FOOD INSPECTION NOTES

H. HILL AND E. BEDFORTH

SECOND EDITION

FOOD INSPECTION NOTES

A HANDBOOK FOR STUDENTS

BY

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PREFACE TO THE SECOND EDITION

THE reception given to this volume and its ready acceptance, together with the demand for a further edition, has proved the authors' contention that a work of this kind was required. The text of the present volume has been revised, amended where necessary and brought completely up to date, and it is once again offered to public health officials and other persons interested in food inspection in the anticipation that its reception will be as cordial as it was on its first appearance three years ago.

H. H.
E. D.

December, 1946.

PREFACE TO THE FIRST EDITION

THE aim of this small volume is to meet what has long been considered by the authors a definite necessity and it has been designed with that end in view. Public health students have long had to delve into many weighty though excellent volumes and sift the grain from the chaff to extract the knowledge which they seek in order to pass essential examinations. Similarly, the qualified and experienced official often requires to be reminded in a speedy manner of an essential point of food inspection work and he will, it is hoped, find much to interest him in the pages which follow.

The authors, being practising public health officers, have on many occasions experienced similar difficulties and this work is the outcome. They hope that this volume will serve the purpose they have in mind and will be received for exactly what it is intended to be, namely, a condensation of present day knowledge of foods and their inspection, clearly presented and stripped of all superfluous matter.

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CONTENTS

FOOD INSPECTION NOTES

MEAT INSPECTION

ANTE-MORTEM INSPECTION

Objects

Examination of live animal important. Assists in :

(1) Detection and isolation of diseased animals.

(2) Avoidance or prevention of transmission of disease from animal to man by infection of persons engaged in slaughtering or in handling meat.

(3) Observation of conditions requiring more rigorous examination after slaughter and assistance in attaining this object.

(4) Obviously diseased animals can be excluded from any insurance scheme which may be in force in a district.

Appearance of Animal

Live animals should be well nourished ; alert, coat loose soft, free moving on underlying structures ; hair smooth with slight lustre ; nostrils healthy, no discharge. Tongue not protruding ; animal rises easily ; firm in flesh. Ill or lame animals shunned by their fellows. Animal's head resting on ground when lying down indicates illness. Ruminant animals never lie on their sides when well. If ailing, coat rough and hidebound with bare patches. Respiration, pulse and temperature are indications of state of health.

SYMPTOMS. Signs of disease in live animals.

LESIONS. Signs of disease in dead animals.

Respiration

Frequency and character indicated by rise and fall of flanks ; should be even and regular ; muzzle cool, no discharge. Breath should be odourless. If flanks heaving and respiration rate increased, animal said to be "blowing" ; nostrils are distended. Respirations more frequent in young animals. With shallow respiration, rise and fall of flanks reduced ; frequency increased. In estimating rate of respiration, following to be considered :

(1) Character of animal.

(2) Incidence of exercise.

(3) Age.

(4) Atmospheric conditions.

Animals with respiratory diseases breathe rapidly and flanks heave ; also cough and noisy respirations.

Pulse

Means of ascertaining strength and frequency of heart beats. Denotes animal's strength. Observed on artery having hollow or bony background. Extremities best for testing. Pulse always in sympathy with respirations. In illness, frequent and weak. Usually taken from submaxillary artery on lower edge of jaw. Inside for horses and outside or on tail for cattle. Sheep and pigs, taken from femoral artery inside thigh.

Temperature

Extremities and limbs just perceptibly warm to hand, muzzle always cool. Coldness of extremities denotes weak circulation and heart action. Warm muzzle, ears, horns and hooves denote fever. Taken by thermometer inserted in rectum.

TABLE 1

Respiration Rate, Pulse and Temperature for Various Domestic Animals

	Respiration per minute.	Pulse per minute.	Temperature.
Oxen . .	12–15	40	101·5° F.
Horse . .	8–10	35	101·0° F.
Sheep . .	12–30	75	104·0° F.
Pig . . .	12–30	75	102·0° F.
Calf . . .	15–20	50	101·5° F.

Digestion

Healthy animals eat and drink greedily. If ill, eat little ; may refuse to drink. Cud chewing noticeable in normal animals ; ceases or delayed when ill. Dung should be of normal consistency, unmixed with blood ; no unpleasant smell. Dung thin and watery when bowels inflamed or digestive troubles. Blown or enlarged stomach noticeable.

Urine

Urine clear yellow in colour. Thick and muddy urine with disagreeable smell indicates bladder trouble.

Generative Organs

Healthy animals, vagina closed; no discharge; whitish mucous membrane; no sores. Whitish discharge may be present if animal diseased. Foul smelling discharge indicates retention of placenta.

Udder

Firm in heifers. In cows, distended and soft. Udder distended when inflammatory conditions present; hot and painful when handled. Fluid may escape from teats.

Injuries

Injured animal often refuses to rise particularly if bones broken.

SLAUGHTERHOUSES

Abattoirs

Should be regarded as essential for all large districts or for combination of smaller districts. Provided in all large towns and many smaller areas.

SITE. Adjoining railway and good access by road. On outskirts of town.

SIZE. According to number of animals to be slaughtered.

PLAN. (1) Lairage.
(2) Slaughter rooms. Separate for oxen, sheep and pigs.
(3) Hanging or cooling rooms.
(4) Cold store.
(5) Meat detention room with condemned meat store and laboratory.
(6) Tripery and gut-scraping premises.
(7) By-products and fat digesting premises.
(8) Manure store with movable containers.
(9) Offices and lavatories.
(10) Messrooms and lavatories.
(11) Boiler house.

Good water supply, lighting and drainage essential. Most colonial and foreign countries now provide abattoirs in all large centres of population.

Advantages are:

Centralisation, greater ease and efficiency of inspection, suitable storage of carcases, utilisation of by-products, ease of access.

Private Slaughterhouses

Still in majority in this country. Some built on sound hygienic lines, majority entirely unsatisfactory, provide poor

accommodation for slaughtering, meat storage and inspection. Difficult to keep clean, many too near dwelling houses; nuisances from noise and smell. Access through congested or busy public thoroughfares. Inspection rendered difficult on account of number of slaughterhouses and times of slaughter. All such premises should be abolished.

SLAUGHTERING AND DRESSING

General

Before slaughter, animal should be rested for at least twelve hours; if travelled long distance, two or three days. Water should be supplied in abundance and animal given quietness and induced to rest. Objects of resting are to get rid of wasting due to recent activities. Allows for healing of bruises and enables animal to bleed properly. Fatigued animals bleed badly and flesh does not keep so well as that from rested animals. Loss of weight due to transport over period of twenty-four hours may equal 10 per cent. Loss increased in hot weather. Main points to remember in slaughtering are:

(1) Speed.
(2) Humanity.
(3) Safety of personnel.
(4) Complete bleeding of animal.

Stunning

With certain exceptions, must be carried out by means of mechanically-operated instruments. Main advantages:

(1) Lack of cruelty.
(2) More speedy as animal is quieter.

Main objections raised:

(1) Bleeding not so complete—doubtful.
(2) Danger of accident when free bullet is employed.

Several types of instrument:

(1) GREENERS.

Consists of short rifled barrel taking small steel-pointed bullet, finished with bell-shaped chamber which deadens sound, protects operator from flash, and directs bullet through brain into spinal cord. Made to be employed either at front or at side.

(2) CASH.

Common type in use. Captive bolt, no free bullet. Made in form of pistol, charge propels steel rod or bolt into brain of animal. Rod or bolt travels 2 inches;

does not leave barrel entirely. *Temple Cox pistol* is constructed on similar lines.

(3) SWEDISH.

Uses bullet fired by tap of mallet. Leather mask covering eyes and forehead of animal, sometimes used. In centre of this is shield-like plate with metal tube receiving striking bolt or pin with pointed head. Struck with wooden mallet to fire bullet.

(4) ELECTRICAL STUNNING.

Normally employed on pigs (see page 6). Can be readily adapted for slaughter of cattle and horses but has not been so employed in this country.

Stunning and Bleeding

In stunning, point aimed at is intersection of lines drawn from each horn base to eye on opposite side. Bullet or captive bolt enters skull and penetrates deeply into brain ; if properly carried out produces immediate and complete insensibility. Pithing cane introduced through hole thus made and passed completely through brain for some distance down spinal cord ; medulla destroyed by violent movement inwards and outwards. Animal then bled. Straight cut made through skin of chest and knife is passed through opening towards chest wall until large vein at this point is opened. Blood emerges in strong stream and is usually collected for further use. Bleeding assisted by pumping by pressure of foot on flanks.

Jewish Method

Method permitted by Slaughter of Animals Act, 1933. Animal thrown to ground by ropes and pulleys, or Weinberg casting pen employed. Fettered so that head rests on horns and nose. Rabbi then severs throat ; incision goes through all structures down to vertebræ. Claimed that anæmia of brain and consequent unconsciousness sets in immediately. Meat passed by Rabbi termed " Kosher." If lungs and chest wall are free from adhesions, carcase passed ; if slightest adhesion exists, meat not used as " Kosher " meat. Objections to this method are :

(1) Animal is conscious until throat is cut.

(2) Animal has to be roughly handled in throwing unless casting pen is used.

(3) Blood wasted as stomach contents become mixed with same.

Jewish fraternity normally use only forequarters of animal

as food. Hindquarters can only be used if freed from large blood vessels.

Calves

Previously hoisted up, head downwards, by rope fixed round hind legs, stunned and throat cut. Claimed that carcase bleeds better this way. Must now be stunned before hanging. Head is finally removed entirely to assist complete bleeding.

Sheep

Placed on wooden crutch or creal ; three legs tied together, one being allowed free to kick and expel blood. Knife inserted into nape of neck and spinal cord severed or neck broken by sharp backward twist of head. Slaughter of Animals Act, 1933, allows local authority to require the stunning of sheep in their area prior to insertion of knife. Most local authorities have made use of these permissive powers. The "*Definite*" sheep stunner is made on lines of captive bolt pistol but operated by powerful spring. No explosives employed, therefore no noise or smell. Stunning is said to damage head, but damage not serious, if any.

Pigs

Formerly animal stunned with blunt instrument then bled. Cash captive bolt pistol now often used. Electrical stunning tongs can be employed if electric current is available. Method provides thoracic bleeding as in bovines. After bleeding, carcases are immersed in hot water, scraped, and dressed. Where large numbers are slaughtered daily, electrical scraping machines employed. Stunning of swine has been objected to by butchers who state that complete bleeding is not achieved, and "splashing" may occur which interferes with bacon curing. Very little evidence to uphold these contentions.

Dressing

OVERSTICKING means that knife has penetrated below throat into chest wall resulting in blood getting behind pleura. Iu such cases pleura removed.

BLOOD SPLASHING sometimes occurs, more often in pigs. Small blood spots throughout muscular tissue.

In dressing bovines, animal is rolled on back and hide incised from brisket to tail. Skin then removed from legs, feet and hocks detached at knees. Head severed from body by cutting at first cervical vertebræ. Hide removed as far down flanks as possible, abdominal cavity being opened and omentum or caul fat removed. Caul fat is later rolled, salted and when "set" sold as suet. Intestines and stomach

with spleen attached are next removed. Aitch bone then cut through and wooden tree passed through hind leg tendons and carcase hoisted to convenient height for completion of dressing. Bladder detached; penis and testicles, or udder removed, followed by liver and pancreas, lungs, heart and trachea with œsophagus in that order. Hide then removed at neck and tail skinned and cut off. Vertebræ chopped or sawed down. Damp, hot clean cloths used to wipe down carcase. Two sides then transferred from tree to travelling hooks and hide entirely removed. Ragged pieces of fat, particularly on neck, trimmed away; carcase set aside to cool. Later quartered.

Liver, heart, kidneys, spleen, throatbread and pancreas are set aside for sale. Stomach washed and sent to tripe boiler, lungs sold for cats' meat, intestines emptied of their contents, washed and sent to gut scraper. Hide, horns and hooves sent to fellmonger, and rough fats collected for soapmaker.

Inflation of Carcases

Practice of inflating carcases of calves and sheep prior to dressing carried out to assist flaying and to improve appearance, increasing apparent value of meat. Removal of skin not assisted. Calf's head and lungs of calf or ox sometimes inflated. Inflation carried out by mechanical machine which has pointed nozzle. This is inserted through incision into subcutaneous tissue. Air distributed throughout carcase by means of stick. Objectionable in that air taken from floor level is not as clean as could be desired. Inflation by mouth or in manner likely to cause infection prohibited.

Inflated carcases recognised by unusual size and glistening appearance. Tissues spongy and crepitate (crackle). Not possible to determine method of inflation so should be prohibited on hygienic grounds.

Dressing Calves and Sheep

Hide first removed entirely before carcase is opened. Internal organs removed, carcase hung on small wooden or metal tree. Lungs, heart and liver (pluck) removed together and not separated. Sometimes backstick placed through belly on one side, drawn round back and pushed through belly on opposite side so that carcase sets with interior visible. Carcase washed down after dressing.

Dressing Pigs

Similar to calves and sheep; head left attached and back sticking not generally employed.

INSPECTION OF CARCASES

Rigor Mortis

Stiffening which occurs in dead body due to coagulation of muscle plasma which during life is contractile, semi-liquid substance within muscle fibres. Coagulation results in formation of myosin, muscle clot which corresponds to fibrin in blood clot. In both cases, clotting produced by action of ferment developed after death. Gradual in onset, muscles becoming taut and acid in reaction; sarcolactic acid produced. Meat before setting is tough, but with acid formation, connective tissue becomes soft and gelatinous; muscle fibres loosen, meat becomes more tender and palatable. Rigor mortis usually persists from one to several days, beginning and ending being subject to considerable variation. Generally supervenes twelve hours after slaughter. Rigor passes off first in animals in which it appears first. Animals tired with muscular exertion often set within a few minutes. In exhaustive or febrile diseases, or with septic conditions, setting of muscles sometimes not observable.

Appearance of Fresh Meat

Ox. Meat should be firm, elastic, moist though not wet, marbled appearance, fresh smell, should not pit. When unsound, softer than normal, wet looking, dark green or black, offensive odour, putrefaction near bone, straw-coloured fat.

Young cattle have light red meat, finely grained.

Bulls' flesh is dark red, tough, coarse-grained, poor in fat. Often smells offensive.

Calf. Light, pale red in colour. Fat, reddish white, whitening with age. Fine fibre.

Horse. Dark red colour, coarse texture, odour unpleasant, yellowish fat, oily, sickly smell, flesh never sets. Glycogen test is determining factor.

Sheep. Light red or brick colour, fine fibre, moderately firm in consistency. White, hard fat, rather suety.

Goat. Flesh darker than mutton. Fat less abundant on body though equally as much on loins. Goaty odour. Fat similar to that of mutton.

Pig. Pale red or rose colour, in part white, fine fibre, medium consistency, odour indefinite. Fat white and oily.

Appearance of Imported Meat

Chilled—kept at temperature of approximately 29·4° F. Frozen—kept at temperatures between 14° and 18° F. Meat freezes at 29° F. Life of chilled meat depends upon the fat which may break down on account of rancidity with

the formation of fatty acids. Hard, white fat is more resistant to breakdown than is the rich yellow variety.

Principal defects are moulds, brine stains and abnormal odours. Variations in temperature cause moulds—fluffy white patches in early stages ; later black spots. Sometimes carcases quickly decompose. In inspection, judgment based on 10 per cent. of whole. Chilled meat may be gas stored in atmosphere containing 10 per cent. carbon dioxide.

IMPORTED MEAT after exposure to atmosphere for short period appears limp and exudes moisture. Fat very white turning yellow when thawed ; flesh bright red colour owing to hæmoglobin dissolved in fluids and permeating tissues. Cut surface has moist feel. Fat often stained by meat juices. May suffer from " ice-burn " ; moisture drawn from surface of meat leaving black-stained portions. Frozen offals may take some discoloration from containers but be quite sound—discoloration usually disappears when thawed out. Liver may show small fatty crystals on surfaces.

IMPORTED MUTTON OR LAMB—fat ragged and greyish in colour, dirty rough appearance ; muscle pale, fat very white.

IMPORTED PORK—skin darker, muscle paler, fat harder.

Examination of Carcases

Following points to be noted :

(1) Blood should be examined and skin also when removed from carcase.

(2) Appearance of animal, emaciated, well-fed, discoloured. Outside fat should be light yellow, free from hæmorrhagic patches.

(3) Carcase should set well (8 to 12 hours).

(4) Pleura and peritoneum examined for evidence of stripping and tubercular deposits ; also posterior surface of diaphragm.

(5) Bones and joints examined.

(6) Lymphatic glands incised where necessary.

(7) Head, tongue and glands of same.

(8) Lungs, heart, trachea and œsophagus, liver, spleen, stomach and intestines, bladder, udder (if any) and glands of same. Incisions should be made where necessary.

Memo. 62 (Foods) should be carefully studied and memorised.

ANATOMY AND PHYSIOLOGY

Animal Body

Consists of :

(1) TISSUES. Made up of cells.

(*a*) *Epithelials*. Outer layer of skin—covering mucous

membrane—intestinal cavities and joints—heart, lungs, blood vessels and glands.

(*b*) *Connective.* Holds organs in position—surrounds and penetrates muscles—covers nerves and blood vessels.

(*c*) *Muscular.* Red flesh—made up of fibres.

(*d*) *Nervous Tissue.* Made up of nerve cells, nerve fibres and supporting tissue.

(2) SKIN. Outer layer, epidermis. Deep layer, true skin. Forms protective covering of body; acts as secretory organ and regulates body temperature.

(3) MEMBRANES. *Serous*, lines body cavity, pleura and peritoneum.

Synovial, lines joints.

Mucous, lips, mouth and nostrils, alimentary tract, genitals, urinary tracts.

(4) CARTILAGE. Gristle; tough flexble tissue.

(5) BONE. Hard tissue forming skeleton of animal.

(6) JOINTS. Assist motions of legs, shoulders and quarters —movable (legs, tail, shoulders) or immovable (pelvis, skull).

Bones

BONE is hard, compact material enclosing cavity filled with marrow. In new or unborn animals, marrow is red in colour. In older animals, is red in flat bones and white or yellow in long bones; fatty in consistency. In healthy bones, marrow does not flow. Bones forming movable joints generally expanded at ends and covered with cartilage giving pure white polished appearance. Held together by bands or capsules of fibrous tissue termed ligaments and lubricated by serous fluid.

Ribs joined to vertebræ by cartilage. Attached to each dorsal vertebræ is pair of ribs. Forward ribs joined to

TABLE 2

Bones of Various Food Animals

	Ox.	Sheep.	Pig.	Horse.
Cervical	7	7	7	7
Dorsal	13	13	14	18
Lumbar	6	6	7	6
Sacral	5	5	4	5
Coccygeal	15–20	15–20	20–23	18–20
Ribs	13	13	14	18
Teeth	32	32	44	36 & 40