked hamburgers enjoyed across-the-board favor in every state except Washington.

Publication of the entire survey, along with analysis of the data, is likely to take another one to two years, according to FDA's Sean Altekruse. Altekruse, the FDA liaison to CDC, characterized the 1995 Food Safety Module data as "a convenient sample as opposed to a more precise survey instrument." He cautioned that some of its results were weighted to bring the data samples into proportion with state breakdowns by ethnicity, age, gender, income and education.

The 1996 Food Safety Module is being used by five states, and the Food Safety Module Working Group is encouraging more state health departments to add the module to their 1997 surveillance of behavioral risks. "The goal of the survey is to identify the target population for intervention," Altekruse said. **CDC estimates that around 6 million Americans fall ill and 9,000 die each year of foodborne illnesses.**

REF: *Food Chemical News*, **38**(47), January 13, 1997. ✓

GAMMA HYDROXY BUTYRATE USE — NEW YORK AND TEXAS, 1995-1996

Gamma hydroxy butyrate (GHB) is a central nervous system depressant approved as an anaesthetic in some countries; however, with the exception of investigational research, it is not approved for any use in the United States. Primary groups using GHB include party and nightclub attendees and bodybuilders. In addition, GHB is one of several agents characterized as a "date rape" drug. During August

1995-September 1996, poison control centers in New York and Texas received reports of 69 acute poisonings and one death attributed to ingestion of GHB. This report describes two cases and summarizes the investigations of GHB use in Texas and New York. The findings of these investigations underscore the health hazards associated with use of GHB.

Texas

At 12:30 p.m. on August 5, 1996, a 17-year-old girl with no previous history of drug or alcohol use was admitted to an emergency department (ED) because of cardiac arrest with cardiopulmonary resuscitation in progress. She was pronounced dead at 12:40 p.m. On the night of August 4, she had been at a local dance club, where she was reported to have ingested soft drinks. An autopsy was performed; multiple toxicologic screens of blood and bile samples did not detect alcohol or other drugs. However, on September 13, a test on previously obtained serum detected a serum level of 27 mg/L of GHB.

New York

On October 30, 1996, a 20-year-old man who was unresponsive after several episodes of vomiting was taken to an ED 2½ hours after ingesting a mixture of GHB and sodium hydroxide. He was intubated and admitted to the intensive-care unit, where a bronchoscopy indicated friable lung tissue that was attributed to aspiration of gastric contents containing sodium hydroxide. He developed bilateral pneumothoraces and had generalized seizures and was transferred to a third hospital for possible extra-corporeal membrane oxygen therapy and lung transplant. However, his condition improved, and he was extubated and placed on supportive care and recovered.

During August 27, 1995-October 30, 1996, the Long Island Regional Poison Control Center received reports of 13 persons with exposure to GHB. All 13 were evaluated in hospital EDs. Four of the 13 also consumed ethanol. All five persons initially had altered mental status, including coma (three), stupor (one), and inebriation (one). Eight of the 13 persons had prepared GHB at home using sodium hydroxide and butyrol lactone; of the eight, three required admission to a hospital.

Editorial Note: GHB increases dopamine levels in the brain and has effects through the endogenous opioid system; most GHB is excreted during the first hours after ingestion. Manifestations of acute GHB toxicity include coma, seizures, respiratory depression, and vomiting. Other documented effects of GHB include amnesia and hypotonia (associated with doses of 10 mg/kg body weight); a normal sequence of rapid eye movement (REM) and non-REM sleep (doses of 20-30 mg/kg body weight); and anesthesia (doses of approximately 50 mg/kg body weight). Doses of >50 mg/kg body weight can decrease cardiac output and produce severe respiratory depression, seizure-like activity, and coma; coma and respiratory depression may be potentiated by concomitant use of alcohol. There is no antidote for GHB overdose, and treatment is restricted to nonspecific supportive care. Patients in New York and Texas have required ED care; many of those hospitalized have required ventilatory support and intensive care.

In the United States, GHB has been produced clandestinely in widely varying degrees of purity. GHB has been marketed as a liquid or powder and has been sold on the street under names such as "Grevious Bodily Harm," "Georgia Home Boy," "Liquid Ecstasy," "Liquid X," "Liquid E," "GHB," "GBH," "Soap," "Scoop," "Easy Lay," "Salty Water," "G-Riffick," "Cherry Menth," and "Organic Quaalude." Improper preparation of GHB can result in a mixture of GHB and sodium hydroxide that can be severely toxic because of the combined effects of the GHB and the direct caustic effects of sodium hydroxide.

In the United States, GHB is under specific Food and Drug Administration exemptions for investigational research protocols for the treatment of narcolepsy. Although possession of GHB is not illegal under federal law, its manufacture and sale is prohibited under the Food, Drug, and Cosmetic Act.

REF: *Morbidity and Mortality Weekly Report (MMWR)*, **46**(13), April 4, 1997. ✓

ENVIRONMENTAL GOALS SET FORTH IN EPA MILESTONES REPORT INCLUDE AMBITIOUS TARGETS FOR PESTICIDE RESIDUES IN FOODS

EPA sent to other government agencies on Jan. 27, 1997, a draft version of a new "bible" for the environment: *Environmental Goals for America -- With Milestones for 2005.* Although the other agencies were asked not to release it to the public, it was distributed at a meeting of the agency's Common Sense Initiative Council.

"EPA has been developing these goals over the past four years," said EPA Assistant Administrator David Gardiner. Asking for comments by March 31, 1997 from the other agencies, the head of EPA's Office of Policy, Planning and Evaluation said EPA hopes to incorporate its suggestions and publish the "first-ever proposal" next year. It is the second round of comments by other agencies, and Gardiner noted that not all of the first-round comments have been incorporated.

Among the 66 goals -- and strategies for achieving "measurable results" -- in the 234-page document were:

- "The frequency of illegal pesticide residues in food will remain at or below the current low level."
- "There will be a significant reduction in the use of the food production pesticides that have the highest potential to cause cancer."
- "All pesticide residues in food will meet the statutory standard of 'reasonable certainty of no harm.'"

Integrated Pest Management

A strategy for attainment of these milestones said that by 2005, "the percent of U.S. crop acreage under integrated pest management will increase to 90%." IPM will be aggressively promoted by the federal government, according to the document, which elaborated:

"... The effectiveness of IPM requires the support of pesticide user groups, extension specialists, researchers, custom applicators, pest

management consultants, pesticide suppliers, and agencies like USDA and EPA."

"EPA is currently working with USDA and grower groups to promote IPM under the Pesticide Environmental Stewardship Program. Several partnerships with grower groups have been established in the last year, and many more are planned."

Other strategies to help assure that food supplies are safe, covered virtually everything EPA is doing in the pesticide area and included: implementation of the Food Quality Protection Act, reregistration, special reviews, field implementation and communication, and development of new policies and streamlining old ones "to keep up with newly discovered risks and scientific advances, to be more flexible and cost-effective and to harmonize pesticide program requirements with those of other nations."

Safer Pesticides

Increasing the use of safer pesticides was another component of the strategy. "By 2005, 75% of new pesticide registrations will be for safer (reduced risk) pesticides. In addition, by 2005, all 'inert' ingredients in registered pesticides will be safe." The document elaborated:

- "Naturally occurring compounds and biological pesticides such as fungi, bacteria, viruses, and other microbial pesticides can be classified as safer pesticides if they have a nontoxic mode of action. The number of new active pesticide ingredients that fall into the biological or reduced risk category has varied in recent years from two in fiscal year 1990 to a high of 15 in FY 94. As more of these safer pesticides are registered and then used by growers as alternatives, the risk to food consumers will be reduced."
- "...Criteria for characterizing safer ingredients are being developed, taking into consideration factors like toxicity, persistence, environmental mobility and bioconcentration potential. EPA is granting regulatory relief for products with nontoxic modes of action.... EPA is also forming a new organizational unit to focus on registration of safer pesticides and pollution prevention activities."

In discussing inert ingredients, EPA noted that all new ones must have a database adequate to evaluate risks, and continued:

"In addition to new inerts, EPA is reevaluating inerts in previously registered pesticides, categorizing them based on their known toxicity, and making determinations on them. EPA has reviewed about 300 of the existing food use inerts and will make determinations on the remaining 300 food use inerts and 1,400 nonfood use inerts by 2005."

REF: *Food Chemical News*, **39**(2), March 3, 1997. ✓

RESEARCHER FINDS DRAMATIC DECLINE IN RESIDUAL NITRITE LEVEL SINCE MID-1970S

Since the mid-1970s, the residual nitrite content of cured meats has declined by approximately 80%, according to Robert Cassens, a professor of animal science at the University of Wisconsin.

Cassens, writing in the February 1997 issue of *Food Technology,* a publication of the Institute of Food Technologists, noted that interest in this subject was recently "restimulated," 25 years after the use of nitrite to cure meat was seriously questioned and 15 years after it was exonerated by the National Academy of Sciences.

The renewed interest came from scientific research which cast a negative light on nitrite and its reaction products based on epidemiological suggestions that hot dog consumption is linked to childhood cancer, and on the positive side because nitric oxide is important to several physiological functions.

Simultaneously, a new generation of cured-meat products which are low in fat and formulated with ingredients not previously used has emerged. These new products provoked Cassens to study the levels of residual nitrite in cured meats currently in the marketplace.

Three trials conducted; dramatically lower nitrite levels found

Three trials were conducted to determine the residual nitrite level in retail samples of typical cured meats purchased by consumers. Trial 1 involved the analysis of 10 packages of cured meats, including bacon, sliced ham and wieners, for residual nitrite. Trial 2 involved 11 packages of bacon, 30 of bologna, 24 of ham and 34 of wieners analyzed for residual nitrite. Analysis of residual nitrite, residual nitrate and residual ascorbates in six packages of bacon, seven of ham, 23 of bologna and 19 of wieners was the focus of Trial 3.

As a reference point, Cassens observed that in 1975, J.W. White summarized existing data and "reported an average residual nitrite in cured meats of 52.5 ppm." In contrast, Cassens current analyses found significantly lower levels, so he said it is reasonable to conclude that the current residual nitrite content of cured meats at retail is approximately 10 ppm.

For Trial 1 the mean residual nitrite level for all products was 5.4 ppm. For individual samples the following was found: 4, 1 and 15 ppm of nitrite for bacon; 3, 9 and 7 for sliced ham; and 1, 4, 1 and 9 for wieners.

In Trials 2 and 3, the mean residual nitrite level for all products was 10 ppm, with a range of 0-48 ppm in Trial 2 and 0-45 ppm in Trial 3.

In Trial 3, "nitrate was not detectable in the cured meat samples tested. All samples were reported as less than 10 ppm, the nitrate detection level," Cassens reported. As for ascorbates, the overall mean residual level was 209 ppm, with a range of 66-483 ppm.

Cassens also reported that the majority of samples contained phosphates. And, he observed, approximately half of the bologna and wiener samples contained poultry and, moreover, the presence of poultry resulted in a higher ($p<0.05$) residual nitrite level.

The "dramatic decline" in residual nitrite levels can be attributed to lowered ingoing nitrite, increased use of ascorbates, improved process control and altered formulations, Cassens said.

Benefits and risks should be reevaluated in light of positive health benefits

In addition to the decline in nitrite levels, another important finding of the trials was the high level of residual ascorbates present in cured meats, said Cassens.

The mean value of 209 ppm residual ascorbates was nearly 40% of the maximum allowable addition of 550 ppm, an amount of residual activity which provides "considerable inhibitory power against nitrosation reactions and undoubtedly represents a positive health benefit to consumers," he said.

Cassens recommended that the results of earlier studies "should be considered in view of the current findings of extremely low residual nitrite levels and substantial quantities of residual-reducing activity." The studies he referenced linked brain tumors with childhood consumption of ham, bacon and hot dogs; children's intake of hot dogs with the risk of leukemia; and consumption of cured meats by mothers with increased incidence of tumors in their children.

Moreover, he said, from a biological perspective, evidence continues to mount that nitrite, and/or its reaction products, is important in human physiology. For example, nitric oxide is a biological messenger important to the physiological functions of neurotransmission, blood clotting, blood pressure control and immune system function. And newly emerging evidence "suggests that generation of salivary nitrite may also provide significant protection against gut pathogens in humans," Cassens said.

Thus, Cassens concluded, the health risk or benefit of cured meats consumption should be reevaluated.

REF: *Food Chemical News*, **39**(4), March 17, 1997. ✓

DOMOIC ACID TOLERABLE INTAKE, CONTAMINATION LEVELS DETERMINED

In order to protect the health of at-risk populations, domoic acid contamination should not exceed 30 mg/kg in the hepatopancreas and viscera of Dungeness crabs or 20 mg/kg in razor clams, a Washington researcher has determined.

With a grant from FDA, Koenraad Marien of the Washington State Department of Health in Olympia conducted surveys to determine consumption levels by populations of concern. Based on these data, he developed a tolerable daily intake (TDI) for individuals most sensitive to the effects of domoic acid and calculated maximum tolerable contaminant levels for domoic acid, according to his report in the November 1996 issue of *Environmental Health Perspectives*, the journal of the National Institute of Environmental Health Sciences.

Domoic acid, a potent neuroexcitatory amino acid, has been found in razor clams and Dungeness crabs in Washington and elsewhere on the West Coast of the United States. Populations considered most at risk of domoic acid toxicity are recreational clam diggers and ethnic Chinese who consume whole crabs, according to the report.

The survey findings suggest there are "distinct, sizable and sensitive populations that may be exposed to domoic acid if clams or crabs become contaminated," the researchers reported, urging that prevalence data continue to be gathered to assure that tolerable levels are not exceeded.

REF: *Food Chemical News*, **39**(4), March 17, 1997. ✓

HOW DOES EPA DECIDE WHETHER A SUBSTANCE IS A CARCINOGEN?

by Allan Felsot
Environmental Toxicologist

In January, EPA released a revised list of pesticides classified as carcinogens. I counted more than 100 active ingredients. In 1987, there were 53 pesticide carcinogens, according to a National Academy of Science report. The difference seems largely due to increased testing and/or evaluation as part of the reregistration process rather than new compounds registered after 1987. Considering that there are about 300 registered active ingredients for food uses, the current number of classified carcinogens represents about 33% of these pesticides. This is curious, considering that Bruce Ames and Lois Gold's analysis of the Cancer Potency Database, funded by the National Institute of Health at the University of California, Berkeley, shows that about 50% of all synthetic and natural chemicals tested for carcinogenicity are associated with tumors. Does this mean that pesticides are less likely to be carcinogenic on average than all other chemicals? Such a question shows how easy it is to put a positive (or negative) spin on available data. This brings me to the central question of this essay: How does the EPA decide if a chemical is carcinogenic? What spin does EPA place on animal testing data?

The Federal Insecticide, Fungicide, and Rodenticide Act requires testing to determine the carcinogenic potential of pesticides. Actually, the tests determine oncogenic potential, which is the ability to cause benign and/or malignant tumors; a substance causing malignant tumors would be considered carcinogenic. One of the first tests for oncogenic potential is the determination of mutagenic potential, the ability to directly damage or alter DNA. Various types of cellular studies have been developed to determine mutagenicity. EPA views with suspicion any compound testing positive for mutagenicity, because the longstanding but now outdated hypothesis of cancer induction assumes that all carcinogens damaged DNA directly. New research has shown that many nonmutagenic chemicals can cause tumor formation at very high doses but not at low or moderate doses.

EPA's theoretical assumptions about cancer etiology dictate the design of oncogenic potential studies and decisions to classify a compound as carcinogenic. EPA assumes that thresholds for cancer do not exist; a single molecule can eventually lead to tumor production. This rule seems to be a holdover of the idea that carcinogens work by directly mutating DNA, and a single mutation can lead to cancer. Nevertheless, the Food Quality Protection Act (FQPA) speaks of threshold and nonthreshold pesticides to distinguish those that are

noncarcinogenic from those classified as carcinogens.

A second EPA assumption is that exposure to the maximum tolerated dose (MTD) over a rat's lifetime is a valid predictor of human risk. Thus, all studies must include the maximum tolerated dose. This dose is determined by feeding a range of doses to test animals for about 90 days (a subchronic test). The maximum tolerated dose is an estimate of the highest dose over a lifetime that will not alter longevity through non-cancer effects. It should cause no more than a 10% weight decrease in treated animals compared to the undosed group. Other benchmarks for the MTD besides no mortality include absence of clinical signs of toxicity and pathologic lesions that would be predicted to shorten an animal's life span.

Usually two to three doses including the MTD are fed to rats during their normal two-year lifespan. Pesticide is mixed with the rats' food, and daily consumption is measured so that doses can be expressed as milligrams pesticide per kilogram body weight per day (mg/kg/day). Researchers dose about 50 animals of each sex and monitor them daily for signs of distress. At the end of the test period, the animals are killed and tissues from multiple organs are examined for a variety of cellular changes in addition to the presence of abnormal growths indicative of tumors. One such chronic feeding study can cost several million dollars.

The EPA reviews studies and classifies compounds as carcinogenic or noncarcinogenic. In addition to animal testing, the EPA may use epidemiological evidence from humans. Epidemiological studies are not conducted on new active ingredients, but older compounds undergoing reregistration may be examined. For example, 2,4-D has received much epidemiological study as well as notoriety. During the mid-1980s, National Cancer Institute (NCI) epidemiologists claimed that Midwest farmers had a risk of non-Hodgkin's lymphoma that increased in proportion to how long they used the product. A study by Dow Chemical scientists published in *Fundamental and Applied Toxicology* reviewed 2,4-D epidemiological studies and concluded that a majority of studies supported no association with cancer. I noted that the current carcinogenic pesticide listing excludes 2,4-D.

Once mutagenicity, oncogenicity, and epidemiological studies are completed, the EPA considers the results of the mutagenicity and oncogenicity tests, the types and diversity of tumors, the structural similarity of the pesticide to known carcinogens, and whether positive results have been replicated. A study showing elevated incidence of tumors in dosed animals will weigh heavily in the classification decision, especially if other studies corroborate increased tumor incidence in the same tissue and/or the compound is a mutagen. To characterize carcinogenic hazard to humans, the EPA has adapted a multi-tiered classification scheme developed by the International Agency for Research on Cancer. A substance may be classified within one of six possible groups as: human carcinogen (Group A), probable human carcinogen (Groups B1 and B2), possible human carcinogen (Group C), not classifiable (Group D), or noncarcinogenic (Group E). All pesticides EPA considers carcinogenic fall into Groups B2 and C. (See Table 1)

The process seems straight forward, but details can be messy. First consider that, well-trained pathologists must examine thousands of tissue slices, and they may not all agree that a damaged cell has changed to a tumor cell. Manufacturers will argue with the EPA about the interpretation of feeding studies. Second, the criteria that EPA uses to classify compounds into Group B2 and C seem mysterious. B2 represents sufficient evidence of carcinogenicity from animal studies, with inadequate or no epidemiologic data. Group C represents limited evidence of carcinogenicity in the absence of human data. Classification of carcinogenicity seems to depend on evidence ranging from limited to sufficient.

I was curious how EPA judged whether evidence was limited or sufficient. I was particularly interested in how negative data are handled and whether thresholds exist. With readily available data in the book *Drinking Water Health Advisory: Pesticides*, compiled by the EPA Office of Drinking Water, I used chlorothalonil (Bravo, Daconil) as a test case to see how EPA makes a decision. Chlorothalonil has been classified as a B2 carcinogen. The fungicide is important for many agricultural and nonagricultural uses; its registration could be jeopardized on some crops when its exposure risk is reassessed under the expanded requirements of the FQPA.

The chapter on chlorothalonil lists 13 mutagenicity studies; some were based on cell culture studies, while others involved whole animal feeding studies. Only one test showed evidence of a mutagenic effect. Thus, chlorothalonil is not considered mutagenic.

Fourteen subchronic and chronic feeding studies used various dosing regimens ranging from 0.2 mg/kg/day to 900 mg/kg/day. In 90-day feeding studies, doses did not exceed 3 mg/kg/day; at this dose there were no changes indicative of a tumor. A two-year feeding study with dogs at a dose of 3 mg/kg/day revealed no conclusive compound-related trends. A 12-week feeding study reported by the NCI revealed no effect in mice dosed with 800 mg/kg/day.

Two-year high dose studies gave evidence of tumor formation that EPA evidently weighed very heavily. An NCI study observed kidney tumors at doses of 253 and 506 mg/kg/day. What I find curious is the percentage of animals with tumors. At the high dose, 4 of 49 males and 5 of 50 females had tumors. EPA apparently chose to consider 10% incidence of tumors after feeding rats amounts of chlorothalonil equivalent to nearly a billion times the estimated human exposure (<0.0000001 mg/kg/day, according to the Food and Drug Administration Total Diet Study) representative of sufficient evidence of ability to cause tumors in animals.

Is there corroboration of the NCI rat study? A study in mice at doses of 119, 251, and 517 mg/kg/day showed significant tumor incidence only in males fed 251 mg/kg/day. There was no linear relationship to dose. A

different two-year study with rats concluded that dose-dependent increases in kidney tumors occurred at feeding levels greater than 40 mg/kg/day. A study filed in 1989 reported a 13% and 20% increase in tumors in male and female rats fed 175 mg/kg/day for nearly 2.5 years. No tumors formed at doses of 1.5 and 3.3 mg/kg/day.

EPA's classification of chlorothalonil as a B2 carcinogen appears to be based on evidence from the two-year rat and mice feeding studies. It does not seem to matter that the incidence of tumors is incredibly low given the high dose rates. It does not seem to matter that the low doses even in the two-year studies were negative. It does not matter that the 90-day low dose feeding studies showed no toxic or cellular effects at doses of 1.5 mg/kg/day, a dose still a million times greater than the estimated human dietary intake. EPA's decision, however, does demonstrate one final assumption the agency makes about pesticides: negative epidemiologic or animal results cannot prove safety.

(Allan Felsot is the Environmental Toxicologist at the Food and Environmental Quality Laboratory, Washington State University.)

REF: *Agrichemical and Environmental News*, **132**, February 1997. ✓

HUMANS MAY BE 10-FOLD, PERHAPS 100-FOLD, LESS SUSCEPTIBLE TO DIOXIN CANCER EFFECTS, RESEARCHERS CLAIM

Wide publicity resulted (January 1997) from a paper in the American Chemical Society's journal, *Environmental Science and Technology*, about a claim that dioxin cancer risk for humans may be 10- to 100-fold less than in rats.

The paper detailed results of a method of analysis conducted by two consulting firms, McLarenHart-ChemRisk and Karch and Associates. They reported on use of a method known as AUC, a dosimetric called "area-under-the-curve," which they said has been used to study

TABLE 1

Group B1 & B2 Carcinogens

Acetaldehyde	Dichloromethane	MGK Repellent 326
Acetochlor (Harness, Surpass)	ETO	Orthophenylphenol & Na Salt
Aciflourfen, Sodium (Blazer)	Oxythioquinox (Morestan)	Pentachlorophenol
Alachlor (Lasso)	Etridiazole (Terrazole)	Procymidone
Amitrole	Fenoxycarb (Comply)	Pronamide (Kerb)
Cacodylic Acid (Montar)	Folpet	Propargite (Omite)
Captan	Formaldehyde	Propoxur (Baygon)
Chlordimeform	Heptachlor	Propylene oxide
Chloroform	Iprodione (Rovral)	Sufallate
Chlorothalonil (Bravo)	Lactofen (Cobra)	Telone (Dichloropropene, 1,3-)
Creosote	Lindane	Thiodicarb (Larvin)
Cyproconazole (Sentinel)	Mancozeb (Dithane)	Toxaphene
Daminozide (Alar)	Maneb	TPTH
	Metiram (Polyram)	Vinclozolin (Ronilan)
	Metam Sodium (Vapam)	

Group C Carcinogens

Quantified Group C

Acephate (Orthene)	Ethalfluralin (Sonalan)	Oxadixyl
Amitraz (Mitac)	Fenbuconazole (Indar)	Oxyfluorfen (Goal)
Atrazine	Fomesafen (Reflex)	Permethrin (Ambush, Pounce)
Benomyl (Benlate)	Hexythiazox (Savey)	Pyrithiobac-sodium
Calcium cyanamide	Hydrogen Cyanamide	Simazine (Princep)
Carbaryl (Sevin)	Imazalil	Tetrachoroethane, 1,1,2,2-
Cyanazine (Bladex)	Metolachlor (Dual)	Tetrachlorvinphos
Dacthal (DCPA)	Molinate	Triallate
Dichlorvos (DDVP)	Oryzalin (Surflan)	Trifluralin (Treflan)
Diclofop-methyl (Hoelon)	Oxadiazon (Chipco, Ronstar)	

Unquantified Group C

2-Benzyl-4-chlorophenol	Fipronile	PCNB (Terraclor)
Acrolein	Fosetyl-Al (Aliette)	Piperonyl Butoxide (Butacide)
Asulam (Asulox)	Hexaconazole (Anvil)	Prodiamine (Barricade)
Bifenthrin (Brigade)	Hydramethylnon (Amdro)	Propazine
Bromacil (Hyvar)	Isoxaben (Gallery)	Propiconazole (Tilt, Orbit)
Bromoxynil (Buctril)	Linuron	Tebuconazole (Folicur)
Clofentizine	Mercaptobenzothiazole, 2-	Terbutryn
Cypermethrin (Cymbush)	Methidathion (Supracide)	Tetramethrin
Dichlobenil (Casoron)	Methylphenol, 3-	Triadimefon (Bayleton)
Dichlorethylene, 1,1-	MGK-264	Triadimenol (Baytan)
Dicofol (Kelthane)	Norflurazon (Evital, Predict)	Tribenuron methyl (Express)
Difenconazole (Dividend)	Paradichlorobenzene	Tribuphos (DEF)
Dimethenamid (Frontier)	Pendimethalin (Prowl)	Tridiphane (Tandem)
Dimethipin (Harvade)	Phosphamidon (Dimecron)	Uniconazole
Dimethoate	Parathion	

pharmaceutical agents for several decades.

Data for the study were said to have been derived from studies by the National Institute for Occupational Safety and Health.

Using AUC, the highest rat dose group had "a nine-fold greater response at approximately 1/10th the AUC of the most highly exposed human group." The authors elaborated in their abstract: "... The rat dose-response was more than 90-fold steeper than the human dose response. Interestingly, regardless of the dosimetric chosen, the cancer rate in humans in the NIOSH cohort, if due to TCDD, is almost completely insensitive to dose. Our analysis indicates that human exposure to background levels of TCDD (about 5 ppt serum lipid concentration) should not pose an incremental cancer risk."

The results should make it possible, the researchers said, "to identify a practical threshold for TCDD carcinogenesis in humans. Both the NIOSH group exposed less than one year and the Ranch Hand cohort suggest that there may be a no-effect level in humans."

In a separate press release, Dennis Paustenbach, who led the study, was quoted to the effect that the timing of the study is important, noting, "The EPA is coming to the end of a nearly five-year evaluation of dioxin, which could affect whether tens of millions of dollars in corrective actions need to be implemented by various industries and municipalities."

REF: *Food Chemical News*, **38**(47), January 13, 1997. ✓

PREGNANCY-RELATED BEHAVIORS AMONG MIGRANT FARM WORKERS — FOUR STATES, 1989-1993

The U.S. workforce includes an estimated 3-5 million migrant and seasonal farm workers; approximately 16% of migrant farm workers are women. Early enrollment in prenatal care and proper weight gain during pregnancy can reduce the risk for poor birth outcomes.

Overall, migrants were more likely than nonmigrants to be of Hispanic origin, younger, and married and were less likely to have attained a high school education. By the first trimester of pregnancy, approximately 60% of both groups were enrolled in prenatal care; migrant women were more likely than nonmigrant women to have initiated this care during the third trimester (8% versus 5%, respectively). The proportion of women who gained less than the Institute of Medicine's recommended weight for their body mass index was higher among migrant women (52%) than nonmigrant women (32%).

Editorial Note: The findings in this report underscore the need for delivery of timely prenatal care and other health services to migrant farm workers and/or their families. One element of the *Migrant and Seasonal Farm Workers Health Objectives for the Year 2000* is that at least 90% of pregnant migrant women be enrolled in prenatal-care services by the first trimester. The findings in this report suggest that, to meet this goal among WIC (Women, Infants, and Children) enrollees, timely enrollment rates would have to increase by 50% over the observed level. In addition, the proportion of women in the study who gained the recommended amount of weight during pregnancy would have to nearly double to meet the year 2000 goal of 85%.

REF: *Morbidity and Mortality Weekly Report (MMWR)*, **46**(13), April 4, 1997. ✓

ALCOHOL CONSUMPTION AMONG PREGNANT AND CHILDBEARING-AGED WOMEN — UNITED STATES, 1991 AND 1995

Moderate to heavy alcohol use by women during pregnancy has been associated with many severe adverse effects in their children, including fetal alcohol syndrome (FAS) — with facial dysmorphology, growth retardation, and central nervous system deficits — and other neurodevelopmental effects. Early prenatal alcohol exposure can occur unintentionally (i.e., before a woman knows she is pregnant); in addition, women who drink at high levels before pregnancy are at increased risk for drinking during pregnancy.

In 1995, 4.7% of women aged 18-44 years reported being pregnant at the time of the interview. Of these, 16.3% reported any drinking during the preceding month, compared with 12.4% in 1991 ($p=0.07$). The rate of frequent drinking among pregnant women was approximately four times higher in 1995 than in 1991 (3.5% in 1995 and 0.8% in 1991, $p<0.01$). This difference persisted after controlling for selected sociodemographic characteristics (i.e., age, household income, marital status, employment status, education level, smoking status, and race). Among all childbearing-aged women in 1995, 50.6% reported any drinking, and 12.6% reported frequent drinking — prevalences similar to those in 1991 (49.4% reported any drinking, and 12.4% reported frequent drinking).

Editorial Note: Official advisories warning against the use of alcohol by both pregnant women and women considering pregnancy were first released in 1981 and again in 1990 and 1995. Although no safe level of alcohol consumption among pregnant women has been established, frequent consumption is associated with a greater risk for FAS and other neurodevelopmental effects. Despite the established health risk, substantial numbers of women continue to drink during pregnancy, and some at frequent levels. The BRFSS (Behavioral Risk Factor Surveillance System) findings indicate that from 1991 to 1995, the prevalences of both any and frequent alcohol consumption by pregnant women increased substantially, even though the prevalences of these behaviors remained stable among all women aged 18-44 years. Alcohol consumption patterns in childbearing-aged women varied by geographic location; reasons for this variation may include age and sociocultural differences.

REF: *Morbidity and Mortality Weekly Report (MMWR)*, **46**(16), April 25, 1997. ✓

"TOX TIDBITS"

TRIPLE WHAMMY! MIRACULOUS INSECTICIDE CHALK

A couple of months ago we had an inquiry about the use of an unregistered product called "Miraculous Insecticide Chalk", which was being heralded by several users as a wonderful, natural, and very effective pesticide for use in controlling insects indoors. (See figure below)



Dr. Alfredo Quattrone of the California Department of Health Services provided me with information about this product. It is an illegal pesticide and contains deltamethrin, a synthetic pyrethroid. In addition to the hazard presented to children by this product which looks just like "writing" chalk, the packaging itself has been shown to contain high levels of lead in the ink.

This is a triple-whammy product. It contains a synthetic pesticide, it is illegal, and it poses two very real hazards to children (the pesticide active ingredient, deltamethrin, and lead in the ink.)

Art Craigmill ✓

TOXICS IN THE NEWS: TOBACCO

"All-natural cigarettes" such as the top-selling Natural American Spirit brand, contain tar and nicotine, but none of the other 559 additives listed by major tobacco makers, and are becoming increasingly popular. While these cigarettes contain high levels of tar and nicotine and carry the surgeon general's warnings, their advertising is based on the dangers of the additives used in regular brands. Says one health food store owner: "It's only since we started adding all these chemicals that we've gotten ill-health effects from smoking."

REF: *Wall Street Journal*, April 14, 1997. ✓

REGULAR HAND WASHING COULD HELP REDUCE E. COLI

Regular hand washing could help reduce the spread of *E. coli* during food poisoning outbreaks, Centers for Disease Control and Prevention (CDC) officials David Swerdlow and Patricia Griffin said in a commentary in the March 15 issue of *The Lancet*. Such measures are particularly important in day-care centers and anyone who seems infected should be kept away from schools, day-care centers and long-term care institutions until they are cleared or cured. "Routine hand washing before snacks and meals and after diaper changes and toileting is the best way to prevent the spread of infection in day-care centers. Hand washing upon arrival would provide additional protection."

REF: *Food Chemical News*, **39**(4), March 17, 1997. ✓

PASTEURIZED OR BOILED APPLE CIDER AND JUICE

Risk of gastrointestinal illness can be reduced by drinking only pasteurized or boiled apple cider and juice, Centers for Disease Control and Prevention (CDC) said in the January 10, 1997 *Morbidity and Mortality Weekly Report*. Noting that three outbreaks of illness associated with drinking unpasteurized apple cider or juice occurred in October 1996, two caused by *Escherichia coli* O157:H7 and one by *Cryptosporidium*, the CDC said that "current production practices do not guarantee the safety of unpasteurized apple cider and juice." *E. coli* O157:H7 and *Cryptosporidium* are "hardy organisms" that can survive up to four weeks in apple cider.

REF: *Food Chemical News*, **38**(47), January 13, 1997. ✓

REMOVAL OF LEAD FROM FOOD AND DRINK CANS

The removal of lead from food and drink cans has contributed to dramatically lower blood lead levels for Americans, according to the Center for Disease Control and Prevention's February 20, 1997 *Morbidity and Mortality Weekly Report*. Average blood lead levels for children ages one to five years decreased from 15.0 to 2.7 micrograms per deciliter between 1976-1980 and 1991-1994, and average blood lead levels for children and adults have dropped more than 80% since the late 1970s. But because many lower-income children still have elevated blood lead -- due to such factors as older, lead-based house paint -- CDC proposed the updating of lead screening guidelines used by state and local health officials.

REF: *Food Chemical News*, **39**(1), February 24, 1997. ✓

CHRONIC DISEASE PREVENTION AND CONTROL, 1994

In 1990, chronic diseases, which are in large part preventable, accounted for an estimated $425 billion (61%) of total U.S. medical-care expenditures; however, in 1994, the per capita public health expenditure for chronic disease prevention and control was only $1.21. Although comparable figures for 1994 are not available, in 1989, chronic disease-control expenditures accounted for only 3% of state health department expenditures.

REF: *Morbidity and Mortality Weekly Report (MMWR)*, **46**(13), April 4, 1997. ✓

OUTBREAKS OF PSEUDO-INFECTION WITH CYCLOSPORA AND CRYPTOSPORIDIUM — FLORIDA AND NEW YORK CITY, 1995

Efforts to expand the scope of surveillance and diagnostic testing for emerging infectious diseases also may increase the potential for identifying **pseudo-outbreaks (i.e., increases in incidence that may result from enhanced surveillance) and outbreaks of pseudo-infection (i.e., clusters of false-positives for infection).** This report describes the investigations of outbreaks of pseudo-infection with *Cyclospora* in Florida and *Cryptosporidium* in New York City in 1995 after health departments in those jurisdictions had initiated surveillance for these emerging organisms. These investigations

emphasize: 1) the need for laboratory training in the identification of emerging pathogens and 2) the importance of confirmation by reference laboratories as an early step in the investigation of any apparent outbreak caused by an emerging pathogen.

REF: *Morbidity and Mortality Weekly Report (MMWR)*, **46**(16), April 25, 1997. ✓

CONGENITAL RUBELLA SYNDROME

A total of 12 infants with laboratory-confirmed CRS were born during 1994-1996. Nine states reported seven indigenously acquired cases, four imported cases, and one case with unknown importation status. The maternal exposures for the four imported cases occurred in Mexico (two cases), Sri Lanka (one), and Dominican Republic (one) — countries that do not routinely provide rubella vaccination. Of the seven infants with indigenously acquired cases, four were born to women of Hispanic ethnicity; of the three with documented sources of exposure, two were outbreak-related and one had contact with an infected relative. Of 10 mothers for whom information was available, seven had one or more missed opportunities for vaccination.

REF: *Morbidity and Mortality Weekly Report (MMWR)*, **46**(16), April 25, 1997. ✓

VET NOTES

TETRACYCLINES, BETA-LACTAMS AMONG MOST COMMON MILK RESIDUES, FDA DATABASE ANNUAL REPORT REVEALS

Tetracyclines and beta-lactams were the most common animal drug residues in milk, according to the National Milk Drug Residue Database annual report for the year ended Sept. 30, 1996.

There were 103 positive tetracycline results out of 83,504 assays. Beta-lactams registered the highest number of positive tests (6,148) compared to other animal drugs, but beta-lactams also were tested 4,480,530 times, far more than any other drug family. Sulfonamides were the second-most tested drug family, at 118,740 tests, with 44 positives. Other drug families tested included aminoglycosides, chloramphenicol, macrolides and novobiocin.

The database is the result of a voluntary industry reporting program. Data cover the extent of national testing activities, analytical methods used, kind and extent of the animal drug residues identified and the amount of contaminated milk, including whether it was disposed of properly for non-human use. According to the report, the data are submitted to a contractor, GLH of Lighthouse Point, Fla., and are not intended or suitable for regulatory follow-up.

For beta-lactams, the Charm II tablet quantitative test method yielded the highest percentage of positive results, compared to other methods (1.27%, or 349 positives out of 27,434 tests). That method also produced the highest percentage of positives for cloxacillin (2.7%, or 9 out of 335) and tetracyclines (0.16%, or 85 positives out of 53,723 tests).

All states and Puerto Rico have participated in the database program since Oct. 31, 1994. The database also includes results from the National Drug Residue Milk Monitoring Program, a national residue sampling program. One state did not submit in the first quarter of fiscal year 1996 and one other state did not submit in the fourth quarter of the reporting period.

A total of 4,812,772 samples were analyzed for animal drug residues during the period. Of these, 6,339 tested positive for a residue. Tests were reported on samples for 22 different groups of families or individual drugs. Fifty-two testing methods were used to analyze the samples.

The report defines a sample as "representing a load or lot of milk sampled and analyzed, e.g., a bulk milk pickup tanker, producer, or over-the-road tanker, a silo, etc." The sources of samples were bulk milk pickup tankers (bulk raw milk from a dairy farm); pasteurized fluid milk and milk products (post-pasteurization products); producer (raw milk from a dairy farm), and other (milk from silos, over-the-road tankers, etc.).

Of 3,384,779 samples from bulk milk pickup tankers, 3,530 samples (0.1%) tested positive. Of 78,557 pasteurized fluid milk and milk products, two samples tested positive. Of 956,014 samples from producers, 1,817 samples (0.19%) tested positive. And of 146,250 samples from other sources, 55 units (0.04%) tested positive. Samples were taken of Grade A and non-Grade A milk, although the number of Grade A samples was far greater than the number of non-Grade A samples. The percentage of positive tests among non-Grade A samples was greater than among Grade A samples.

The report contains tables detailing the number of tests conducted by drug family and specific drug, and the number of positive tests per family and drug. The report also carries a table listing the number of tests by method, and that table lists how many positive tests were recorded per method. Other tables include one that separates results of industry tests and regulatory tests, and myriad tables breaking down the variety of components tested, such as Grade A producer testing, non-Grade A "other" testing, etc.

REF: *Food Chemical News*, **39**(1), February 24, 1997. ✓

SWINE PATHOGEN EMERGES AS HUMAN PATHOGEN

In recent years, *Yersinia enterocolitica* has been recognized as an emerging human pathogen, with the pig being the principal reservoir.

Although devoid of clinical signs of disease, some swine may harbor pathogenic strains that heavily colonize the pharyngeal region, including the tonsils. The organism can also be isolated from cecal contents and feces. **The gastrointestinal syndrome is the most common set of symptoms in human beings with yersiniosis from *Y enterocolitica*. It is more prevalent during the winter months, with children**

under five years old particularly susceptible. Older children and adults manifest acute mesenteric lymphadenitis, which mimics appendicitis. Another risk is septic shock resulting from transfusion with red blood cells obtained from "silent bacteremic" donors and held long enough for bacterial growth and production of endotoxin.

The organism is currently an uncommon etiologic agent for foodborne illness in the United States and is more prevalent in Europe. *Yersinia enterocolitica* is considered a primary foodborne pathogen in Belgium, Canada, Japan, Denmark, and Finland. It reportedly rivals *Salmonella, Shigella,* and *Campylobacter.* Only a few of the many serotypes of *Y enterocolitica* are pathogenic for human beings. An example of infection in infants and children associated with the household preparation of chitterlings, the large intestine of swine, was reported in 1990; the patients had been exposed directly or indirectly to raw pork intestine.

Another species, *Y pseudotuberculosis,* may cause a similar illness. Widespread among many avian and mammalian hosts, the organism is particularly prevalent in rodents and other small mammals.

The USDA-FSIS' primary concern is with the risk of yersiniosis from isolates of pathogenic *Y enterocolitica* in a variety of foods. Pathogenic strains are most commonly isolated from raw pork and pork products. They can multiply under refrigeration and microaerophilic conditions, so risk of infection is increased when uncured meat is undercooked and stored in evacuated plastic bags. The organism can survive for extended periods in frozen food, even after repeated freezing and thawing. Annual estimates of human disease in the United States range from 3,000 to 20,000 cases.

Although *Yersinia* sp are considered to be a potential emerging threat in the United States, additional baseline information is needed to conduct risk assessment of the US swine population as a reservoir for human yersiniosis. Dr. H. F. Troutt, head of the Department of Veterinary Clinical Medicine, University of Illinois, Urbana, is involved in epidemiologic research on this subject. "If we can determine on-the-farm risk factors for infection and propagation of pathogenic *Y enterocolitica,* we may be able to establish control points where institution of management practices could essentially help reduce these pathogens," Dr. Troutt said. Important preventive measures include the following:

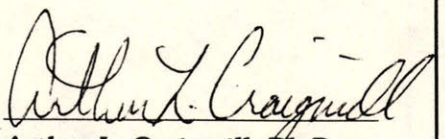
- Appropriate techniques should be applied to the slaughtering of pigs. This includes removal of the head and neck to avoid contaminating the meat. The USDA-FSIS Field Operations staff continually reviews procedures and methods that inspectors use to provide state-of-the-art results.
- Consumers should avoid eating raw pork, and prepare meat and other foods in a sanitary manner to prevent cross contamination. Irradiation of meat, and possibly intestines, can effectively reduce exposure to this organism.
- Consumers should wash their hands prior to handling food and eating, and after handling raw pork and coming in contact with animals.

REF: *JAVMA*, **210**(5), March 1, 1997. ✓

BEEF CATTLE HAVE HIGHER TOLERANCE FOR VOMITOXIN-CONTAMINATED FEED

Beef cattle have a much higher tolerance for vomitoxin-contaminated feed than do either pigs or dogs, North Dakota State University studies indicate. The steers were fed barley with up to 22 ppm vomitoxin and experienced no reduction in growth rate, feed intake or carcass quality, according to *Feedstuffs* magazine. In another study, bred heifers ate barley containing up to 36 ppm vomitoxin with no ill effects to the heifers or their calves. Feed standards currently call for no more than 5 ppm vomitoxin in rations for beef cattle, based on previous research using pigs and dogs. Researchers theorize that rumen actually neutralizes the vomitoxin.

REF: *Food Chemical News*, **38**(37), November 4, 1996. ✓



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WHY OUR FOOD IS SAFER THROUGH SCIENCE
FALLACIES OF THE "CHEMICAL THREAT"

DR. JIM E. RIVIERE

Chemicals. Risk. Two very frightening words. Frightening, that is, unless two others are considered along with them—perception and knowledge. Anything can terrorize if viewed the wrong the way, and we are all afraid of what we do not understand.

Why Our Food is Safer Through Science: Fallacies of the "Chemical Threat" confronts such terrors and attempts to debunk the phobias surrounding the use of chemicals in our world today. With straightforward logic and facts, it explains just why these compounds may be saving our lives, and why some of the claims seen in today's media are wrong and may even be risking our health.

The book introduces us to a revolutionary new area in science, risk assessment, and shows us it is possible to identify the real threats and protect ourselves, while preserving the benefits and availability of chemicals that really do help. Lastly, in an age of AIDS, Ebola fever, and other modern day "plagues," it gives optimism and hope for the future, hope for what science can yet do to safeguard our lives.

Why Our Food is Safer Through Science is the eighth book for North Carolina State University Distinguished Professor, Jim Riviere, D.V.M., Ph.D. He is the Burroughs Wellcome Fund Distinguished Professor of Veterinary Pharmacology, and the director of the Cutaneous Pharmacology and Toxicology Center, in the College of Veterinary Medicine at North Carolina State University. He graduated summa cum laude from Boston College in 1976 with a B.S. degree in biology and later received his M.S. degree in endocrinology with distinction, from the same institution. He obtained his D. V. M., and a Ph.D in pharmacology, from Purdue University in 1980.

His research experience is substantial—he's received industry and government grants totaling over 7 million dollars; published over 235 research papers and chapters; presented over 140 research abstracts; authored or co-authored 7 books; and holds 3 U.S. patents. He is a member of several professional organizations, including the FDA's Science Board Committee on Research, the Society of Toxicology, and the American Association of Pharmaceutical Scientists, and has received numerous awards for his work. He was the editor of the Journal of Veterinary Pharmacology and Therapeutics and served on various other journal editorial boards. He is married and has three children.

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