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New Swine Inspection System (NSIS) Implementation Guideline

Developed by Meat Institute and American Meat Science Association

American Meat Science Association

Meat Institute

Nourishing Today
Sustaining Tomorrow

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Introduction

Company implementation of the NSIS program may include a number of steps to communicate, plan, and implement NSIS. This document is intended to provide a guideline into these steps and provide additional material to support a company's planning, training, and implementation efforts.

Overview Of NSIS

On October 1, 2019, the Food Safety Inspection Service (FSIS) published the final rule "Modernization of Swine Slaughter Inspection" (84 FR 52300). The final rule established an optional new inspection system for market hog slaughter establishments, called the NSIS. This new inspection system option is based on FSIS's experiences under the HACCP based Inspections Models Project (HIMP). HIMP was initiated to determine whether applying new Government slaughter inspection procedures, along with new establishment responsibilities, could promote innovation and provide at least the same food safety and consumer protection. After years of experience with HIMP, FSIS determined a new inspection procedure could do just that, resulting in the New Swine Inspection System [NSIS].

Under NSIS, FSIS inspectors will continue to inspect all animals, carcasses, and parts prior to use for human consumption and take regulatory control actions if necessary. If company antemortem and postmortem procedures do not result in correct sortation decisions, Inspection Program Personnel (IPP) may retain carcasses for veterinary disposition, stop the production line, verify restoration of carcasses or parts, and issue non-compliance records. Under NSIS, the FSIS Public Health Veterinarian (PHV) will continue to have the authority to direct the establishment to reduce the line speed or stop the line if the establishment is unable to maintain process control or sorters are not properly conducting sorting activities. Proper preparation, planning and training is important for a company's successful implementation.

Implementation of the NSIS program requires establishments opting into the program to have facility, procedures and programs that USDA- FSIS IPP are instructed to verify per USDA- FSIS Directive 6600.1. The required elements for USDA- FSIS IPP verification include:

- Separate and designated antemortem pens for company 'subject' swine from those pens designated to hold 'US Suspect' swine identified by USDA- FSIS personnel.
- Establishment personnel to sort and remove unfit animals prior to presentation for FSIS antemortem inspection.
- Establishment personnel to identify, mark and/ or remove any condemnable conditions or defects on carcasses and/ or parts prior to presentation for FSIS post-mortem inspection.
- Establishment use of identification systems [unique tag, tattoo, or similar device] for animals, carcasses and/ or parts that have been sorted and removed for disposal before presentation to FSIS for antemortem and postmortem inspection.
- Written procedures as a part of the HACCP System [HACCP, SSOPs, Pre-requisite Program] to ensure that animals, carcasses and/ or parts that have been sorted and removed to discard to not enter the human food supply and are properly disposed of.
- Maintain records to document the total number of animals and carcasses that have been sorted and removed for disposal during antemortem and postmortem sorting and the reasons for removal
- Establishments must immediately notify USDA-FSIS of an animal or carcass that they suspect of a reportable disease or Foreign Animal Disease [FAD]
- Maintain records to demonstrate products resulting from an NSIS slaughter operation meet the definition of Ready-To-Cook [RTC] pork. Definition of RTC products is any slaughtered pork product

sufficiently free from bile, hair, scurf, dirt, hooves, toenails, claws, bruises, edema, scabs, skin lesions, icterus, foreign material, and odor which is suitable for cooking without need of further processing.

- Authorizing establishments to determine their own line speeds based upon their ability to maintain process control. NOTE: USDA- FSIS continues to assess line-speed considerations related to NSIS. Companies should access current rulemaking related to availability of line-speed waivers .

Although the NSIS is targeted for market swine plants, the FSIS District Manager may allow establishments, other than market swine operations, to request a waiver of slaughter regulations in accordance with the Salmonella Initiative Program [SIP].

Preparation Timeline

At the outset of the project, it is useful to create a timeline of the project with delivery stages. Some of these key stages include:

- Initial FSIS communication of NSIS conversion
- Evaluation of facility pre-sorter stations and FSIS inspection station layout
- Written, required pre-requisite programs
- Training programs for antemortem and postmortem sortation
- Safety briefings and equipment training for antemortem and postmortem sortation personnel
- Training implementation with NSIS training experts
- Implementation start dates and station progression of antemortem and postmortem sortation
- Required documentation, data collection and transfer to FSIS and internal partners
- Verification, validation, and assessment plan

Notification And Communication With USDA- FSIS

On October 1, 2019, the Food Safety Inspection Service [FSIS] published the final rule, 'Modernization of Swine Inspection' [84 FR 52300]. Within the Federal Register Notice, an initial notification date was identified in which establishments must notify the FSIS of intent to submit waivers to participate. In the intervening period since publication, the FSIS is still accepting market swine establishments into the NSIS program. However, there are no specific outlined procedures to notify and communicate NSIS implementation. Generally, the establishment notifies FSIS officials of the intent to implement NSIS and gives an intended date of implementation for FSIS to consider. Communication on this point is critical to ensure company and FSIS personnel understand and agree on the implementation plan to prevent disruption of FSIS staffing to the inspected facility. Establishments may begin communication of NSIS interest with the In-Plant Inspection Personnel [IPP] as well as the Front-Line Supervisor [FLS] up to including the District Office team.

All four stations [three postmortem and antemortem] may be implemented at the same target date. The establishment can request staggered implementation through antemortem and the designated pre-sortation post-mortem stations as desired to facilitate training, coordination, and facility modifications. If staggered implementation is desired, discussion of these specific, individual facility needs with FSIS officials may be helpful in managing the implementation timeline and clarifying FSIS inspection staffing needs. Any change of NSIS targeted implementation date must be communicated to the FSIS officials in a timely manner.

Facility Evaluation and Layout

As NSIS planning progresses, evaluation of the facility antemortem, post-mortem company sortation spots and FSIS designated inspection spaces is required. Designated antemortem 'subject' pens identified for further sorting use by company personnel are required to be segregated from designated 'US Suspect' pens [9 CFR 307.2(a), 309.2(m)-(n), and 313.1(c)] to only hold swine identified for PHV disposition. The establishment assessment may include needs for additional pen space depending upon the size, type of animals received, and conditions presented on antemortem pre-sortation.

NSIS requirements for company antemortem sortation stations and pens do not include any certain dimensions or layout restrictions and must include provisions for animal welfare. FSIS inspection requirements persist as written and required in regulation. Neither NSIS nor regulation requires a certain, pre-determined amount of space for a 'subject' or 'US Suspect Pen,' however, expectations to maintain the condition and welfare of market swine are present in regulation and FSIS policy. Establishments seeking to implement NSIS may benefit from reviewing the pen space, temperature, alley access, and water availability in certain situations.

Under NSIS, FSIS does not mandate post-mortem sortation station placement, station size or orientation of company sortation personnel. However, just as is expected under traditional FSIS inspection , USDA-FSIS IPP do have required elements for the post-mortem inspection area, space and access to carcasses, viscera, and heads. As the NSIS implementation is planned, the company must evaluate lighting, rail-out access, water, sterilizers, and knife space needed for sortation. In some cases, this may result in the need to evaluate additional space needs and constraints. It should be noted that NSIS does not require a one-for-one sortation exchange from traditional inspection to the new program. Meaning, if under traditional FSIS inspection, three viscera pan inspectors were necessary for a certain line speed and presentation, that three viscera pan sorters are NOT required. The facility intending to implement the NSIS option can use new methods, innovative line set-ups to perform the necessary function. In fact, pre-sortation activities can be re-allocated, parted into different activities and work in ways different than traditional USDA- FSIS work. Examples of this may be personnel completing knife cuts and parts of sortation at different locations. Key elements of change and innovation should include pre-communication and identification between sub-stations of pre-sortation activities to ensure appropriate sortation and identification to USDA-FSIS. The combination of supporting written pre-requisite programs that detail how and where sortation decisions will be determined and communicated to USDA- FSIS may assist in further communication needs after initial implementation. For example, post-mortem final sortation determination that includes a pre-sortation step of railing out a carcass, head, and viscera for final determination rather than requiring final sortation at chain speed or chain stop would ensure that all involved understand the process approved in the NSIS waiver process.

Written Prequisite Programs

Written procedures as a part of the HACCP System [HACCP, SSOPs, Pre-requisite Program] are required to document and prove that animals, carcasses and/ or parts that have been sorted and removed to discard to not enter the human food supply and are properly disposed of. As these procedures are required as a part of the HACCP System, these written programs must be made available to USDA- FSIS IPP to review and verify. The records that flow from the written programs is also expected to be made available for record-review for USDA- FSIS personnel. As a matter of practice, the chosen program [HACCP, SSOP or pre-requisite] is expected to be cited as supporting justification at the antemortem and postmortem steps within the hazard analysis to support whether the identified hazard[s] are or are not reasonably likely to occur. Failure to implement the cited, required programs may result in USDA- FSIS noncompliance.

These written programs should include antemortem procedures, disposed animal and carcass disposal

and identification, animal, and carcass identification [paper tags, ink identification methods, tattoos, etc.], postmortem sortation procedures, postmortem identification and tagging procedures and documentation of total numbers of animals sorted and identified for removal at antemortem and post-mortem sortation. As FSIS IPP are directed to verify these procedures, the written programs are de facto regulatory documents although the establishment may choose to incorporate in HACCP, SSOP or pre-requisite programs.

Antemortem Sortation

Ante-mortem sorting under NSIS mirrors voluntary segregation, a program some establishments have been conducting for years. Just as in voluntary segregation, under NSIS, a FSIS Public Health Veterinarian (PHV) will continue to have the authority to direct the establishment to reduce the line speed or stop the line if the establishment is unable to maintain process control or sorters are not properly conducting sorting activities. Proper training is important to the sorters' ability to make decisions on animals, carcasses, and parts.

NSIS Antemortem Sortation

Under traditional ante-mortem inspection, FSIS inspectors examine all hogs for visible signs of condemnable diseases or conditions while they are at rest and in motion. FSIS ante-mortem inspectors direct company personnel to set apart animals showing signs of condemnable disease or conditions into separate "suspect" pens for further examination by a USDA- FSIS Public Health Veterinarian [PHV]. A PHV determines whether the animals shall be identified as "condemned" or passed for slaughter. However, many companies already voluntarily segregate animals that show signs of diseases or conditions from healthy animals before ante-mortem inspection. Therefore, FSIS inspectors are able to conduct a more efficient and effective ante-mortem inspection to determine whether each animal is fit for slaughter.

Under NSIS ante-mortem inspection, trained, company personnel sort and remove animals for discard that are unfit for slaughter before they are presented to FSIS for ante-mortem inspection and final USDA-FSIS disposition. Sorters segregate animals that appear to be healthy into "normal" pens and animals that appear to have diseases or abnormal conditions into "subject" pens. This approach is like voluntary segregation under the traditional ante-mortem inspection process. Proper identification of diseases and conditions is critical to protecting public health and maintaining the health of the U.S. swine herd.

Sorting on Premises: How to conduct an effective ante-mortem sorting program

1. Know the behavior of normal healthy hogs.
    a. Being able to recognize normal behaviors and conditions of healthy hogs is important to identify and detect when a hog needs to be removed and identified for discard.
2. Observe normal hogs in motion; look for:
    a. Alertness: Healthy hogs are aware of their surroundings and actively investigate the environment and their pen mates when initially unloaded or placed in pens. During lairage, hogs will be recumbent and resting for much of the time;
    b. Locomotion: Healthy hogs bear weight on all four legs;
    c. Body condition: Healthy hogs are full fleshed, with fat and muscle completely covering the ribs, backbone, and hips.

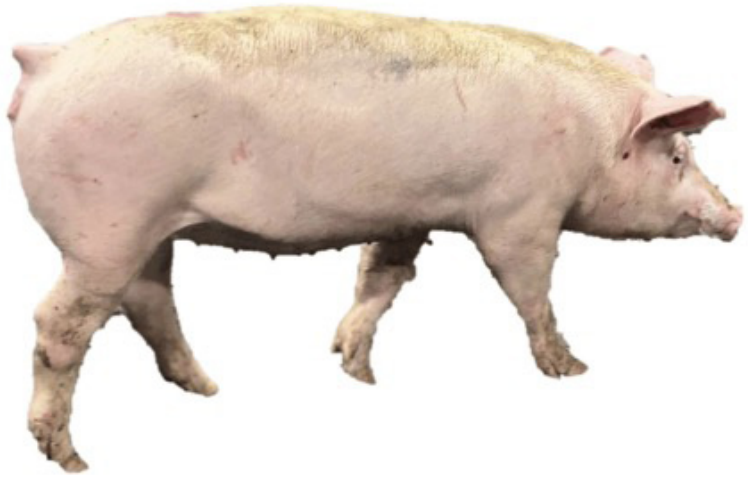
d. Body functions: Healthy hogs pass clear to pale yellow urine and formed yellow to greenish to brown stools, depending upon their diet. Hogs may vomit due to motion sickness from transportation, so occasional vomiting in an otherwise healthy hog should not be cause for concern.

3. Observe normal hogs at rest; look for:
   a. Alertness: Healthy hogs retain awareness of what is going on around them when resting and often vocalize when stimulated;
   b. Respirations: Healthy hogs display regular, rhythmic breathing;
   c. Skin color: Healthy hogs will have a white to pink uniformly colored skin (if not pigmented).

Image 1. Live Swine- Normal, Healthy

Company Sorting Options

1. Allow onto FSIS Inspection: normal, healthy hogs



2. Segregate for Resale: Hogs that are healthy, but do not meet company specifications should be handled according to company policy.
3. Hold for Further Sorting and/or FSIS Inspection: abnormal hogs that may be healthy enough for slaughter. Must be segregated away from normal hogs for evaluation by a lead sorter and inspection by the FSIS PHV.
4. Discard: unhealthy, injured, or unfit hogs. Must be humanely euthanized in a timely fashion and disposed of according to company policy.

Critical Ante-mortem conditions requiring removal and discard or identification for discard

If animals with the following conditions are not properly sorted out before FSIS ante-mortem inspection, FSIS has the authority to issue a non-compliance record.

1. Dead;

2. Moribund: Animals in the act of dying. Look for inactivity, abnormal skin color (blotchy or blue discolorations), irregular (gasping) respirations, frothy mouth and/or nasal discharge, pigs that are unable to rise and walk;
3. Central nervous system diseases: Look for seizures, convulsions, abnormal manner of walking (circling, loss of balance), abnormally excited or aggressive behavior, abnormal sexual behavior (constantly mounting and riding other animals);
4. Pyrexia: Hogs are defined as pyrexic when their body temperature is 106.0°F or higher. Look for loss of activity and awareness, reddish or bluish skin discoloration in white to pink hogs, increased respirations, difficulty breathing, reluctance to get up from a recumbent position, and/ or lameness.

Other Ante-mortem conditions requiring further evaluation by company sorters and/ or USDA- FSIS Inspection Program Personnel

1. Fatigued or non-ambulatory hogs: Fatigued hogs appear normal at first, but tire easily and usually become recumbent. Some fatigued hogs suffer from muscle cramps and will vocalize and shake until they lay down. If allowed to rest, fatigued hogs that recover are eligible for slaughter.
2. Overheated hogs: Hogs do not control their body temperatures well during warm weather and may overheat during inclement weather. Look for rapid, panting respirations, reddish skin discoloration, and lack of activity. If allowed to rest, overheated hogs that recover are eligible for slaughter.
3. Hogs of uncertain status at the time of initial sorting: If sorters are unsure about the health status of a hog or its eligibility for slaughter they should place the hog in a pen for further sorting by a lead sorter, and final inspection by FSIS if it is not designated for discard by the lead sorter. Conditions include abnormal body swellings, lameness, skin discolorations, scabs, wounds, coughing, sneezing, and abnormal body discharges (bloody urine, diarrhea, vaginal discharges, significant vomiting).

Ante-mortem conditions for holding hogs in a pen designated for re-inspection, further sorting by the lead sorter and final inspection by the USDA- FSIS.

This section provides guidance relative to the most common abnormal conditions seen in hogs that require sorting or discard depending on the nature, degree, or extent of the condition.

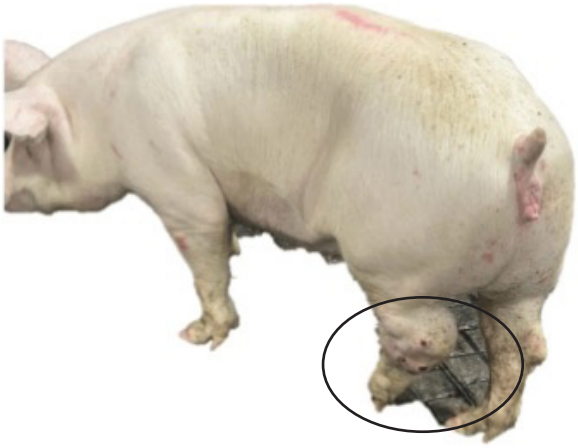
Arthritis

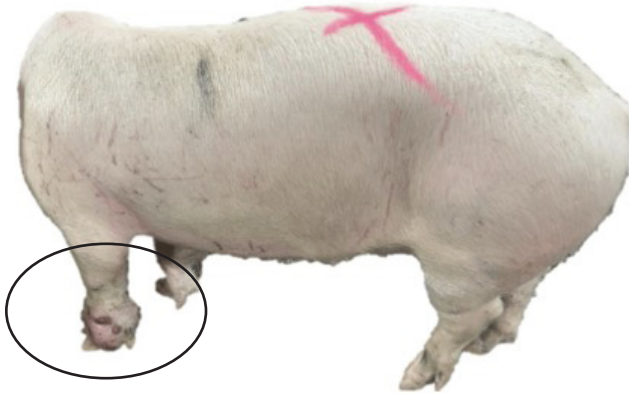
Signs:

1. Enlargement of one or more joints of the leg(s);
2. Abnormal stance and movement;
3. Reluctance to move or stand;
4. Poor wasting condition;

Images 2 and 3. Abnormal Live Swine- Arthritis

Sorters are to identify animals with severe arthritis that impedes the hog's ability to walk for discard or if





the hog can be safely moved it may be segregated in a designated pen and held for inspection.

Acute Erysipelas

Signs:

1. Fever;
2. Reluctant to move, non-ambulatory;
3. Swollen joints;
4. Sudden death;
5. Multiple areas of purple raised, red diamond skin.

Images 4 and 5. Live Swine- Erysipelas

Sorters are to identify animals with signs of fever and acute erysipelas for discard. Hogs with less severe \signs suggesting a localized condition can be moved to the designated pen held for inspection.

Abscess, Hernia, Prolapse, or Injury

1. Inactive, sluggish;
2. External wounds on or near:
    a. Scirrhous cord;
    b. Umbilical/midline/belly abscess, tail-bite lesions, or infected open wounds;
3. Swollen joints;
4. Rectal prolapses, protrusions from the anus, are the most common;
5. Abscesses, may be evident in various parts of the animals.

Images 6 and 7. Abnormal Live Swine- Abscess

Images 8 and 9. Live Swine-Hernia

Images 10 and 11. Abnormal Live Swine- Prolapse

Sorters are to identify animals with severe abscesses, hernias, prolapses, or injuries for discard or if the hog can be safely moved it may be segregated in a designated pen and held for inspection.

Foreign Animal Diseases

Foreign animal diseases (FADs) can have a significant impact on the entire livestock industry. These diseases are believed to have never been or no longer are seen in the U.S. It is important for FADs to be identified immediately, so the disease can be controlled, and measures can be taken, as needed, to prevent the spread. FSIS must be notified immediately if hogs show signs of a FAD. Conditions associated with FADs and other reportable conditions include:

1. Sudden, unexplained death loss in many hogs that were previously observed as healthy;
2. Sudden, unexplained fever in many hogs;
3. Sudden, unexplained severe lameness in many hogs;
4. Vesicles (blister-like structures) or ruptured vesicles on the nose and/or in between the toes;
5. Large numbers of hogs with diarrhea;
6. Signs of central nervous system disease;
7. Maggot infestations;
8. Redness of the ears, belly, and legs;
9. Purple spots on the skin, indicating bleeding.

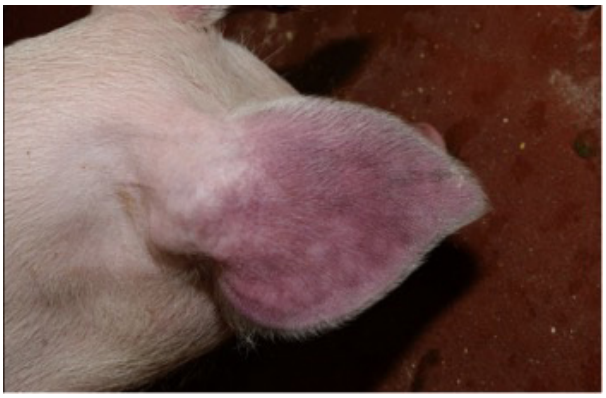
Image 12. Abnormal Live Swine- Pigs Huddled with Signs of Fever

Pigs huddled together demonstrating signs of fever. The animal in the foreground has cyanotic ears and conjunctivitis.

Image 13. Abnormal Live Swine- Difficulty Standing

Pig demonstrating signs of ataxia with stumbling and difficulty standing.

Image 14. Petechial Hemorrhage and Cyanosis of the Ear



This pig is showing petechial hemorrhage and cyanosis of the ear.

Images 15 and 16. Abnormal Live Swine- Petechial Hemorrhage and Ulceration of Skin

Hemorrhage, ulceration and lesions on the skin around legs and joints are potential FAD signs.

Images 17 and 18. Abnormal Live Swine- Bloody Stools and/ or Loose Stools

Image 19. Abnormal Live Swine- Vesicles on the Snout, Feet or Inside the Mouth

Sorters are to identify animals with signs of FADs and immediately notify management, who will notify FSIS. Further instructions will be provided to the establishment on whether hogs showing signs of FADs are eligible for slaughter. FAD determination is a combination of signs and conditions identified during antemortem and postmortem. Further information and guidance material on FAD can be found through USDA- APHIS and through industry guidance documents .

Antemortem record keeping required by NSIS

Documentation of antemortem sortation is a regulatory requirement. Correlation with IPP in preparation for NSIS is recommended. During this correlation, review of the current USDA- FSIS documentation, nomenclature and reasons for sortation is especially helpful prior to implementation. NOTE: In some cases, animals are deemed not fit for the particular type of slaughter operation and subsequently shipped to a secondary location. It is crucial to delineate 'company discard' vs USDA 'condemned' in documentation. In some instances [suspect FAD], USDA- FSIS will request the producer's name [s], producer origin and potential future shipments from the same location. Information directing FAD required information is available .

1. Sorters must document activities to include the lot number or other identification for hogs sorted, the reason for sorting, and the sorting option utilized.
2. Sorters must follow company policy for documentation of sorting.

Post Mortem Sortation

The general methods sorters will use to detect diseases, abnormalities, and contamination will involve the senses, including:

1. Sight – observing a sign such as an abscess, tumor, or discoloration
2. Feel – palpating or feeling an abnormal lump in tissues, feeling abnormal firmness in viscera
3. Smell – smelling the urine odor of uremia, smelling the contents of a broken abscess
4. Hearing – listening to a carcass fall off the line on to the floor

The initial post-mortem pre-sorting process is broken up into three main stations:

- Head sorting
- Viscera sorting
- Carcass sorting

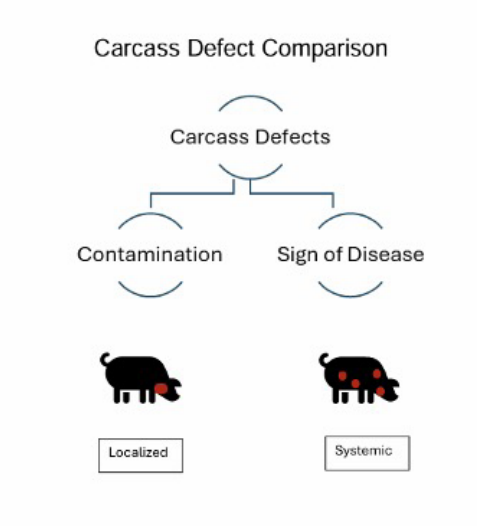
If certain diseases or conditions are identified at one or more of the sorting points the entire carcass set must be segregated for additional final sortation/ determination and/ or FSIS PHV disposition. This last step is key in identifying certain conditions and diseases, and ensuring the proper action is taken. No step in the sorting process may be omitted.

NOTE: The NSIS process encourages innovation by establishments in the antemortem and postmortem sortation process. Although the USDA- FSIS post-mortem process may be used as a traditional model. For example, the NSIS program does not required certain layout requirements for company sortation stations or sortation stages. Companies are encouraged to delineate the specific sortation processes within the NSIS application process to ensure the USDA- FSIS compliance and verification process is understood.

As a basic rule, if the disease or condition of the head, viscera, or carcass only affects a small area, this is referred to as 'localized' and it is possible to trim and discard the affected tissues, although a few exceptions will be covered at a later point. If the disease or condition affects a large area or multiple

areas and affects the majority of the head, viscera, or carcass, this is referred to as 'systemic' and it is necessary to mark or otherwise identify it to retain the entire carcass set for final sorting and/ or FSIS PHV disposition.

Figure 1. Localized vs Systemic



The post-mortem sortation process builds in a logical progression that begins with a pre-sortation activity at each of the three stations including heads, viscera, and carcass. At the pre-sortation step, the general evaluation is determining normal vs not normal. The progression builds from evaluation of normal vs not-normal to identification and segregation of 'not-normal' conditions to a final sortation step to determine next steps in disposition. In some cases, the disease or condition is presenting very clearly, and the pre-sorters can confidently identify and segregate the carcass set or a part of the set for disposition. In other cases, additional evaluation is required up to and including USDA- FSIS correlation. In all cases, the final carcass set presentation to USDA- FSIS inspection is expected to present carcass sets to USDA- FSIS inspectors that meet the regulatory requirements to be considered USDA Accepted and Passed.

To build upon understanding of the process, this guideline will work through the process stepwise and build into more detailed considerations. Additional training materials that include specific steps necessary to the process is included in this guideline as an example. Companies can use the materials to adapt and build upon for specific processes.

Post-Mortem Sorting Options

1. Allow on to FSIS Inspection: normal, healthy carcasses, heads, viscera, and carcass sets.
2. Hold for Final Sorting and Determination: abnormal carcass sets for further evaluation of localized, systemic conditions. The determination to hold a carcass set for further final sorting and/ or FSIs inspection can be made at a sorting station because of the condition of the carcass, head, viscera, or any combination.
    a. Carcass sets [carcass, viscera, and head] designated for additional review must be identified held and segregated off the evisceration line for further determination by a lead sorter and/ or disposition by the FSIS PHV.
    b. Establishments may elect to further sort abnormal carcass sets or submit abnormal carcass sets to the FSIS PHV for disposition. NOTE: Final sorting determinations may be taken at any

stage in the company's process. Correlation with the FSIS PHV on certain conditions can be used to update and refine the sortation process.

3. Conditions identified as 'localized' may be marked otherwise identified for trimming.
4. Conditions that are observed as 'systemic' must be marked or otherwise identified for discard. These 'systemic' conditions indicate an unhealthy, diseased, or otherwise unfit carcass. It is critical that in either case the corresponding head, viscera and carcass must be identified, held, and dispositioned.

Maintaining Identity Of Carcasses And Parts

Follow company policy to maintain the identity of a carcass and the associated head and viscera. This identity must be maintained until final inspection by FSIS. Company programs must demonstrate the ability to retrieve the entire carcass set [carcass, viscera, and head] if any part of the set is retained either at the final rail or any time before final inspection by FSIS.

Carcasses and Parts Intended for Discard

Sorters must mark or otherwise identify carcasses, heads, viscera, or affected portions for discard before FSIS inspection. Each NSIS pre-requisite program must have a documented identification, tagging and discard procedure sufficient to maintain identity, conditions, and control throughout the discard process.

Preparation and Proper Presentation of Carcasses and Parts

Prior to sorting, carcasses should be trimmed so that the surface is visible. Defects and contamination such as feces, ingesta, or milk and dressing defects such as hair, minor bruises, and rail dust, if the trimming does not affect sorting of the carcass or part, should be removed. Examples of defects that should not be removed or discarded because it might impede sorting include hair in the same area as an abnormal skin condition where removing the hair would remove the skin condition or a head with extensive contamination from an abscess before the carcass has been inspected by FSIS at final rail. Signs of disease or abnormal conditions must be preserved for sorting and FSIS PHV disposition, when necessary.

Sortation Stations

In general, three traditional sortation stations are common: head, viscera, and carcass. Throughout the NSIS preparation process, the facility layout and evaluation of needed facilities, safety and sanitary conditions should be evaluated. Under NSIS, it is possible to implement the program in a non-traditional company sortation setting, however, presentation of the head, viscera and carcass to FSIS must be discussed and verified for the mandatory regulatory post-mortem inspection.

Images 20, 21 and 22. Head, Viscera, and Carcass Stations



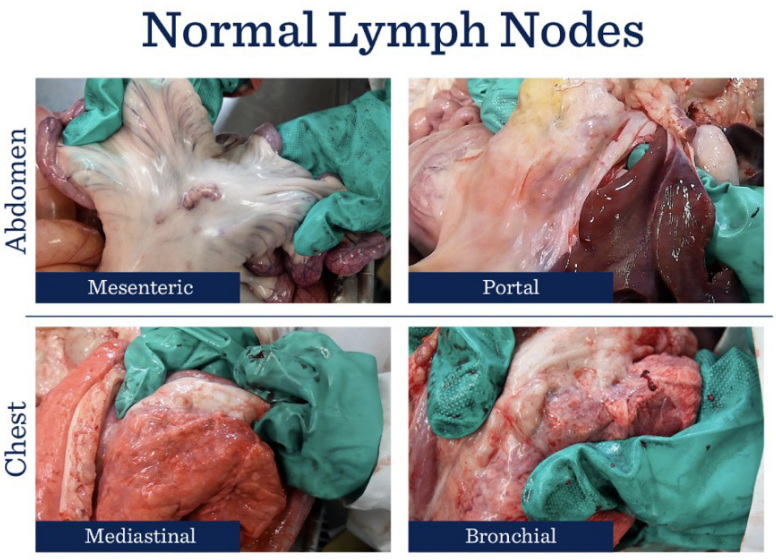
Head	Viscera	Carcass
Outer Surfaces	Eviscerated carcass	Outer surfaces or back
Cut Surfaces	Chest Cavity	Cut surfaces or front/ inside
Lymph nodes [incise]	Hearts	+/- Kidneys [palpate]
Carcass [when required]	Lungs	
	Lymph Nodes [+/- palpate]	
	Spleen	
	Liver	
	Intestines	
	+/- Kidneys [palpate]	
	Non-gravid uteri & ovaries when saved	

Basic Post Harvest Sorting

Lymph Node Considerations

In general, the lymph system plays a crucial role in the immune system of swine. As a result, swine with acute or chronic disease exposure may result in signs of abnormality in the lymph node. As lymph node evaluation is a central feature throughout sortation, specific examples are provided below. Evaluation of lymph nodes is a central feature to post-mortem sortation at all three stations.

Images 23,24,25 and 26. Normal Lymph Nodes



Signs of disease/ illness abnormalities include changes in color [red, blue, or purple], changes in size, shape or density, loss of normal structure and/ or changes in appearance or texture.

Examples of abnormal lymph nodes are shown below.

Image 27. Abnormal Lymph Node Color

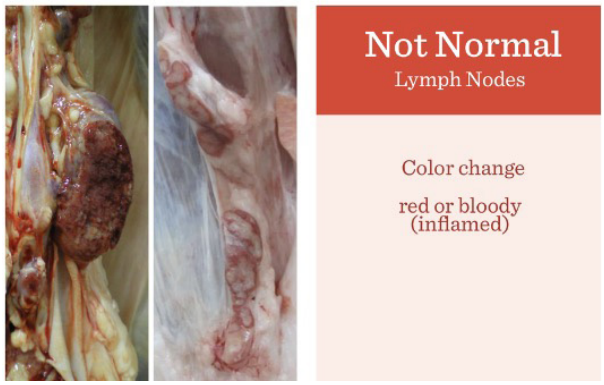


Image 28. Abnormal Lymph Node Foreign Animal Disease

Image 29. Abnormal Lymph Node Size, Shape and/ or Density

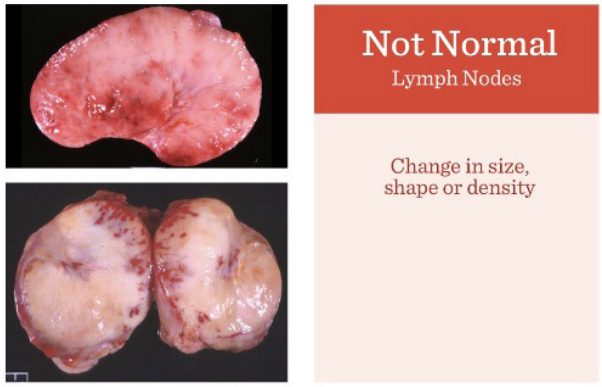
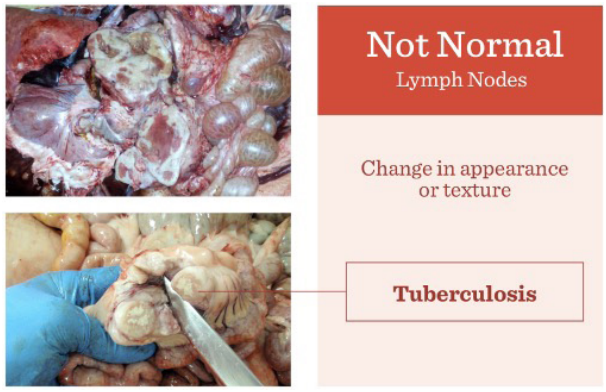
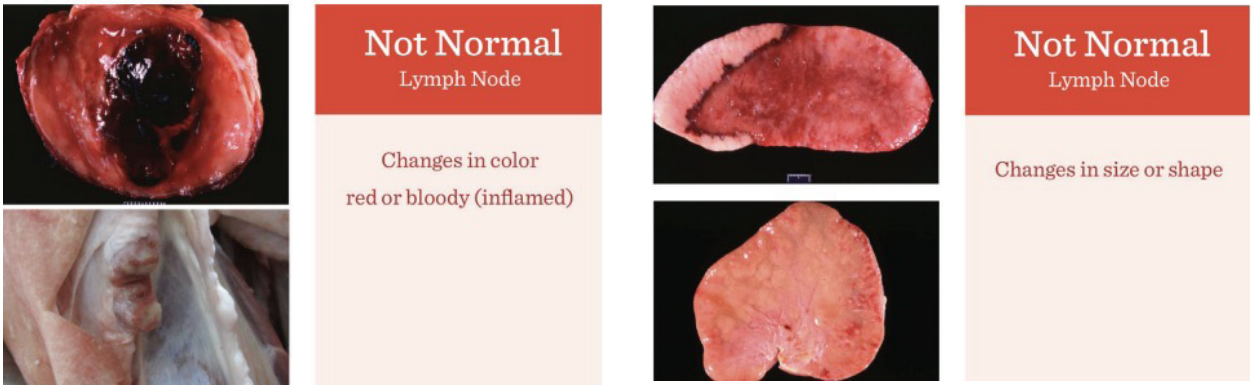


Image 30. Abnormal Lymph Node Texture and Appearance



Images 31 and 32. Abnormal Lymph Node- Changes in Color, Size and Shape



Images 33 and 34. Abnormal Lymph Node- Changes in Density and Texture

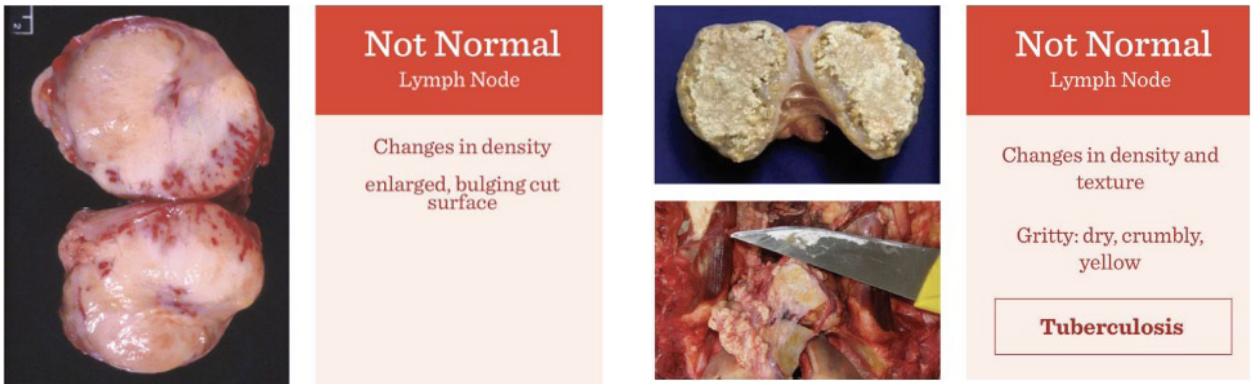
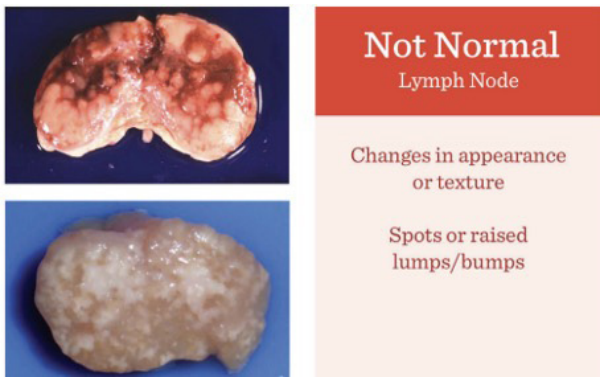


Image 35. Abnormal Lymph Node- Changes in Appearance



Head Sortation Method at Post-Mortem

Identification, evaluation, and sortation at the head station includes knife work and visual evaluation of outer and inner surface tissues and lymph nodes. While layout of individual plants may vary, pictures included are intended as a starting point to evaluate how the process may be structured. As mentioned earlier, it is possible to further sub-divide sortation activities to facilitate the layout and space availability.

Images 36 and 37. Head [Front and Back]


Head sorting includes the following steps:

1. Observe head and cut surfaces – the eyes, fat, cheek muscles, and other tissues for abnormalities.
2. Incise and observe the right and left mandibular lymph nodes. To incise, make a cut through the lymph node deep enough to expose the inside for observation.

Note: Establishments operating under a FSIS approved discretionary program to assess whether to incise lymph nodes on a lot-by-lot basis may not incise lymph nodes. This FSIS approved discretionary program should be kept on-site and must be followed as written and approved.

In addition to observing abnormal conditions in heads, sorters need to identify improper presentation. Contamination and poor presentation can affect a sorter's ability to properly identify signs and conditions. Examples include:

1. If the head is missing, company sorting and FSIS inspection cannot be done. Notify the area supervisor or follow your company's procedure for missing heads.
2. If the head was separated in the wrong place, the mandibular lymph nodes are not on the head but may be on the carcass. Notify the area supervisor immediately. Mandibular lymph nodes must be incised to conduct head sorting activities.
3. Ear tags should be removed prior to sorting. Mark or otherwise identify them for removal. If there are multiple heads with ear tags, notify the area supervisor.

Head Abnormalities and Signs

Below is a list of common abnormalities and signs of disease or conditions found through observation of the head. Review the Glossary of Diseases and Conditions to assess abnormalities or signs and determine the appropriate sorting option.

1. Feces or ingesta
2. Abscess
3. Cuts, bruises, injuries, bug bites

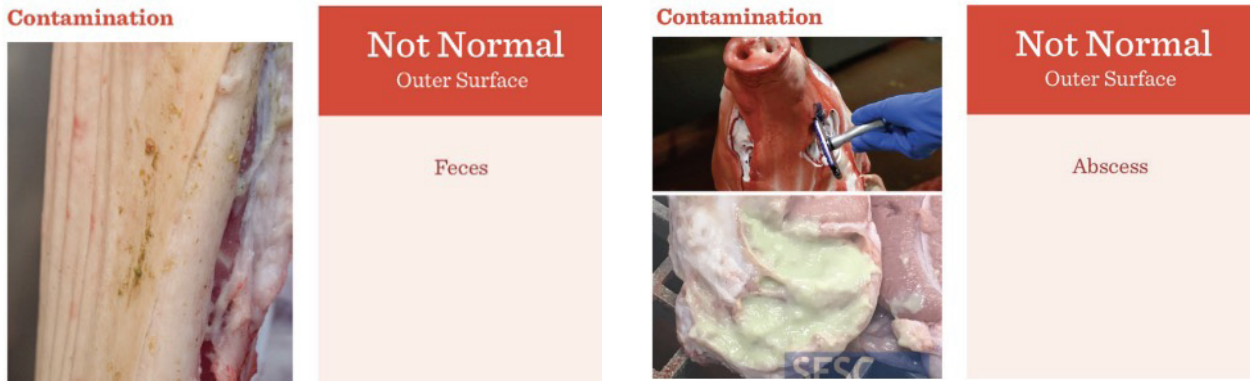
4. Swollen, enlarged, bloody or discolored [red/ blue/ purple] lymph nodes; Changes in Shape, Size, Density, Texture and Structure are examples of 'not normal' and indicate further assessment is needed.
5. Discolored fat, muscle, white area or the eye, or other tissues
6. Cysts, tumors, granulomas, or lesions
7. Blood spots in skin, fat, muscle, or lymph nodes

The sortation process begins with ability to identify 'normal' and 'abnormal' conditions. The pictures provided below are a sample of normal and 'not normal' conditions associated with the head.

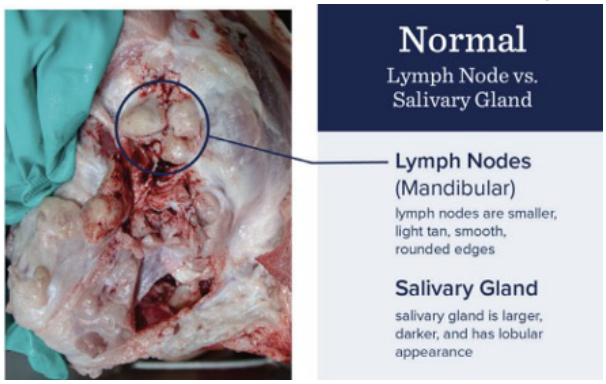
Image 38. Normal View of Bottom/ Jowl Side Outer Surfaces

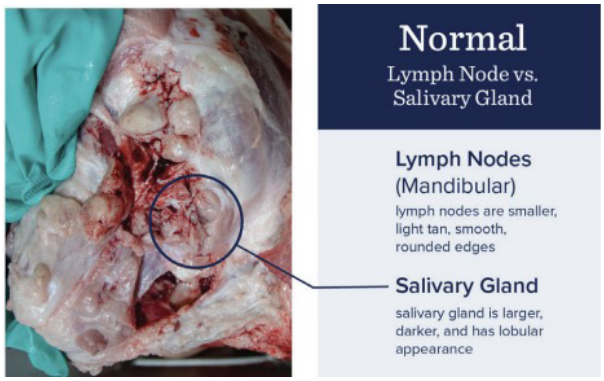
Images 39 and 40. Abnormal Bottom/ Jowl Side- Feed, Ingesta and Grease/ Oil

Images 41 and 42. Abnormal Bottom/ Jowl Side- Feces and Abscess

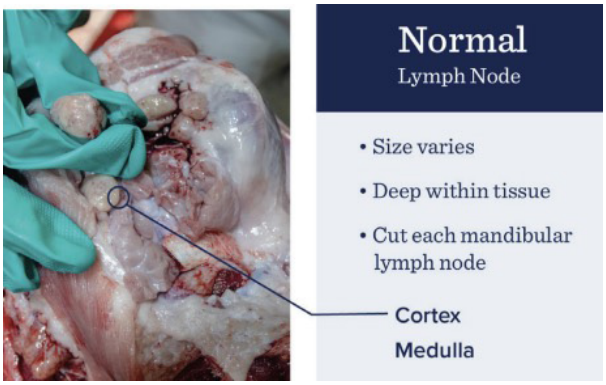


Images 43 and 44. Normal Bottom/ Jowl View of Lymph Nodes and Salivary Gland





Images 45 and 46. Normal View of Mandibular Lymph Node



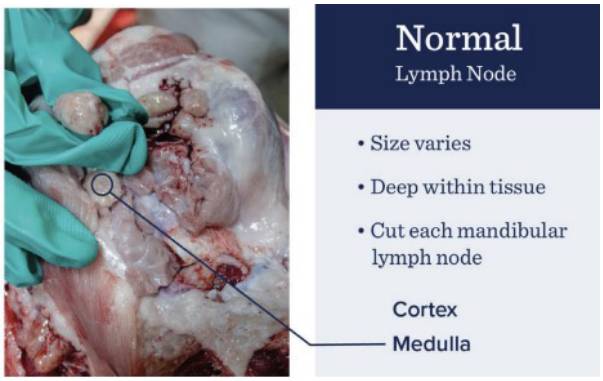


Image 47. Normal View of Top of Head

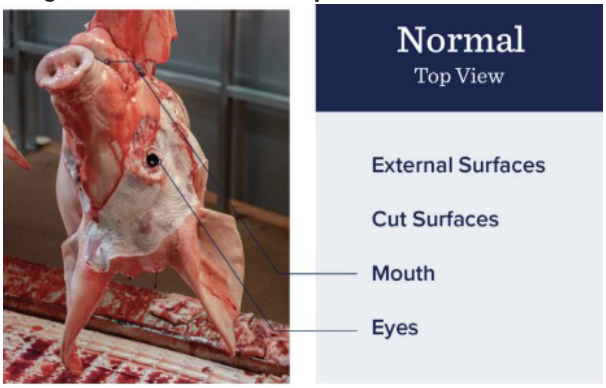
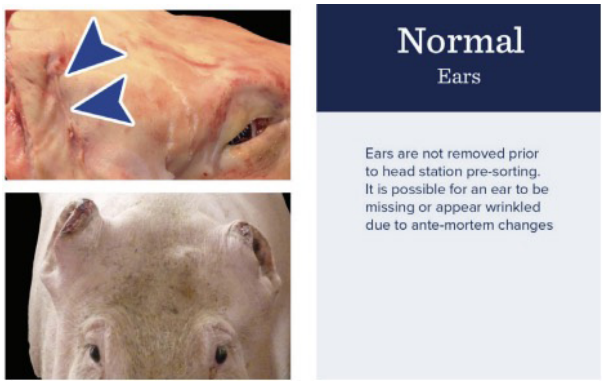
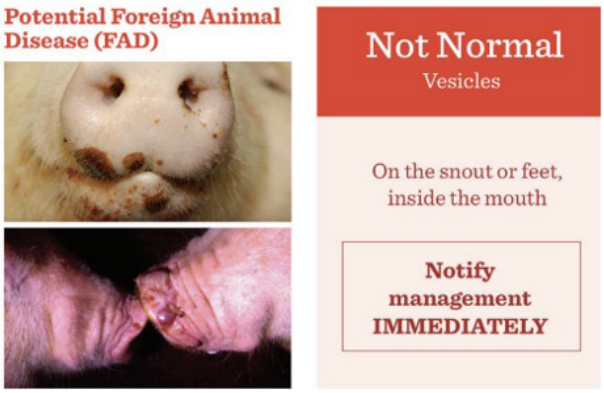


Image 48. Normal View of Ears



Images 49 and 50. Abnormal Top of Head- Feed, Ingesta and Hair

Image 51. Abnormal Top of Head [Snout] Vesicles



Viscera Sorting Method

The viscera set includes the internal organs of the thoracic and abdominal cavities. Viscera sorters must be able to determine the associated carcass and view the carcass with the viscera.

Viscera sorting includes the following steps:

1. Observe the eviscerated carcass, viscera, and the top surface of spleen.
2. Observe and palpate mesenteric lymph nodes.
3. Palpate portal lymph nodes.
4. Observe the curved surface of lungs.
5. Palpate bronchial lymph nodes, right and left.
6. Observe mediastinal lymph nodes.
7. Turn lungs over and observe the flat surfaces.
8. Observe the heart.
9. Observe the curved surface of liver.
10. Turn the liver over and observe the flat surface.

    Note: Establishments operating under a FSIS approved discretionary program to assess whether to palpate viscera on a lot-by-lot basis may not include viscera palpation. The FSIS approved discretionary program should be available on-site and must be followed.

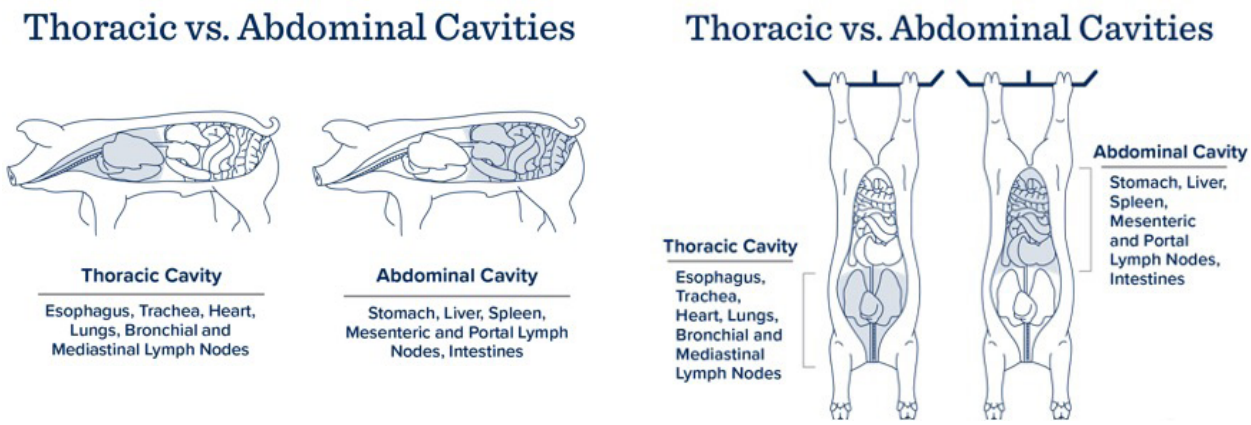
As in head sorting, there are various forms of improper presentation that sorters need to identify. Contamination and poor presentation can affect a sorter's ability to properly identify signs and conditions. Examples include:

1. Gross contamination with feces or ingesta that obstruct sorting evaluation is one of the most common presentation issues. Other contamination such as hair, toenails, pus, or bile may also lend towards unacceptable conditions. If the viscera are highly contaminated, mark or otherwise identify for reconditioning or discard. If severe or mild presentation issues are repetitive, notify the area supervisor or designee according to company policy.
2. If part of the viscera is missing notify the area supervisor immediately. All parts of the viscera must be present for sorting.

Images 52 and 53. Viscera Set Anatomy View from Viscera Pans

Viscera sets are derived from the thoracic and abdominal cavities. The thoracic cavity viscera sorting observations include the esophagus, trachea, heart, lungs, bronchial and mediastinal lymph nodes. The abdominal cavity viscera sorting observations include the stomach, liver, spleen, intestine, and mesenteric and portal lymph nodes.

Figures 2 and 3. Thoracic vs Abdominal Cavities [Lateral View and Hanging Carcass]



Viscera Abnormalities and Conditions

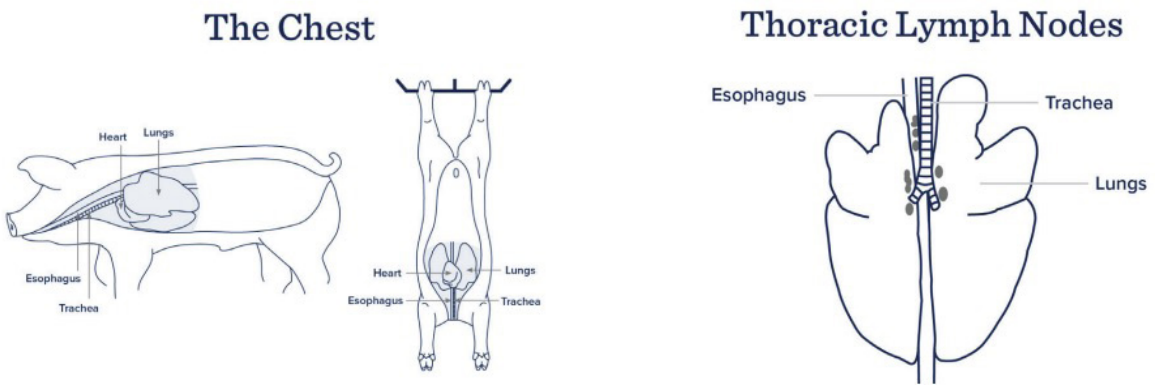
Below is a list of common abnormalities and signs of disease or conditions found through observation of the viscera. Review the Glossary of Diseases and Conditions to assess abnormalities or signs and determine the appropriate sorting option.

1. Abscesses
2. Swollen, enlarged, or discolored [red, blue, or purple] lymph nodes
3. Swollen, discolored, enlarged, or otherwise abnormal organ or tissue structures, including gritty, stringy, or abnormally thick material
4. Cysts, tumors, granulomas, or lesions
5. Missing or discolored fat tissues
6. Blood spots in organs or lymph nodes
7. Adhesions from organs to thoracic or abdominal walls
8. Fluid in the thoracic or abdominal cavity
9. Parasites
10. Odors

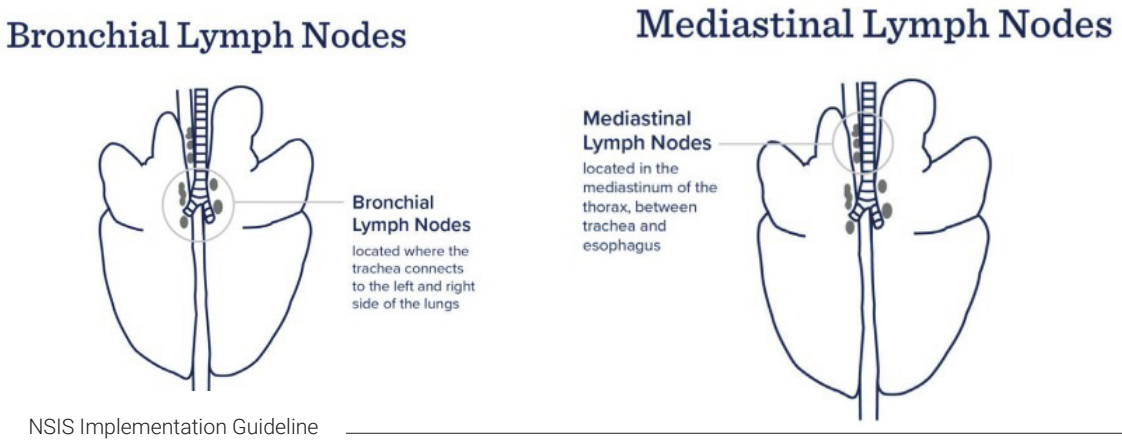
The sortation process begins with ability to identify 'normal' and 'abnormal' conditions. The pictures provided below provide an overview of normal vs abnormal conditions associated with the viscera.

Thoracic Cavity Viscera

Figures 4 and 5. Thoracic Anatomy Sketches



Figures 6 and 7. Bronchial and Mediastinal Lymph Node Anatomical View



The Thoracic cavity viscera consist of the heart, lungs, esophagus, trachea and associated thoracic lymph nodes. Additional detail is available within the supplemental training examples as a part of this Guideline.

Images 54 and 55. View of Normal Mediastinal and Bronchial Lymph Nodes

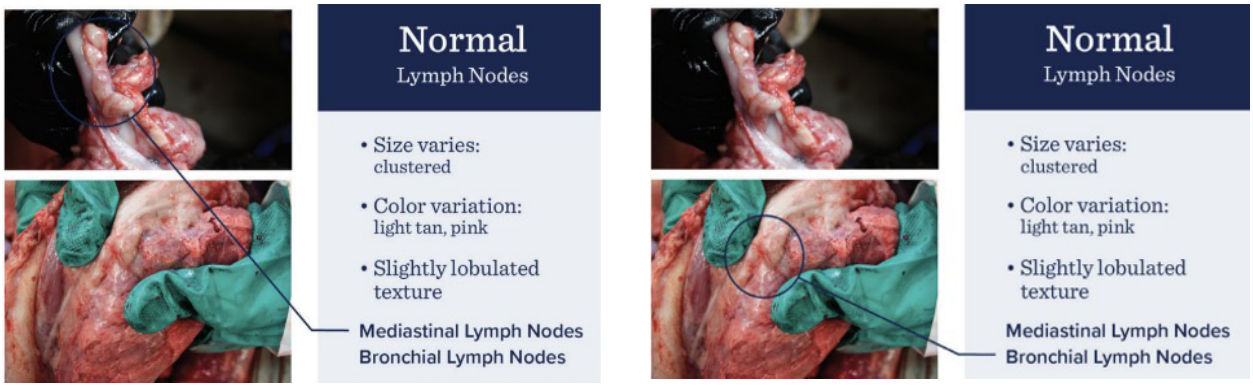


Image 56. View of Normal Esophagus and Trachea in Viscera Pans

Image 57. View of Normal Lung in Viscera Pans

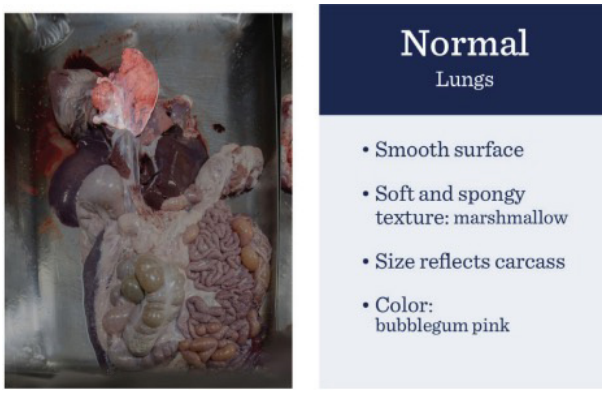
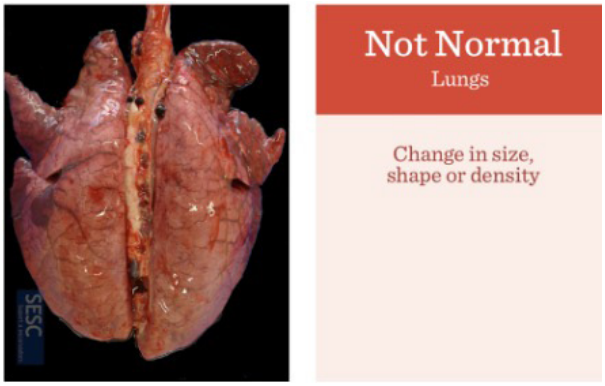
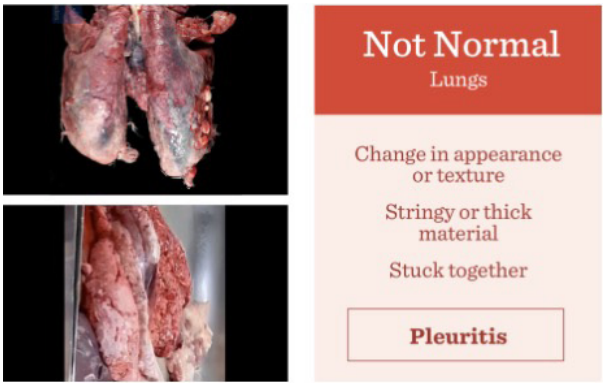


Image 58. Abnormal Lung Color

Image 59. Abnormal Lung Size, Shape or Density



Images 60 and 61. Abnormal Lung Appearance and Texture



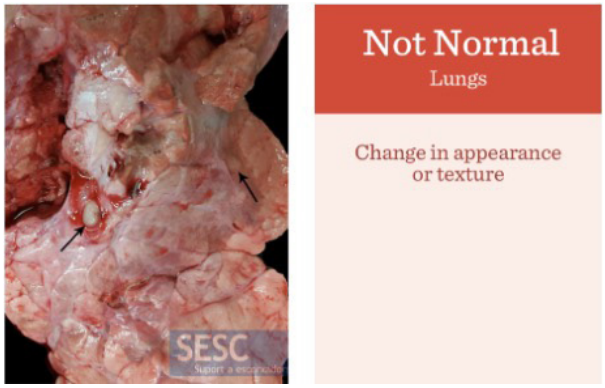


Image 62. View of Normal Heart in Viscera Pans

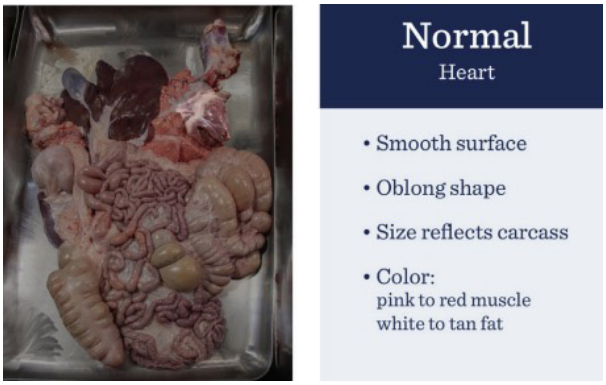


Image 63. Abnormal Heart Fat

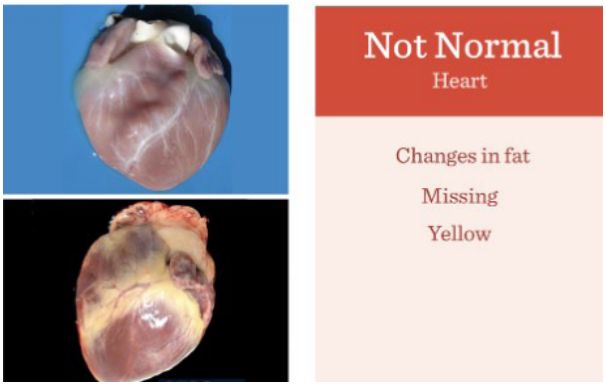


Image 64. Abnormal Heart Color Changes

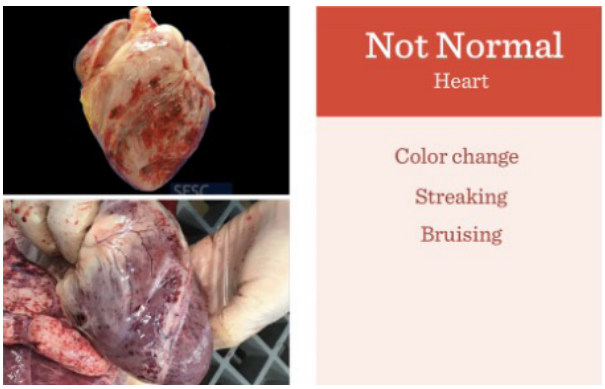
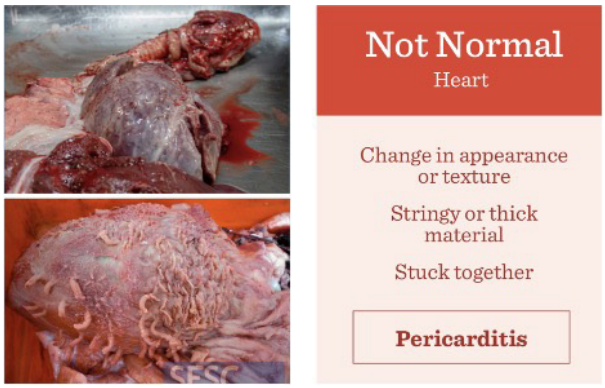


Image 65. Abnormal Heart Texture [Stringy and Thick material]



Abdominal Viscera

Figure 8. The Abdomen [Lateral and Cavity View]

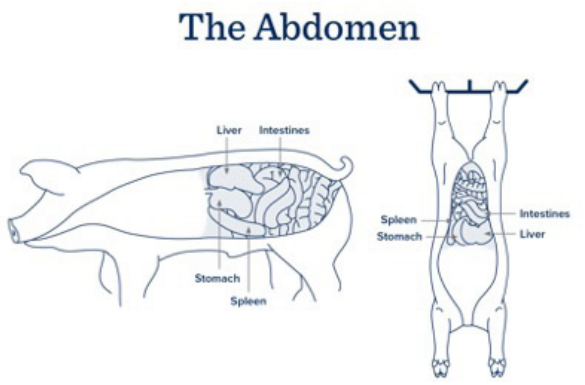
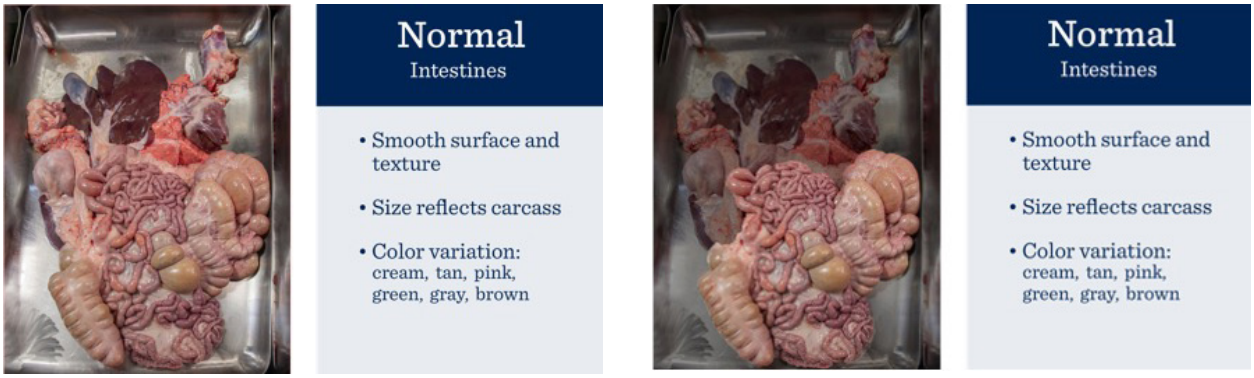


Image 66. Normal Abdominal Viscera View from Viscera Pans

Images 67 and 68. Normal View of Intestines



Images 69 and 70. Abnormal View of Intestines- Change in Color and Texture

Not Normal
Intestines

Color change
Red
Purple
Bruising
Black

Not Normal
Intestines

Change in texture
Stuck together
Gritty surface
Yellow stringy material

Peritonitis

Images 71 and 72. Abnormal View of Intestines- Change in Structures and Texture

Not Normal
Intestines

Lumps/bumps
Masses

Not Normal
Intestines

Change in texture
Stuck together
Gritty surface
Yellow stringy material

Peritonitis

Image 73. Normal View of The Bung

Image 74. Normal Mesenteric Lymph Nodes

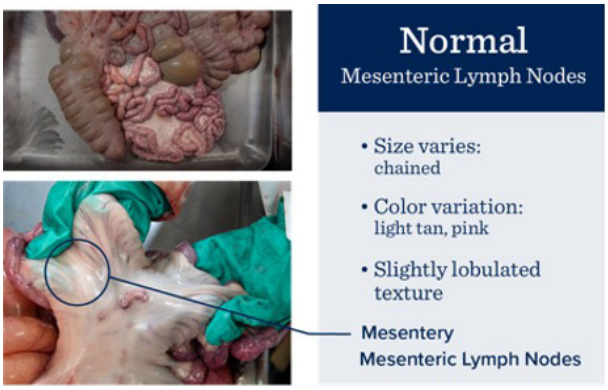


Image 75. Normal View of Spleen

Image 76 and 77. Abnormal View of Spleen- Change in Color, Appearance or Texture

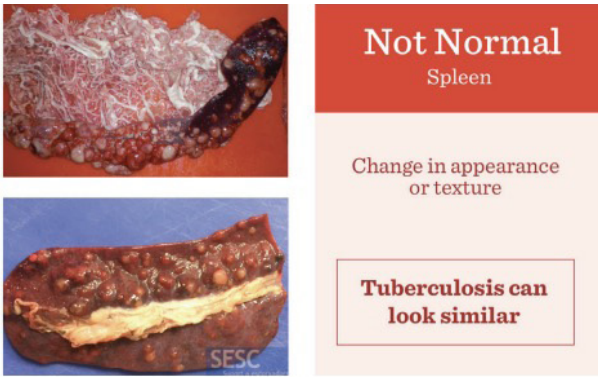
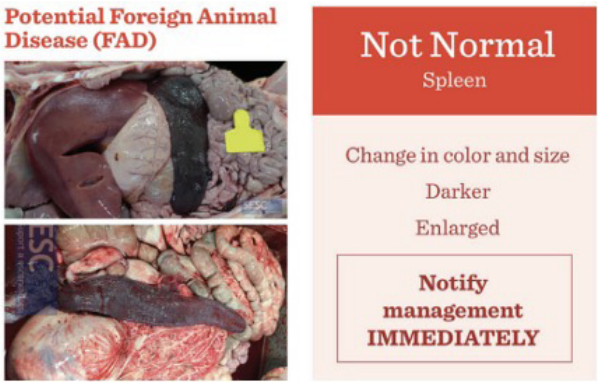


Image 78. Abnormal View of Spleen- Potential Foreign Animal Disease

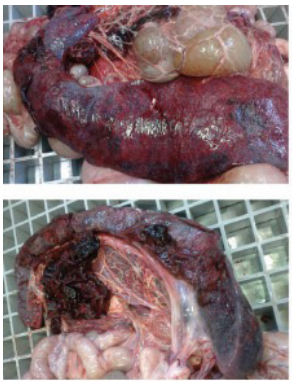


Images 79 and 80. Abnormal View of Speen- Splenic Torsion

Not Normal
Spleen

Splenic Torsion

Change in shape or density

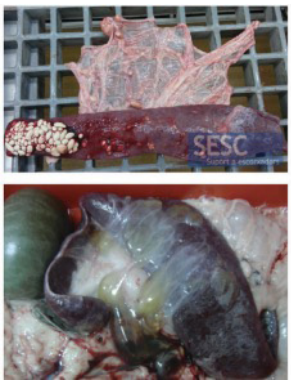


Not Normal
Spleen

Splenic Torsion

Change in shape or density

Image 81. Abnormal View- Change in Appearance



Not Normal
Spleen

Change in appearance or texture

Measly pork or Cysticercosis can look similar

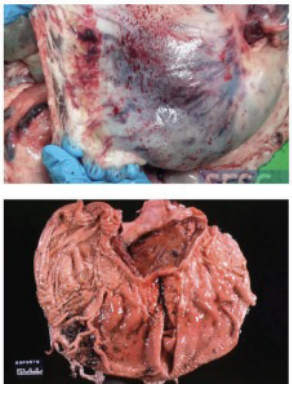
Notify management IMMEDIATELY

Image 82. Normal View of Stomach

Normal
Stomach

- Smooth surface
- Size reflects carcass: contents vary
- Color variation: white, tan, light pink

Image 83. Abnormal View of Stomach- Change in Color, Shape and Structure



Not Normal
Stomach

Change in color

Bloody

Bruising

Change in shape

Open/deflated

Images 84 and 85. Normal Top and Bottom View of Liver

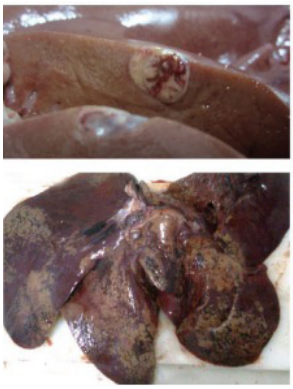
Normal
Top of Liver

- Curved lobes
- Smooth, thin edges
- Size reflects carcass
- Consistent color: deep red to purple

Normal
Bottom of Liver

- Curved lobes
- Smooth, thin edges
- Size reflects carcass
- Consistent color: deep red to purple

Images 86 and 87. Abnormal View of Liver- Change in Color, Size, Shape or Density



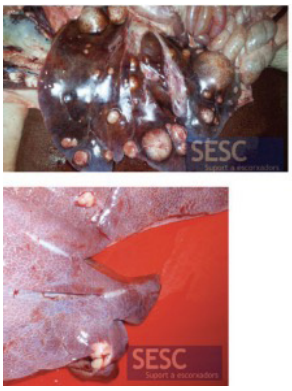
Not Normal
Liver

Color change
Lighter
Darker
Yellow

Not Normal
Liver

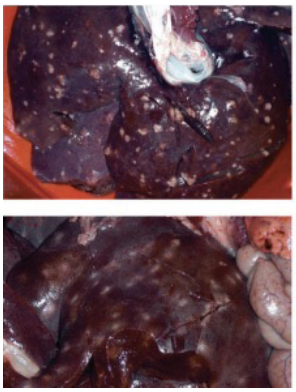
Change in size, shape or density

Images 88 and 89. Abnormal View or Liver- Change in Appearance or Texture



Not Normal
Liver

Change in appearance or texture

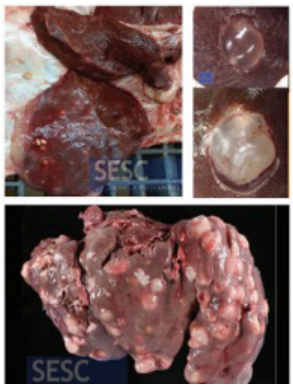


Not Normal
Liver

Change in appearance or texture

Tuberculosis & "milk spot" parasite can look similar

Image 90. Abnormal View of Liver



Not Normal
Liver

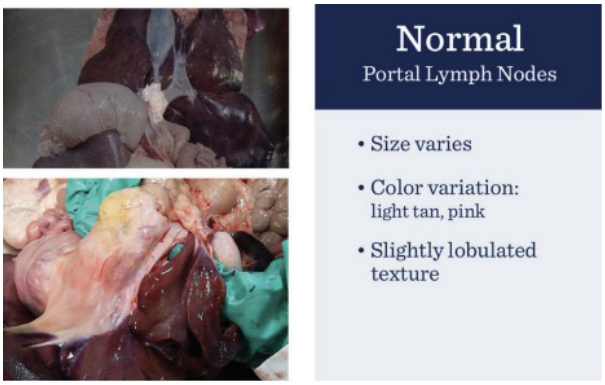
Change in appearance or texture

Measly pork or Cysticercosis can look similar

Notify management IMMEDIATELY

Image 91. Normal View of Gallbladder

Image 92. View of Portal Lymph Nodes



Carcass Sorting Method

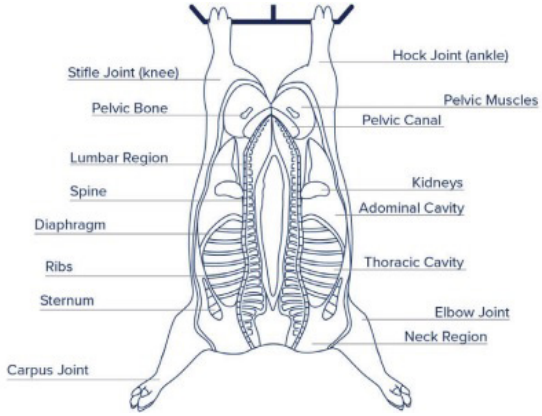
Carcass Sorting includes the following steps:

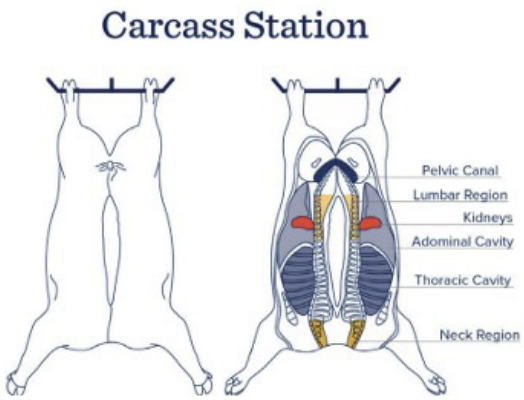
1. Observe the back of the carcass. This may involve observing it in a mirror or turning the carcass manually.
2. Observe the front and the inside of the carcass.
3. Observe all cut surfaces.
4. Observe all body cavities (pelvic, abdominal, and thoracic).
5. Observe the lumbar region.
6. Observe the neck region.
7. Grasp, turn, and observe both sides of the kidneys. Kidneys must be removed from the outer membrane and exposed for sorting.

As in head and viscera sorting, there are various forms of improper presentation that sorters need to identify. Contamination and poor presentation can affect a sorter's ability to properly identify signs and conditions. Examples include:

1. If the kidneys are missing or not exposed, notify the area supervisor immediately. Kidneys must be present and visible for sorting.
2. Carcasses should be presented in a consistent fashion according to company procedure. If carcasses are not facing the proper direction, notify the area supervisor.

Figures 9 and 10- Carcass Anatomical Sketches





Carcass Abnormalities and Conditions

Below is a list of common abnormalities and conditions found through observation of the carcass. There is a detailed description and action for each abnormality and condition in the glossary.

1. Feces, ingesta, or milk
2. Abscess
3. Fractures, cuts, bruises, injuries, bug bites
4. Swollen, enlarged, or red lymph nodes
5. Discolored or swollen skin, fat, muscle, or other tissues
6. Cysts, tumors, granulomas, or lesions
7. Blood spots in skin, fat, muscle, kidneys, or lymph nodes
8. Swollen, discolored, enlarged, or otherwise abnormal kidneys or tissues
9. Adhesions from organs to thoracic or abdominal walls
10. Fluid in the thoracic or abdominal cavity
11. Parasites
12. Odors

Image 93. Normal Back View of Carcass

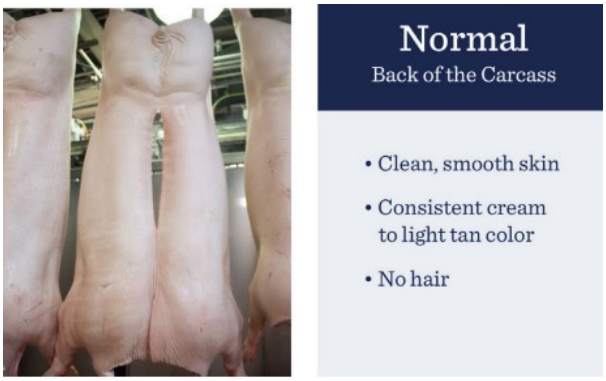
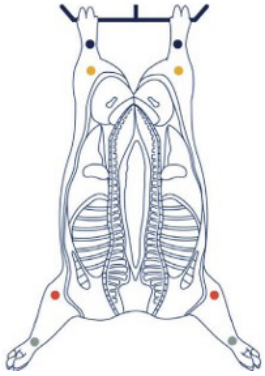


Figure 12 and Image 94. Front View of Normal Leg Joints



Normal
Leg Joints

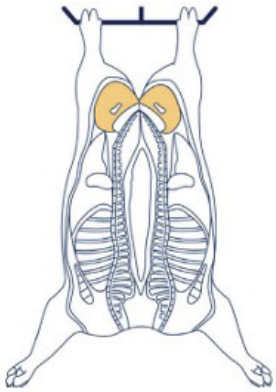
- Clean, hairless, smooth skin
- Consistent cream to light tan color
- Paired joints are similar in size

Normal
Leg Joints

- Clean, hairless, smooth skin
- Consistent cream to light tan color
- Paired joints are similar in size

hock (ankle) elbow
stifle (knee) carpus

Figure 13 and Image 95. Normal Front View of Pelvic Muscles



Normal
Pelvic Muscles

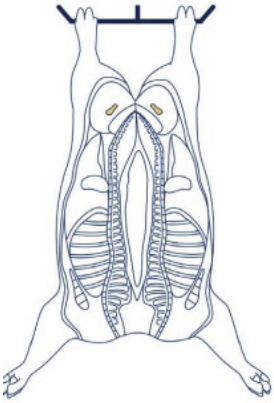
- Consistent red color
- Paired muscle groups are similar in size

Normal
Pelvic Muscles

- Consistent red color
- Paired muscle groups are similar in size

Pelvic muscles

Figure 14 and Image 96. Normal Pelvic or Aitch Bone View



Normal
Pelvic or Aitch Bone

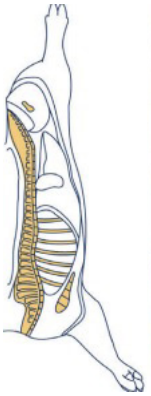
- White outer surface
- Red inner surface

Normal
Pelvic or Aitch Bone

- White outer surface
- Red inner surface

Pelvic Bone

Figure 15 and Image 97. Normal Front View- Bones



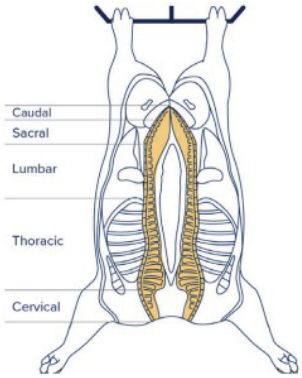
Normal
Bones

- Pelvic/Aitch
- Spine
- Sternum
- Ribs

Normal
Bones

- Pelvic/Aitch
- Spine
- Sternum
- Ribs

Figure 16 and Image 98. Normal Front View- Spine



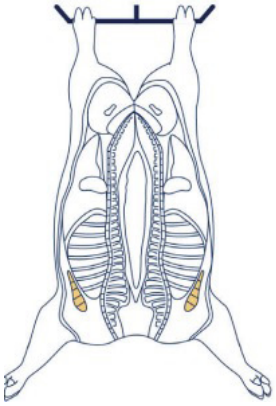
Normal
Spine

- Red color
- Bodies: square
- Processes: various shape & size
- Joints between

Normal
Spine

- Red color
- Bodies: square
- Processes: various shape & size
- Joints between

Figure 17 and Image 99. Normal Front View- Sternum [Breastbone]



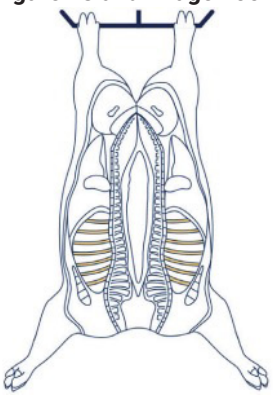
Normal
Sternum or Breastbone

- Red color
- Square to rectangular

Normal
Sternum or Breastbone

- Red color
- Square to rectangular

Figure 18 and Image 100. Normal Front View- Ribs



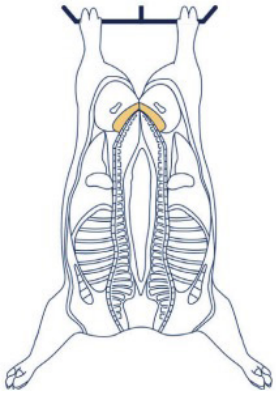
Normal
Ribs

- Smooth surface
- Covered by thoracic lining (pleura)

Normal
Ribs

- Smooth surface
- Covered by thoracic lining (pleura)

Figure 19 and Image 101. Normal Front View- Pelvic Canal



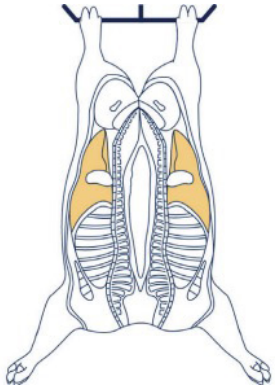
Normal
Pelvic Canal

- Empty
- Clean

Normal
Pelvic Canal

- Empty
- Clean

Figure 20 and Image 102. Normal Front View- Abdominal Cavity



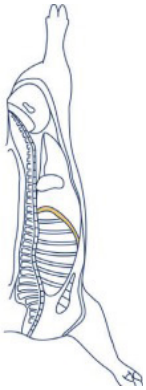
Normal
Abdominal Cavity

- Clean
- Smooth
- White to cream shiny color

Normal
Abdominal Cavity

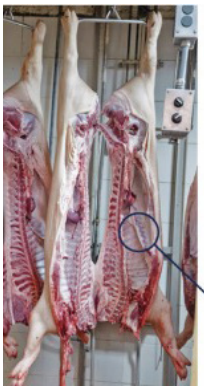
- Clean
- Smooth
- White to cream shiny color

Figure 21 and Image 103. Normal Front View- Diaphragm or Skirt



Normal
Diaphragm or Skirt

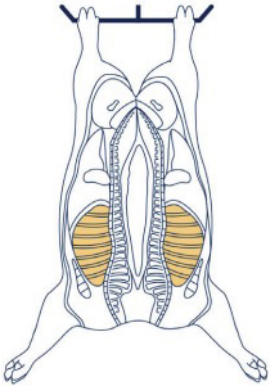
Muscle that divides the thoracic and abdominal cavities



Normal
Diaphragm or Skirt

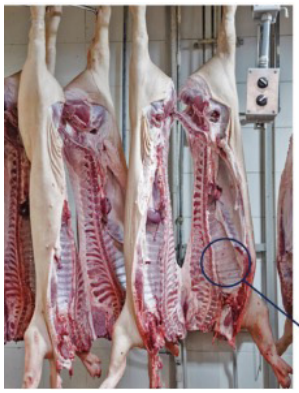
Muscle that divides the thoracic and abdominal cavities

Figure 22 and Image 104. Normal Front View- Thoracic or Chest Cavity



Normal
Thoracic or Chest Cavity

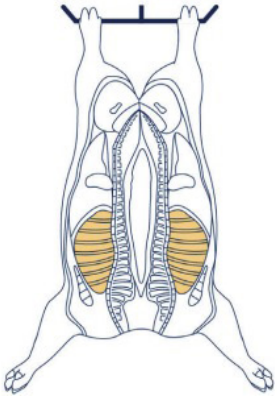
- Empty
- Clean
- Smooth
- White to cream shiny color



Normal
Thoracic or Chest Cavity

- Empty
- Clean
- Smooth
- White to cream shiny color

Figure 23 and Image 105. Normal Front View- Lower Back

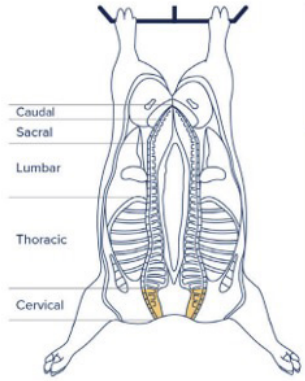


Normal
Thoracic or Chest Cavity

- Empty
- Clean
- Smooth
- White to cream shiny color

Normal
Lower Back

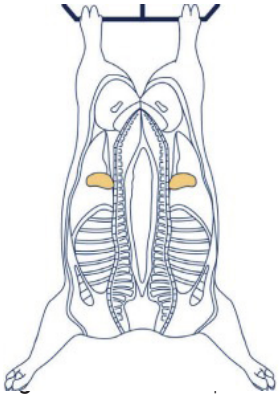
Figure 24 and Image 106. Normal Front View- Neck or Jowl



Normal
Neck or Jowl

Normal
Neck or Jowl

Figure 25 and Image 107. Normal Front View- Kidney



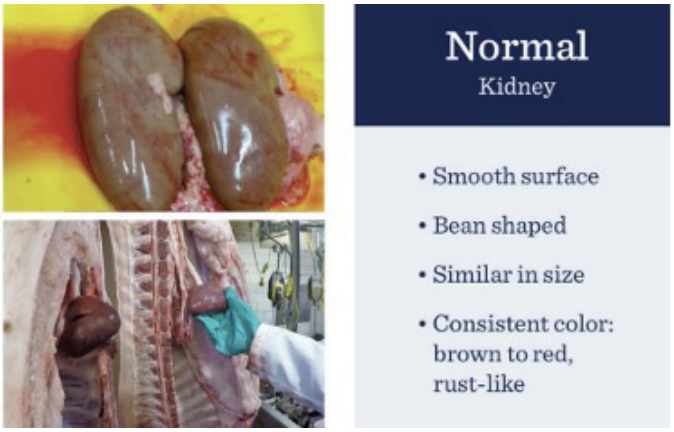
Normal
Kidney

Between lumbar region and diaphragm

Normal
Kidney

Between lumbar region and diaphragm

Image 108. Normal Front View- Kidney



Final Sortation And Disposition

The expected end state of the entire antemortem and postmortem sortation process is to present carcasses, heads, and parts to USDA- FSIS that are expected to be 'inspected and passed' by inspection personnel. Within NSIS, this includes identifying conditions as well as making final determination on the carcass, head, and parts.

This process is a funnel and through subsequent steps is expected to yield situations in which additional determination may be needed and culminates in the final step- final sortation and determination. While correlation may be requested by USDA- FSIS and is recommended as an ongoing communication and education step, the company sortation process requires final determination and identification of conditions. As such, it may be necessary to identify 'lead' sorters within the process to provide further expertise, scrutiny, and determination beyond the initial post-mortem sortation process.

As part of the ability of NSIS plants to innovate, additional means can be included to continue to support and educate the company post-mortem sorters. This may include on-site veterinary experts, third-party veterinary expertise as well as laboratory analysis. This on-going correlation may be requested at any time by the company team.

A potential useful tool in continued final sortation correlation can be the use of a pathology laboratory. Veterinary pathology laboratories can be accessed at several major universities with veterinary science programs. Prior to submission of samples to a laboratory, planning should take place to identify the correct sample tissues, specimen delivery as well as the potential condition of interest. Careful consideration on product hold, including the carcasses, viscera and/ or head products of the samples submitted should be assessed prior to sample submission.

Food Safety And Critical Disease Identification

Certain diseases in swine pose a potential food safety hazard to humans if pork associated with the disease is consumed. If carcass sets with the following conditions are not properly sorted out prior to FSIS post-mortem inspection, FSIS has the authority to issue a non-compliance record. Sorters must identify and mark or otherwise identify for discard carcass sets with the following food safety conditions:

1. Septicemia
2. Toxemia
3. Pyemia
4. Cysticercosis

Septicemia

Septicemia is a food safety condition caused by the presence of pathogenic microorganisms spread through the entire carcass by way of blood or lymphatics. Not all signs listed below will be present in every animal with septicemia.

Post-mortem signs:

1. Dark and blood-filled organs or infected wounds or dark bruises;
2. Pin-point to blotchy blood spots, may appear as dark spots (most noticeable in kidneys, heart, lungs, spleen, and surfaces typically 0.125 to 1.0" or greater in dimension);
3. Multiple swollen, red, or enlarged lymph nodes. Cut surface of lymph nodes may be reddened or pale with a rough surface;
4. Carcass is thin, pale (anemic);
5. Pale tissues or organs;
6. Yellow to bloody fluid in abdominal and/or thoracic cavities;
7. Swelling of the entire carcass.

Sorting Instructions: Carcass sets with any signs of septicemia, mark or otherwise identify for discard.

Notes:

1. Blood spots and enlargement of multiple lymph nodes is enough to discard a carcass.
2. Pinpoint blood spots on an otherwise normal kidney in a healthy carcass is not enough evidence. Carcasses will show signs in multiple areas.

Images 109 and 110. Abnormal Kidneys- Pinpoint and Starburst Lesions

Kidneys with pinpoint lesions associated with an otherwise healthy and acceptable carcass may not require discard of the carcass, head and viscera set. Additional evaluation would be indicated by the lead sorter.

Images 111 and 112. Abnormal Carcass with multiple signs of septicemia.

Red stringy material is present on the leaf lard and a large portion of the lungs are adhered to the rib cage of the carcass. Also, note that the joints indicate potential arthritis. In this case, the lead sorter, excised the joints and confirmed signs of arthritis

Image 113. Abnormal Carcass- Septicemia .....

Image 114. Abnormal Viscera Set- Septicemia

Image 115. Abnormal Large Intestines and Liver - Septicemia

Red, stringy material, slimy in consistency was noted on every organ associated with the carcass. Note the enlarged kidney lymph nodes present in the carcass and red stringy material encasing the large intestines and the liver. These images depict septicemia involvement that would require discard of the carcass, viscera, and head for the septicemia condition

Image 116. Abnormal Lymph Nodes- Hemorrhagic Lymph Node Associated with Septicemia

Hemorrhagic lymph node associated with septicemia; Generalized lymphadenopathy may be hemorrhagic or enlarged or both.

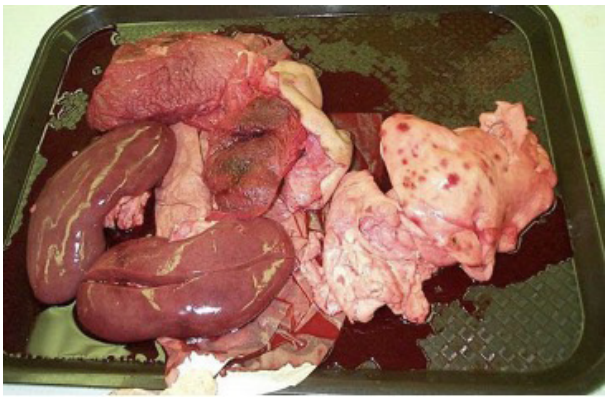


Image 117. Abnormal Organs- Hemorrhages and Swelling of Membranes

Carcasses showing signs of septicemia may involve multiple organs, noting hemorrhages and swelling of membranes covering heart, and organs themselves.

Toxemia

Similar to septicemia, toxemia is a food safety condition caused by the circulation of toxins produced by microorganisms or the death of tissues spread throughout the animal by the blood or lymphatics. Not all signs listed below will be present in every animal with toxemia.

Post-mortem signs:

1. Pinpoint or bruise-like blood spots (most noticeable in kidneys, epicardium, lungs, and membrane surfaces);
2. Multiple swollen or enlarged lymph nodes;
3. Large or shrunken spleen;
4. Pale or yellowish tissues, organs, or skin;
5. Yellowish fat;
6. Red-brown to yellow color to tissues, organs, and fat.

Sorting Instructions: Carcass sets with any signs of toxemia, mark or otherwise identify for discard.

Note: Signs of toxemia can appear in varying degrees in carcasses with septicemia. A septicemia, a toxemia, or both may occur.

Pyemia

Pyemia is a food safety condition caused by pus forming bacteria from wounds or injuries entering the bloodstream and forming abscesses in the lungs, joints, or throughout the body.

Post-mortem signs:

1. Infected wound;
2. Swollen joints;
3. Multiple abscesses in lungs;
4. Blood spots in lungs, and organs;
5. Degeneration of tissues or organs;
6. Multiple enlarged, red, or swollen lymph nodes.

Sorting Instructions: Carcass sets with any signs of pyemia, mark or otherwise identify for discard.

Note: Multiple abscesses in a carcass should not be confused with an active pyemia.

Cysticercosis

Cysticercosis (pork measles) is a parasitic condition transmissible to man and therefore, of public health concern. Cysticercosis cysts are the larval form of the tapeworm Taenia soleum. Cysticercosis is very rare in markets hogs, although still possible, but more likely in pasture-raised or free-range swine. Cysticercosis should be considered any time multiple small cysts are observed in large muscle cuts, heart, diaphragm, or weasand. The heart is the most common site.

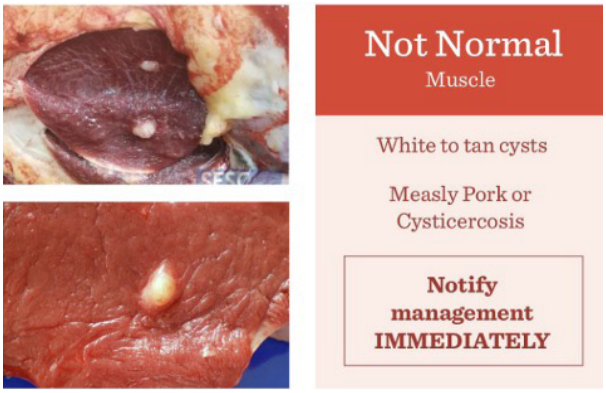
Post-mortem signs:

1. Muscle is swollen or discolored;
2. One to several dozen cysts on the heart, tongue, weasand, diaphragm, or carcass. Cysts may occasionally be found in fat and viscera. Grape-like clusters in tissue underneath the tongue or attached to heart.

Sorting Instructions: Carcass sets with cysticercosis, mark or otherwise identify for discard. FSIS may want to observe the carcass set prior to discard for confirmation.

Note: Cysticercosis is a reportable disease. Notify management to alert FSIS is cysticercosis is identified.

Image 118. Abnormal Carcass- Muscle Tissues, Cysticercosis



Picture of Heart muscle showing live cysts.

Contamination with Feces, Ingesta, or Milk

Feces, ingesta, and milk may contain pathogens. Following sanitary dressing procedures can help prevent carcasses being contaminated, but visual inspection is important to ensure carcasses and parts are free from feces, ingesta, and milk. Upon presentation to USDA- FSIS Inspection, there is a "zero tolerance" standard for visible fecal material, ingesta, or milk on carcasses and head, cheek, and weasand meat.

Company sanitary dress programs can and may include procedures to identify carcasses in need of reconditioning upon the 'final rail.' Procedures that clearly outline carcasses still under company control in and around the final FSIS inspection station may be warranted to ensure control of carcasses, heads, and viscera. These procedures may also include instructions for 're-presentation' of the carcass via a loop-in, stationary area for FSIS inspection or other measure for presentation to USDA- FSIS. Discussion of these procedures with USDA- FSIS can be helpful in implementation of the NSIS program.

Sorting Instructions: When you find feces, ingesta, or milk, follow your company's zero tolerance program.

Note: Feces and ingesta in swine are typically yellow, green, tan, or brown and may include grain particles or plant materials.

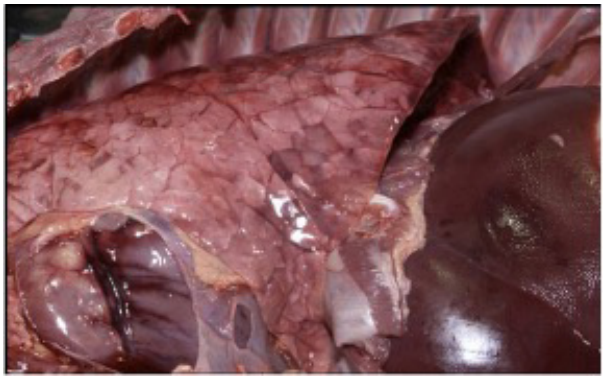
Final Sortation And Disposition- Foreign Animal Disease

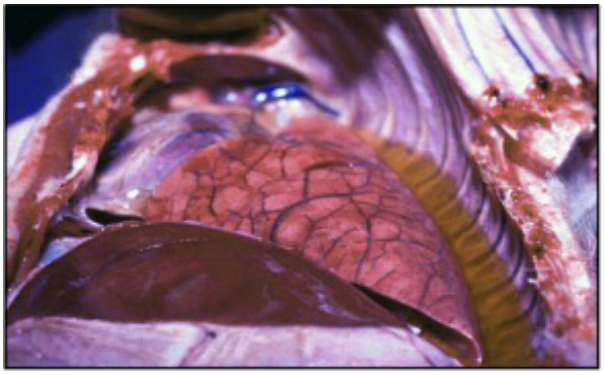
Sorting Instructions: Certain physical signs or abnormalities presenting in the head, carcass and/or viscera may indicate a foreign animal disease. In the NSIS sortation program, it is the sorters responsibility to identify the potential and then present the parts to USDA- FSIS for further evaluation.

Note: These diseases will be treated as a set of potential diseases and will be further classified and determined by the USDA- FSIS, State Veterinarians and USDA- APHIS.

African Swine Fever [ASF]

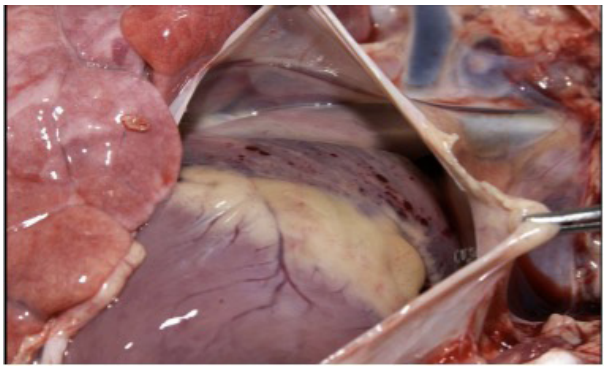
Images 119 and 120. Abnormal Lungs, African Swine Fever [ASF]





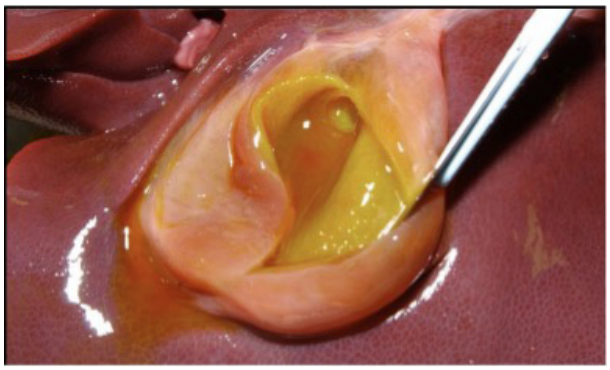
Lungs showing diffuse interstitial pneumonia, interlobular edema, and hydrothorax.

Images 121. Abnormal Heart, African Swine Fever [ASF]



Multiple multifocal epicardial hemorrhages on atrium.

Image 122. Abnormal Gallbladder- African Swine Fever [ASF]

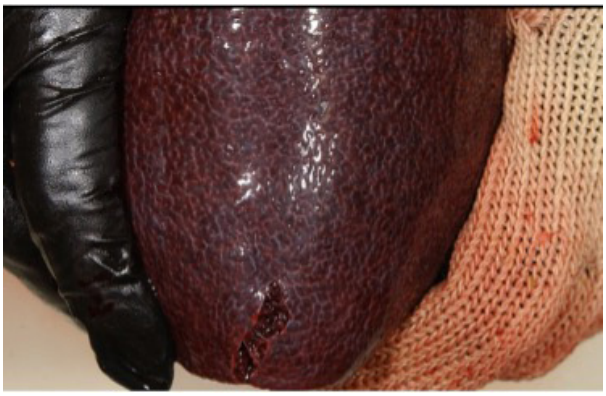


Gall bladder wall is thickened and edematous.

Image 123. Abnormal Spleen- African Swine Fever [ASF]

The spleen is more than twice its normal size and dark, black red in color.

Image 124. Abnormal Spleen- African Swine Fever [ASF]

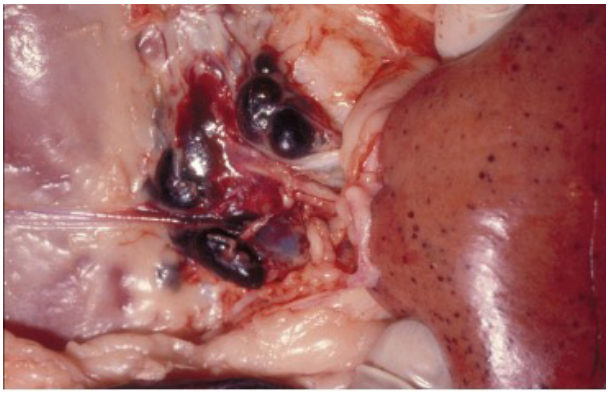


The spleen is markedly thickened.

Image 125. Abnormal Spleen- African Swine Fever [ASF]

The spleen is friable with capsules breaking easily when folded.

Image 126. Abnormal Gastrohephatic Lymph Node- African Swine Fever [ASF]



Enlarged and hemorrhagic gastrohephatic lymph node.

Image 127. Abnormal Kidney and Perineal Lymph Node- African Swine Fever [ASF]

Kidneys with perineal edema and hemorrhagic perineal lymph nodes.

Image 128. Abnormal Mesenteric Lymph Nodes- African Swine Fever [ASF]

Mesenteric lymph nodes are enlarged and hemorrhagic.

Image 129. Abnormal Urinary Bladder- African Swine Fever [ASF]

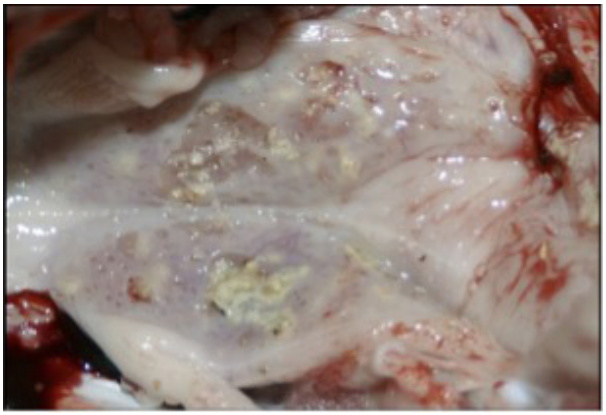
Urinary bladder with multiple petechial hemorrhages on bladder mucosa.

Classical Swine Fever [CSF]

Image 130. Abnormal Spleen- Classical Swine Fever [CSF]

Sever multifocal splenic infarcts from highly virulent strain of CSF.

Images 131 and 132. Abnormal Tonsil- Classical Swine Fever [CSF]

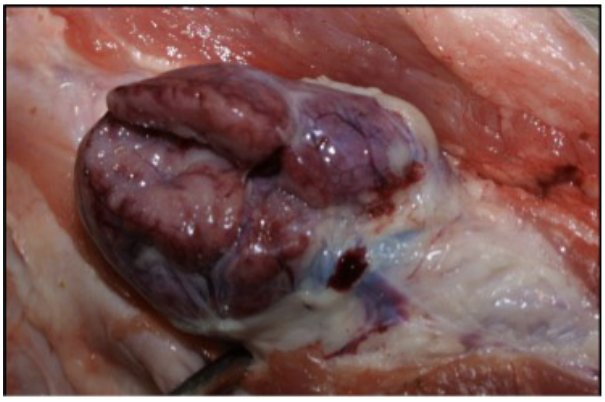


Multifocal crypt necrosis and diffuse congestion.

Image 133. Abnormal Duodenum- Classical Swine Fever [CSF]

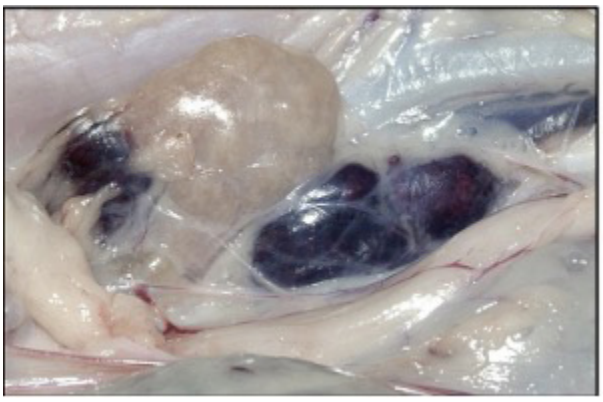
Slight hemorrhage with fibrinous necrotic inflammation of the mucosa.

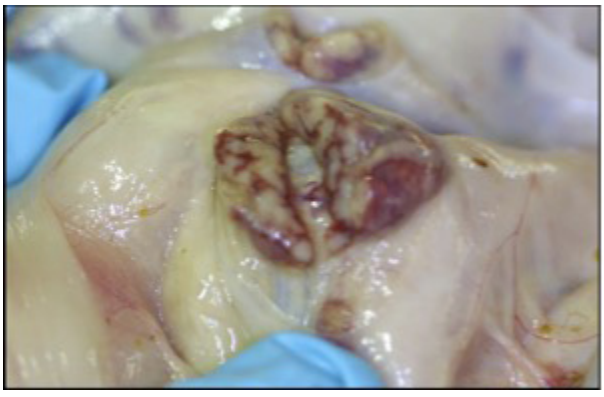
Image 134. Abnormal Mandibular Lymph Node- Classical Swine Fever [CSF]



Slightly enlarged, congested and edematous mandibular lymph node.

Image 135. Abnormal Abdominal Lymph Node- Classical Swine Fever [CSF]





Enlarged and hemorrhagic abdominal lymph nodes.

Final Sortation And Disposition- Other Consumer Protection Conditions Requiring Sorting

This section provides guidance relative to the most common abnormal conditions seen in carcasses and parts that require trimming or discard depending on the nature, degree, or extent of the condition.

Abscess

Abscesses in swine typically have a thick wall surrounding a creamy pus-filled center. Abscesses may be found anywhere on the carcass, joint, bone, or viscera. It is important to recognize the difference between abscesses and tumors.

Post-mortem signs:

1. Abscess capsules may be thin (active, recent) or thick (older), pus may have any texture, and the color is mostly yellowish, rarely red-brown, greenish-white, or pinkish to white in color;
2. May have enlarged lymph nodes near an abscess.

Sorting Instructions:

Heads: For smaller abscesses, mark or otherwise identify the abscess and associated lymph nodes for trimming or discard the head, according to company policy. For large abscesses, mark or otherwise identify the head for discard.

Carcass: Abscesses that can be trimmed, mark or otherwise identify for trimming. Carcasses with abscesses too large in size or number for removal without contamination must be discarded. More than one abscess in a carcass is not a reason for discard if the abscesses can be removed in a sanitary manner and the carcass is otherwise normal.

Viscera: Organs with abscesses must be marked or otherwise identified for discard.

Notes: If an abscess is inadvertently cut open, all surfaces in contact with the pus must be trimmed and removed. Open abscesses cannot be “cleaned” off.

Abscesses may be mistaken for other conditions:

1. Large old tumors may have a dry bright yellow center up to 1” in diameter that may look like an old abscess.
2. Fungal granulomas and TB may look like thick or grainy abscesses about the size of a fingernail. These carcass sets should be held for further sorting and/or FSIS PHV disposition.

Arthritis

Arthritis is the inflammation of joint tissues from trauma or infection.

Post-mortem signs:

1. Enlarged or swollen joints;
2. Red or swollen lymph nodes near an enlarged or swollen joint;
3. Degeneration of tissues or organs;
4. Abnormal joint fluid (normal joint fluid is clear, like water):
   - Increased amount,
   - Blood-tinged,
   - Cloudy red to yellow orange.

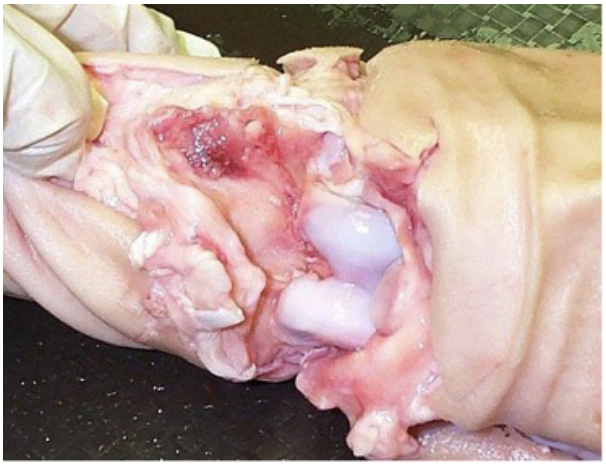
Sorting Instructions:

Arthritis can be a sign of other conditions, see other sections. Otherwise, for carcasses with arthritis without other signs of disease or abnormal conditions, mark or otherwise identify affected joints for trimming.

Notes:

1. Avoid opening arthritic joints to prevent contamination with joint fluid, which may be infected.
2. The color or consistency of the joint fluid is not the primary consideration for determining if the entire carcass set should be discarded; whether the condition is throughout the carcass is most important.
3. Discard of carcasses is not based on the number of affected joints but the condition of the joints. If the arthritis can be removed by trimming, the joint should be removed along with associated lymph nodes and the carcass allowed on to FSIS inspection.
4. The hind leg joints may be marked or otherwise identified to be removed on the fabrication floor if the joint is bone solid without evidence of pus or blood spots.

Image 136. Abnormal Joint- Arthritis



Arthritis can present in various stages and may be locally addressed if not part of a larger, systemic condition.

Pericarditis

Pericarditis is a condition of the heart sac (pericardium) usually from infection.

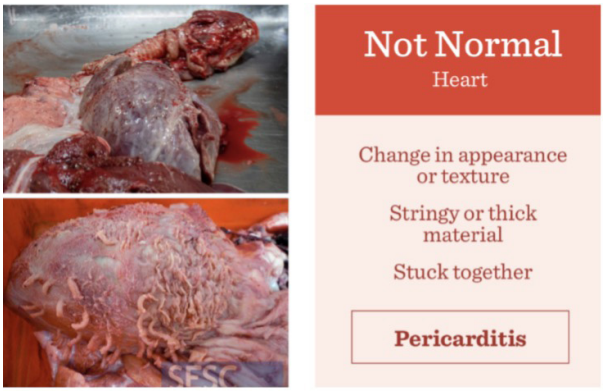
Post-mortem signs:

1. Adhesions of pericardium and pleura covering ribs or lungs – normal to inflamed red in color;
2. Rough, thickened heart or heart sac (shaggy heart);
3. Swelling of body tissues and excess fluid;
4. Foul odor of cut-surface of pericardial, abdominal, or thoracic.

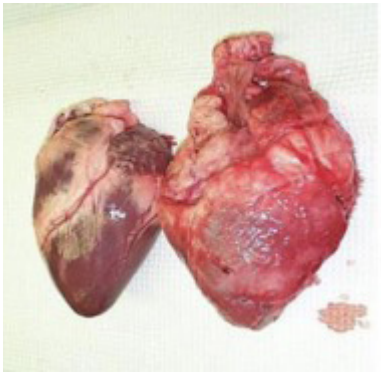
Sorting Instructions:

Mark or otherwise identify heart with pericarditis for discard. Carcass sets with reddened or bloody pus on heart sac with other carcass changes, mark or otherwise identify carcass set for discard.

Image 137. Viscera, Heart Pericarditis



Images 138, 139 and 140. Various Hearts- Stages of Pericarditis



Normal Heart next to an enlarged heart with a mild inflamed heart surface with epirarditis or pericarditis (multiple surfaces).

Stages of hearts from normal (left) to pericarditis (right).

Pericarditis

Pleuritis

Pleuritis is a condition of the pleural lining covering the lungs and ribs usually from an infection.

Post-mortem signs:

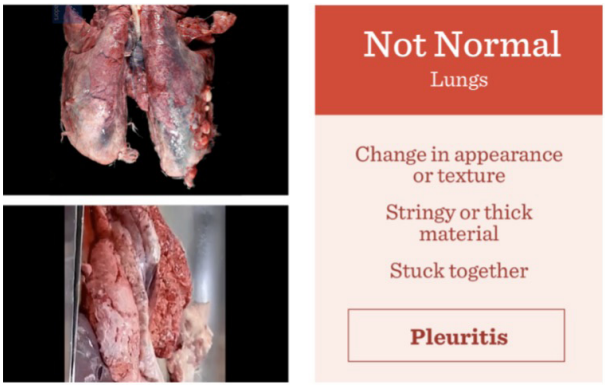
1. Adhesions between lungs, heart, and ribs;
2. Fluid in the chest cavity;
3. Reddened to enlarged lymph nodes within the chest.

Sorting Instructions:

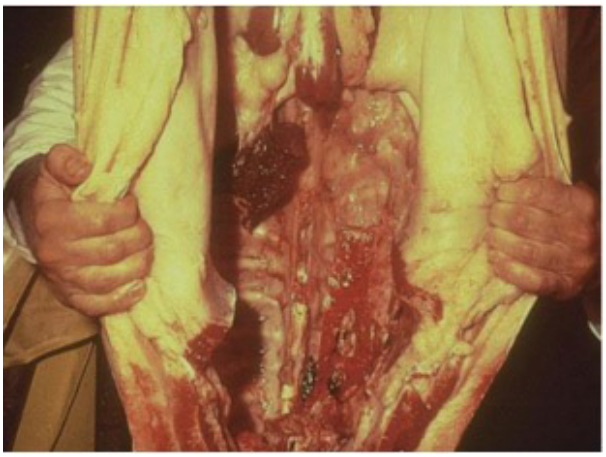
Carcasses with extensive, reddened lungs and ribs and red or swollen lymph nodes near the lungs, heart, and ribs, mark or otherwise identify for discard. Carcasses with adhesions and no other signs may be marked or otherwise identified for trimming, also known as being “peeled out”.

Note: Pleuritis can be a sign of pneumonia.

Image 141. Abnormal Lungs- Pleuritis



Images 142 and 143. Abnormal Carcass Tissue- Pleuritis



Pneumonia-Pneumonia is a condition of the lungs from infection, parasites, physical trauma, or foreign material inhalation.

Post-mortem signs:

1. Lungs may be reddened to grayish in color;
2. Red adhesions on the ribs;
3. Lymph nodes around the lungs may be swollen, bloody, or enlarged;
4. Abnormal color, size, or shape of liver, spleen, and/or kidneys;
5. Blood spots on lungs, kidneys, viscera, or carcass;
6. A lung lobe in a thick-walled abscess; or
7. Pale carcass.

Sorting Instructions:

Carcasses with minor forms of pneumonia, mark or otherwise identify affected areas for trimming, such as the lungs, which will always be discarded when pneumonia is identified. Carcasses with more severe cases, such as those with widespread signs, mark or otherwise identify for discard.

Images 144 and 145. Abnormal Lungs- Pneumonia

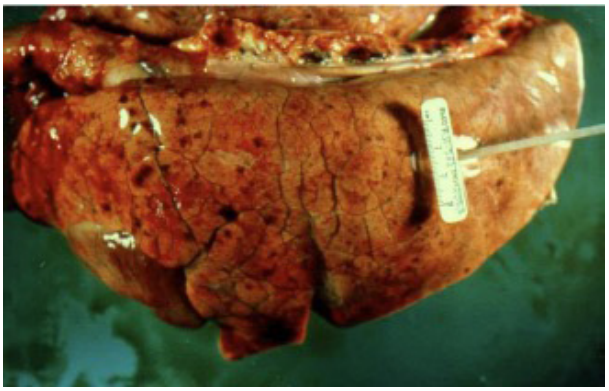


Image 144 demonstrating pulmonary hemorrhage and Image 145 demonstrating edema.

Peritonitis

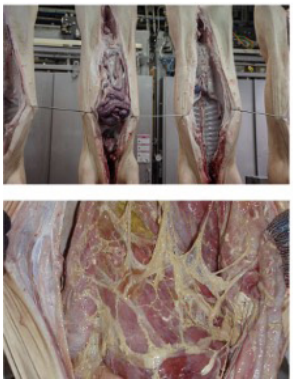
Peritonitis is a common condition of the peritoneal lining usually from infection.

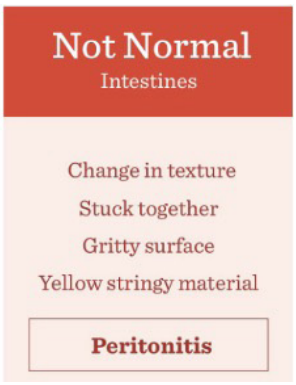
Post-mortem signs:

1. Red, swollen, bloody or blood spotted stomach, intestines, abdominal organs, or walls;
2. Swollen or enlarged lymph nodes;
3. Degeneration of tissues or organs;
4. Excess fluid in abdominal cavity.

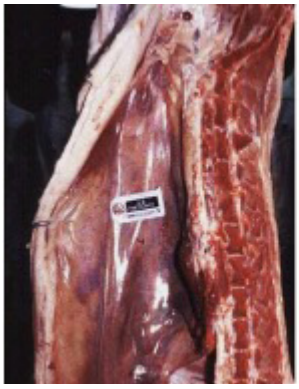
Sorting Instructions: Carcasses with multiple signs, mark or otherwise identify for discard. Carcasses with one sign, mark or otherwise identify for trimming to remove the affected areas, such as the stomach.

Images 146 and 147. Abnormal Carcass and Viscera- Peritonitis

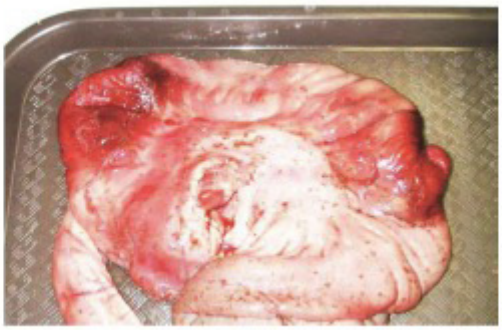




Images 148, 149 and 150. Abnormal Carcass and Viscera- Peritonitis



Discoloration of the leaf lard suggesting peritonitis.



An inflamed and distended loop of intestines with congested mesenteric lymph nodes from a carcass that may have an associated peritonitis.

Gastroenteritis

Gastroenteritis is a condition of the stomach or intestines usually from infection.

Post-mortem signs:

1. Red or swollen stomach or intestines and associated lymph nodes;
2. Dark, blood-filled intestinal loops;
3. Dark, dead looking stomach or intestine with a foul odor;
4. Lots of tiny air sacs, making the intestines look foamy;
5. Thickened “garden-hose” intestine.

Sorting Instructions: Carcass sets with minor signs, mark or otherwise identify the viscera for discard. Carcasses with severe signs or other signs throughout the c1arcass, mark or otherwise identify for further sorting and FSIS inspection or discard.

Note: Notify the area supervisor when multiple carcasses show signs of gastroenteritis.

Images 151, 152 and 153 Abnormal Viscera- Gastroenteritis

Enlarged, darkened and blook filled loops of intestines and enlarged darked spleen.

Nephritis

Nephritis is an inflammatory condition of the kidneys from infection, parasites, or toxins.

Post-mortem signs:

1. Red, enlarged, blood spotted, or abnormally colored kidney;
2. White, firm, depressed, scarred, or pitted kidneys [scarred];
3. Multiple abscesses of entire kidney;
4. Degeneration of tissues, organs, and lymph nodes;
5. Carcass and tissue swelling;
6. Pyelonephritis – accumulation of pus in the ureters and into the kidney;
7. Hydronephrosis – normal kidney tissue is replaced by fluid, kidney becomes a "bag of water;"
8. Urine odor of carcass (see Uremia).

Sorting Instructions:

Kidneys with any signs, mark or otherwise identify for discard. Carcass sets with signs in the kidneys and carcass, mark or otherwise identify for discard.

Images 154, 155 and 156- Acute Nephritis, Kidneys



Carcasses with indications of acute nephritis must be evaluated for signs of disease in the carcass tissues to determine final sortation determination. The kidneys must be disposed of.

Images 157 and 158. Chronic Nephritis, Kidneys, Hard, White, and Scarred


Image 159. Abnormal Kidneys- Stages of Nephritis

Image 160. Abnormal Kidney- Nephritis

Pale enlarged kidneys with hemorrhages on the surfaces.

Image 161. Normal vs Abnormal Kidney- Nephritis

Images 162 and 163. Abnormal Kidneys- Embryonal Nephritis

NOTE: Carcass sets with chronic nephritis specifically in the kidneys can be passed for food if there are not generalized changes [e.g., uremia], after removal and disposition of abnormal tissues.

Uremia

Uremia means urine in the blood. Uremia occurs when temporarily or permanently damaged kidneys fail to remove waste materials in the blood.

Post-mortem signs:

1. Fluid in the pleural cavity;
2. Fluid or swelling in the abdominal cavity;
3. Fluid in all body tissues;
4. Nephritis or pyelonephritis;
5. Peritonitis;
6. Kidney stones, look like small white or clear crystals;
7. Swollen kidneys;
8. Carcass swelling and reddening;
9. Urine odor to muscles.

Sorting Instructions:

If the only sign is kidney stones, mark or otherwise identify the affected kidney(s) for discard and allow the carcass on to FSIS inspection. Carcass sets with multiple signs, mark or otherwise identify for discard.

Note: Urine odor can come from a broken bladder during dressing. If so, the only sign will be the urine odor, and contaminated areas must be trimmed.

Image 164. Kidneys- Uremia

The urine smell may be faint or strong. In many cases, the kidney itself will be enlarged and if incised, will seep urine to the surface.

Images 165 and 166. Carcass- Uremia

NOTE: Uremia is typically found through the smell of urine. Determining degree of involvement through the carcass may include urine dripping down the rib cage and pooling in carcass fat tissues. Uremic carcasses with multiple signs may require carcass condemnation.

Tuberculosis (TB)

Swine tuberculosis is a rare condition associated with the ingestion of pathogens, almost exclusively identified as Mycobacterium Avium, which is known to be present in the outside environment. M. avium in market hogs has steadily decreased but is still possible in hogs raised with increased exposure to the

outside environment, such as free-range hogs. TB lesions are most likely to be found in the mandibular, mesenteric, and bronchial lymph nodes. TB lesions are difficult to see and typically identified by incising the mandibular lymph nodes and palpating mesenteric, portal, and bronchial lymph nodes.

Post-mortem Signs:

1. Granulomas that look like small grains of sand or abscesses the size of a pinpoint up to a grain of rice, typically in lymph nodes, and seen by incising;
2. Granulomas that look like small abscesses just below the surface of the mesentery.

Sorting Instructions:
Carcasses with signs of TB, mark or otherwise identify for further sorting and FSIS inspection. Some establishments may elect to segregate suspected TB carcasses for cooking only, but the disposition of a suspected TB carcass for cooking only must be made by an FSIS PHV. Establishments may choose to discard all carcass sets with signs of TB, follow company policy.

Images 167 and 168. Abnormal Lymph Nodes- Tuberculosis

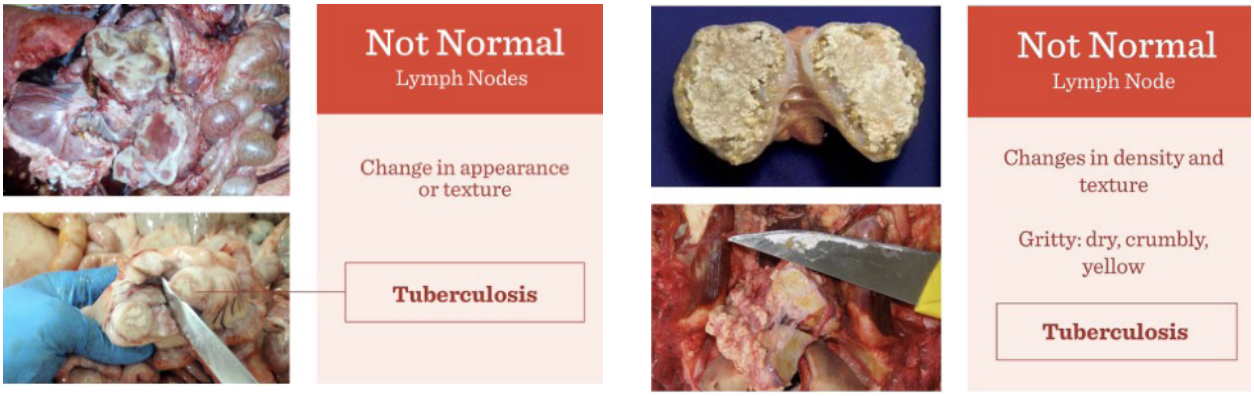
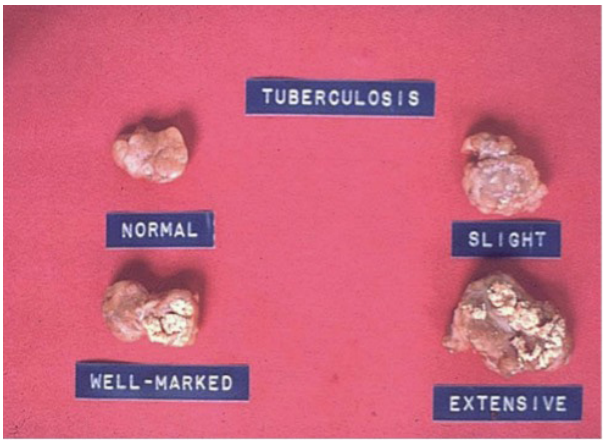


Image 169. Abnormal Lymph Node- Tuberculosis

The lymph node shows multiple, diffuse TB lesions.

Image 170. Normal vs Abnormal Lymph Nodes- Tuberculosis



Final Sortation- Parasites Not Transmissible To Humans

Stephanuriasis

Stephanuriasis (swine kidney worms) is a rare parasitic condition due to the presence of Stephanurus dentatus in the carcass tissues, most likely in pasture-raised or free-range swine.

Post-mortem Signs:

a. Lesions from worms in the following areas:
    i. Pelvic inlet, pelvic and femoral canal;
    ii. Abdominal lining;
    iii. Muscle-primarily loin and ham muscles;
    iv. Organs-primarily kidney, liver, pancreas, spleen, and lungs;
b. Brownish-lemon color of skin and fat.

Notes:

1. The larvae migrate to tissues surrounding the kidneys, form cysts and abscesses, and develop to adulthood. The area around the kidneys often appears reddish-brown, and the cysts contain a creamy to reddish-brown colored substance. It is even possible to palpate cord-like masses in the kidney fat, which are tracts made during migration.
2. In the liver, there are sometimes multiple large orange-tan areas, with the liver taking on a mahogany color. Abscesses occur where the larvae have been trapped. Also, severe scarring results from old abscesses.

Sorting Instructions:
Carcasses with several or severe signs, or with other signs of disease, mark or otherwise identify for discard. Carcasses with mild signs, mark or otherwise identify for further sorting and FSIS inspection.

Image 171. Abnormal Kidney- Stephanuriasis (swine kidney worms)

Ascarids

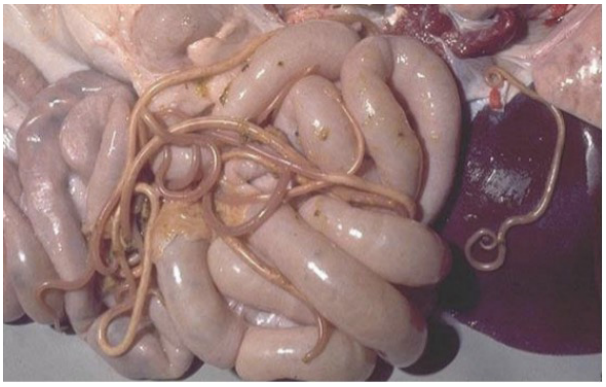
A parasitic condition due to the presence of Ascaris suum, commonly referred to as roundworms.

Post-mortem Signs:

a. Worms, most often in:
    i. Intestines,
    ii. Bile ducts,
    iii. Gall bladders;
b. Larvae cause “milk spots” on livers;
c. Damage to lungs.

Sorting Instructions:
Affected organs, mark or otherwise identify for discard.

Image 172. Abnormal Viscera- Ascarids [Round Worms]



Final Sortation- Miscellaneous Skin Conditions- Skin Conditions Are Varied And Many Are Very Nonspecific.

Post-mortem signs:

1. Red or swollen skin;
2. Scabs with general areas of reddened or thickened skin;
3. Red or swollen lymph nodes;
4. Red and raised bug bites;
5. Tissue or organ degeneration;
6. Pinpoint or bruise-like blood spots in tissues, organs, or skin.

Sorting Instructions:
Carcasses with minor to moderate skin conditions, mark or otherwise identify for trimming. Carcasses with major skin conditions or with other signs, mark or otherwise identify for discard.

Notes: Healed scabs, cuts, or bug bites do not need to be removed, unless for quality reasons according to company policy. Only those that are active or infected, shown by red, raised tissue, pus, or open wounds, must be trimmed.

There are conditions that might be confused with skin disease, such as:

1. Over-scald;
2. Reddening and bruising from injury or irritation;
3. Frostbite.

Image 173. Abnormal Skin Condition- Fungal Dermatitis [Ringworm]

Swine Erysipelas

Erysipelas is a disease caused by infection of the bacteria Erysipelothrix rhusiopathiae, also known as “diamond skin” disease.

Image 174. Abnormal Carcass- Erysipelas

Post-mortem Signs:

1. Diamond shaped, dark or red skin lesions;
2. Arthritis;
3. Red or swollen lymph nodes;
4. Pinpoint blood spots in lungs, kidneys, and heart;
5. Degeneration of tissues or organs;
6. Inflammation of the heart valves, where masses may form, also known as “swollen heart.”

Sorting Instructions:
Carcasses with minor to moderate skin lesions that do not penetrate past the skin, mark, or otherwise identify for trimming. Carcass sets with severe lesions or additional signs, mark or otherwise identify for discard.

Final Sortation- Fractures, Cuts, Bruises, And Injuries

Post-mortem signs:

1. Bruises, injuries, or fracture with blood pooling in tissues and nearby lymph nodes;
2. Dark, bloody, or pale organs;
3. Dark, dead looking tissues with a strong foul odor;
4. Injection lesions;
5. Brownish or dark discoloration of body tissues over whole carcass.

Sorting Instructions:
Carcasses with minor to moderate injuries, mark or otherwise identify for trimming. Post-mortem fractures have no blood pooling near the fracture and can be removed on the fabrication floor accordingly to company policy. Carcasses with major injuries that cannot be removed by trimming or additional signs, mark or otherwise identify for discard.

Melanomas vs. Melanosis

Melanin is a black pigment of the body. Black spots on the skin, like freckles, are normal, but more severe colorations or black inside the body can be a sign of cancer.

Post-mortem signs:

1. Black spots on lungs, liver, lymph nodes, or other organs;
2. Black spots in white part of the eye;
3. Black spots with red or swollen tissue;
4. Tumors in lymph node or organs.

Sorting Instructions:
Normal black spots on the skin, like freckles or moles, do not need to be removed. Black spots in muscles or organs, mark or otherwise identify for trimming or discard the organ. Carcass sets with a lot of or very large black spots on the skin; black spots in multiple types of tissues, such as lymph nodes and organs; or black spots and additional signs, such as tumors; mark or otherwise identify for discard.

Note: Minor black spots in the spinal cord sheath are normal.

Image 175- Abnormal Carcass, Melanoma

Image 176- Abnormal Carcass, Melanosis

Images 177 and 178. Abnormal Carcass- Melanosis

Image 179, 180 and 181. Abnormal Carcass- Melanoma [benign or malignant tumor]

Icterus

Icterus, also known as jaundice, is an abnormal accumulation in the blood of yellowish bile pigments normally in the liver or gallbladder.

Post-mortem signs:

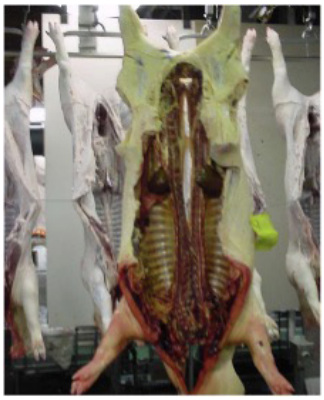
1. Pale, enlarged liver and/or darkened spleen;
2. Lemon-yellow colored connective tissues that are normally very white or pale including:
    a. White part of the eye,
    b. Tendons,
    c. Pleura,
    d. Peritoneum,
    e. Cut surface of abdominal wall fat,
    f. Joint surfaces, or
    g. Mesentery.

Sorting Instructions:
Carcass sets with signs of icterus, mark or otherwise identify for discard.

Images 182 and 183. Abnormal Tissue- Icterus

The tissue underlying the kidney is colored yellow.

Images 184 and 185. Abnormal Tissue- Icterus



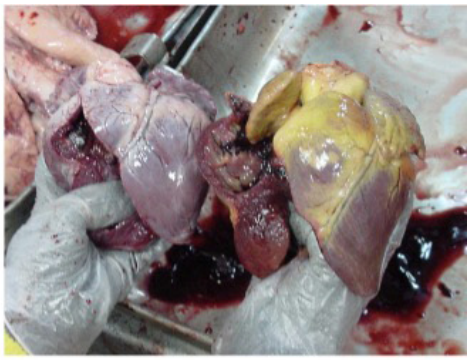


Image 186. Carcass- Icterus w/ Splenic Torsion

Images 187 and 188. Splenic Torsion- Icterus

Splenic torsions may occur when the spleen becomes entangled and wrapped in the mesenteric fat. These spleens will be significantly enlarged. Determining splenic torsion from a lymphoma spleen, is that a splenic torsion will ooze and bleed if broken apart.

Icterus is usually characterized by pale, lemon yellow patches or colorations on the skin or connective tissues. This yellow coloring can be faint and sometimes difficult to determine. Many times, icterus may be caused by splenic torsion. If additional evaluation is required, the lead sorter may evaluate the carcass and viscera together to evaluate whether the yellow coloration and splenic torsion are present together in the same carcass and viscera set.

Embryonal nephroma

Embryonal nephromas are rough raised tumors of the kidney that occur more commonly in young animals.

Sorting Instructions:
Minor kidney tumors, mark or otherwise identify affected kidney(s) for discard. Major kidney tumors or other signs of disease, mark or otherwise identify carcass set for discard.

Malignant Lymphoma

Cancer of the lymphatic system. There are many different signs of the disease, which allows it to be confused with other disease processes such as granulomas, abscesses, or other types of abnormal growths.

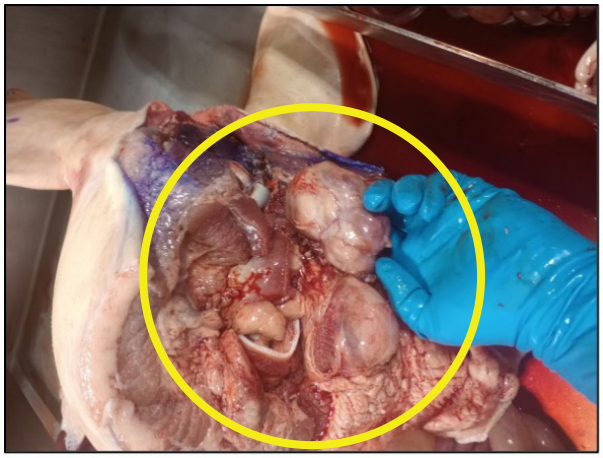
Post-mortem signs:

1. One or more lymph nodes very enlarged and pale;
2. Very large lymph node with a large yellow center, more often in mandibular lymph nodes or lymph nodes of the thoracic inlet;
3. Very large lymph nodes with a dark red center;
4. Very enlarged liver and spleen;
5. Tumors on inside rib or abdominal walls.

Sorting Instructions:
Carcass sets with any degree or extent of signs of lymphoma, mark or otherwise identify for discard.

Images 189 and 190. Abnormal Head- Lymphoma

Image 191.Abnormal Head- Lymphoma



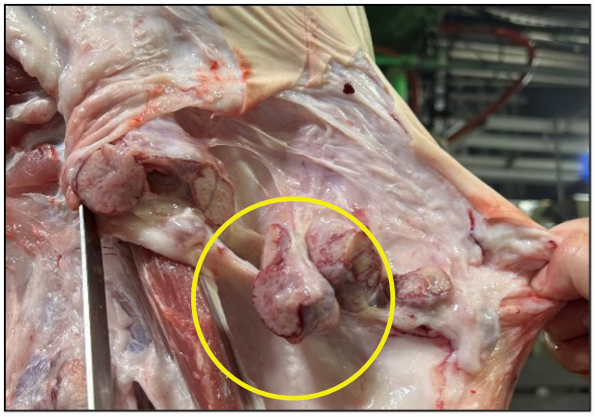


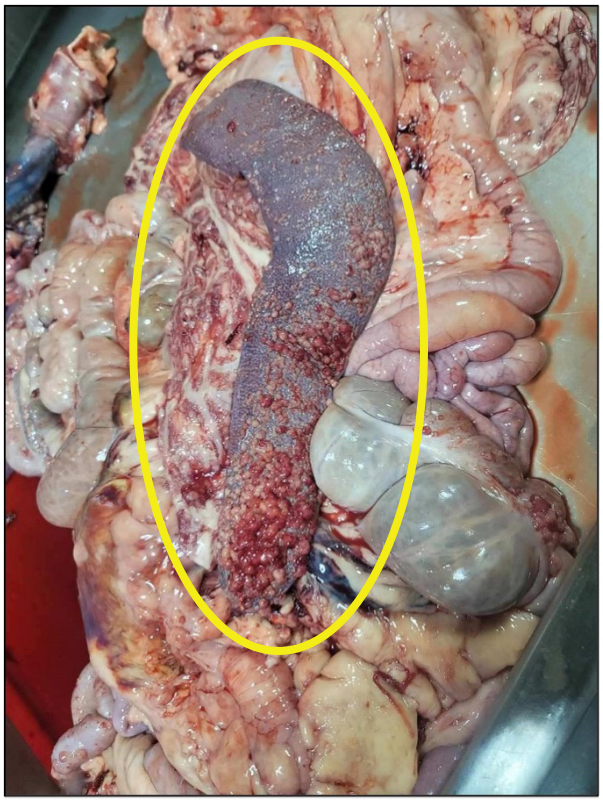
Image 192. Abnormal Carcass- Lymphoma

In most cases, swollen lymph nodes in the head representative of a lymphoma will have a distinctly different appearance then lymph nodes associated with the head in a healthy carcass. These lymph nodes will be significantly enlarged with a lumpy presentation and texture. Lymph nodes may have a wet or shiny appearance.

Image 193. Abnormal Spleen- Lymphoma

The lymphoma spleen will be significantly enlarged and, in some cases, a raspberry jam-like color. This enlarged, raspberry jam-like colored spleen and will have a crumbly texture if broken apart.

Image 194. Abnormal Spleen- Lymphoma



Another presentation of spleen lymphoma is the presence of tiny tumors on the top surfaces and throughout the spleen.

Image 195. Abnormal Liver- Lymphoma

Lymphoma in liver is typically presented as significantly enlarged. Note the size difference in the two livers [pictured above]. The liver pictured towards the bottom is much larger than a normal liver. When the lymphoma liver is incised, it may 'bloom' as the tissue sort of expands rather than be represented by straight lines in tissue that would be seen in a normally, healthy liver.

Image 196. Abnormal Liver- Lymphoma

Another presentation of lymphoma in the liver may be raised, pale colored spots on the surfaces or within the liver. When incising the liver, the raised bumps will also 'blossom' or expand out of the incision.

Odors

The carcass of a male hog with testicular tissue leftover after castration can have a sexual odor, referred to as boar taint. It is rare in young animals but has a distinct foul odor.

Sorting Instructions:

Carcass with strong abnormal or foul odors, mark or otherwise identify for discard. You can smell strong odor several inches away from the carcass. Carcasses with weak odors, mark or otherwise identify for further sorting and FSIS inspection. You must get very close to the carcass to smell weak odors.

Pale Soft Exudative Pork (PSE)

Post-mortem signs:

1. Pale, soft, and watery muscle tissue in one or muscles;
2. Slight sour smell;

Sorting Instructions:
Mild PSE, allow on to FSIS inspection. Moderate PSE, mark or otherwise identify for trimming. Mild to moderate PSE may not be noticed during slaughter and can be trimmed on the fabrication floor according to company policy. Severe PSE that cannot be trimmed, mark or otherwise identify for further sorting and FSIS inspection or discard, depending on severity.

Over-scald

Carcasses that were in the scald tub for too long or at too high a temperature have a cooked appearance.

Post-mortem Signs:

1. Lighter and firmer muscle tissue than usual;
2. Varying degrees of tearing and contamination of tissues with scald water.

Sorting Instructions:
Carcasses with mild over-scald, mark or otherwise identify for trimming. Carcasses with moderate, mark or otherwise identify for further sorting and FSIS inspection. Carcasses with severe over-scald, mark or otherwise identify for discard.

Frostbite

Hogs can develop frostbite in severe cold weather, typically around the ham, loin, and side areas, sometimes up into the shoulder.

Post-mortem Signs:

1. Pin-point or larger blood spots;
2. Reddened skin, fat;
3. Dark red or bruised looking muscle tissue.

Sorting Instructions:
Minor to moderate frostbite, mark or otherwise identify affected areas for trimming. Carcasses or heads with severe frostbite that cannot be trimmed, mark or otherwise identify for discard. Viscera and heads without signs do not need to be discarded because a carcass is discarded.

Image 197. Abnormal Antemortem- Frost Bite

Image 198. Abnormal Postmortem- Frostbite

Frost bite causes what is essentially a burn to the skin and muscle tissue. These frost-bite burns may extend deep into the muscle tissue with also a bruised appearance. Frost-bite may be more frequently found in locations on the animal that may have had extended contact with trailer or exterior surfaces [hams, bellies or top of backs]. After slaughter, these areas may worsen in appearance, especially after emerging from the scalding process.

Acknowledgements

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Appendix One. Glossary Of Terms

Abscess: a swollen area within body tissue, containing an accumulation of pus.

Ante-mortem: before death.

Discard: an establishment determination to divert animals, carcasses, or parts for disposal, rendering, or other approved uses other than for human consumption.

Establishment: a single facility that produces meat, poultry, or egg products under FSIS inspection.

Moribund: at the point of death, dying.

Post-Mortem: after death.

Recumbent: lying down.

Abscess: a swollen area within body tissue, containing an accumulation of pus.

Adhesion: bands of fibrous tissue that can form between abdominal or thoracic tissues and organs.

Anemic: lacking in color.

Ante-Mortem: before death.

Carcass set: a carcass after the head and viscera are removed and the head and viscera from that carcass.

Cysts: a sac-like pocket of membranous tissue that contains fluid, air, or other substances.

Degeneration: breaking down or wasting away of body tissue such as muscle or organs. Affected tissues will be abnormal in texture (possibly soft or liquid-like) or appear loose and disorganized.

Establishment: a single facility that produces meat, poultry, or egg products under FSIS inspection.

Granulomas: a mass of granulation tissue (grainy or gritty texture), typically produced in response to infection, inflammation, or the presence of a foreign substance.

Lead Sorter: a designated employee or member of management with more training, knowledge, or experience than a sorter. Establishments may elect not to have a lead sorter, in which case decisions would go from the sorter to the FSIS PHV.

Lesion: is any damage or abnormal change in the tissue of an organism, usually caused by disease or trauma.

Moribund: at the point of death, dying.

Pathogen: a bacterium, virus, or other microorganism that can cause food borne illness in humans.

Pleura: the membrane lining the thoracic cavity (parietal pleura) and covering the lungs (visceral pleura).

Post-Mortem: after death.

Recumbent: lying down.

Scirrhous cord: a fibrous enlargement of the cut end of the spermatic cord in a castrated animal caused by bacterial infection.

Tumor: an abnormal growth or mass of tissue that may be solid or fluid filled.

Vesicles: a fluid- or air-filled cavity or sac.

Viscera: the internal organs in the main cavities of the body.

Weasand: name for the trachea, esophagus, or both combined to