

Residue Detection Program

OBJECTIVES

To demonstrate mastery of Module Subject the trainee will:

1. List the purpose for a residue program in FSIS.
2. List the names of the three federal agencies that are involved with residues in food animals.
3. Name and give the distribution of the forms used when the following types of samples have been collected and are ready to be mailed to the appropriate laboratory.
 - a. Directed sample for monitoring phase
 - b. Inspector generated suspected antibiotic residue
4. Name four tissues commonly requested on the FSIS Form 10,210.3.
5. List three conditions which would lead to a decision by the PHV to perform an in-plant residue test.

INTRODUCTION TO THE FSIS NATIONAL RESIDUE PROGRAM

An essential aspect of food safety in meat, poultry, and egg products is the control of residues that may result from the use of animal drugs and pesticides, or from incidents involving environmental contaminants. The United States has a complex residue control system, with rigorous processes for approval, sampling and testing, and enforcement.

Three principal agencies are involved in the control of residues in meat, poultry, and egg products: the Food Safety and Inspection Service (FSIS) of the United States Department of Agriculture (USDA), the Food and Drug Administration (FDA), and the Environmental Protection Agency (EPA). FDA and EPA establish tolerances (maximum permissible levels) for chemical residues in foods, and FSIS enforces these tolerances through its various residue control programs.

FDA establishes tolerances for veterinary drugs and food additives under the statutory authority of the Federal Food, Drug, and Cosmetic Act (FFDCA). These tolerances are published in Title 21 of the Code of Federal Regulations (21 CFR). EPA establishes tolerances for registered pesticides under the statutory authority of the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) and FFDCA, as modified by the Food Quality Protection Act (FQPA). These are published in 40 CFR. Maximum permissible levels have also been established for residues that are the result of environmental contamination, such as cancelled pesticides that are no longer approved for use but persist in the environment (e.g., DDT), industrial chemicals (e.g., PCBs), and heavy metals. Tolerances for industrial chemicals and heavy metals are established by FDA and published in 21 CFR. For cancelled pesticides, action levels (similar to tolerances, but less formal) are established by FDA or FSIS, based on recommendations that EPA has published in the Federal Register.

Under the Federal Meat Inspection Act (FMIA), the Poultry Products Inspection Act (PPIA), and the Egg Products Inspection Act (EPIA), FSIS acts to ensure that USDA-inspected meat, poultry and egg products do not contain illegal levels of chemical

residues. The cornerstone of FSIS residue prevention activities is the FSIS National Residue Program (NRP), a multi-component analytical testing program for residues in domestic and imported meat, poultry, and egg products. The FSIS NRP, which has been in effect since 1967, provides a variety of sampling plans to prevent violative residues from entering the food supply, and develops national data on the occurrence of chemical residues to support risk assessment, enforcement and educational activities.

The range of chemical compounds evaluated for inclusion in the various NRP testing programs is comprehensive in scope. It includes approved and unapproved pharmaceutical drugs and pesticides known or suspected to be present in food animals in the U.S. and in countries exporting products to the U.S. It also includes any other xenobiotic or naturally occurring compounds that may appear in meat, poultry, and egg products and that may pose a potential human health hazard.

The NRP is designed to provide: (1) a structured process for identifying and evaluating compounds of concern by production class; (2) the capability to analyze for compounds of concern; (3) appropriate regulatory follow-up of reports of violative tissue residues; and (4) collection, statistical analysis, and reporting of the results of these activities.

When violative residues are detected in food-producing animals submitted for slaughter, FSIS notifies the producer and other parties involved in offering these animals for sale. Product found to contain violative levels of residues is considered adulterated and is subject to condemnation. If the product has been distributed into commerce, it may be subject to voluntary recall and/or other actions. In addition, FDA and cooperating state agencies may make on-site visits to these firms.

The purpose of the residue program is to maintain vigilance for non-permitted residues in food animals. The national residue program is the corner stone of FSIS residue prevention activities. The regulatory system that enforces U.S. food safety laws has been evolving since 1906.

We will be covering the following topics:

- The National Residue Program of FSIS
- The regulatory authority of FSIS in the U.S. Code, Code of Federal Regulations and touch briefly on Residue in a HACCP environment
- The components of the NRP
- In-plant sampling tests and Veterinary Public Health Officer responsibilities
- Residue case management

The National Residue Program (NRP)

There are three major aspects of the NRP:

1. the prevention of illegal chemical residues,
2. an analytical systematic testing program for the residues in domestic and imported products, and
3. verification that plants are fulfilling their responsibilities under HACCP for preventing violative residues. This is discussed more under "Residue in a HACCP environment".

An essential aspect of food safety in meat, poultry and egg products is the **control** of residues that may result from the use of animal drugs and pesticides, or from incidents

involving environmental contaminants. The NRP is an example of interagency cooperation and teamwork between Food and Drug Administration, the Environmental Protection Agency and FSIS. It is also an example of intra-agency cooperation and teamwork. Within FSIS there is extensive teamwork among the following offices and personnel, Office of Public Health and Science, Technical Service Center, National Information Technology Center, District Offices, Laboratory support (Eastern Lab, Western Lab and Midwestern Lab), and most importantly, the FSIS in-plant personnel who review animals everyday, collect and submit the samples. This teamwork is what makes the National Residue Program a success.

Due to the multiple offices and agencies that have a role in the NRP the residue control system of the United States is very complex. There are multiple steps and processes for the approval, sampling, testing and enforcement activities that take place daily. As part of this system the three major Agencies, FSIS, FDA and EPA work together to provide control of residues in the meat, poultry and egg products. While we traditionally view residue control as the responsibility of the government, we also need to understand that with the implementation of PR/HACCP a responsibility for residue control also resides with the Meat and Poultry Industry.

To have a better understanding of the role you will fulfill as an in-plant Veterinary public health officer it is important to understand the basics of the components of the NRP Domestic residue sampling program. There are four basic components of the NRP domestic residue sampling program. The monitoring plan covers both domestic and imported product. There is a "special project" component which encompasses projects such as the testing of show animals for Clenbuterol, FSIS Notice 45-01. This notice has expired but it is still useful as a guideline. Surveillance sampling is a scheduled sampling designed to investigate and control the occurrence of residue violations in targeted animal populations. The fourth component that you need to understand is the enforcement testing. This is the testing for residue in animals or lots that appear suspicious to FSIS in-plant inspectors, based on herd history or Ante mortem or postmortem inspection.

Import residue sampling is part of the NR and this program is where FSIS randomly samples meat, poultry and egg products for residues at the U.S. port-of-entry. However, as a PHV the main components of the NRP that you will be concerned with as a Veterinary public health officer are the monitoring plan and enforcement testing.

There are some basic differences between the plans. For example, monitoring samples are directed samples. You will receive direction and forms from OPHS, in Washington D.C., letting you know when to collect a sample and what sample to collect. The method of animal selection is also different. Monitoring samples are randomly chosen from animals that have passed inspection and been permitted entry into the food supply.

Enforcement testing is initiated by the in-plant FSIS personnel based on their judgment that an animal (or lot) may contain drug or chemical residues. This judgment can be based on ante-mortem findings, post-mortem findings and herd history. Herd history means that due to previous residue violations by a producer you may decide that in-plant screening for enforcement testing should be performed. The other reason to test is to verify the plant's HACCP system.

Regulatory Authority and Residue in a HACCP Environment

Because you are joining a public health regulatory agency it is beneficial to know the regulatory authority under which we operate. Regulatory residue authority for FSIS is in the US code Title 21 chapters 10 and 12, the Poultry Product Inspection Act and the Federal Meat Inspection Act. Under the FMIA, PPIA and EPIA, FSIS acts to ensure that USDA inspected meat, poultry and egg products do not contain illegal levels of chemical residues.

There are multiple regulations in the CFR 9 that give guidance on residue. These are parts 309, 310, 311, 318, 320, 381, and 417. Production classes for which FSIS has regulatory authority include: horses, bulls, beef cows, dairy cows, heifers, steers, bob veal calves, formula-fed veal calves, non formula-fed calves, heavy calves, sheep, lambs, goats, market hogs, boars, sows, young chickens, mature chickens, young turkeys, mature turkeys, ducks, geese, rabbits, and egg products (liquefied eggs and dried eggs).

Contained in the regulations above, that cover livestock and poultry, there are parts that should be clarified due to changes in practice. CFR 9 part 310.21 specifically pertains to calves. You will notice that the regulation is written with CAST as the testing used. CAST is no longer used for federal establishments (we now use FAST for all bovine); however we still use the regulation as a guideline. You may disregard the definition of "certified calves" as that classification is no longer used. CFR 9 part 310.5 refers to carcasses or parts found to be adulterated; under FSIS definition (301.2 - adulterated), could mean with residues. The information regarding the increased testing that happens in calves when positive test results occur is still followed even though we use FAST instead of CAST.

The development and implementation of PR/HACCP introduced a new evolution to the residue control and avoidance responsibilities of the government and industry. Residue in a HACCP environment is a complex subject. Residue in a HACCP environment introduced the thinking that the establishment has a responsibility to address residue within their system. It is made clear in 9 CFR 417.2 (a) (3) that violative residues present food safety hazards that may arise from chemical contamination, pesticides and drug residues. Using the principles of HACCP, each establishment must perform a hazard analysis and determine if residue is a hazard likely to occur in that establishment.

The tolerance limits of drugs, chemicals and pesticides are set by FDA and EPA. A result is said to be violative when this tolerance level is exceeded. When a result is reported to you by the Technical Service Center as violative you need to determine if the establishment addresses residue in a HACCP environment. FSIS has told establishments that if their HACCP plans include residue controls that constitute the best available preventive practices, if they supply FSIS with information about violators, then the Agency will not treat violative residue findings by the establishment that are followed by appropriate corrective actions as noncompliance (see CFR 9 part 417.3(a)). We will also follow these guidelines on FSIS monitoring and enforcement sample results.

However, when a residue result is violative and the establishment does not fully address residue in a HACCP environment a noncompliance record (NR) is generated. The O3J procedure code is used with the "verification" trend indicator. Also, if the plant does fully

address residue in a HACCP environment, but they have failed to follow their plan, a noncompliance record should be generated.

Best available preventive practices are discussed in the federal register titled: Residue control in a HACCP environment dated November 28, 2000 (Vol 65, No 229). Several things happen with best available preventive practices. The plant must ensure all animals are identified for successful trace back to the owner of origin. Our concern is to prevent repeat violators from continually sending residue animals to slaughter. To do this we need to have the correct owner name and address. The plant needs to notify producers in writing of the residue findings and the company's future expectations of the producer. Future expectations may include the company's business practice of refusing to purchase more animals from a producer after several repeated violative results are confirmed by the FSIS labs. A company may have a policy where they send a representative to visit with the producer to make sure they understand residue avoidance.

Additional practices mentioned in the federal register discuss how some states may have a state-certified voluntary residue avoidance program. If this exists the plant may be able to add to their purchase specifications a requirement that suppliers participate in the program and supply certification to that effect. The establishment could explore live animal testing as a rapid and convenient verification tool. If the plant institutes the named best available preventive practices, when a violative residue occurs - they may not receive an NR (in general) as long as appropriate corrective actions are followed. By adopting these practices the plant takes a more active role in residue control and if they institute best available preventive practices and follow appropriate corrective actions they will not automatically receive an NR for a violative residue result.

In-plant Screening Tests

These are the in-plant screening tests that are currently being used in federally inspected establishments.

- FAST – this test is validated for all bovine species. If you are at a plant that runs bovine, you should have the supplies and equipment for performing the FAST test.
- STOP – all other species, including poultry, use the STOP test.

Enforcement testing makes extensive use of rapid in-plant screening tests. In this way, only those samples that test positive by a screening test are sent to an FSIS lab for confirmation testing. However, if you feel the carcass may contain a violative level of a residue for which there is no official FSIS screening method, a sample taken from that carcass is sent directly to the lab for testing.

The in-plant screening tests provide a way to screen animals that are seen as suspicious based on their herd history, ante-mortem or post-mortem findings. They are used as a follow up on producers who have been known in the past to have residue violation issues, and also to verify the establishments HACCP system.

Residue Testing Procedures: Cattle and Swine

There are basic principles you should keep in mind when you are deciding whether or not a carcass may contain residues. The in-plant screening tests provide guidance and should be used as primary tools in the first step of the residue program.

Notice 44-01 clarifies cattle residue testing procedures. The following is a list of the pathologies and conditions that warrant retention and testing of carcasses. Symptoms are described to help PHVs determine when to retain and test carcasses.

- Mastitis – carcasses with inflammatory ventral edema in the perineal area resulting from mastitis. Hemorrhages and yellow serous infiltrate, located ventrally, are typically present.
- Metritis – carcasses with acute metritis. Associated pathology includes enlargement of the uterine body, distension of the uterine horns with a fetid brown, red brown, or black fluid; thinning of the uterine wall; and lack of evidence of normal uterine involution (no lines of contracture in the myometrium).
- Peritonitis and surgery – carcasses with active peritoneal inflammation associated with fibrinous exudate or fetid ascitic fluid, no matter how limited the extent of the lesions or with ventral abdominal cellulitis secondary to percutaneous abomasal surgery. Findings of surgical devices (suture, toggles, fistula devices, etc.) are only significant if they are associated with active (i.e. the presence of fibrin as opposed to chronic peritonitis with fibrous adhesions) peritoneal inflammation.
- Injection sites – carcasses with lesions associated with injections. Injection sites are likely to be found in a variety of locations including the neck, shoulder, thorax, axilla, ventral abdomen (along the subcutaneous abdominal vein), flank, hindquarter, pelvic area (perirectal) and tail. Also, look for cellulitis that is away from pressure points (e.g., tubor isschii, hip joint, stifle joint). These are generally found in the semimembranosus and semitendinosus muscle.
- Pneumonia – carcasses with acute, subacute and chronic active pneumonias; with pleural cellulitis resulting from reticulo peritonitis complex; or with embolic pneumonia.
- Pericarditis – carcasses with fibrinous or fibrinosuppurative pericarditis.
- Endocarditis – carcasses with endocarditis and acute pulmonary, renal or other embolic lesions. Also, test carcasses that are condemned due to septicemia, pyemia, or other reasons.
- Abomasal disease – carcasses with recent abomasal displacement and abomasal torsions or with intussusceptions, mesenteric torsions, and cecal torsions.
- Septicemia and pyemia – carcasses that are being condemned for septicemia, pyemia, or other inflammatory/infectious conditions.

- Downers - carcasses of any animal that was non-ambulatory. (Note: January 8, 2004 the non ambulatory disabled cattle ban was put into effect. Non ambulatory disabled cattle are ineligible for slaughter for human food.)
- Animals identified during ante-mortem inspection that were determined to be U.S. Suspect for residues.
- Carcasses with acute cellulitis or other acute inflammations associated with a fibrinous or fibrinosuppurative exudate in any location on the carcass or viscera.

Notice 16-03 clarifies the use of the rapid in-plant screen test STOP for mature swine. It also contains guidance material for specific pathologies and conditions that are considered at risk for residue violations.

The following is a list of symptoms and conditions that may warrant collection of samples for rapid in-plant antibiotic drug residue screening. At post-mortem inspection:

- Animals that are identified during Ante mortem inspection as U.S. suspects for antibiotic drug residues
- Carcasses that are condemned for septicemia/pyemia
- Carcasses with lesions suggestive of injection sites
- Diamond skin or other skin conditions associated with septicemia
- Pneumonia/pleuritis
- Pericarditis/endocarditis
- Nephritis/cystitis
- Metritis
- Mastitis
- Peritonitis
- Arthritis

ANIMAL IDENTIFICATION AND DEVICES

When a residue sample is taken in the plant, USDA will request the producer/owner name and address from the plant. The USDA inspector will also request any external identification (back tags, ear tags, etc) numbers of that carcass from the plant.

By regulation and Law the plant is required to comply and provide the accurate identification requested.

Regulations pertaining to animal ID and connection with residue

FSIS, Department of Agriculture: Chapter III

9 CFR 309.16: Livestock suspected of having biological residues.

9 CFR 309.17: Livestock used for Research

9 CFR 309.18: operations must adhere to the defined use of U.S. Suspect and U.S. Condemn tags.

9 CFR 310.2 Animal trace back: all forms of identification are required to be removed and kept coordinated with the carcass until postmortem inspection is completed.

9 CFR 310.3: Carcasses and parts in certain instances to be retained.

9 CFR 310.21: carcasses suspected of containing sulfa and antibiotic residues; sampling frequency; disposition of affected parts.

9 CFR 311.30: Biological residues

9 CFR 318.20: Use of animal drugs

9 CFR 320.1(a): every person ...within any of the classes specifiedis required by the Act to keep records which will fully and correctly disclose all transactions involved in his or its business subject to the Act.

9 CFR 320.3: Record retention period.

FSIS Notice 5-02: Animal Identification

Packers and Stockyards Act: Chapter II

9 CFR 201.49(a): Livestock weighed for purchase or sale must be serially numbered and scale tickets must be generated; if hot carcass weights are used for purchase, the scale must be linked to a printer to generate scale tickets with dates, names of buyers and sellers, number of head, kind of livestock, weights and the individual responsible for this task.

9 CFR 201.86(d): identity of the consignment is required until inspection has been completed.

9 CFR 201.94 and 201.95: Information and records described above must be made available to USDA.

FSIS Notice 5-02 titled Animal Identification was distributed to remind all veterinarians and inspection program personnel of the importance of ensuring that all animal identification remains associated with the carcass until post-mortem examination has been completed. While this notice was primarily addressing the bio-security of the United States, it can also be used in support of the residue animal identification issue. When plants refuse to provide trace back information to FSIS it was determined that an NR could be written due to their failure to be in compliance with the regulations (cited above). This NR is written without a code. This is now an instance where there is no trend indicator noted.

These are some of the animal ID devices that are found and should be collected to provide trace back information.

- Back tags
- Producer tags
- Feedlot tags
- Canadian ear tags
- Calf vaccination ear tag

Make sure you write all the numbers from the tags onto the lab form. The blue tags are gang tags and the cream are retain/reject tags used by the in-plant FSIS personnel to control carcasses.

FAST ANTIMICROBIAL SCREEN TEST

The Fast Antimicrobial Screen Test (FAST) is a biological screening test for the detection of antimicrobial residues in animal tissues. It is designed to be performed by a veterinarian or a designated food inspector in a slaughtering plant. FAST is an adaptation of the antimicrobial screening test that has been used in FSIS laboratories for years.

FAST is based on the principle that, if a carcass contains a residue from a previously administered antimicrobial drug, tissue fluid from the carcass will inhibit the growth of a sensitive target bacterial organism. With FAST, a cotton swab, saturated with tissue fluid from a suspected carcass, is placed on a culture plate seeded with a harmless organism. This organism, *Bacillus megaterium*, is sensitive to most commonly used antimicrobial drugs. The swab and plate are incubated to allow growth of *Bacillus megaterium*. Then the plate is examined for a zone of inhibited growth around the swab. The presence of a zone of inhibition is presumptive evidence that the carcass contains an antimicrobial drug residue. A presumptive positive carcass is retained and tissue is submitted to the laboratory for confirmation. A negative carcass is released provided all other inspection criteria are met.

The Inspector-in-Charge will determine when to perform the FAST on the collected kidney tissue samples. This determination will be influenced by the number of samples collected and the current staffing at the establishment. Once the FAST is started, a FSIS in-plant inspection person must be available to complete the FAST and a PHV to must be available to read the results 6 to 24 hours after the FAST was started.

If no FSIS in-plant inspection person will be available during that time, the kidney tissue samples must be held under refrigeration until a FSIS in-plant inspection person is available to complete the FAST and read the results.

If the test can be completed in the 6 to 24 hour time span, then some initial data entry on FSIS Form 6600-7 (10/96) is required.

Record initial information

Obtain a blank copy of FSIS Form 6600-7 and complete the heading. Enter the establishment number, establishment name, and the numerical codes for the District, Circuit, and State. Enter the numerical code for the District in the box labeled "REGION". Leave the box labeled "AREA" blank. The numerical codes for the District, Circuit and State can be found in the Meat and Poultry Inspection Directory.



Enter the date in the "DATE TEST STARTED" column and the retained tag number for the kidney tissue sample in the "RETAIN TAG NUMBER" column. Enter any information from other available carcass identification devices in the "BACK TAG OR TRACE BACK ID" column.

Enter the [Species Code](#) that best describes the species being tested in the "SPECIES CODE" column. The Species Codes can be found on the reverse of FSIS Form 6600-7 (10/96).

Enter the [Reason Code](#) . Enter the code for the primary reason that best describes why the carcass was retained for FAST in column "P" sub-column of the "REASON CODES" column. If a secondary reason for the carcass being retained for FAST for testing exists, enter this code in the "S" sub-column of the "REASON CODES" column.

| FAST ANTIMICROBIAL SCREEN TEST WORKSHEET | | | | | | | | | | | SERIAL NO. | | | | | | |
|--|-------------------|---|---------------|--------------|-----------|-----------------------|---------------|------|-------------------------|------------------------|-----------------------|--------------------|-----------------------------------|--------|-------------|----------|--------------|
| ESTABLISHMENT NO. 00000-M | | ESTABLISHMENT NAME Razorback Pack | | | | REGION DO25 | | AREA | | CIRCUIT 2509 | | STATE 19 | 42904 | | | | |
| DATE TEST STARTED (mm/dd/yy) | RETAIN TAG NUMBER | BACK TAG OR TRACE BACK ID | SPECIES CODES | REASON CODES | | INCUB. TEMP. (°C) | MILITARY TIME | | ZONE OF INHIBITION (mm) | | TEST RESULTS (+ or -) | DISP. CODE | FSIS DDDO 2 LAB REPORT SERIAL NO. | CASE # | INSPECTOR'S | | |
| | | | | P | S | | IN | OUT | NS | SWAB | | | | | H HS | TR HS | BADGE ID NO. |
| 02/22/01 | 34880602 | 93NF0366 | 15 | 14 | 01 | | | | | | | | | | | | |

For information on completing FSIS Form 6600-7, go to FORMS.

The FAST is performed using a cotton swab saturated with tissue fluid absorbed from macerated kidney tissue. Sterile technique is not required because the short incubation time rarely allows interfering growth of contaminating microorganisms.

However, your hands should be clean and dry whenever the cotton swab is handled to avoid contaminating the cotton swab with a substance that could interfere with growth of *Bacillus megaterium*. The cotton swab should never contact anything other than the sample kidney tissue and the FAST plate.

Preparing Cotton Swab



Remove a sterile cotton swab from the pack and push the sharp end through the plastic bag and into the kidney tissue. Using the sharp end of the sterile cotton swab, widen the hole in the plastic bag to about 1/2" in diameter. The 1/2" diameter hole in the plastic bag will prevent squeezing tissue fluid from the cotton swab head when it is removed from the kidney tissue and pulled back through the hole in the plastic bag.

Push the sharp end of the cotton swab about 1/2" to 3/4" into the kidney tissue. Move the sharp end of the cotton swab shaft back and forth several times to macerate the kidney tissue.

Remove the sharp end of the cotton swab, reverse the cotton swab, and insert the cotton end of the cotton swab through the hole in the plastic bag and into the kidney tissue.



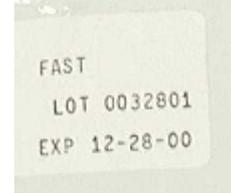
Twirl the cotton swab shaft to ensure good contact between the end of the cotton swab and the macerated kidney tissue.

To ensure proper saturation of the absorbent end of the cotton swab, the cotton swab must remain in the kidney tissue no less than 30 minutes and no more than 2 hours.



Examine the FAST plate

An expiration date for the FAST plate is printed on the plastic wrapper and on the lid of the FAST plate. Check this date before using the FAST plate.



If the FAST plate has expired, call the Midwestern Laboratory, in St. Louis, MO. Tell them the expiration date on the FAST plate. The Midwestern Laboratory personnel will decide whether or not to extend the shelf life of the FAST plate.



The FAST plate should always be examined before use. The agar should not be dried out or cracked. Examine the surface of the agar for obvious contamination or bacterial/ fungal growth. Check for indications of freezing. If any of these defects are observed, the FAST plate should be discarded and a new plate used.

Always allow the plate to equilibrate to room temperature before using.

Mark the FAST Plate



Lift the FAST plate cover and mark an X on the outer vertical sidewall of the FAST plate.

On the bottom of the FAST plate, starting at the X, draw a straight line across the diameter of the plate so that the straight line divides the FAST plate into two equal sized sections.



Prepare the cotton swab with spore suspension

With the cap tightly screwed on, vigorously shake the vial of *Bacillus megaterium* spore suspension to thoroughly mix the spores. If particulate matter is present within the spore suspension or the spore suspension is cloudy or colored, the spore suspension must be discarded.



Remove the cap from the vial, being careful to avoid touching the inside of the cap or vial with your hands. Insert the cotton swab into the vial until the cotton swab is completely immersed in the spore suspension.

Before removing the cotton swab from the vial, gently touch the cotton swab tip to the side of the vial to remove excess fluid from the tip. Dip the cotton swab into the spore suspension only once. Replace the screw cap and set the vial of *Bacillus megaterium* spore suspension aside.

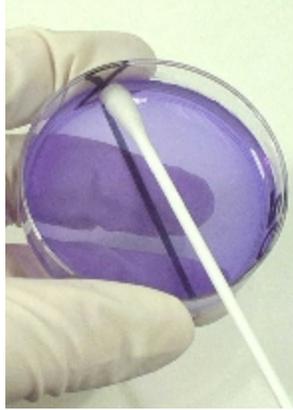


Streak the FAST plate

The *Bacillus megaterium* spore suspension must be applied to the agar surface of the FAST plate to create a "lawn" of bacterial growth. Avoid touching the cotton tip with your hands or allowing the cotton tip to touch another surface. If the cotton swab touches your hand or another surface discard the cotton swab and prepare another cotton swab with spore suspension.

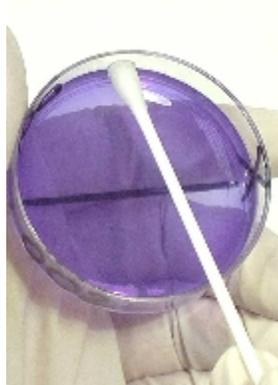
The recommended method for streaking the plate is demonstrated in the following photos.

1. Remove the cover from the FAST plate and streak the spores over the surface of the agar by **starting at the reference mark** and gently streaking from top to bottom, back and forth, moving the swab to the right edge of the FAST plate.

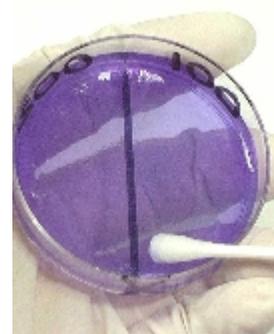
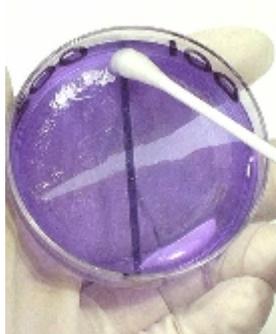


Be careful not to dig or plow the surface of the FAST plate.

2. Turn the plate 1/4 turn clockwise and repeat the streaking pattern, gently streaking from top to bottom, back and fourth, moving the swab to the right edge of the FAST plate. A left handed person may wish to swab the FAST plate from the reference mark to the left edge and turn the FAST plate counterclockwise.



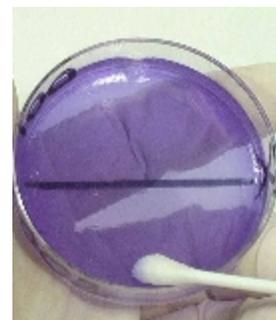
3. Turn the FAST plate $\frac{1}{4}$ turn and repeat the pattern.



4. Turn the FAST plate $\frac{1}{4}$ turn and repeat the pattern.



5. Finally, turn the FAST plate $\frac{1}{2}$ turn and repeat the pattern.



Replace the cover on the FAST plate and discard the used cotton swab.

Do not reuse the cotton swab to streak additional FAST plates.

Use a fresh swab for each FAST plate prepared!

Identify the FAST Plate

After the FAST plate has been streaked with *Bacillus megaterium* spore suspension, the FAST plate must be accurately identified.



The FAST plate is identified with the last three digits of the kidney tissue sample retained tag number.

The last three digits of the kidney tissue sample retained tag number are written on the outside, vertical edge of the bottom half of the FAST plate. Each FAST plate can be used to perform two FAST tests. Therefore, it is important to write corresponding kidney tissue sample retained tag number on the half of the FAST plate where the corresponding cotton swab will be placed. If the other half of the FAST plate is used to perform a second FAST, identify that second half of the FAST plate to correspond with the second kidney tissue sample retained tag number for the second sample.

Accurate identification of the FAST plate is essential to ensure proper reporting of test results. The last three digits on the plate should match the last three digits of the retained tag number recorded on the FSIS Form 6600-7 (10/96).

Position the Neomycin Disc

Remove the cover from the FAST plate. Place the cover from the FAST plate open-side up beside the bottom of the FAST plate.



Dispense one neomycin disc into the cover from the FAST plate.





With the thumb forceps, pick up the neomycin disc by the edges. Select a point about ½" inch from the X reference mark and directly above the line dividing the FAST plate into two equal halves.

Carefully place the neomycin disc flat onto the agar. Do not try to reposition the disc if it is not exactly above the line. Use another plate if the neomycin disc is badly out of position.

Lightly touch the neomycin disc with the thumb forceps tip to assure uniform contact. Be careful not to press hard enough to break the surface of the agar.



Position the Kidney Tissue Fluid Swab



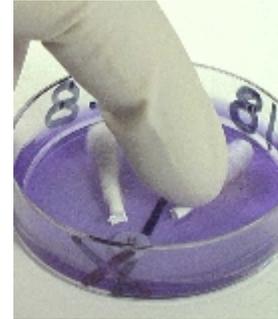
After the neomycin disc has been placed on the FAST plate, break the cotton swab shaft off as close to the cotton tip as possible.

Place the cotton swab tip on the half of the FAST plate marked with the last three digits of the corresponding kidney tissue sample retained tag number.

The broken end of the cotton swab shaft should be near the neomycin disc and the cotton tip in the center of its section.

Avoid touching the cotton swab tip with your fingers when placing the cotton swab on the FAST plate! Sterile technique is not required, but fingers may transfer a contaminant to the FAST plate that could alter the result. Handle the cotton swab by the shaft only. Wash your hands and change gloves as often as necessary to avoid contaminating the FAST plate.

After the cotton swabs are correctly placed on the agar plate; lightly press down on the cotton swab shaft with your fingertip to ensure proper contact of the cotton swab head with the agar. Be careful not to break the agar surface when applying pressure on the cotton swab head.



Do not use the forceps! Forceps are contaminated with neomycin.

Incubating the FAST Plate



Place the FAST plate on the incubator shelf with the cover on top. Do not invert the FAST plate. The swabs can be dislodged during incubation. For optimum growth of *Bacillus megaterium* and clear zones of inhibition, the FAST plate must be incubated at $44^{\circ}\pm 0.5$ Celsius for a minimum of 6 hours and a maximum of 24 hours.

Remove the FAST plate from the incubator after 6 hours of incubation. Otherwise, remove the FAST plate from the incubator within 24 hours.

Incubation in excess of 24 hours will allow the growth of interfering organisms, or the antibiotic activity of the neomycin disc can dissipate allowing the *Bacillus megaterium* to grow into the zone of inhibition. This creates false negative FAST test results. Tissues incubated longer than 24 hours should be retested, either by redoing FAST or submitting to the laboratory.

Using military time, record the "Time In" on the FSIS Form 6600-7 (10/96) in the "Military Time IN" column using the format HHMM.

| MILITARY TIME | |
|---------------|-----|
| IN | OUT |
| 0600 | |
| | |
| | |
| | |

If FAST testing is performed early enough in the tour of duty to allow 6 hours of incubation time prior to the end of the work day, then FAST plates should be read prior to the end of the tour of duty. The appropriate time should be recorded in the "Military Time Out" column when the plates are removed for evaluation.

If FAST testing is performed late in the tour of duty, allow the FAST plates to incubate overnight and read the FAST plates after the start of the next day's tour of duty, up to a maximum period of 24 hours incubation. The appropriate time should be recorded in the "Military Time Out" column when the plates are removed for evaluation.

FSIS has begun using FAST testing for all bovine. This includes calves, when emergencies happen in the field STOP supplies can be used on the adult bovine – but only FAST can be used for the calves.

Using the N5 disc give you a reference point to use in determining if the supplies being used are working properly.

Observe the zone of inhibition around the disc. If the zone diameter is between 20-26 mm you read the rest of the plate.

- Zone less than 20 could mean;
 - N5 disc is outdated
 - too many spores on the plate (lawn issue)
 - incubator temp too high or low
 - too much moisture on surface of the plate
- Zone greater than 20 mm:
 - not enough spores on the plate
 - incubator temp too high or low

Observe the zones of inhibition around the swab heads

- present equals presumptive positive
- absent except for right under swab equals negative

If the zone of inhibition around the neomycin disc is greater than 26 mm or less than 20 mm, the FAST test result may be unreliable and the FAST test may have to be rerun or samples submitted to the laboratory. A decision to repeat the FAST or submit tissue to the laboratory depends on two factors:

1. Can changes be made that will result in a zone of inhibition around the neomycin disc zone that is not greater than 26 mm or less than 20 mm; and
2. what is the impact of waiting for FAST results versus submitting tissues now. If tissue is submitted to the laboratory, interpret the FAST as positive and record

the result under the appropriate time column for the "Test Results" column. If the FAST is rerun, the FAST is inconclusive. Record "I" under the appropriate time column for the "Test Results" column. Do not place entries in both time columns!

If there is growth of *Bacillus megaterium* and the zone of inhibition around the neomycin disc is not greater than 26 mm or less than 20 mm, proceed with interpretation of the FAST.

The FAST worksheet is filled out as you take and complete FAST results. When a sheet is completed accurately and legibly you need to keep one copy for your plant files, send the top copy to the Des Moines Data Center, and the final copy to the TSC. If you have less than the full sheet filled out, you will still send it in on at least a monthly basis. These worksheets are scheduled to become all electronic in the near future, but the fields will remain the same.

After a presumptive positive FAST test the inspector will follow the unified sampling Directive 10,210.1 to process all the tissues collected. After freezing, all samples with the form are packaged for shipping to the Midwest Lab in St. Louis, MO. Before you send off the sample make sure to request the owner name and address from the plant and put it on the form.

We talked about the STOP test and the differences from FAST testing when we went over the FAST slides. The STOP test will be run in basically the same manner as the FAST, however the incubator temperature settings are different, the spore species is different *Bacillus subtilis* for STOP, and the results are read "the next day" between 16 and 24 hours after setting the test.

BASIC RESIDUE RESPONSIBILITIES FOR THE PUBLIC HEALTH VETERINARIAN

As the PHV, there are basic responsibilities that you should be aware of regarding residues and in plant residue testing.

- You will need to know how to identify animals at Ante mortem and postmortem. To aid you in this work it will be important to make sure the FSIS in-plant personnel are correlated on the conditions and symptoms that may warrant collection of samples for residue. They can then have carcasses railed out or hung back for you to assess.
- You should be familiar with how the establishment addresses residue in their plant.
- Assure your equipment works and you have appropriate supplies for the tests you perform. If you need supplies and equipment you need to follow FSIS Notice 54-02 to order supplies and equipment.
- We've discussed the three in -plant screening tests, FAST and STOP. As the PHV you are responsible for the in-plant screening tests being done correctly.

- If a carcass has been identified for residue sampling, make sure the samples are collected and identified and taken to the area you perform the tests.
- The PHV is responsible for the reading of the results. Once the test is run and there is a presumptive positive, the tissue samples from each carcass are double bagged and frozen. After they are frozen the samples are packaged and mailed to the MWL (for most antibiotic testing)
- This is the point where the initial producer information is gathered.
 - FSIS inspection relies on the plant to provide the correct information.
 - The management of the residue violations, violators, FDA investigation and National Residue Program hinges on getting correct owner name and address information.
 - Make sure to fill out the form 10,000.2 correctly – see your reference material
- The Lab receives the sample. They follow an internal SOP for the receiving, running and reporting of the results.
- After you have FedEx the sample to the lab, check daily on LEARN to follow it's status. The labs will report to LEARN when the sample arrives, if it is discarded, and when the results are complete. LEARN is a system that the field FSIS Veterinarians uses to look up their results and to track their sample arrival to the lab.

TECHNICAL SERVICE CENTER ROLE

After the sample is sent to the lab an internal SOP will be followed for testing tissues and faxing results to the Technical Service Center in Omaha, NE. On a daily basis we receive faxes from the labs on the residue results. The TSC reviews all the faxes, but make a carcass disposition only on the ones that are violative. After making the carcass disposition the Technical Assistance and Correlation Veterinary staff officers will contact the IIC/in plant personnel. If you have been checking LEARN you may already see the results are completed. Currently, all violative results need to be confirmed by the TSC TAC veterinarians. Any missing information will be requested at the time the TSC contacts you (e.g. missing names, addresses, etc). The TSC will also contact the field when the lab informs us a sample has been discarded.

The majority of the calls from the TSC to the IIC/IPP are to discuss the results from enforcement or inspector generated residue sample that was submitted. There are some differences between the enforcement sampling and the monitoring sampling. FSIS retains the carcass in enforcement sampling. FSIS does NOT retain the carcass in monitoring sampling. If the TSC calls regarding an enforcement sample the carcass disposition will entail either releasing or condemning the retained carcass. In monitoring, while FSIS does not retain the carcass, the plant may decide to retain it when a sample is taken. The TSC will call on violative results on monitoring tests to indicate "if there is product retained" you should either tell the plant to release the product or that there was a violation and they need to dispose of the product. Usually in monitoring samples there is no product present by the time the residue results are reported.

RESIDUE VIOLATION CASES

All violative residue reports result in a “residue notification letter” being sent to the owner identified on the residue lab form. The TSC will send the original letter to the owner, and copies will be sent to FDA for their investigation efforts, and to the District Office of where the owner lives. There may be two District Offices informed of one case. For example when the TSC first receives the lab fax, the form with the written residue carcass disposition will then be faxed to the D.O. of where the establishment is located. This provides the IIC and that D.O. the information that a violation occurred. When the “residue notification letter” is completed a copy of it is sent to the D.O. of the residence of the identified owner. A case file is built at the TSC for each violator.

FDA, EPA and FSIS work in conjunction on the National Residue Program. An MOU spells out the information on violators that FSIS is required to provide to the other Agencies. In the spirit of teamwork and cooperation, FDA also provides FSIS with a final report (Called Attachment C) of their case investigation. The TSC reviews the final reports for any changes that should be made to the Residue Violation Information System.

RESIDUE “FOLLOW UP” FOR CASES

There are different situations where you may be asked to increase your in-plant testing on a producer’s animal. If you have knowledge that there have been previous violations by the owner, you may want to increase testing of those animals when they arrive. This is a judgment call on your part, you should discuss with the TSC veterinarians if you have concerns. The FDA or the State may call the TSC who will in turn contact you in cases where increased scrutiny is requested. On the FSIS Residue Information Center on the FSIS website; www.fsis.usda.gov you will find the repeat violator list. If there is a producer from that list bringing animals into your facility, you may also want to increase scrutiny and testing.

The TSC, in conjunction with the labs and OPHS, review residue results for trends and unusual findings. In cases where an illegal drug, or a result of 10X over the tolerance or when a new drug shows up we will notify and work with FDA and EPA to determine the risks involved and if additional action is needed.

RESIDUE TERMINOLOGY

These are the basic “understood” definitions of violator and repeat violator.

- Violator: a person or organization that presents an animal for slaughter for food purposes (not including pre-clearance testing) which contains a violative tissue residue concentration of a drug, pesticide or other chemical. However, the language of repeat violator that is on the residue information center to define a repeat violator on the list;

-The Food Safety and Inspection Service has defined “*repeat violators*” as individuals or firms who repeatedly (i.e., on more than one occasion within a

12-month period) sell an animal for slaughter whose carcass is found to contain a violative level of a drug, pesticide, or other chemical residue; provided, however, that the most recent such sale occurred no earlier than September 6, 2001.

-This list contains the names and addresses of those parties responsible for repeat drug, pesticide, or chemical violations in animals presented for slaughter.

- Repeat violator: a violator who has had two or more violative tissue residues within the twelve months following issuance of an FSIS violation notification letter. (same thing as “residue notification letter”)
- AMDUCA: Animal Medicinal Drug Use Clarification Act - The AMDUCA establishes conditions for extra label use or intended extra label use in animals by or on the orders of licensed veterinarians of FDA approved new animal drugs and approved new human drugs.

-There are a list of drugs that are prohibited for extra label use; Chloramphenicol, Clenbuterol, Diethylstilbestrol (DES), Dimetridazole, Iprnidazole, Other Nitroimidazoles, Furazolidone, Nitrofurazone, other Nitrofurans Sulfonamide drugs in lactating dairy cattle (except approved use of sulfadimethoxine, sulfabromomethazine, and sulfaethoxy pyridazine) Fluoroquinolones Glycopeptides (example: vancomycin) Phenybutazone in female dairy cattle 20 months of age or older

RESIDUE VIOLATION INFORMATION SYSTEM (RVIS)

Frequent communication between Agencies (FSIS, FDA, EPA, and states) and divisions of FSIS is vital to the NRP. The RVIS database is a nationwide, interagency computer information system designed to share pertinent data for regulatory enforcement on an open and regular basis. The system operates 24 hours a day to provide information on residue violations in livestock and poultry slaughtered in the USA. The RVIS has proven to be an excellent tool for supporting residue control measure in meat and poultry because it allows exchange of information among participating agencies regarding regulatory enforcement.

RVIS is a unique system and a successful example of interagency cooperation and teamwork. It was implemented in 1987, and since that time improvements have been made to increase the capabilities for its use. The goal continues to be to provide reliable, consistent, current and accessible source of information on residue violations.

RESIDUE DOCKETS OF INTEREST

These are current, ongoing federal register dockets that pertain to Residue issues. They would be good references for building your understanding of the National Residue Program.

- Residue Control in a HACCP environment

- Target tissue marker residue policy
- 5/15 policy

For any correlation questions pertaining to residue you can call for a Technical Assistance and Correlation Veterinary Staff Officer at 800-233-3935, or send an email question to the Technical Center's email account on outlook.

**UNITED STATES DEPARTMENT OF AGRICULTURE
FOOD SAFETY AND INSPECTION SERVICE
WASHINGTON, DC**

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| FSIS NOTICE | 16-03 | 5/16/03 |
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Use of Rapid In-Plant Screening Tests for Antibiotic Drug Residues in Mature Swine

I. PURPOSE

The purpose of this notice is to set out FSIS policies' regarding the use of rapid in-plant screening tests for the detection of antibiotic drug residues in mature swine.

II. BACKGROUND

VMOs are to perform rapid in-plant antibiotic drug residue screening tests as part of the FSIS National Residue Program's (NRP) enforcement testing. The mature swine to be selected for testing are those presented for antemortem or postmortem inspection that appear to have disease conditions or lesions that, in the VMO's professional assessment, may indicate that the animal was treated with antibiotics.

NOTE: For residue sampling, FSIS defines "mature swine" as swine over 6 months of age that weigh over 300 pounds.

The Swab Test on Premises (STOP) screen for antibiotic residues in the kidneys of mature swine is the only test available for use in establishments that slaughter this class of animals. FSIS has trained all VMOs on how to collect samples and perform the STOP screening test. VMOs with questions about sample collection or the STOP test should contact the Technical Service Center.

III. RESPONSIBILITIES

A. What are the symptoms and conditions that may warrant the collection of samples?

The following is a list of symptoms and conditions that may warrant collection the of samples for rapid in-plant antibiotic drug residue screening.

1. Antemortem

- a. Downers. Animals that are non-ambulatory.
- b. Septicemia/generalized disease. Animals exhibiting any of the following conditions: depression, an elevated or subnormal body temperature, hyperemic skin, congested mucous membranes, dehydration, or poor body condition, in association with an injury or inflammatory condition.
- c. Injury or inflammatory conditions such as abscesses, arthritis, pneumonia, mastitis, metritis, or diamond skin.

2. Postmortem

- a. Animals that are identified during antemortem inspection as U.S. suspects for antibiotic drug residues.
- b. Carcasses that are condemned for septicemia/pyemia.
- c. Carcasses with lesions suggestive of injection sites.
- d. Diamond skin or other skin conditions associated with septicemia.
- e. Pneumonia/pleuritis.
- f. Pericarditis/endocarditis.
- g. Nephritis/cystitis.
- h. Metritis.
- i. Mastitis.
- j. Peritonitis.
- k. Arthritis.

B. What should a Veterinary Medical Officer (VMO) do when performing a rapid in-plant residue screening test?

- 1. All carcasses sampled for NRP enforcement testing are to be retained until the results of the screening test are obtained.
- 2. VMOs should prepare for traceback of the animal by asking the establishment to provide any information they have on the source of the hog.

IV. RESULTS

A. What should VMOs do with the results of the rapid in-plant screening tests?

1. If the rapid in-plant antibiotic screening test result is negative, inspection program personnel are to release the carcass and parts.
2. If the rapid in-plant residue screening test result is positive, inspection program personnel are to continue to retain the carcass and parts, and submit appropriate tissue samples (liver, kidney, and muscle tissue) for further testing to a FSIS Food Service Laboratory (FSL).
 - a. If the test results from the FSIS FSL are negative for violative levels of antibiotic residues, inspection program personnel are to release the carcass and parts.
 - b. If the test results from the FSIS FSL show violative levels of antibiotic residues, inspection program personnel are to condemn those parts or the carcass that are represented by the sample.

NOTE: FSIS is requesting that VMOs collect samples for the NRP enforcement testing even after a carcass is condemned because the use of veterinary drugs above the established limits and the use of prohibited veterinary drugs are violations of Federal law. The violator is subject to regulatory action by the Food and Drug Administration as well as being listed on the FSIS Residue Information Center's repeat violators list. Therefore, at the time a VMO performs an in-plant rapid screening test on a condemned carcass, he or she is to collect the appropriate tissue samples before the establishment disposes of the carcass and parts. This is necessary so that the tissue samples can be submitted to the FSIS FSL if the result of the in-plant rapid screening test is positive.

/s/ Philip S. Derfler

Deputy Administrator
Office of Policy and Program Development

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| DISTRIBUTION: Inspection Offices; T/A Inspectors; Plant Mgt; T/A Plant Mgt; TRA; ABB; TSC | NOTICE EXPIRES: 6/1/04 | OPI: OPPD |
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**UNITED STATES DEPARTMENT OF AGRICULTURE
FOOD SAFETY AND INSPECTION SERVICE
WASHINGTON, DC**

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| FSIS NOTICE | 44-01 | 10-11-01 |
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CLARIFICATION OF CATTLE RESIDUE TESTING PROCEDURES

Why is FSIS issuing this Notice?

FSIS is issuing this Notice to ensure that Veterinarian Medical Officers (VMO) continue to have clarification of FSIS's policies regarding when to use rapid in-plant tests (i.e., Swab Test on Premises (STOP) or Fast Antimicrobial Screening Test (FAST)). The information in this Notice is the same as that found in FSIS Notice 24-00.

USE OF RAPID IN-PLANT TESTS

When do VMOs conduct rapid in-plant residue tests?

FSIS has trained all VMOs to conduct rapid in-plant tests on carcasses with the types of pathologies or conditions listed below and to retain the tested carcasses until the test results are received. Carcasses with such pathologies or conditions are at risk for residue violations. However, there are no instructions that effect this training. This Notice serves that purpose.

The following is a list of the pathologies and conditions that warrant retention and testing of carcasses. Symptoms are described to help VMOs determine when to retain and test carcasses.

1. Mastitis – carcasses with inflammatory ventral edema in the perineal area resulting from mastitis. Hemorrhages and yellow serous infiltrate, located ventrally, are typically present.
2. Metritis – carcasses with acute metritis. Associated pathology includes enlargement of the uterine body, distension of the uterine horns with a fetid brown, red brown, or black fluid; thinning of the uterine wall; and lack of evidence of normal uterine involution (no lines of contracture in the myometrium).
3. Peritonitis and surgery – carcasses with active peritoneal inflammation associated with fibrinous exudate or fetid ascitic fluid, no matter how limited the extent of the lesions or with ventral abdominal cellulitis secondary to percutaneous abomasal surgery. Findings of surgical devices (suture, toggles, fistula devices, etc.) are only significant if they are associated with active (i.e. the presence of fibrin as opposed to chronic peritonitis with fibrous adhesions) peritoneal inflammation.

4. Injection sites – carcasses with lesions associated with injections. Injection sites are likely to be found in a variety of locations including the neck, shoulder, thorax, axilla, ventral abdomen (along the subcutaneous abdominal vein), flank, hindquarter, pelvic area (perirectal) and tail. Also, look for cellulitis that is away from pressure points (e.g., tubor isschii, hip joint, stifle joint). These are generally found in the semimembranosis and semitendinosus muscle.
5. Pneumonia – carcasses with acute, subacute and chronic active pneumonias; with pleural cellulitis resulting from reticulo peritonitis complex; or with embolic pneumonia.
6. Pericarditis – carcasses with fibinous or fibrinosuppurative pericarditis.
7. Endocarditis – carcasses with endocarditis and acute pulmonary, renal or other embolic lesions. Also, test carcasses that are condemned due to septicemia, pyemia, or other reasons.
8. Abomasal disease – carcasses with recent abomasal displacement and abomasal torsions or with intussusceptions, mesenteric torsions, and cecal torsions.
9. Septicemia and pyemia – carcasses that are being condemned for septicemia, pyemia, or other inflammatory/infectious conditions.
10. Downers - carcasses of any animal that was non-ambulatory.
11. Animals identified during ante-mortem inspection that were determined to be U.S. Suspect for residues.
12. Carcasses with acute cellulitis or other acute inflammations associated with a fibinous or fibrinosuppurative exudate in any location on the carcass or viscera.

Philip S. Derfler
Deputy Administrator
Office of Policy, Program Development
and Evaluation

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| DISTRIBUTION: Inspection Offices; T/A Inspectors; Plant Mgt; T/A Plant Mgt; TRA; ABB; PRD; Import Offices | NOTICE EXPIRES: 11-01-02 | OPI: OPPDE |
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United States Department of Agriculture
Food Safety and Inspection Service
Washington, DC 20250

Residue Information Center

[Privacy and Security Policy](#)

Welcome

Welcome to the U.S. Department of Agriculture, Food Safety and Inspection Service, Residue Information Center. This site contains the most recent information on residue regulations, notices, policies, laboratory procedures, and other related topics from the [Office of Policy and Program Development](#), the [Office of Public Health and Science](#), and the [Office of Field Operations](#).



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For Further Information Contact:

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Fax: (202)-720-0080
Email: [FSIS Residue](#)

WORKSHOP

1. The pork, beef and dairy Quality Assurance Programs primarily address production practices that:
 - a. Help prevent violative residues in high risk livestock (cull sows, boars, cows, bulls, calves and roaster pigs)
 - b. Help prevent *E. coli* O157:H7 from contaminating livestock
 - c. Uses veterinary practitioners to certify and guarantee livestock are safe for food
 - d. Are required by all slaughter plants before a producer can sell to them

2. Verifiable producer certification programs:
 - a. Guarantee that the animals and eggs are safe
 - b. Are the wave of the future as purchasers require objective audits and other records sufficient to document risk-reduction management practices
 - c. Require a third party audit of records and/or practices
 - d. Promote public health by ensuring chain of custody

3. Multiple hurdle hazard reduction interventions are a key public health tool:
 - a. Because Typhoid Mary had to wash her hands to prevent spread of typhoid to others
 - b. Because human outbreaks from food are caused by direct contact
 - c. Because water treatment, food handling practices and proper disposal of feces reduced human illness and current animal production research is also looking into how similar approaches can apply to reducing *E. coli* O157:H7
 - d. Because a magic bullet will probably be found that will be able to reduce fecal contamination, improve water sanitation and reduce pathogens on meat products