

**Part II**

**ANTE-MORTEM CARE**



# TRANSPORT, ANTE-MORTEM CARE, AND INSPECTION OF ANIMALS INTENDED FOR SLAUGHTER

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Meat hygiene may be defined as expert supervision of all meat products with the object of providing wholesome meat for human consumption and preventing danger to public health.

Inspection of meat has two aspects : examination of the live animals on entry to the slaughterhouse (ante-mortem inspection), and examination of the carcass and any food products made from the meat after slaughter (post-mortem inspection).

## **Ante-mortem Inspection**

Of the two, the most important is the ante-mortem inspection, without which no adequate inspection of the carcass or meat is possible. There is no need in that connexion to specify the diseases found in domestic animals in which anatomical changes are slight in comparison with the severe clinical symptoms (notably, septicaemia) ; paratyphoid may be regarded as one of the most dangerous of these to the health of man. In cases of emergency slaughter or slaughter of sick animals, too, it is difficult for the meat inspector to form his judgement without ante-mortem inspection. Again, transportation affects the condition of the slaughter animals, exciting or tiring them to a greater or lesser degree according to the type of transport and the length of the journey. This, in turn, has a direct influence on the keeping qualities of the meat and, without ante-mortem inspection, there is no possibility of holding up slaughter pending recovery.

Ante-mortem inspection ought to be carried out solely by veterinarians, and these should preferably have had a long experience of general clinical practice before taking up this type of work. Furthermore, it should be veterinary inspectors who deal with all animals marked down as suspect at the ante-mortem inspection. In many cases the judging of such animals is difficult, even for scientifically trained men ; it frequently proves a hard test of their knowledge and skill.

The amount of weight placed on the ante-mortem inspection varies from country to country. In the Netherlands, for example, no animal is condemned outright on the findings of this inspection alone. In the USA, on the other hand, any animal showing on ante-mortem inspection symptoms of rabies, tetanus, milk-fever, or railroad sickness is immediately condemned and subsequently consigned to the offal tank. Obviously, the need to protect the public against the danger of consuming diseased or unsound meat must always be the primary consideration. Nevertheless, the importance of avoiding wastage of valuable meat and meat products requires that only those animals that are totally unfit for human consumption should be wholly condemned. Hence, the correct procedure in such cases would be to conduct a post-mortem inspection, supplemented by the requisite bacteriological tests, before forming the final judgement.

#### *Emergency slaughter and slaughter of unsound animals*

Immediate killing is sometimes necessary where an animal is so injured or sick that death is inevitable. It is important that such animals should be slaughtered at the earliest possible moment, in order to save the meat for human consumption.

Where an animal already dead is brought to the abattoir, irrespective of the hour of arrival, a microscopic examination of blood taken from a subcutaneous vein should be made immediately. The carcass should be left untouched until this has been done.

Where an animal has been involved in a serious accident or is a potential danger to life or property, it is, of course, not always possible to carry out an ante-mortem inspection.

In cases of emergency slaughter or the slaughter of a "suspect" animal, the temperature should always be taken.

#### **Transportation and Ante-mortem Care of Slaughter Animals**

Animals may be moved from one place to another by any one of the following means :

- (1) driving on the hoof ;
- (2) road transport ;
- (3) rail transport ;
- (4) sea transport.

As a rule, slaughter animals are not carried by air with the exception of hogs, as this means of transport tends to be rather costly. The internationally accepted standards adopted by K.L.M. (Royal Airways Company) of the Netherlands are reproduced in Annex 5, page 381.

Moving of animals, whether by driving on the hoof or transportation by rail or by any other means, will cause a change in their physical condition. This change is always evidenced in the quality of the meat. Fractures, bruises, and such-like injuries may be incurred, and suffocation is a further risk with which all transport companies are familiar. Furthermore, no consigner of cattle overlooks the loss of weight that is caused by transportation, whatever its nature.

### *Driving on the hoof*

When driven over short stretches of road under favourable weather conditions, animals will show no sign of physical strain on arrival at the place of destination, provided they receive proper treatment *en route*. Apart from the inhumane aspect—and most countries have legislation against cruelty to animals—all unnecessarily cruel practices to keep the animals on the move should be condemned because of the effect on the quality of the meat.

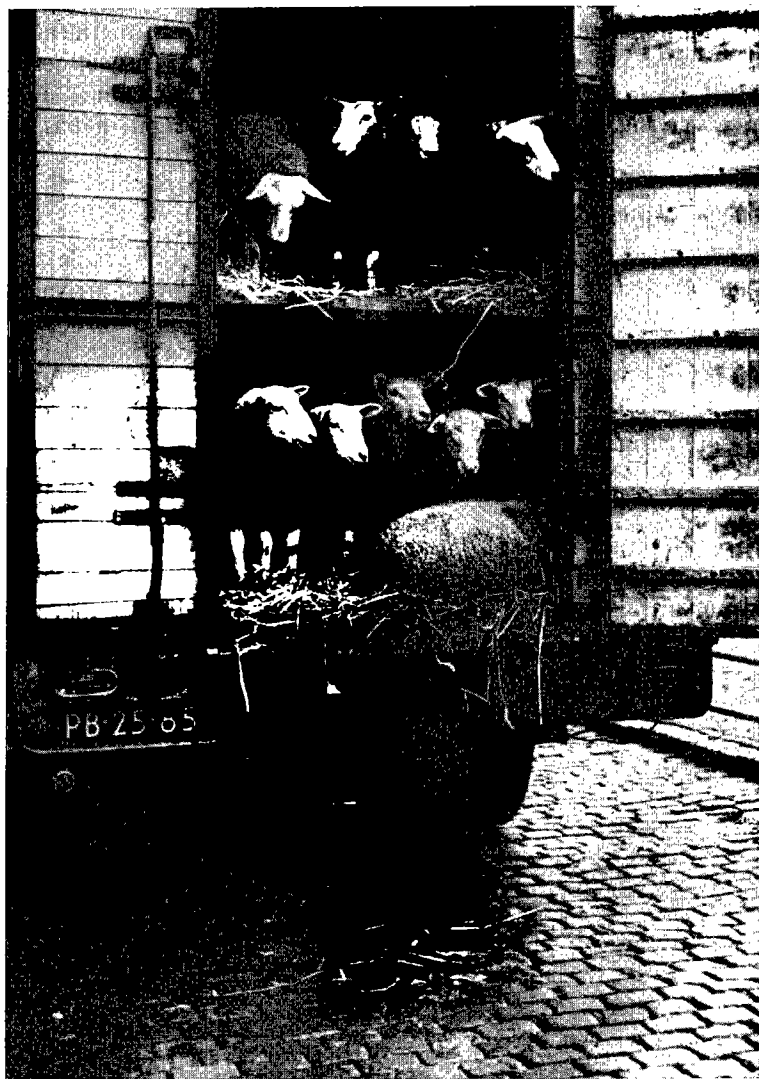
### *Road transport*

Road trucks for the transportation of animals should be specially built for the purpose and should be adapted to the different kinds of animal. Provision should be made, too, for easy loading and discharging.

FIG. 1. TRANSPORT TRUCK FOR SHEEP, WITH TWO FLOORS : I



FIG. 2. TRANSPORT TRUCK FOR SHEEP, WITH TWO FLOORS: II



Regulations governing road vehicles for the transport of animals are in force in the Netherlands (see Annex 2, page 370), the object of which is to lay down hygienic requirements that will safeguard the animals against unnecessary suffering during transportation and ensure arrival at the destination in the best possible condition. Other European countries appear to have regulations on very much the same lines.

The cattle trucks that have been built to these requirements generally appear to be excellent. One special design in the Netherlands has a trailer accommodating 80-100 cattle and has a special compartment for attendants and spare drivers. For the transport of the smaller animals, such as pigs and sheep, a special type of truck has been devised with two or more decks to economize in space (see Fig. 1, 2). Incidentally, there is an Australian sheep-truck that has several trailers and can transport 800-1000 sheep at a time.

On humane grounds, animals conveyed by truck should not be fettered unless there is a risk of their jumping out ; tying of the legs of small animals should not be permitted either. It is very foolish, too, for consigners to try to economize on freight by overcrowding. The risk of suffocation and injury to the animals is greatly increased.

Road transportation of animals has a number of advantages over transport by rail. It is much quicker, since trucks can move from point to point by the shortest direct route, cutting out the deviations necessitated by rail. For this reason, many European countries favour transport by road. Unfortunately, up to the present, all efforts to set up international standards for the road transportation of livestock have failed, despite the obvious desirability of such measures within Europe.

#### *Rail transport*

Special wagons, developed in the light of experience over many years, have been devised in the Netherlands and elsewhere to meet the requirements of this type of transport for animals. The size of the wagon is prescribed ; proper ventilation is ensured ; and feeding and watering arrangements have been perfected. In the USA, the transport of cattle is mostly effected by rail. In view of the immense distances to be covered and the capital value of the consignments, the stockbreeders must be assured that the animals will arrive at the destination in good condition. Consequently, the railway companies have special departments dealing with cattle transportation. Special wagons have been built to fit the transit platforms, so that a long cattle-train can be serviced quickly. Rail transport of animals in Europe, on the other hand, is negligible. The regulations governing rail transport of animals in the Netherlands are reproduced in Annex 3, page 372.

United States law requires cattle to be unloaded and rested every 28 hours ; the only exception is where the total duration of the journey does not exceed 36 hours. Transport is effected in the following way. Local wagons are taken to one of the nearest main railway lines. There, a cattle train is made up and dispatched on an express schedule to one of the special transit centres, where the wagons are handed over to a forwarding company for dispatch to the central markets. To avoid exhaustion, it is regarded as essential that the animals should be given humane

treatment and care during transportation. Otherwise, the meat will deteriorate and even the skins will lose in value. The National Live Stock Exchange has issued valuable advice for stockholders and farmers, concerning :

- (a) preparation of wagons for conveyance of cattle ;
- (b) classification of different kinds of cattle and separation of dangerous animals ;
- (c) employment of experienced livestock attendants, familiar with the various peculiarities of animals and their transport.

The United States Department of Agriculture further recommends that pigs in transit in hot weather should be placed in a well-ventilated place for some time before the train leaves, in order to cool off. Loading should not be permitted earlier than one hour before departure time. Regulations in the USA are also very strict concerning the state of health of animals. Some of the States require a certificate of health stating that cattle to be transported are free from tuberculosis ; exemptions from this rule are permitted for animals in transit through intermediate States. The same formality is also required for pigs, in some cases to be supplemented by a certificate that no contagious diseases, or symptoms of such diseases, have been observed in the area of origin. For the purpose of scabies control, it is a frequent requirement that sheep should be dipped under veterinary supervision within the ten-day period preceding transport, the dipping to be repeated within 10 days of arrival at the place of destination.

Considerable loss of weight during transport, or "shrink" as it is called, may be caused by faulty transport methods, but there are many other factors which will give rise to loss of weight, notwithstanding adequate feeding arrangements : for instance, rough handling, a change in weather conditions, or other more or less important causes that cannot always be eliminated.

It has been established by the United States Department of Agriculture that feeding during transportation has a great influence on the amount and duration of the shrink. In the case of cattle under transport, the shrink may amount to :

2.05%	-	3.91%	in 24 hours
3.45%	-	5.40%	in 24-36 hours
3.88%	-	6.37%	in 36-72 hours
3.96%	-	7.00%	in 72 hours

An interesting investigation, reported by Hanfland,<sup>3</sup> on the shrink in the live weight of cattle during transportation was carried out over a three-year period by the United States Bureau of Animal Industry. The investigation yielded the following information :

(a) The shrink in cattle during transport depends upon various factors, including :

- (i) the condition of the animals at the time of loading and the kind of treatment received during the drive to the place of loading ;
- (ii) the length of time between the last feed and loading ;
- (iii) the kind of food the animals are given before loading (when grass or sugar-beet was fed, a greater loss of weight was observed) ;
- (iv) the weather conditions prevailing at the time of loading and during transportation ;
- (v) the kind of transport to the market (if conditions are not good, the loss of weight will be greater) ;
- (vi) the kind of treatment during halts at the stations in transit ;
- (vii) the time of arrival at the market. (The loss of weight will be considerable if the animals have to cover a great distance on the hoof after arrival at night. On the other hand, if they arrive during the afternoon or on the eve of market day, they can be rested and fed.)

(b) The shrink in calves may appear to be small ; under normal conditions, however, this will be in the same proportion as the shrink in full-grown animals.

(c) The difference in shrink between bulls and cows is not as great as is generally supposed, but bulls do not shrink as much as cows of the same weight.

(d) The shrink during the first 24 hours of transport is relatively greater than during the following 24-hour period.

(e) The shrink in cattle is in direct proportion to the live weight, provided that all conditions and factors are the same.

(f) Cattle shrink is about 5%-6% of the live weight for a period of transportation lasting 70 hours. During transport for 36 hours or less, the shrink is 3%-4%.

(g) Fat animals, fed on sugar-beet, shrink more than normal cattle during transport, and consequently show a greater net shrink.

(h) The shrink diminishes proportionally for every 12 hours after the first 24 hours of transport.

The more intensive feeding of pigs for a few days prior to transportation is of no value and will neither increase the market weight nor reduce the shrink.

Floor space in rail cattle-wagons requires that cattle should be placed crosswise, alternately head to tail, in a fully loaded wagon. According to Zschokke (quoted by Edelmann<sup>1</sup>), adult bulls and steers require for this

purpose 66 cm and cows 57 cm of the wagon's length. The space he recommends for pigs is about 0.4 m<sup>2</sup> per animal, that for calves 0.31 m<sup>2</sup>, and that for sheep 0.24 m<sup>2</sup>. These figures should not be taken as a universal standard, since the size of animals of the same species may differ from country to country. Practical experience and local hygiene and welfare requirements should be taken as a guide.

The disadvantages and risks involved in rail transport of animals are determined by various conditions that need not be enumerated in detail. Experience has established that fat animals suffer more than lean ones. The greater the number of animals stowed in a wagon, the higher the temperature will rise and the greater will be the risk of suffocation. The longer the distance to be covered, the more exhausted the animals will become, with consequent greater loss of weight. The less suitable the wagons for the purpose, the greater will be the risks. It has further been established that pigs suffer more from transport by rail compared with other animals; this is undoubtedly due to their physique. Death from suffocation and heart paralysis is quite a common occurrence among pigs in transit. It appears that the constant swaying of the wagons causes the animals to fall down and they are then trampled upon by the others. This causes serious injuries, from which death will eventually ensue; suffocation may also occur.

### *Sea transport*

For overseas transportation, Dutch shipbuilders have devised special vessels, the arrangement, equipment, and fitting-out of which are ingeniously adapted to the many needs that have become apparent during decades of animal transportation.

At first many transportation difficulties had to be solved, but these have all been satisfactorily overcome, and nowadays the loading and discharging are no longer problems, owing to specially constructed gangways, crates, and other contrivances. No difficulty is experienced in feeding and watering the animals on board ship, in contrast to the problems involved in doing so during road and rail transport.

In every country regulations have been drawn up governing the shipping of livestock. The requirements of the Foot-and-Mouth Disease Institute in Amsterdam, for example, are largely met through the shipping in of cattle, mostly from Ireland, that have never suffered from the disease. This subject has been studied from every angle, and questions relating to the required formalities, inspection prior to loading, attendants, rejection of unfit animals, killing instruments, construction of pens, ventilation, insulation, lighting and drainage, fire-protection, feeding, etc., have been considered.

A careful comparative study of the British, Canadian, Irish, and United States regulations on sea transportation of animals intended for human food shows that these are more or less identical with the laws in force in the Netherlands, which are reproduced in Annex 4, page 374.

Although not generally prohibited by regulation, ropes should never be used to tie cattle, either by the head or by the horns. It frequently happens that animals strangle themselves through falling and being choked. On the other hand, horses, being nervous animals, must be tied. Cattle will climb the gangway of a ship easily, provided its slope does not exceed 45 degrees; the gangways should not be slippery and should be provided with battens. They should also be just wide enough to allow the animals to pass, thus preventing them from turning round on encountering some obstacle. Feeding troughs are not necessary for cattle as they follow their natural inclination to eat straw direct from the ground or floor. Horses are often difficult to handle, especially the highly strung ones. It is helpful to blindfold them, especially during loading and unloading. Horses should be placed so that they will be supported on all sides; cattle, on the contrary, should have a little space in which to move freely. To guard horses against damage from their habit of head-tossing, roofing should be cushioned.

River transportation of livestock is generally not favoured, since it is too slow and cumbersome, and losses of weight are great even when feeding takes place *en route*.

### Disinfection

The principal agents for disinfection of equipment, transport vehicles, and stockyards are :

- (1) quicklime, freshly slaked ;
- (2) lime-water, in concentrations of 1/3 or 1/20 ;
- (3) chloride of lime,  $\text{CaOCl}_2$  (bleaching powder), to be used suspended in water in the same concentrations ;
- (4) concentrated chloride of lime, soluble in water and containing 70% active chlorine ;
- (5) chloramine T,  $\text{CH}_3 \cdot \text{C}_6\text{H}_4 \cdot \text{SO}(\text{ONa}) : \text{NCl}$  (sodium *p*-toluene sulfochloramide), containing 22% active chlorine ;

(The two last-named chemicals should be used in concentrations of 2.5% or 7%. They are not suitable for the disinfection of manure.)

- (6) a solution of cresol,  $\text{CH}_3 \cdot \text{O} \cdot \text{C}_6\text{H}_3(\text{OH})\text{CH}_3$ , stabilized by soap and marketed under the name of "Lysol", diluted with water to a concentration of 2.5% ;

(7) a mixture of two parts of crude cresol and one part of sulfuric acid, diluted with water to a concentration of 3% ;

(8) crude phenol,  $C_6H_5OH$ , diluted with water to a concentration of 3% ;

(9) corrosive sublimate (mercuric chloride,  $HgCl_2$ ) in an aqueous solution of 1% (as sublimate is very poisonous, it should be neutralized after 24 hours by a 0.5% solution of potassium sulfide,  $K_2S$ ) ;

(10) formalin ( $CH_2O$ ), in an aqueous solution of 1% ;

(11) steam (particularly useful for the disinfection of blood and milk containers).

Two further means of disinfection which can be very effective are dry heat and burning.

Instruments, etc., may be disinfected by immersion in boiling water for 15 minutes (a 3% solution of washing soda ( $Na_2CO_3$ ) or soap is useful for this purpose); hooks, handles, covers, etc., should be scrubbed in boiling water or soda solution.

The efficacy of a disinfectant depends upon the resistance of the contaminating agents, which can be divided into two groups :

(a) Those which are easily destroyed, together with those which do not leave the animal body. In these cases, a simple cleansing of walls, floors, doors, and tools with lime-water 1/20, or with a suspension of bleaching powder 1/20, suffices. For metal parts, an aqueous solution of cresol or phenol is preferable.

(b) Those which are not easily destroyed and which are communicable to other animals, as, for example, the agents responsible for :

anthrax	pox
glanders	scabies
foot-and-mouth disease	septicaemia
blackleg	swine fever
fowl cholera	

In these cases, manure, straw, etc., must be burned, buried, or disinfected by storage for a long period and, in some cases, mixed with slaked lime.

Liquids such as blood and water should be disinfected with a 30% suspension of chloride of lime.

For walls, floors, instruments, etc., most of the above-mentioned disinfectants may be used. Metal tools or instruments should be sterilized by heat, if possible ; otherwise, a solution of cresol or phenol is quite effective. This solution may also be used for wooden tools, rubber boots, etc. If these are of little value, they should be destroyed by burning.

Netherlands legislation lays down specific requirements for cleansing and disinfecting transportation facilities and equipment similar to those described above.

### **Conditions Induced in Animals by Transportation**

In addition to the risk of injury, suffocation, and loss of weight already mentioned, attention should be drawn to some diseases that frequently occur in the course of transportation, or are directly caused by or related to it. These diseases include, among others, shipping fever, muscle bleeding, and transport sickness.

Shipping fever is a disease entity, associated with the shipment of livestock, of which the etiology has not been clearly defined. The *Pasteurella* organism is believed to be associated with it, and the prophylactic and therapeutic measures most commonly used are based upon this belief. Various vaccines, sera, sulfa-drugs, and antibiotics have been used for the prevention and treatment of this disease complex, but consistent results have not been obtained.<sup>2</sup>

The etiology of muscle bleeding frequently encountered in pigs has been ascribed to the lack of rest between transport and slaughter. Suffocation and damage to the central nervous system have also been implicated as causes.<sup>4</sup>

Transport sickness seems to affect cattle particularly and strikes older animals in advanced pregnancy, or those which have just given birth. Sometimes fat, non-pregnant cows are affected. The animals usually become ill about 24 hours after having been unloaded, although some may be affected during transit. The symptomatology resembles milk fever, and treatment is similar to that for the latter.<sup>5</sup> The etiology of the disease is not clear and has been variously ascribed to starvation, overcrowding, and unhygienic conditions in general. A differential diagnosis would have to include other metabolic disturbances such as ketosis and milk fever.

### **Necessity for Rest before Slaughter**

Animal dealers have always been well aware of the undesirability of slaughtering animals too soon after shipment. Butchers say it is essential to give the animals a period of rest, as the meat of tired animals is not satisfactory for canning, salting, or sausage-making. So much stress has been laid on this point that most countries have regulations stipulating a rest period for animals on entry to the slaughterhouse. The duration of the rest period naturally depends on the season of the year and the state

of fatigue of the animal. Investigations have shown that tired animals do not bleed as well as those that have had sufficient rest. Bongert & Ficker (quoted by Lebbin <sup>4</sup>) have also shown that where cattle, calves, and sheep are in a state of fatigue, organisms, especially *Escherichia coli*, are absorbed through the mucous membrane of the intestines into the blood circulation, kidneys, liver, and lymph-glands of the intestine. This process is facilitated by hunger, which weakens natural resistance. A live animal has sufficient resistance to combat such organisms but, upon slaughter, the body's resistance is eliminated with the result that the hitherto uncontaminated carcass harbours organisms liable to reduce the keeping quality of the meat. It must again be stressed, therefore, that slaughter should be prohibited until the animals have been rested and have entirely recovered from the effects of transportation.

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