

Poultry HEALTH REPORT

A National Institute for Animal Agriculture Publication

Winter 2003

California Continues END Fight

More Than 3 Million Birds Destroyed to Help Contain Exotic Newcastle Disease

Officials continue to battle the costly outbreak of Exotic Newcastle Disease (END) in California. The disease was diagnosed in backyard poultry flocks in southern California on Oct. 1, 2002.

"Right from the beginning we have emphasized the need to address this disease very quickly," said Dr. Richard Breitmeyer, California's state veterinarian. "I was living on a poultry facility in southern California in 1973 when a previous outbreak hit the state. Nearly 12 million birds at a cost of \$56 million dollars had to be destroyed to get the disease out of commercial poultry. We don't want to go through that again."

The California Department of Food and Agriculture (CDFA) and

the USDA are currently working to eradicate END. The disease is in backyard and commercial poultry in Los Angeles, Orange, Riverside, San Bernardino, San Diego, and Ventura Counties. END has also been diagnosed in Clark County in Nevada and La Paz County in Arizona.

Officials are going door-to-door to find sick birds in affected areas and tracing birds into and out of infected flocks.

Officials point out that END is not a public health threat and does not affect the safety of poultry or eggs.

A state regional quarantine and a federal regional quarantine (see map) are in place to prevent the spread of END.

A statewide quarantine affects poultry exhibitions and owners of birds (listed species). Owners of any species of birds affected by these quarantines are prohibited from moving birds and bird products out of the quarantined area without a permit from the USDA. Officials said that any gathering of birds increases the risk of spreading disease. Officials strongly recommend that no birds of any species be gathered, moved into or moved within the quarantined area. This quarantine will remain in effect until END has been eradicated from California.

The outbreak continues to require vast resources to contain. Officials released the following statistics as of early March:

- More than 1,372 people are working in southern California to eradicate this disease.

- 12,627 premises have been quarantined (birds are not allowed to leave these premises); investigations are ongoing.

- 2,277 of these premises con-

Federal Regional Quarantine



The Federal quarantine affects all birds within the eight counties in southern California

tained birds infected with or exposed to END; all birds in these flocks have been or will be humanely destroyed. All affected premises are being cleaned and disinfected after the birds have been removed.

- 17 of these are commercial poultry facilities.

- 3,117,773 birds have been humanely destroyed.

Continuous updates are available on the Web by visiting: www.cdffa.ca.gov/ahfss/ah/Newcastle_info.htm

You also can learn more about END by clicking on "Hot Issues" at the APHIS Web site: www.aphis.usda.gov.

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USDA recruiting veterinarians, technicians for Newcastle disease eradication

The Veterinary Services branch of the Department of Agriculture's Animal and Plant Health Inspection Service is recruiting nonfederal veterinarians and veterinary technicians to assist in the exotic Newcastle disease eradication program in California and other western states.

The volunteers would become Veterinary Services employees for 23 to 60 days to assist in the program, and would join the agency's National Animal Health Emergency

Response Corps. Veterinary students can qualify as veterinary technicians and be mobilized.

The program's purpose is to enroll veterinary personnel interested in serving as VS employees in the event of an outbreak or other animal disease event, to preprocess some of their administrative paperwork for employment, to include them in training opportunities, and to better disperse VS program information.

According to Dr. Ty Vannieuwenhoven, 365 veterinarians and 70 veterinary technicians have registered to be NAHERC volunteers, but more are needed, and there is a particular shortage of technicians.

Over the past two years, veterinary professionals enrolled in this program have assisted the United Kingdom with its foot-and-mouth disease outbreak, and Virginia with its low-pathogenic avian influenza control program. More than 250 NAHERC members have responded to requests for assistance and been activated so far.

Individuals interested in the program should contact their Veterinary Services area office, listed on the APHIS Web site at www.aphis.usda.gov/area_offices.htm. Other questions can be addressed to EmergencyVMO@aphis.usda.gov.



Poultry Health Report

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6 Ways to Keep Poultry Diseases "Cooped Up"

1. **Clean and disinfect vehicles and equipment.** Clean manure spreaders, tractors, truck tires, and undercarriages with a strong detergent - then apply disinfectant to kill avian influenza and other viruses that can linger on surfaces.
2. **Wear sanitized coveralls and boots.** Make sure everyone who enters your premises wears them too! Poultry disease viruses can be spread by clothing and shoes of people who come into contact with infected flocks.
3. **Practice "all in—all out" poultry management.** Avoid skimming flocks - birds left behind are exposed to work crews and equipment that may carry poultry disease viruses. Process each lot of birds separately, and clean and disinfect poultry houses between flocks.
4. **Keep out unnecessary visitors and equipment.** Allow only essential personnel onto your farm. Secure gates and lock all poultry buildings. Avoid lending or borrowing equipment - it can carry avian disease viruses. Don't visit other poultry farms.
5. **Avoid contact with game birds and migratory waterfowl.** Don't raise, keep, or allow contact with pet birds, ducks, geese, or other game birds. They are suspected carriers of poultry diseases. If possible, avoid visiting duck ponds and hunting waterfowl.
6. **Know the warning signs of major avian diseases.** Higher death losses; sudden drop in egg production; swelling of head, eyelids, combs, and hocks; diarrhea; purplish-blue coloring of wattles and combs; bloody nostril discharge; loss of appetite; incoordination.

Source: USDA

More information on END and the outbreak in the Western US . . .

USDA, APHIS, Veterinary Services
www.aphis.usda.gov (Click on Hot Issues)
California Department of Food and Agriculture www.cdffa.ca.gov
Nevada Department of Agriculture www.agri.state.nv.us
Arizona Department of Agriculture www.agriculture.state.az.us

Budget Boost

President Calls for \$42 Million Increase for Food Safety

President Bush will seek record-level support for USDA's meat and poultry food safety programs as well as increase efforts to strengthen agricultural protection systems in his FY-2004 budget. That's according to Agriculture Secretary Ann M. Veneman, who announced recently that USDA's food safety budget will increase to \$797 million, an increase of \$42 million over the FY-2003 request.

This represents a \$148 million (or 20%) increase in food safety programs since FY-2000. The FY 2004 request will fund 7,680 food safety inspectors, provide specialized training for the inspection workforce, increase microbiological testing and sampling, strengthen foreign surveillance programs and increase public education efforts.

In addition, USDA's budget will also include \$70 million in new funding through other USDA programs to strengthen agricultural protection systems, that would include increased laboratory security measures; biosecurity, animal disease and vaccine research; and additional animal and plant pests and disease monitoring programs.

"The President cares deeply about ensuring a strong food safety system and the protection of agriculture against potential threats," said Veneman. "This additional funding continues to build upon a strong record of achievement in further strengthening our protection systems to ensure the integrity of our food systems."

The Secretary outlined the following details that will be contained in USDA's FY-2004 budget for food safety and agricultural protection systems. More details were expected in early February, when the Bush Administration was to release its formal budget proposals.

Highlights include:

- A \$42 million increase to provide record-level funding for USDA's Food Safety and Inspection Service (FSIS). These additional resources will support FSIS food safety activities, including increasing its inspection workforce to 7,680 meat, poultry and egg products inspectors and veterinarians; providing specialized training for food safety authorities to ensure safety of the commercial supply of meat, poultry and egg products; increasing microbiological testing to ensure effective controls or elimination of pathogens in products; increasing foreign product surveillance; and new food safety public education efforts.

- A \$23 million increase for Animal and Plant Health Inspection Service programs for inspections at ports of entry; increase availability of foot-and-mouth disease vaccines; and expansion of diagnostic and other scientific and technical services.

- A \$47 million increase for USDA's various research agencies for strengthening laboratory security measures; conducting additional research on emerging animal diseases; new vaccine development; new biosecurity database systems; and continued development of the unified Federal-State Diagnostic Network for identifying and responding to high-risk biological pathogens.

Secretary Veneman made the announcement during remarks at the U.S. Poultry and Egg Association International Poultry Exposition in Atlanta. The Secretary toured exhibits highlighting new food safety research and technologies. She also conducted a roundtable discussion with local farmers to discuss food safety, homeland security and other farm issues.

First On-Line Poultry Science Master's Program Offered

Texas A&M University will begin offering the world's first on-line master's of agriculture degree in poultry science and continuing education program next fall.

The semester-long courses will be graduate level and continuing education courses for those people who are interested in an additional degree or in some type of certification in an area of specialization, said Dr. Alan Sams, head of the department of poultry science.

Courses in poultry nutrition and processing poultry products will be available in the fall of 2003. During 2004, courses in physiology, food safety and waste management will be phased in. Future courses will cover embryology and poultry management. Sams said at some point, short courses on such topics as game bird management and showing contest poultry will be added.

Registration for the classes begins during the spring of 2003.

"Our program will allow people to continue their education, improve their job qualifications and career competitiveness, or just get more information on an area of personal interest," Sams said.

"By offering these upper-level courses online, we're reaching out to everyone in the poultry industry who can't come to the Texas A&M campus because of their work schedule, geographic location or personal commitments."

The master's degree in agriculture is considered a professional degree and does not require research.

Surface Treatments Could Make Ready-to-Eat Products Safer

A new product called acidified calcium sulfate is showing promise as a way to kill *Listeria monocytogenes* and keep lunch meats and frankfurters safer for consumers.

"Our goal was to look at different treatments that might be used to decontaminate the surface of cooked products to ensure that *Listeria* was killed and it had very little opportunity to grow after that," said Dr. Jimmy Keeton, professor with the department of animal science at Texas A&M University. "*Listeria* grows at refrigerator temperatures."

L. monocytogenes is considered a serious threat because—even though it doesn't affect that much of the population—when it does strike, it can be deadly. In humans, listeriosis can cause flu-like symptoms, meningitis, spontaneous abortions and prenatal septicemia, said Keeton. About 20 percent of listeriosis cases are fatal.

"There's a real concern about

from the time ready-to-eat products are cooked until the time they are packaged that they not become contaminated with pathogens, specifically *L. monocytogenes*," he said.

Research had already shown that adding substances such as lactic acid and sodium lactate created microbiological "hurdles" to organisms such as *Listeria*, Keeton said. But still, these were not considered entirely effective against the regrowth of the organism.

However, acidified calcium sulfate—an organic acid, calcium sulfate combination—is showing potential as a product that not only kills the *Listeria* on the surface of products, but also keeps it from coming back. Even though it is acidic, Keeton said, it is safe enough to hold in the hand and has Generally Recognized As Safe status from the Food and Drug Administration.

In November, the USDA released an administrative directive outlining additional steps to be taken by its

inspectors to ensure that establishments producing ready-to-eat meat and poultry products are taking the necessary steps to prevent contamination with *Listeria*.

Under the directive, plants producing high- and medium-risk ready-to-eat products, such as deli meats and hot dogs, that do not have an evaluated environmental testing regime designed to find and take necessary actions to eliminate *Listeria* will be placed under an intensified testing program by USDA's Food Safety and Inspection Service. The program will consist of increased testing of the final product, and testing of food contact surfaces and plant environment.

The Texas A&M study was funded by the American Meat Institute Foundation, whose members are from the meat industry. A summary of the research also has been sent to USDA's Food Safety Inspection Service as a validation study to gain support for the use of this material.

Embrex Announces Patents For In-Ovo Delivery of Coccidiosis Vaccine

Embrex, Inc., recently announced that two key U.S. patents have been issued by the U.S. Patent and Trademark Office. The two patents relate to a method of vaccinating domesticated birds including chicken or turkey against coccidiosis before hatching.

The patents issued from applications filed by Pfizer, Inc. and worldwide rights were exclusively licensed to Embrex by Pfizer in June 2001. The patents relate to administering in ovo (in the egg) an effective immunizing dose of live *Eimeria*,

the causative agent of coccidiosis.

Embrex's Inovocox coccidiosis vaccine, currently under review by the USDA, is a novel in-ovo biological control method for coccidiosis. Large-scale field trial results have demonstrated safety and efficacy. Embrex plans to begin building a North Carolina-based manufacturing facility to produce the vaccine during 2003.

"These patents help Embrex maintain a solid position in the in-ovo delivery of any live vaccines against coccidiosis," said Randall L.

Marcuson, president and chief executive officer of Embrex. "We believe that our product will provide significant benefits to poultry producers by making coccidiosis vaccine delivery more precise as well as more efficient because it can be delivered in ovo with other vaccines."

Coccidiosis is a parasitic disease of the bird's digestive system. While seldom fatal, it causes weight depression, lower feed conversion ratios, intestinal lesions and diarrhea.

Pfizer and Embrex collaborated in the area of coccidiosis vaccines from 1997 to 2000. Under the license agreement, Pfizer will receive milestone payments from Embrex and a royalty on future sales of the vaccine.

Poultry Scientists Use Viruses to Fight Bacteria

With the poultry industry facing the possible loss of traditional antibiotics, scientists at the University of Arkansas Division of Agriculture and the USDA Agricultural Research Service are updating century-old technology to fight illness-causing bacteria in poultry by infecting them with viruses known as bacteriophages.

"There has been growing concern that use of antibiotics has been causing an increase in antibiotic-resistant strains of bacteria that cause diseases," said ARS researcher Bill Huff, a Food Safety Consortium (FSC) investigator. "We felt it was important to find alternatives to antibiotics," he said. "Bacteriophages give us another tool to battle disease-causing bacteria and reduce pressure on bacteria to develop resistance to antibiotics."

Arkansas poultry scientist and FSC researcher Billy Hargis said two European scientists working independently in England and France discovered bacteriophages almost 100 years ago.

"Bacteriophages are very specific viruses," Hargis said. "They don't harm people, animals or plants, only a narrow range of bacteria."

Hargis is working with bacteriophages that attack *Salmonella* and

Huff is working with bacteriophages that attack *E. coli*. In both studies, they are learning to use them to protect poultry from respiratory infections.

Huff said bacteriophages are much smaller than the bacteria they attack. When one comes into contact with a target bacterium, the phage attaches to an anchor site on the cell's surface. It penetrates the cell wall and membrane and injects its DNA into the host. The DNA rewrites the cell's reproductive programming to replicate bacteriophage. It also produces an enzyme that causes the cell to burst, releasing the new virus particles.

Both scientists found aerosol spray offered the best means of

delivering the phages to large numbers of chickens or turkeys. They also found a large dose was needed to provide effective and consistent protection, but they are easy to amplify in a lab to sufficient numbers.

Hargis and Huff have demonstrated that bacteriophages can protect poultry from respiratory infections, but they are still working to see if the viruses can cure birds that are already sick.

They are also trying to find a way to get bacteriophages into the birds' intestinal tracts, where they can fight the bacteria that can contaminate poultry meat during processing and cause a health risk to humans.

Hargis said bacteriophages are not only safe, but also are environmentally friendly.

"Bacteriophages are ubiquitous. They occur naturally everywhere, even on your hands and face," he said.

"In the U.S., we use only defined cultures," Hargis said. "That means we know exactly what organisms are in it, what they'll do and that nothing unknown is in there."



Scott Zornes, technician at the University of Arkansas, lets poults out of a chamber after they inhaled an aerosol mist containing bacteriophages.

New NTF Chair Challenges Turkey Industry to Invest in Further Food Safety Interventions

The National Turkey Federation's Board of Directors has elected Robert Wright to serve as the federation's 2003 chairman. Wright is president of ConAgra Foods Turkey Business Unit based in Downers Grove, Ill.

During his acceptance speech, Wright challenged the industry to further reduce the incidence of microorganisms on turkey prod-

ucts. Wright said the federation will "continue to focus its resources on food safety in 2003, because the industry wants to provide the safest, most wholesome product possible."

He also spoke about the need for the industry, individually and collectively, to find ways to increase consumer awareness of turkey products outside the holiday season.

As president of ConAgra Foods

Turkey Business Unit, Wright oversees the company's fresh, frozen and further-processed turkey products sold under the Butterball brand, one of the nation's leading turkey brands.

ConAgra Foods, Inc., is one of North America's largest packaged food companies, serving both consumer grocery as well as restaurant and foodservice establishments.

Before joining ConAgra Foods in 1997, Wright worked at Cargill, Jerome Foods, ESI Meats and Howard Johnson Company.

Food Safety Research

Scientists Enlist Bacteria to Fight Food Contamination

University of Arkansas scientists are using harmless intestinal bacteria to ward off illness-causing bacteria, like *Salmonella* and *Campylobacter*, that can contaminate processed poultry.

The process, called "competitive exclusion," is not a new concept, said Arkansas poultry scientist Billy Hargis, a Food Safety Consortium researcher. "It's been around since 1907 and was proven in chickens in 1973."

Antibiotics have been the dominant anti-bacterial agents since they were discovered in the 1940s, Hargis said. But recent concerns about the consequences of widespread use may lead to restrictions on their use in animal production. "Competitive exclusion is another, safer weapon in the arsenal to fight harmful bacteria," he said.

The study, conducted at the Arkansas Agricultural Experiment Station, has shown competitive exclusion to be effective in preventing and controlling bacterial infections. It also accelerates the birds' natural immunity to harmful bacteria.

"Birds get more resistant to infection as they get older," Hargis said. "Competitive exclusion can acceler-

ate the development of resistance by making birds resistant to infection at an earlier age."

When he began this research,



University of Arkansas graduate student Stacy Higgins adds beneficial bacteria to drinking water for research on using competitive exclusion to fight food contamination in poultry.

Hargis wanted to develop a treatment that would be inexpensive to produce using batch cultures. He

wanted it to be therapeutically effective, so it could be used to treat sick birds as well as keep healthy birds from getting sick. The product also needed to be tolerant of freezing and exposure to oxygen so that it could be stored and transported without losing effectiveness.

"We screened 4 million to 8 million bacteria for their ability to meet these criteria and compete with *Salmonella*, then screened out pathological bacteria," Hargis said. "We were left with 23 organisms—and have added some since then—that we can use together to protect chickens."

Hargis and his research team have a patent pending for this competitive exclusion cocktail. Four million doses can be produced for less than a dollar.

"I'm optimistic that, if we get this right, we won't even miss the antibiotics," he said.

"Competitive exclusion is environmentally friendly," Hargis said. "It's non-polluting in both production and use, produces very low amounts of waste, and is not harmful to animals, plants or humans. It's a totally organic, biodegradable alternative for poultry health care."

Feed Additive Boosts Broiler Gain, Efficiency

Research at the University of Saskatchewan shows that including Red Lake Earth (RLE) in broiler diets improves the growth and feed efficiency of broiler chickens while numerically reducing mortality. RLE is a diatomaceous earth, anti-caking agent, approved for use in all live-stock rations.

Dr. Henry L. Classen, a professor

of poultry management and nutrition at the University of Saskatchewan, fed broilers diets containing up to 2% RLE. The diets in the study did not contain a growth promotant. The study concluded that the inclusion of dietary RLE at rates of up to 2% showed reduced mortality, weight gains of more than 2% and improved feed conversions by as much as 3%.

After receiving the results of Dr. Classen's study, several poultry producers included the product in their poultry diets as part of a field trial evaluation. Broiler producers

reduced their time to market by up to two days; layer producers witnessed reductions in under grades and improvements in shell quality, while turkey producers reported improvements in manure quality, reduced odor and fewer breast blisters.

RLE, a binary mineral containing naturally occurring diatomaceous earth and montmorillonite, is listed by the Organic Material Review Institute (OMRI) for use in organic production. RLE is registered in many states, and is registered in Canada for inclusion in all animal feeds at rates of up to 2%.

The North Carolina Emergency Management Experience

An Interview With Thomas McGinn III, DVM

Dr. Thomas McGinn III is the director of the Emergency Programs Division for the North Carolina Department of Agriculture and Consumer Services. A pioneer in the use of Geographic Information Systems for animal health management, he is active on the Federal level in activities such as Crimson Sky. This was an exercise that simulated the government's course of action in case of a bioterrorism event.

Dr. McGinn, who serves as a director for the National Institute for Animal Agriculture, shared his experiences with emergency animal disease management in the following interview.

Q. It appears that teamwork is a repeated theme when discussing response to animal emergency situations. Is that the case, and if so, how do you foster teamwork between various stakeholders?

A. I think the whole idea of getting results depends on first beginning with rapport. Then, develop alignment, then agreement and then you get results. You cannot shortcut this process. Developing rapport begins with being a "missionary" in other agencies. This means one has to live among them, understanding their objectives, concerns and motivations. One other thing I would add is that relationships are forged through the pursuit of common interests. One must find the common ground.

Q. Was there a significant event, such as Hurricane Floyd, that sparked the development of the emergency animal programs in North Carolina?

A. Really, our Emergency Programs Division was developed after the threat of Foot and Mouth Disease escalated globally. Hurricane Floyd primed North Carolina to be concerned about animal emergencies. It also showed us that animal emergencies would be bigger than any one agency's ability to respond. If Agriculture was going to take the lead, it had to develop a divi-

sion that addressed these concerns specifically. Our Emergency Programs Division is responsible for all hazards, including animal, pesticide, plants, fairs, fertilizers, laboratories, research farms, and so on.

Q. What have been the keys to getting as much budget, priority and attention as you have been able to bring to the emergency animal health programs in North Carolina?

A. Secretary Veneman supported Commissioner Meg Scott Phipps in designating specialty crop money for Foot and Mouth Disease prevention. We hired experts in threat



Dr. Tom McGinn

assessment with military backgrounds, in order to understand and communicate the risks in the agricultural production and supply arena. We also converted positions once used for pseudorabies and brucellosis eradication to the more pressing issues of our day, namely agriculture being part of the critical infrastructure of our country.

Q. What advice do you have for other states that may be trying to get up to speed in setting up their emergency animal programs?

A. Broaden your stakeholder base by communicating how a disaster will impact them economically, legally and socially. Then, build a team, build a plan and exercise.

Q. What have been your observations from participating in exercises such as Crimson Sky?

A. We all have our oars in the water, and are pulling as hard as we can. We just need bigger oars. We

need to be before Congress for additional dollars for education, research, detection, diagnostics, surveillance, preparedness and response. I am very impressed with the Department of Defense, USDA, Public Health, FEMA and many private, state and local agencies and organizations for their dedication and preparedness. National exercises tell us we are going to need all the resources we can seamlessly assemble to address these emerging threats.

Q. What would you identify as your biggest moments of success so far, and what remain as the biggest obstacles and challenges for emergency animal health planning?

A. My biggest moment of success is the public-private partnership that we have been able to build in North Carolina. The State Animal Response Team (SART) is becoming a model for the country, and we are proud of that fact. A public-private partnership brings to bear the best of both sectors. I am also very proud to be the Deputy Team Leader of VMAT-3, and have had the privilege to serve my country at the site of the World Trade Center.

Q. How did events of Sept. 11 change your approach, if at all?

A. Standing in the pit of "Ground Zero" seared in me the desire to protect our nation, and the vulnerability of our country to those who seek to do us harm. We are learning how to think like our enemies so as to reduce the probability of being a target. As I watched fallen firefighters being pulled from the rubble, I was awestruck by how many different states, agencies and person from all walks of life would devote all its resources and efforts on behalf of each and every one of us. What I realized is that these same Americans are depending on us to bring together all of these same resources to protect their food production and supply.

Turkey Processing Intervention Results in Reduction of Salmonella Bacteria by Half

Technological interventions in the immersion-chill tanks used in turkey processing resulted in a 50% reduction of *Salmonella* bacteria on turkeys.

That's according to a study conducted by Texas A&M University. "The National Turkey Federation (NTF) and its members voluntarily worked with Texas A&M to conduct research to find the best food safety procedures to control bacteria on turkeys produced in our plants," said NTF President Alice L. Johnson, D.V.M. "The 'Chiller Study' provided the industry with some positive tools to use in reducing microorganisms on birds. As an industry, we are committed to aggressively researching innovative technologies that will reduce naturally occurring pathogens."

The 2002 "Chiller Study" also found post-chiller pathogen levels reduced by two-thirds from the original study conducted two years ago.

The 2002 "Chiller Study" results will now be used to prepare industry "Best Management Practices for Immersion Chilling," an important step in pathogen control.

The turkey industry historically has researched emerging technologies that result in reducing pathogens from the farm through processing. NTF's members have developed biosecurity systems that protect live birds from contamination. In processing plants, the turkey industry does microbiological testing for bacteria to detect and eliminate problems.

This use of rapid chilling is just one more pathogen control step, according to Dr. Johnson.

While the industry does its part to fight foodborne illness, consumers also must do their part in ensuring food safety, she pointed out. Consumers play an important role in proper food handling and cooking procedures. Turkey is a fresh, natural product, and it is important to remember that cooking destroys the microorganisms that are present on all meat and poultry and makes it safe to eat, Dr. Johnson added.

Home chefs need to cook turkey to its target temperature, which will sufficiently kill any bacteria that may be present. That means chefs need to check to make sure the turkey reaches a temperature of 170 degrees F in the breast and 180 degrees in the thigh. The true indicator that a turkey is ready to eat is to measure the bird's temperature with a food thermometer.

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