

§ 147.11 Laboratory procedure recommended for the bacteriological examination of salmonella.

(a) *For egg- and meat-type chickens, turkeys, waterfowl, exhibition poultry, and game birds.* All reactors to the pullorum-typhoid tests, up to 25 birds, and birds from *Salmonella enteritidis* (SE) positive environments should be cultured in accordance with both the direct enrichment (paragraph (a)(1)) and selective enrichment (paragraph (a)(2)) procedures described in this section: *Provided*, That in turkeys, if there are more than four reactors to the pullorum-typhoid tests in the flock, a minimum of four reactors as provided for in § 145.14(a)(6)(ii) of this subchapter shall be submitted to the authorized laboratory for bacteriological examination. Careful aseptic technique should be used when collecting all tissue samples.

(1) Direct culture (refer to illustration 1). Grossly normal or diseased liver, heart, pericardial sac, spleen, lung, kidney, peritoneum, gallbladder, oviduct, misshapen ova or testes, inflamed or unabsorbed yolk sac, and other visibly pathological tissues where purulent, necrotic, or proliferative lesions are seen (including cysts, abscesses, hypopyon, and inflamed serosal surfaces) should be sampled for direct culture using either flamed wire loops or sterile swabs. Since some strains may not dependably survive and grow in certain selective media, inoculate non-selective plates (such as blood or nutrient agar) and selective plates (such as MacConkey [MAC] and brilliant green novobiocin [BGN] for pullorum-typhoid and MAC, BGN, and xylose-lysine-tergitol 4 [XLT 4] for SE). After inoculating the plates, pool the swabs from the various organs into a tube of non-selective broth (such as nutrient or brain-heart infusion). Refer to illustration 1 for recommended bacteriological recovery and identification procedures.⁷ Proceed immediately with collection of organs

and tissues for selective enrichment culture.

(2) Selective enrichment culture (refer to illustration 1). Collect and culture organ samples separately from intestinal samples, with intestinal tissues collected last to prevent cross-contamination. Samples from the following organs or sites should be collected for culture in selective enrichment broth:

(i) Heart (apex, pericardial sac, and contents if present);

(ii) Liver (portions exhibiting lesions or, in grossly normal organs, the drained gallbladder and adjacent liver tissues);

(iii) Ovary-Testes (entire inactive ovary or testes, but if ovary is active, include any atypical ova);

(iv) Oviduct (if active, include any debris and dehydrated ova);

(v) Kidneys and spleen; and

(vi) Other visibly pathological sites where purulent, necrotic, or proliferative lesions are seen.

(3) From each bird, aseptically collect 10 to 15 grams of each organ or site listed in paragraph (a)(2) of this section. Mince, grind, or blend and place in a sterile plastic bag. All the organs or sites listed in paragraph (a)(2) of this section from the same bird may be pooled into one bag. Do not pool samples from more than one bird. Add sufficient tetrathionate enrichment broth to give a 1:10 (sample to enrichment) ratio. Follow the procedure outlined in illustration 1 for the isolation and identification of *Salmonella*.

(4) From each bird, aseptically collect 10 to 15 grams of each of the following parts of the digestive tract: Crop wall, duodenum, jejunum (including remnant of yolk sac), both ceca, cecal tonsils, and rectum-cloaca. Mince, grind, or blend tissues and pool them into a sterile plastic bag. Do not pool tissues from different birds into the same sample. Add sufficient tetrathionate enrichment broth to give a 1:10 (sample to enrichment) ratio. Follow the procedure outlined in illustration 1 for the isolation and identification of *Salmonella*.

(5) After selective enrichment, inoculate selective plates (such as MAC and BGN for pullorum-typhoid and MAC, BGN, and XLT 4) for SE. Inoculate

⁷Biochemical identification charts may be obtained from "A Laboratory Manual for the Isolation and Identification of Avian Pathogens," chapter 2, Salmonellosis. Fourth edition, 1998, American Association of Avian Pathologists, Inc., Kennett Square, PA 19348.

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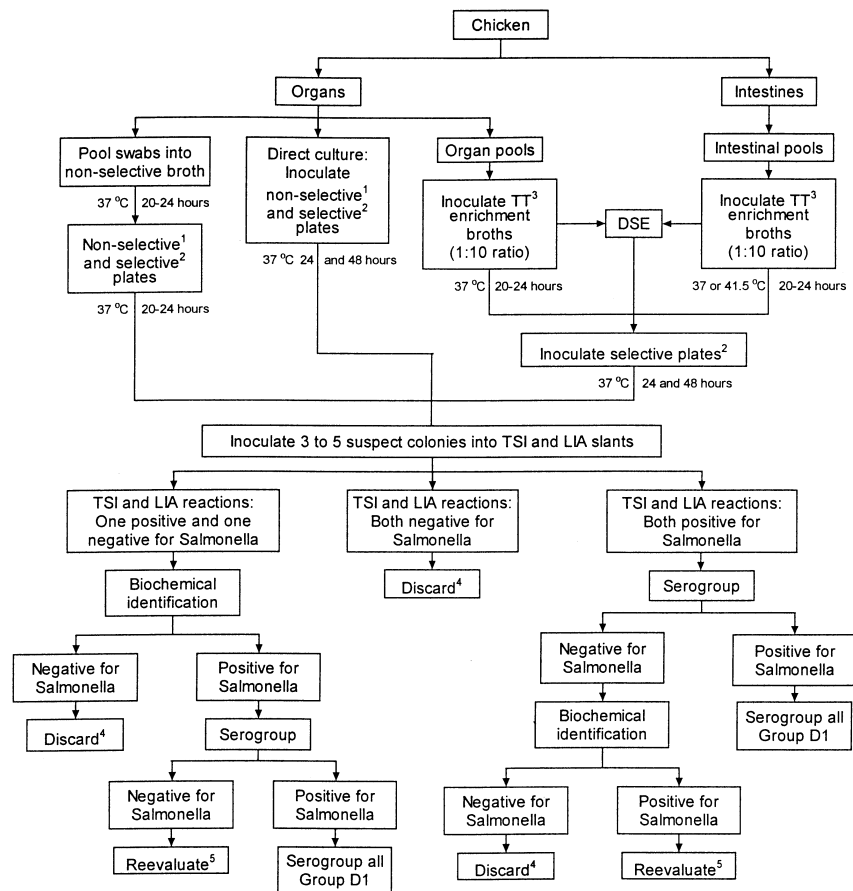
three to five *Salmonella*-suspect colonies from plates into triple sugar iron (TSI) and lysine iron agar (LIA) slants. Screen colonies by serological (*i.e.*, serogroup) and biochemical procedures (e.g., the Analytical Profile Index for Enterobacteriaceae [API]) as shown in illustration 1. As a supplement to screening three to five *Salmonella*-suspect colonies on TSI and LIA slants, a group D colony lift assay may be utilized to signal the presence of hard-to-detect group D *Salmonella* colonies on agar plates.

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(6) If the initial selective enrichment is negative for *Salmonella*, a delayed secondary enrichment (DSE) procedure is used. Leave the tetrathionate-enriched sample at room temperature for 5 to 7 days. Transfer 1 mL of the culture into 10 mL of fresh tetrathionate enrichment broth, incubate at 37 C for 20 to 24 hours, and plate as before.

(7) Serogroup all isolates identified as salmonellae and serotype all serogroup D1 isolates. Phage-type all SE isolates.

Illustration 1.—Procedure for culturing Pullorum-Typhoid reactors and birds from SE-positive environments.



1. Non-selective plates such as blood or nutrient agar.
2. Selective plates such as MacConkey, Brilliant Green Novobiocin (BGN) for pullorum-typhoid reactors and MacConkey, BGN, and xylose-lysine tergitol 4 (XLT 4) for SE.
3. Tetrathionate enrichment broth.
4. Reevaluate if epidemiologic, necropsy, or other information indicates the presence of an unusual strain of *Salmonella*.
5. If biochemical identification and serogroup procedures are inconclusive, restreak original colony onto non-selective plating media to check for purity. Repeat biochemical and serology tests.

(b) [Reserved]

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§ 147.12 Procedures for collection, isolation, and identification of *Salmonella* from environmental samples, cloacal swabs, chick box papers, and meconium samples.

Information concerning the pen arrangement and number of birds per pen should be obtained from the owner so that the required number of samples per pen and per flock can be determined. A means of identifying each sample by pen of origin should be provided. The vehicle transporting the personnel taking the samples should be left as far as practical from the poultry pens. Sanitary precautions, including personal cleanliness, should be observed during the sampling procedure. The hands should be carefully washed with a sanitizing soap prior to the sampling. Outer clothing, including gloves, should be changed between visits to different premises so that clean clothing is worn upon entering each premises.

The used and clean apparel should be kept separate. Boots or footwear should be cleaned and disinfected between visits to different premises. Disposable caps should be provided and discarded after use on each premises. After collection, the samples should be protected from drying, light, and excessive temperatures and delivered to the laboratory within one day. If delivery is delayed, samples should be refrigerated.

(a) *For egg- and meat-type chickens, waterfowl, exhibition poultry, and game birds.* All samples and swabs described in this paragraph should be cultured in accordance with illustration 2 of § 147.11, including delayed secondary enrichment. All salmonellae recovered shall be serogrouped or serotyped.

(1) *Environmental samples.* Fecal material, litter, dust, or floor litter surface or nest box drag swab samples to be submitted for bacteriological exam-

ination shall be collected in accordance with the procedures described in paragraphs (a)(1), (a)(2), or (a)(3) of this section:

(i) *Procedure for sampling in broth.* Authorized laboratories will provide capped tubes 1 to 2 cm in diameter and 15 to 20 cm in length that are two-thirds full of a recently made, refrigerated, sterile enrichment broth for each sample. Sufficient tubes shall be taken to the premises to provide at least one tube per pen or one tube per 500 birds, whichever is greater. At least one sterile, cotton-tipped applicator will be needed for each tube. The dry applicator is first placed in or drawn through fresh manure (under roost, near water troughs, fecal droppings, or diarrhetic droppings). After each streaking, place the cotton-tipped applicator in the tube of broth and swirl the applicator to remove the collected material. Withdraw the applicator from the tube and use it to take additional specimens by streaking on or through areas where defecation, trampling of feces, or settling of dust is common; e.g., on or near waterers, feeders, nests, or rafters, etc. When the volume of material collected equals approximately 10 percent of the volume of the broth (usually 10–12 streakings), place the applicator in the tube and break the stick in half, leaving the lower or cotton-tipped half in the broth and retaining the upper half for future disposal. Replace the cap on the inoculated tube and continue the sampling procedure in other areas of the pen.

(ii) *Procedure for sampling in dry containers.* Place a sample of fecal material, litter, or dust in a sterile, sealable container. The sample shall consist of several specimens of material taken from a representative location in the pen or house. Collect at least 10 g (approximately a heaping tablespoonful) of material for each sample. Collect the specimens in each sample with a sterile tongue depressor or similar uncontaminated instrument. The samples shall vary in type and consistency. Half of the samples shall be comprised of material representing defecated matter from a large portion of the flock; i.e., trampled, caked material near waterers and feeders. The minimum number of samples to be taken