



The Food Safety Consortium Newsletter

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Fighting *Campylobacter* in Turkeys by Going to the Source

The pathogen *Campylobacter*, Dan Donoghue says, is “a very interesting organism.” His team recently found that it occurs naturally in turkeys’ male and female reproductive tracts. To make things more complicated, it appears that artificial insemination procedures at turkey farms could expand the pathogen’s prevalence.

But another procedure used on the farm — placing antibiotics in turkey semen — could offer some hope for fighting *Campylobacter* there. Donoghue’s Food Safety Consortium research project at the University of Arkansas is testing these antibiotics to determine their effectiveness against foodborne pathogens.

Campylobacter bacteria are commonly found in poultry intestinal tracts. “*Campylobacter* doesn’t cause disease in

Continued on page 2



Graduate student Kim Cole and Dr. Dan Donoghue inoculate plates with *Campylobacter* for a study of the pathogen in turkeys.



FSC Unveils New Web Site, Address

The Food Safety Consortium has revamped its World Wide Web site and adopted an easy-to-remember address. The new site can be viewed at its new address: <http://www.fsconsortium.net>.

The old address — <http://www.uark.edu/depts/fsc> — still works, so any links or bookmarks directed to it will continue to be valid. The new address is actually an “alias” that automatically forwards a viewer to the old address of the web site, which is maintained on the University of Arkansas Internet server.

The site includes updated links to food safety news search engines, current and archived editions of *The Food Safety Consortium Newsletter* in HTML and PDF formats, the current edition of the FSC annual report, the FSC personnel directory, individual FSC researchers’ web pages and other food safety related links.

Fighting *Campylobacter*... continued

birds, it causes disease in people,” said Donoghue, a poultry science researcher in the U of A Division of Agriculture. “It apparently doesn’t hurt the productivity of the birds.”

The U.S. Department of Agriculture says *Campylobacter* can exist in the intestinal tracts of people and animals without causing any symptoms or illness. However, if people consume live bacteria in raw milk, contaminated water, or undercooked meat or poultry, they may acquire a *Campylobacter* infection (also called campylobacteriosis). The illness symptoms include diarrhea, stomach pain and nausea.

Thorough cooking of poultry will eliminate the pathogen, but food safety researchers want to reduce or eliminate it at the source as much as possible.

On the turkey farms, Donoghue explained, artificial insemination is the means by which nearly all turkeys are produced. A male turkey’s semen is used to inseminate multiple females. But the

current concern is over the possibility that semen contaminated with *Campylobacter* could be spreading the pathogen to females and the next generations.

“Semen collection by nature of the tom’s anatomy is predisposed to fecal contamination,” Donoghue said.

Additionally, semen on commercial turkey farms is pooled before it is used to inseminate hens, making it possible that contaminated semen could spread through entire flocks.

With these hurdles facing producers, Donoghue sees some possible solutions for research to pursue.

One approach takes advantage of semen extenders, which are added to turkey semen to increase the volume and extend their usage.

“Some extenders have antibiotics, some don’t have antibiotics and some have different antibiotic combinations,” he said. “We’re hoping that some of these with antibiotic combinations will be more effective against *Campylobacter*.”

Semen has not been considered a potential source of pathogenic bacteria

until recently, so its extenders have not been tested against foodborne pathogens to measure their effectiveness. “We’re hoping to find one that is already being used that will be effective against foodborne pathogens,” Donoghue noted.

In addition to searching for the right antibiotic, Donoghue is also testing whether cooling the semen would reduce or eliminate *Campylobacter*. The catch is to cool the semen enough to hurt the pathogens without damaging the viability of the sperm.

“We can get rid of *Campylobacter* in semen,” Donoghue said in reference to the cooling process. “It would be easy enough to do. But, unfortunately, you’re also going to kill the sperm.”

One procedure that hasn’t eliminated the pathogen is to oxygenate the semen, an important procedure for in vitro storage. *Campylobacter* generally does not react well to high oxygen content, but Donoghue’s studies show it is apparently strong enough to survive under these conditions.

The experiments continue among scientists inside and outside the Food Safety Consortium, Donoghue said. “We are looking at different approaches and trying to eliminate that segment of the contamination or reduce it. We’re trying to eliminate it in the bird.” ■

Turkey semen contaminated with Campylobacter could be spreading the pathogen to females and the next generations.

Murano Leaves USDA Post, Returns to Texas A&M

Elsa Murano in November announced her resignation as U.S. Department of Agriculture undersecretary for food safety. She returned to Texas A&M University to accept the position of vice chancellor of agriculture for the TAMU System, dean of the College of Agriculture at TAMU-College Station and director of the Texas Agricultural Experiment Station. Murano submitted her resignation to President Bush, effective Dec. 3.

Merle Pierson, the deputy undersecretary for food safety, is serving as acting undersecretary.

“It has been an incredible privilege and an honor to serve this president and my fellow Americans as the USDA

undersecretary for food safety,” Murano said. “It has also allowed me to serve my adopted country, which has given me so much. The last three years have afforded me the opportunity to work with the great professionals at the Food Safety and Inspection Service. They are the real heroes who work daily to ensure the safety of meat, poultry and egg products for the entire nation. I can leave Washington knowing that we have made a significant difference in improving public health and am confident that our science-based policies will continue to drive foodborne illnesses down even further.

“I am extremely excited to be going back home to Texas and to once again be

part of the Texas A&M family. I am very much looking forward to the opportunities that lie ahead and to working with the faculty, staff, students and many stakeholders within Texas to ensure that our research, teaching and extension programs in the agricultural and life sciences are second to none, in total fulfillment of the university’s mission as a land-grant university.”

Murano, a native of Havana, Cuba, and a former Food Safety Consortium researcher at Iowa State University, is the first Hispanic American to have served as undersecretary for food safety at USDA. She will also be the first Hispanic American and first woman to serve in her new position at Texas A&M. ■

Consumers Say Safe Meat Worth the Higher Cost

A majority of consumers would be willing to pay a higher price for meat that has been treated — either by irradiation or steam pasteurization — against pathogenic bacteria. These results of a mail survey by Food Safety Consortium researchers at Kansas State University might surprise anyone who thought the public was leery of irradiation.

“A point I want to emphasize is the fact that in this survey, we did not provide any information about irradiation,” said Sean Fox, the KSU agricultural economics associate professor who conducted the survey. “We’ve shown in other surveys that providing information about the technology is absolutely critical to acceptance. In this survey there was no information other than a statement that irradiation is used to kill bacteria.”

Fox’s survey was mailed to households in Colorado, Nebraska, Kansas, Oklahoma, Iowa, Missouri, Arkansas and Wyoming. It asked consumers which they would choose if they could buy a standard meat product at \$1.69 per pound or a “treated” product at the same price or at prices from 10 to 40 cents per pound higher.

Fox received 715 usable surveys with 79 percent of respondents indicating that at equal prices, they would choose the treated product. Fifty-five percent would choose treated

Households with children were more likely to choose the safer products.



Sean Fox

product if it cost more. The survey also found that:

- Some consumers were still more concerned about irradiation than steam pasteurization. The probability of choosing to buy an untreated product was higher if irradiation, rather than steam pasteurization, was the treatment.

- Although steam pasteurization had a lower rejection rate, respondents who chose to buy a treated product tended to place a higher value on irradiation than on steam pasteurization. They displayed a higher willingness to pay for it, Fox said.

- Households with children were more likely to choose the safer products. But the presence of children did not influence the family’s willingness to pay a higher price.

- Those who were willing to pay more were on average willing to pay a premium of 22 to 26 cents per pound.

- People who consume more ground beef away from home were more likely to choose to buy the treated product.

- Women had “marginally” higher willingness-to-pay values than men.

Consumers who were aware of the possibility of reducing risk through careful cooking and handling were willing to pay for treated products at a lower rate than those who weren’t aware. Does that suggest that people who consider themselves to be careful cooks don’t place as much importance on a product’s treatment before they buy it?

“That’s one way of putting it,” Fox said. “They are aware that there is a substitute there, that instead of having to pay for this treatment that somebody else does, they can do the treatment at home.” ■

Report from the Coordinator



Gregory J. Weidemann

When Tommy Thompson announced in December that he would step down as secretary of health and human services, he attracted some attention when he said he wasn't comfortable with the safety of the nation's food supply.

As secretary, Thompson had jurisdiction over the Food and Drug Administration. The agency has been busy lately tightening rules. About the time of Thompson's announcement, the FDA announced it was finalizing a rule to require food processors and distributors to keep records of where their food comes from and where it goes, information that can be valuable in the event that contamination needs to be traced.

"I'm still not comfortable, and I still think we have a ways to go," Thompson said of food safety efforts. "We've come a long way, but I'm still not satisfied."

Lester Crawford, the FDA acting commissioner, echoed Thompson's sentiments. "We have to continue to improve and be as close to fail-safe as we can be," he said. Crawford acknowledged that while "the probability (of a terrorist attack on the food supply) is very low indeed, based on historical data that we have," FDA was still "looking for every

eventuality" that could threaten the food supply.

Thompson and Crawford were speaking mainly of deliberate attempts to contaminate the food supply through terrorism. Their remarks can also be applied to non-deliberate contamination, whether by natural microbiological means or inadequate processing procedures.

The goal of everyone in the U.S. food safety community has long been to apply their knowledge to the world's safest food supply and to make it safer. Consumer confidence in food safety remains high.

But no one should begin to feel too comfortable about food safety. The people who are responsible for safeguarding the food supply never choose to rest on their laurels. Even if no terrorism threat existed, nature and technology continue to pose challenges that must be addressed in an ongoing process. Food safety practices can fall out of date without constant updating and the accompanying research that makes those updates possible.

The Food Safety Consortium and its allied researchers across the country are certainly optimistic about efforts to

stave off threats to our food system. And like Secretary Thompson, we're also reluctant to get too comfortable.

Speaking of retiring federal officials, an article on page 2 of this edition notes the departure of Elsa Murano as undersecretary for food safety at the U.S. Department of Agriculture. We wish to take this opportunity to thank her for her service and to welcome her back to academic ranks as the dean of the Texas A&M University College of Agriculture and director of the Texas Agricultural Experiment Station. Earlier in her career, Elsa was a Food Safety Consortium investigator during her time on the Iowa State University faculty. She spoke to the FSC during our annual meeting last October about the need for continued cooperation between researchers in the government and at the universities. She thoroughly knows both ends of the equation and will continue to be an important voice in food safety for years to come. ■

Rapid Methods Workshop Plans 25th Anniversary at KSU

The annual rapid methods workshop hosted each summer at Kansas State University and directed by Daniel Fung of the Food Safety Consortium will hold its 25th session in 2005. The nine-day event will include a special day of celebration recognizing the milestone.

The XXV Quarter Century Gala International Workshop/Symposium on Rapid Methods and Automation in Microbiology will run from June 16 to 24 at the Holiday Inn Holidome in Manhattan, Kan. A celebration day will begin the workshop on June 16 with a series of afternoon lectures and evening festivities.

For those who do not plan to attend the full nine days, a



mini-symposium is included within the workshop from June 16 to 18. Registration fees for only the mini-symposium is \$615. The cost for the complete nine-day workshop is \$1,995. All Food Safety Consortium personnel will receive a 50 percent discount. All official participants will receive a silver medallion. Room rates at the hotel are \$72 a night plus tax.

Since the first workshop in 1980, the conference has attracted more than 3,500

participants from 46 states and 58 countries.

The full agenda is available online at <http://www.dce.ksu.edu/dce/cl/rapidmethods/>. For registration information, contact Debbie Hagenmeier at debbieh@ksu.edu or at 800-432-8222 within the U.S. or at 785-532-5575 from outside the U.S.

To Keep the Swine Healthy, Keep the Surroundings Clean

Looking for ways to keep market-bound swine as free of *Salmonella* as possible, researchers have come back to what most suspected in the first place: follow principles of sanitation on the farm, keep the transport vehicles clean, maintain sanitation in processing companies' abattoirs, watch out for dirty water and handle the carcasses carefully.

"Intervention at just one point is probably not going to be sufficient," explained Ron Griffith, a Food Safety Consortium researcher in veterinary microbiology at Iowa State University. "It does no good to have clean pigs on the farm and run them into a dirty abattoir. And it does no good to have dirty pigs on a farm and run them into a clean abattoir."

Griffith and his co-workers Jim McKean and Scott Hurd noted these principles after examining whether there would be any benefit to shortening the time that swine spend in holding pens and expose themselves to *Salmonella* contamination. He found that it wouldn't be possible to shorten that time span enough to make a difference. In a few cases, pigs could be infected after 15 minutes in the pen.

Most facilities hold pigs in the pen for at least two hours, Griffith said. Studies have shown that pigs held in the pens for two, four or six hours tested positive for *Salmonella*, with higher rates for those held longer.

"The work we've been involved with is trying to reduce the *Salmonella* in that abattoir holding area," Griffith said. "If that could be accomplished, pigs could go into a clean abattoir unit and possibly reduce the amount of *Salmonella*."

In the process, pigs are taken to



Holding pens for market-bound swine should be kept as clean as possible to reduce risks of Salmonella contamination. The longer pigs are held in the pen, the greater the risk of contamination.

a pen for holding and then taken to slaughter. Then another group of pigs comes into the pen, with several groups of pigs taking their turn in the pen during a day. At best, it may be flushed with water between groups but it's likely not clean, Griffith said.

In some studies, each pen showed evidence of *Salmonella*.

"Until now we really hadn't had good evidence that the abattoir holding had an effect," he said. "Many people were saying that the pigs

were picking it up in transit and that stress was a major factor."

In that case, the answer may be to go back to the farm. The ideal would be to never let a pig with *Salmonella* leave

the farm and come to the abattoir, but that would be difficult to achieve, Griffith noted.

In Denmark, pork producers follow stringent procedures at the farm level to limit *Salmonella* exposure. The American model, Griffith said, has been to increase sanitation at the processing level and to pay attention to the critical control points in the plants. The American plan has its merits because the processing plant is where *Salmonella* activity is likely to pick up.

"If you go out to an ordinary pig farm and examine resting pigs — not excited, not moved — and do fecal cultures on them, you're going to get from 1 to 3 percent of them *Salmonella* positive. If you take the same pigs and sample their intestines at the slaughter plant, you can have up to 70 or 80 percent positive." ■

"It does no good to have clean pigs on the farm and run them into a dirty abattoir."

1-3-4: FSC Universities Score Tops Again

For the fourth year in a row, *Meat and Poultry* magazine has ranked the three universities of the Food Safety Consortium in the nation's top five academic programs. In determining its rankings, the magazine considered the quality and variety of the universities' workshops, conferences and short courses available to the meat and poultry industry. By that yardstick, Iowa State University took first place, the University of Arkansas ranked third, and Kansas State University finished fourth.

The magazine's December edition noted that this year's ranking system was done differently than in previous years, when the evaluations were based on the universities' undergraduate and graduate programs. "We feel programs dedicated to continually educating the industry's executives and managers warrant our recognition," the editors said.

Universities offering short courses for meat and poultry products got the highest scores. Programs devoted to industry-specific issues such as food safety or sanitation earned slightly lower scores.

Here are summaries of the magazine's comments about the three FSC universities:

■ Iowa State University (first place)

ISU's strong base was anchored by its annual Sausage and Processed Meat short course and the school's educational offerings that "have a long history of serving the industry well." The magazine noted that ISU's workshops address a variety of food safety topics and provide processing personnel with information on improving product quality using

Meat and Poultry Top 10 Programs	
1.	Iowa State University
2.	Texas A&M University
3.	University of Arkansas
4.	Kansas State University
5.	University of Georgia
6.	The Ohio State University
7.	Oklahoma State University
8.	Colorado State University
9.	Texas Tech University
10.	Auburn University

the latest technology. It listed HACCP courses for domestic and international attendees and a course on BSE. "Food safety is a common theme in most of the ISU workshops and courses, from the Cured Meats Short Course to the Meat Processing Seminar put on for the Iowa Meat Processors Association as well as the series of ConAgra-sponsored meat and poultry training sessions hosted throughout the year."

■ University of Arkansas (third place)

The magazine pointed out that the U of A, while in the heart of poultry country, "offers a broad spectrum of courses designed for poultry and beef processors." The university's course "GMPs, SOPs and HACCP for the Meat and Poultry Industry" is for meat and poultry industry managers of food safety, quality assurance and production. Its twice-yearly course "Sanitation for the Meat and Poultry Industries" serves managers responsible for sanita-

tion standard operating procedures. Topical courses such as a one-time class on BSE issues attracted producers and small processors. BSE is also covered in the twice-yearly "Research Development in Food Safety" course. The university also hosts the Arkansas Poultry Processors Workshop each year for plant supervisors to learn the basics of poultry operations. The "Thermal Processing and Validation Workshop" is held in the classroom and in the university's poultry pilot processing plant.

■ Kansas State University (fourth place)

KSU's programs were cited for their strength in teaching regulatory compliance to beef and pork processors. Beef processing is the base of most courses, but its Pork 101 class "crosses species lines by teaching attendees about the processing and food safety steps involved in pork product manufacturing." Daniel Fung's annual rapid methods workshop helped the university earn a high ranking as did its workshop on *E. coli* O157:H7. The editors praised KSU's course on animal identification and traceability and its Beef ID Academy. The animal science department regularly hosts courses on recall-related compliance issues, reassessment procedures for *E. coli*, validation of critical control points, HACCP audits and microbiological testing methods. KSU's distance education courses "are designed to enhance the knowledge of those already working in the industry as well as students seeking alternatives to traditional degree programs in meat science." ■

J. Scott Smith, Kansas State, and **Suresh Pillai**, Texas A&M University, have co-authored “Irradiation and Food Safety” for the November edition of *Food Technology* magazine, published by the Institute of Food Technologists. The Scientific Status Summary report says food irradiation is a proven, beneficial method of improving the safety of the food supply and poses no human health threat. The report specifically addresses and counters misleading claims that irradiation produces worrisome carcinogenic byproducts, is harmful to the environment, substantially reduces food macro- and micro-nutrients, or that its use allows for sloppy practices elsewhere in the food processing line. The summary supports the use of this technology as a means to inactivate pathogens, maintain quality, and increase shelf life, as part of an effective overall food processing management system. The report calls for further research to focus on pathogen reduction protocols allowing for standards in pathogen control levels, inactivation of viruses in ready-to-eat foods and minimally processed fruits and vegetables, irradiating packaged meals and packaging advancements affecting sensory attributes.

Daniel Fung and **Beth Ann Crozier-Dodson**, Kansas State, presented “Rapid Methods and Their Application in Industry” at the second Sino-American Food Safety From Farm to Home conference in November in Shanghai, China. Fung was also the key presenter at the Rapid Methods and Automation in Microbiology Workshop and conference in November in Barcelona, Spain. He was also the keynote presenter on “Rapid Methods and Automation in Microbiology: 25-Year Update and Market Trends” at the IBC International Conference on Rapid Microbial Methods, Regulations, Technologies and Practical Applications

for Better Quality Control of Manufacturing Processes in December in San Diego.

In July, Fung received the Distinguished Service Award in Food Microbiology from the Institute of Food Technologists at its annual meeting in Las Vegas.

Curtis Kastner, Kansas State, spoke on food safety and security in January to the Kansas Association of College Teachers of Agriculture meeting at KSU.

Yanbin Li, Arkansas, delivered invited presentations on “Microfluidics-based Optical Biosensor for Rapid Detection of *Escherichia coli* O157:H7” and “Inactivation of *Listeria* in Recirculated Chilling Brine Using Flow-through Electrolyzing Treatment” in October at the International Commission of Agricultural Engineering meeting in Beijing. Li also presented “QCM and Nanomagnetic Beads-based DNA Sensor for Rapid Detection of *Escherichia coli* O157:H7” at the Biomedical Engineering Society annual meeting in October in Philadelphia. He presented “Quantitative Microbial Risk Assessment Simulation for *Salmonella Typhimurium* in Poultry Processing” at the Society for Risk Analysis annual meeting in December in Palm Springs, Calif.

Zhihui Liu, **Betty Swem** and **Yanbin Li**, Arkansas, won first prize in the graduate students poster competition of the Arkansas Section of the American Society of Agricultural Engineers at its annual meeting in October in Little Rock for “The Mechanisms, Scale-up, and Pilot Plant Scale Test of a Flow-through Electrolyzing Chamber for In-line Inactivation of *Listeria* in Recirculated Chilling Brine.” **Abani Pradhan** and **Li** won second prize in the competition for “A Quantitative Microbial Risk Assessment Model for *Salmonella Typhimurium* in Poultry Processing.”

Irene Wesley, National Animal Disease Center, delivered presentations on “Advances in Diagnostic Microbiology: From Culture to Microarrays” in October at Universidad Autonoma de Nuevo Leon in Monterrey, Mexico; “Effect of Transportation and Holding on the Prevalence of *Salmonella* and *Campylobacter* in Commercial Turkeys” at the North Central Avian Disease Conference in October in Ames, Iowa, and “Prevalence of *Campylobacter jejuni* and *Campylobacter coli* in Market Weight Turkeys Pre- and Post-Transport” at the Conference of Research Workers in Animal Disease in November in Chicago and at the 39th U.S.-Japan Cooperative Program in Natural Resources in November in Ames. Wesley also published “Small Intestinal Intussusception Associated with *Campylobacter jejuni* Infection in a Raccoon (*Procyon lotor*)” in *Veterinary Record* 155: 338-340. ■

Food Safety Digest

by Dave Edmark

The Food and Drug Administration issued regulations in December that require food industries to maintain records that identify the sources of the food they receive and the recipients of the food they release. They were written to implement portions of the Bioterrorism Act.

"These records will be crucial for FDA to deal effectively with food-related emergencies, such as deliberate contamination of food by terrorists," said Acting FDA Commissioner Lester Crawford. "The ability to trace back will enable us to get to the source of contamination. The records also enable FDA to trace forward to remove adulterated food that poses a significant threat in the food supply."

The regulation requires records on human-consumed food to be maintained from six months to two years, depending on the food's shelf life. Animal-consumed food records must be retained for one year.

Other regulations aimed at implementing the Bioterrorism Act cover registration of foreign and domestic food facilities, prior notice of food shipments being imported into the U.S., and administrative detention of food that may pose a threat to public health. Additional information about the regulations is

available online at <http://www.fda.gov/oc.bioterrorism/bioact.html>.

■ ■ ■

Elsewhere on the regulatory scene, the government says its rule covering ready-to-eat meat and poultry products has reduced the incidence of *Listeria monocytogenes* on those products. The U.S. Department of Agriculture Food Safety and Inspection Service released a study of the impact of its "interim final rule" on the matter. It said food processing establishments have strengthened their control procedures by increasing testing and taking other steps.

An FSIS assessment team evaluated the effectiveness of the rule and its implementation in plants. Its report said many plants have improved their procedures by means such as adding antimicrobial ingredients to their products to inhibit the pathogen's growth and installing a post-processing treatment step to eliminate the pathogen. The plants have also initiated or increased their testing for organisms on plant surfaces that come in contact with products after cooking, the report said.

The full report is available as a PDF document for downloading at http://www.fsis.usda.gov/Oppde/rdad/frpubs/97-013F/LM_Assessment_Report_2004.pdf.

■ ■ ■

Also regarding ready-to-eat foods, *Food Quality* magazine reports that Purdue University has developed a biosensor that will reveal the presence of *Listeria monocytogenes* in less than 24 hours at

concentrations as low as 1,000 cells per millimeter.

Arun Bhunia, a Purdue food science professor, developed the technology with a research associate, Tao Geng. Bhunia said the biosensor is an improvement over current test kits. They developed sensors that could detect only *L. monocytogenes* since FDA has a zero tolerance policy for the pathogen in ready-to-eat foods. The biosensor's ability to detect the pathogen at low levels is significant because *L. monocytogenes* can grow at refrigeration temperatures.

■ ■ ■

While North America contends with the rarity of reported cases of BSE in cattle, Europe continues to find itself with a more widespread problem. Through November, the European Commission confirmed 774 cases of BSE reported among its 25 member nations during 2004, the agribusiness newspaper *Feedstuffs* reported.

The United Kingdom led the continent with 325 cases of BSE during the year, followed by 114 each in Spain and Ireland, 58 in Germany and 49 in France. The disease, which was discovered in Britain 18 years ago, has decreased in the nation over time. In 2003, there were 612 cases in the U.K.

The World Health Organization said, "Speculation as to the cause of the appearance of the agent causing the disease has ranged from spontaneous occurrence in cattle, the carcasses of which then entered the cattle food chain, to entry into the cattle food chain from the carcasses of sheep with a similar disease, scrapie." ■

The Food Safety Consortium Newsletter

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Your comments are welcome.

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