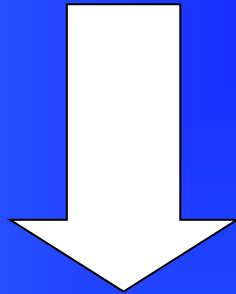
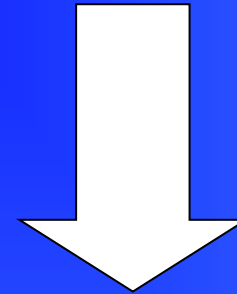


POULTRY BREEDING AND WELFARE

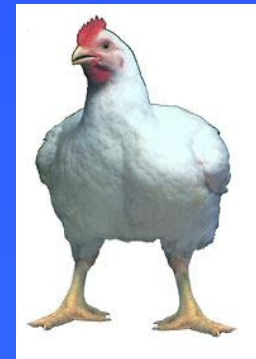
Division of intensive poultry farms



Laying hens



Chicken reared for meat



Organisation of poultry breeding in the Czech Republic

- Breeding farms with pure lines of poultry
 - Parent breeding farms
 - Production breeding farms

- **Breeding farms with pure lines** - are mostly organised into a few large breeding companies producing biological material with high genetic potential. Outside of these, in some countries, including ours, there are small independent breeding farms, producing breeding material mainly for small-scale breeders.
- They are built as smaller operating units, preferably in areas without livestock production. They carry out individual breeding, which includes heredity control and individual laying eggs control. The product of these farms are animals with a known origin (pedigree) on the part of both parents with some more hereditarily stabilised characteristics.

- **Parent breeding** - they are mostly built as separate specialised plants with a capacity of 10 - 40 thousand breeding poultry, several breeding farms are linked contractually to a hatchery, built at a sufficient veterinary distance from the breeding farms with pure lines
- **Production breeding** - hatched poultry, derived from eggs produced in parent breeding farms, are supplied to commercial farms for fattening chickens or for rearing chickens to supplement the basic flock of hens producing eggs.

Hatching technology

It is carried out in separate hatcheries machines and rooms - pre-hatching and hatching rooms. Prehatching room - it is the space where the eggs are placed, where are rotated, and in the hatching rooms the actual hatching is achieved.

Prehatching room – air temperature = 37.5°C and humidity 55%. From 14th day cooling starts and three days before the end of hatching, the eggs are transferred to the hatchery room. It is carried out random screening of the eggs for control of incubation (unfertilised eggs, dead embryos).

Hatching in hatcheries - eggs are laid in the hatching boxes lying flat, air temperature = 36.6-37,0°C, humidity 65%. Hatching takes 2-3 days. After hatching, the chicks are selected, sexed and cauterized (for final hybrids). The chicks are transported within 48 h, when they do not accept food and are best able to cope with transport.

Sexing of poultry - allows separation of genders in breeding poultry, exclusion of cockerels of laying hybrid chickens - only hens are used for the production of eggs, gender-separated fattening (mainly in turkeys and ducks).

Breeding of final hybrids of laying hens

The period from hatching to sexual maturity. Rearing is carried out until the age **of 15-17 weeks**. The aim is a hen with the ability to produce quality eggs and with good laying persistence. A weight of **1.5 kg** at sexual maturity is desired. To achieve this, it is important to regulate **the diet and light level appropriately**.

For the first 3 days, the chicks **get 23 hours of light** - orientation to the environment so they learn to eat and drink. From day 3, the length of the light day is reduced so that from **week 7** the length of the light day is **only 10 hours** (up to week 15). From this age onwards, the length of light begins to increase again, stimulating egg laying, increasing sex hormone levels and the development of the sex organs. Sexual maturity occurs with the laying of the first egg. With a reduced light regime, sexual maturity is delayed because the goal is not to reach sexual maturity quickly, but to reach sexual maturity at a certain weight. During rearing, a sample of chicks is weighed every week and if the chicks are growing slower or faster, the day shortening can be slowed down - the growth curve is monitored.

Nutrition and feeding technique is another major factor that influences the quality of rearing. It is also the environmental conditions (ventilation, temperature, humidity), the concentration of chickens per m², the quality of vaccination or cauterisation and the state of health.

Rearing is carried out **in cages, on litter, on litter combined with slats or in aviaries.**

2 weeks before reaching maturity, the chickens are transferred to the production hall where they will lay eggs. Here, for better adaptation, it is advisable to increase the light intensity in the first few days or to add ascorbic acid to the water.

Rearing of laying hens

It is rearing in **windowless** halls with controlled environmental conditions. The length of the light day is gradually extended **to 15-16 hours per day**. The optimum stable temperature **is 18-22 °C** and ventilation is used to maintain it. Mechanical feeding (automatic trough or circular feeders) and automatic egg collection are used. Feeding is by **dropper or cup feeders**. After egg collection, the eggs are sorted, weighed and packed on the premises. The length of daylight must not be shortened as this would reduce production.

As laying hens get older, the number of eggs laid and number of eggs production decreases, so it is possible to reduce the nutrient content - especially nitrogenous substances and some amino acids. Age also decreases the availability of calcium from the mixture and therefore the calcium content of the mixture increases.

Technology for egg production

CAGE TECHNOLOGY

- ✿ Conventional cages
- ✿ Enriched cages

✿ ALTERNATIVE TECHNOLOGY

- ✿ Floor systems
 - Bedding with slats
 - Bedding in combination with outdoor run
- ✿ Aviaries

Conventional and enriched cages

In conventional cages, hens are provided with feed, water, claw sharpening equipment and, according to the decree, a minimum of 550 cm². Hens cannot show natural behaviour here – dust bathing, roosting, laying eggs in the nest. In 1 cage there are 4-7 hens.

Enriched cages – have certain elements to ensure the expression of natural behaviour - each cage must have a laying nest, roosts and space for dust bathing and digging. The net usable area must be 750 cm² for each hen, each hen must have a 12 cm trough feeder and a 15 cm roost, and have access to 2 drinkers.

Cage size - from 8 to 20 hens, but also for 40 hens.



Advantages of conventional cages

- ❧ The laying hens do not come into contact with faeces, they only have access to two waterers and are kept in small groups - **reducing the risk of transmitting infectious diseases and intestinal and external parasites**. Very good hygiene conditions reduce mortality and drug consumption.
- ❧ A set social order with a low number of hens in the cage minimizes **mortality** due to cannibalism and does not require beak cutting.
- ❧ Little movement of laying hens, **daily removal** of faeces and sometimes pre-drying of faeces - reduces the amount of ammonia and dust - beneficial effect on reducing respiratory diseases.
- ❧ The production of biological heat by the large number of hens in the house does not require **heating** during the winter months.

- 🐔 **The low percentage of contaminated eggs** with little bacterial contamination of the shell ensures the freshness of the eggs collected.
- 🐔 Due to the high degree of automation, high stocking density, good feed utilization with no variation in laying, low mortality, production costs are **the lowest compared to other systems.**

Disadvantages of conventional cages

- **The reduced rigidity** of the bones makes them brittle when removed from the cages after laying in the hall and at slaughter.
- **The quality of feathering** is also reduced, especially as a result of feathers rubbing against the cage wires.
- The inability to dig results in **claw overgrowth** on the legs.
- Laying hens have **limited movement**, they cannot flap their wings, roost, lay in nests, dig, peck, dust themselves, they do not have the possibility of escape in the event of cannibalism.
- Laying hens do not have direct contact with the external environment.
- High concentrations in the hall lead to **higher dust and ammonia emissions.**

Advantages of enriched cages



- ✓ Avoidance of contact with faeces, preferable lower number of laying hens in the cage (up to 20 pcs), impossibility of contact of individual groups of laying hens with each other - **reduces the risk of transmission** of infectious diseases, occurrence of internal parasites, reduces the consumption of pharmaceutical products, risk of cannibalism.
- ✓ **It also improves skeletal rigidity.**
- ✓ Compared to floor rearing methods, it reduces **ammonia production.**
- ✓ The higher density improves the **heat balance** of the halls in the winter months and, with little movement of the laying hens, the feed conversion.



Deficiencies of enriched cages



- ✓ The presence of faeces in the nest area - deteriorated microbial **contamination of the eggshell**.
- ✓ The greater number of hens in the cage, which nibble and rub their feathers on the wire bars, has a negative effect on their **plumage**, which may allow cannibalism to occur.
- ✓ Residues of faeces, peeled skin and feathers that stick in the spaces between the protrusions of the nest floor can provide a suitable environment for parasites.
- ✓ The limited cage space and the considerable movement of the laying hens restricts **quiet roosting**.
- ✓ **Egg quality** depends on the nest design. In general, the shell is clean with a minimum of cracking. However, a variable number of cracks are found when sorting them, caused by the egg's **longer path** out of the nest and its impact on the accumulating eggs on the belt.

Alternative systems

Hens are housed freely, but the conditions for their natural behaviour must also be ensured. When using bedding in combination with slats - at least 1/3 of the hall must be made up of bedding (sand, shavings, straw) - enough space for digging and dustbathing. Advantage of slats - faeces fall into the sub-grate space - **better zoohygienic conditions** - cleaning of legs before entering the nest. In this type of breeding, group laying nests with a sloping bottom, with automatic egg collection, are used.

Breeding with bedding can be combined with outdoor enclosures (rarely in the Czech Republic), the enclosures are paved and roofed or unroofed with vegetation (shade is necessary).

Technology advantages



- **Free movement of hens, flapping wings, hopping, dust bathing.**
- **The possibility of exercising natural instincts strengthens the skeleton and digging solves claw abrasion.**
- **Large space does not cause mechanical abrasion of feathers.**
- **Mechanical means can be used when loading and unloading droppings and bedding.**
- **Compared to aviary housing, it is easier to check the health status of the laying hens.**

Weaknesses in technology



- In halls with **wooden construction**, with grates and nests that are difficult to clean, there is a higher incidence of external parasites.
- Large groups of laying hens, high dust levels, halls **with higher ammonia production** and direct contact with droppings increase the risk of rapid spread of infectious diseases - especially those affecting the digestive and respiratory systems, intestinal parasites and thus the need for more frequent medication.
- Increased number of injuries when the roosts are placed **in multiple levels**.
- **Large groups of laying hens** do not allow to form stable social relationships - feather pecking occurs and - stimulation of cannibalism.

Egg quality

- A higher percentage of contaminated eggs is found from these farms with significantly **higher bacterial contamination of the shell** compared to eggs from cage farms.
- Egg quality may also be affected by the proportion of eggs laid **outside the nest**, eggs laid in litter may be buried there for several days. The penetration of mould and bacteria into the contents of the egg increases the risk of alimentary diseases in humans. Egg content also increases the residues and used pharmaceuticals from droppings.
- Compared to cage rearing - **higher costs** (higher feed consumption), increased number of non-standard eggs, increased mortality.

Environment of the halls

- **The humid bedding in unheated and poorly ventilated halls in winter** results in increased production of harmful and inflammable gases - ammonia, hydrogen sulphide, indole and skatole and the accumulation of faeces on the birds' legs.
- In summer, dry litter increases **air dust**.
- Movement of laying hens and lower house temperature increases **feed consumption**.

Enclosure breeding

- Often used in smaller farms with a capacity not exceeding **2000 laying hens**. Natural lighting and ventilation are used with litter or all-grid floors with manually or automatically supplied feeders, drinkers and roosts. The nests used are with bedding with manual egg collection, and in larger halls with mechanised egg collection.
- There is a grassy enclosure around the farm, planted with trees, and the hens are released on one side of the run, while the other side is sanitised and overgrown grass is cut.

Advantages



- The free-range method of keeping fewer hens in a group **allows natural behaviour**, strengthens the skeleton and creates a less stressful environment.
- The large enclosure space **reduces mutual conflicts** between hens.
- The whole-slatted floor and the rotation of the runs **reduces the occurrence of internal parasites**.
- Relatively good egg cleanliness, but **production costs per egg are highest**.

Weaknesses



- The contamination of enclosures by **wild birds** increases the risk of infectious diseases (including avian TB, salmonella, internal and external parasites).
- Much of the mortality is attributed to **predators**.
- Open enclosures can **reduce temperatures** to below freezing in winter months if not heated.
- If there is deep bedding in the house, the quality of **the bedding decreases** during these months.
- There is an increase in the **residues of drugs** from substances in the droppings, as well as increased levels of heavy metals that have adhered to the surface of the green plants that the laying hens consume.

Aviary breeding

Combination of cage breeding with deep bedding. Here, the house includes a structure (max. 4 floors) and in the individual floors there are feeders, waterers and laying nests. Here too, $\frac{1}{3}$ of the usable area must be litter and the movement of hens is free. A maximum of 9 hens can be housed per 1 m^2 , each with a 10 cm trough feeder, a 15 cm roost and a maximum of 120 hens per 1 m^2 of laying nest. These are usually placed on each floor.

Advantages



- All round movement strengthens the skeleton, reduces bone fragility, prevents overgrowth of claws and reduces mechanical abrasion of feathers.
- It creates an environment on several levels that allows the hens to use their natural instincts as well as escape when attacked by another hen.
- Higher space density of housing, higher body heat production allows to solve housing without heating.
- Better feed utilization and more balanced egg laying and egg quality compared to deep litter rearing. The cost of egg production is slightly reduced compared to deep bedding.

Weaknesses



- **Increased risk of disease transmission** following incomplete cleaning and disinfection of the hall prior to a new stocking of chickens. Direct contact with droppings, which are a suitable environment for the proliferation of bacteria, viruses and parasites, high dust levels and direct contact with large numbers of laying hens **increase the risk of rapid spread of infectious respiratory diseases. and gastrointestinal tract and the frequent occurrence of external and internal parasites.**
- The large number of laying hens does not allow the formation of groups with a permanent social order.
- **More frequent injuries**, different and high intensity of lighting in the surroundings of the lights - are factors for the danger of laying eggs outside the nest and their eating and feather pecking and the emergence of cannibalism - to reduce it, it is necessary to cauterize the beak of chicks in the first days after hatching.

Ensuring standard breeding conditions requires a **high level of expertise on the part of the breeder and caretakers**. This includes knowledge of how to ensure that hens are penned in laying halls to avoid unnecessary stress, mortality, delayed and reduced egg laying, dealing with the problems of getting hens used to laying in nests to minimise the number of eggs out of the nest, dealing with problems of cannibalism and egg eating, dealing with the problem of hens being difficult to catch after production.

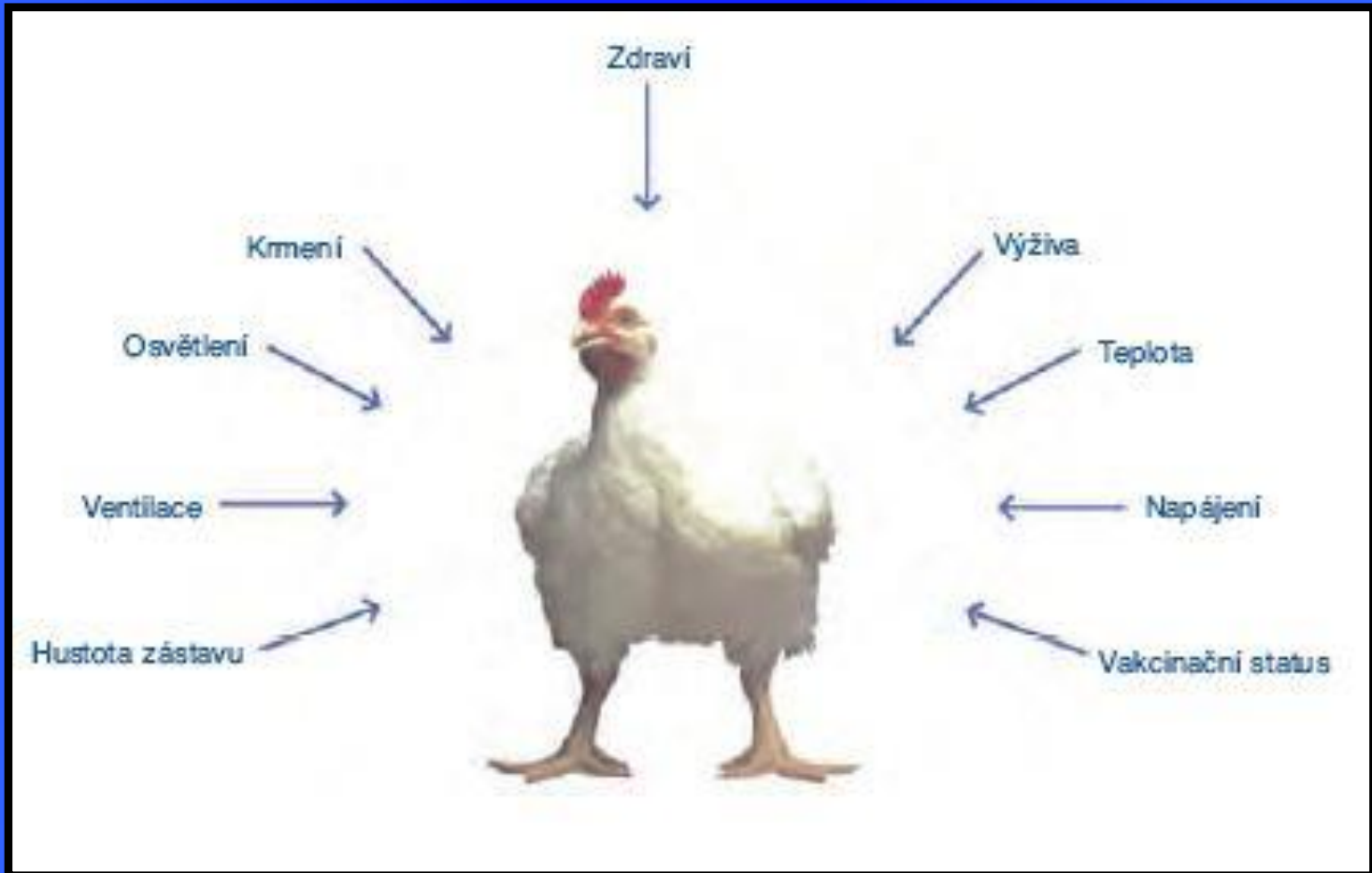
Laying hen health

- The main sign of health is **good production and low mortality**. Birds with swollen heads and runny eyes are most likely to have influenza or bronchitis. **Smells in the barn** may be caused by birds suffering from symptoms of diarrhoea due to coccidiosis or other diseases. The appearance of **white eggshells** in hens with brown shells may be an indicator of mite infestation. **Soft-shelled eggs or eggs without shells** may be a sign of Ca deficiency. **Increased incidence of aggression**, feather pecking or cannibalism increases based on frustration, house overcrowding, lack of drinkers and feeders, and unsuitable environment.

Production problems

- **Osteoporosis** - the daily Ca requirement is higher than the birds are able to supply for eggshell production; in times of deficiency, Ca stores are mobilized from bones, especially long bones. During the peak of laying period, muscle paralysis or weak bones can be a sign of Ca deficiency - cage tiredness in laying hens.
- **Feather pecking, cannibalism**- once the feather pecking turns into bleeding wounds, aggressive pecking and cannibalism is started. This is caused by sudden changes or inappropriate environments - high temperature, high light intensity, poor air exchange, overcrowding, lack of feeders, access to sick and dead birds. Especially in alternative breeding with thousands of birds, where social order cannot be established compared to cage breeding. But even there it can occur.
- **Beak shortening** - it is recommended to shorten one third of the distance between the nostrils and the end of the beak. This prevents aggressive pecking and even cannibalism.

Chicken fattening



Rearing hens of the meat type - production of hatching eggs

Due to the weight - **roosters 4.5-5.5 kg, hens 3.5-4.0 kg** - they are kept on deep litter in combination with special grids. Rearing is carried out separately for each gender.

The aim is to reach the required weight at the required age and at sexual maturity. In the rearing and breeding of this type of poultry, feed restriction is carried out = hens and roosters are given a precise feed ration to avoid fattening of breeding animals.

The light scheme is shortened for the same reason as for the chickens of laying hens. A breeding flock of 1:10-12 is established before maturity is reached. Feed restriction is also used for egg production. The length of the light day is 14-16 hours.

The length of the production period is up to 64 weeks of age, during which the hen lays 180 eggs.



Control if all chickens have found the feed - 8 and 24 hours after stocking the house, a sample of 30-40 chickens is taken at 3-4 locations in the house. By 24 hours 100% of the chicks, the drum should be filled smooth, round.

Currently, in the Czech Republic it is almost exclusively carried out **in windowless halls on litter with controlled environmental conditions**. There are 6.5-7 rounds, and after each round the hall is mechanically cleaned, pressure washed, disinfected and allowed to dry.

Bedding should be of good quality, dry, non-mouldy - straw, shavings, spread to a height of 5-10 cm.

After hatching, the chicks have not developed thermoregulation, so the house must be heated with gas burners or electric lamps (30-33°C) to warm the litter before loading.

The temperature decreases with age and from week 5 the optimum temperature in the hall is 18-21 °C.

The requirements for fattening chickens are laid down in Decree No 208/2004 Coll.

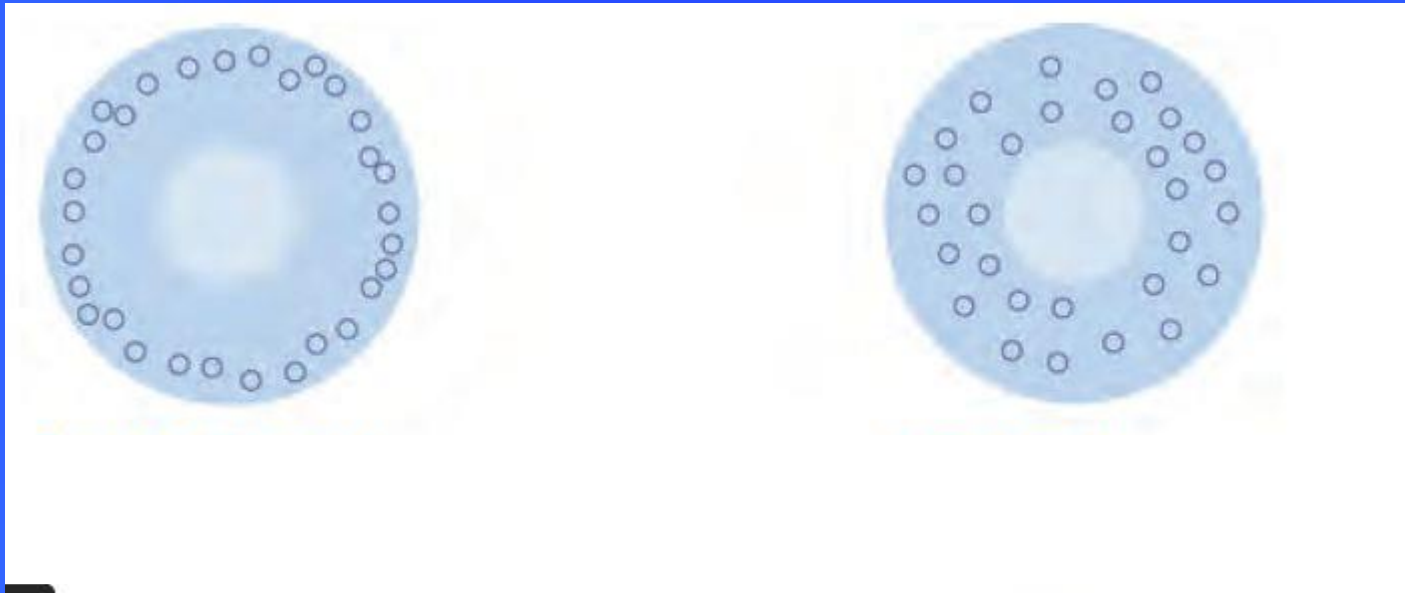
Behaviour of the chickens when using lamp

- The behaviour of the chickens is the best indicator of the correct temperature of the hall.

Distribution of chickens under the heat lamp

The temperature is too high. The chicks are quiet, breathing heavily, keeping their head and wings lowered, and staying away from the heat source.

The right temperature, the chickens are spaced evenly, the beeping is satisfied.

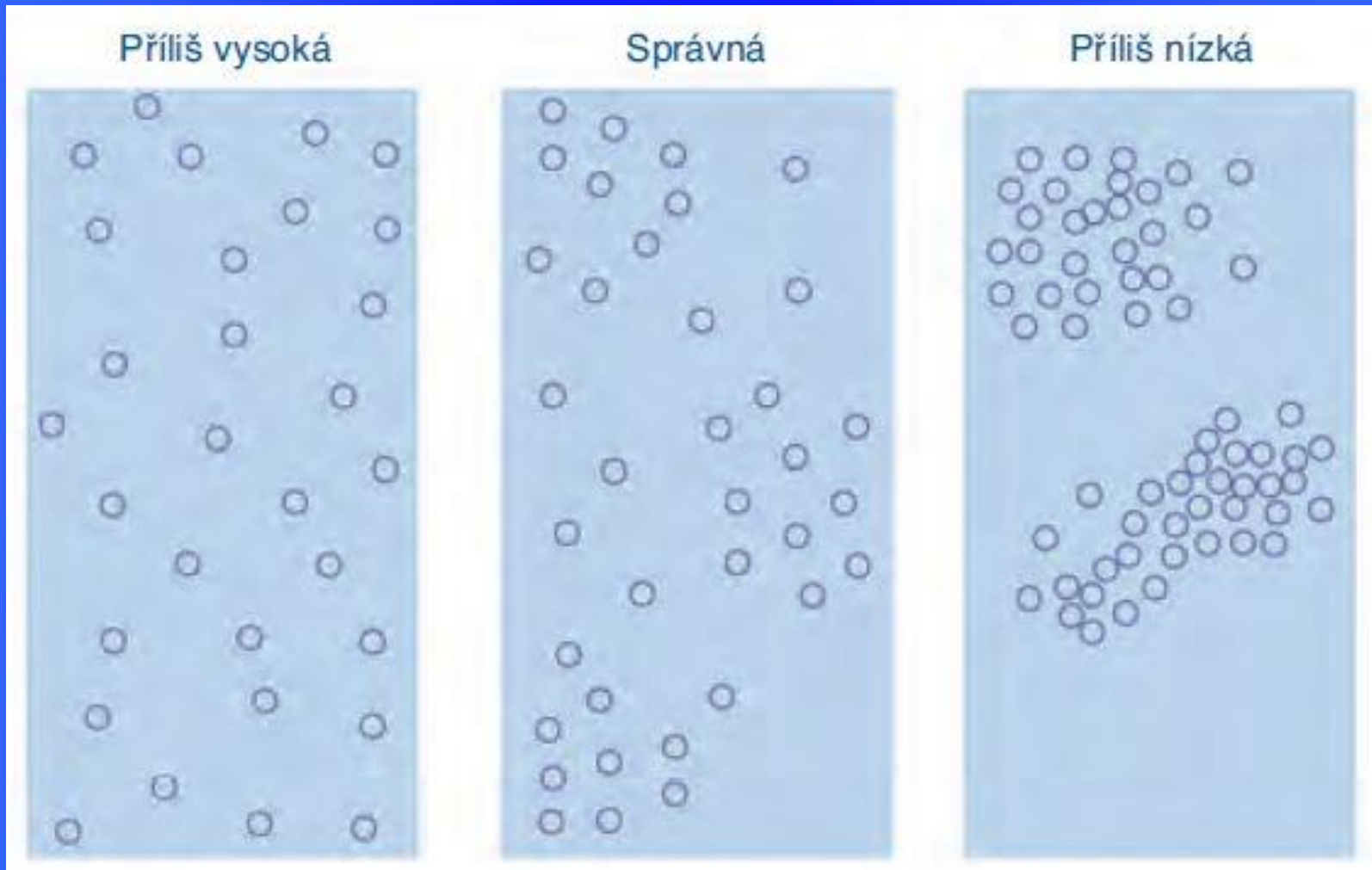




The temperature is too low, the chickens gather under the heat source, they are noisy, they beep excitedly.

Draught. This location requires investigation. It is affected by draughts, uneven distribution of light, noise from outside.

Behaviour of chickens when the whole hall is heated



Too high

Correct

Too low

- Relative humidity should be between **65-70%**. To increase humidity, which is difficult to achieve in small chickens, humidify the air by spraying a fine fog - also to cool the air in summer.
- **Forced negative pressure ventilation** - used in all halls to control temperature, humidity and the concentration of harmful gases. Fresh air is supplied through the ventilation.
- **From 2 weeks of age, chicks must have a minimum of 6 hours of darkness** during daylight hours. Lighting intensity min. 20 lx.
- **Automatic watering and feeding system** - used in large capacity halls. Plate feeders and dropper feeders with drip bowl are used. For feeding are used feed mixtures - BR₁, BR₂, BR₃ - cereal shreds, vegetable oils, minerals and vitamins. Coccidiostats are used in the mixtures as a preventive measure.

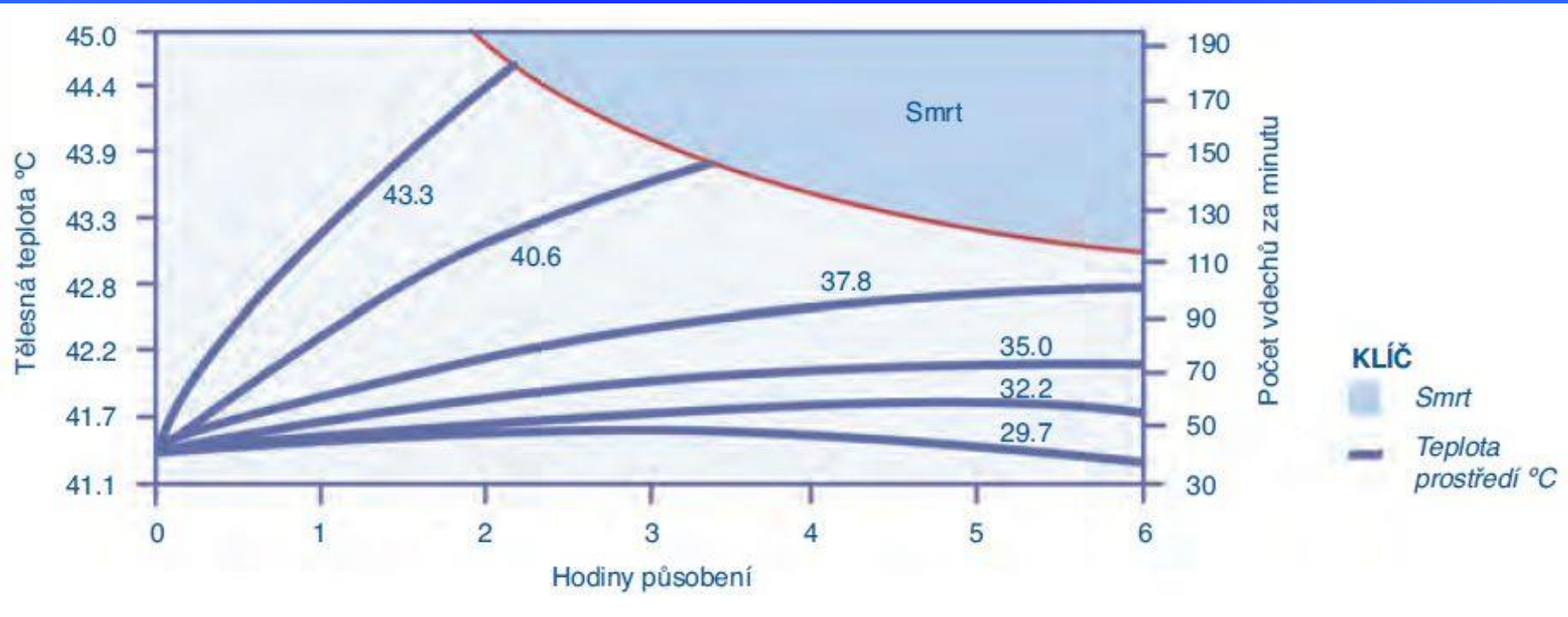
Quality of bedding

- The quality of litter directly affects the health of broilers. Low humidity levels in the bedding reduce the amount of ammonia - which reduces respiratory stress. Good quality bedding also reduces the development of foot inflammation.
- Nutritional strategies can help good litter quality:
- **Limit large amounts of protein in the feed.**
- **Avoid large amounts of salt - consequently water intake will increase and the bedding will become wet.**
- **Feeding a feed containing good quality fats will prevent intestinal disorders - wetting of the litter.**

Water quality

- Water is an essential ingredient for life - reduced water intake or increased water loss can have a significant impact on performance.
- Water must not contain too many minerals and should not be contaminated with bacteria - **check regularly for bacteriological contaminants.**
- Unrestricted access to fresh, good quality water 24 hours a day must be ensured.

Heat stress - normal body temperature is about 41°C. If the ambient temperature exceeds 35°C, the broiler will suffer from excessive heat. The longer it is then exposed to these temperatures, the greater the stress and its effects.



Relationship between ambient temperature, exposure time and body temperature

Health problems in broilers

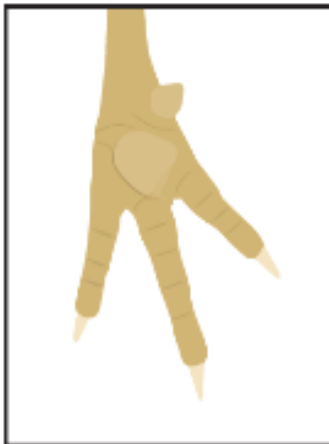
- Abnormal bone development -rapid growth, broilers become too heavy for their legs. The leg bones are then turned inwards or outwards or are curved. This is due to faulty calcification of the bones.
Degenerative diseases - loss of cartilage or osteoporosis of the hip joints, tendon ruptures.

- **Heart failure (ascites)** - 2 forms - fluid accumulation in the abdominal cavity and sudden death syndrome. Caused because the rapid growth of broilers requires large amounts of oxygen for other body needs, so the heart has to work harder. The skin on the abdomen may turn red, the abdomen fills with fluid, the bird has to breathe more rapidly, the lungs become collapsed. Ascites is considered the leading cause of broiler mortality. Sudden death syndrome - birds suddenly start flapping their wings, fall on their back or side and die. In both types, the heart and lungs cannot keep up with the rapid growth of muscle.
- **Susceptibility to disease** - by breeding for rapid growth and efficient food conversion. Rapid growth is also probably related to a high incidence of cellulitis = a disease caused by E. coli that manifests itself in infected scratches on the surface of the skin.
- **Inactivity**- inadequate space in halls, lack of energy for movement, little dustbathing and digging, stretching wings. They sit and rest most of their lives.

Contact dermatitis (grades)

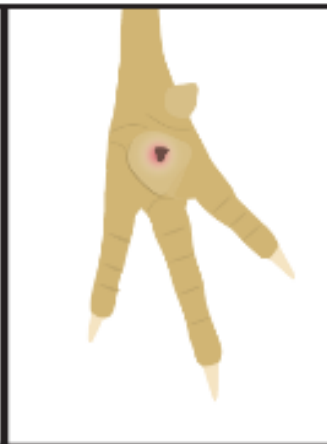
Clinical Grades of Bumblefoot Lesions in Chickens

Grade I



Small, shiny pink areas and/or peeling or flaking on the chicken's legs and/or feet.

Grade II



Smooth, shiny surfaced, circumscribed areas on the pads of one or both feet.

Grade III



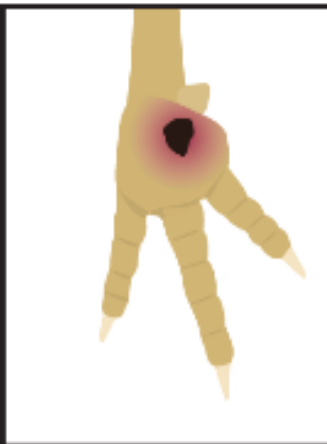
Ulcerations on footpads. Peripheral callus may form.

Grade IV



Necrotic plug of tissue present in ulcers. Will be painful and cause mild lameness.

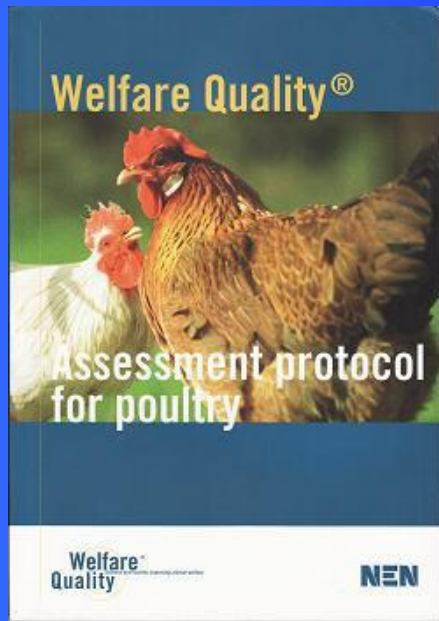
Grade V



Swelling and edema of the tissues surrounding the necrotic debris. Severe lameness is usually present.

The accumulation of animals causes increased moisture in the bedding and ammonia and causes pododermatitis, where the skin on the legs is chemically adhered and turns black. Lesions are usually found on the legs, withers and chest. And they are painful. It is necessary to reduce with sawdust added during the production cycle and introduce waterers to keep bedding from getting wet, increase air exchange or heated floors.

Broilers



5.1A Collection of data for broiler chicken on farm (measured on farm)

| | Welfare Criteria | | Measures |
|------------------------------------|------------------|--|---|
| Good feeding | 1 | Absence of prolonged hunger | <i>This criterion is measured at the slaughterhouse</i> |
| | 2 | Absence of prolonged thirst | Drinker space |
| Good housing | 3 | Comfort around resting | Plumage cleanliness, litter quality, dust sheet test |
| | 4 | Thermal comfort | Panting, huddling |
| | 5 | Ease of movement | Stocking density |
| Good health | 6 | Absence of injuries | Lameness, hock burn, foot pad dermatitis |
| | 7 | Absence of disease | On farm mortality, culls on farm |
| | 8 | Absence of pain induced by management procedures | <i>This criterion is not applied in this situation</i> |
| Appropriate behaviour ¹ | 9 | Expression of social behaviours | <i>As yet, no measure is developed for this criterion</i> |

¹ At the slaughter house, no management procedures such as beak trimming, claw cutting etc are carried out. However, stunning and slaughter processes are carried out and these are assessed under the heading 'assessed at slaughter'

| | | | |
|--|----|--------------------------------|--|
| | 10 | Expression of other behaviours | Cover on the range, free range |
| | 11 | Good human-animal relationship | Avoidance distance test (ADT) |
| | 12 | Positive emotional state | Qualitative behavioural assessment (QBA) |

6.1 Collection of data for laying hens on farm

| | Welfare Criteria | | Measures |
|------------------------------|------------------|--|---|
| Good feeding | 1 | Absence of prolonged hunger | Feeder space |
| | 2 | Absence of prolonged thirst | Drinker space |
| Good housing | 3 | Comfort around resting | Shape and total length of available perches, evidence of red mites, dust sheet test |
| | 4 | Thermal comfort | Panting, huddling |
| | 5 | Ease of movement | Stocking density, perforated floors |
| Good health | 6 | Absence of injuries | Keel bone deformation, skin lesions, foot pad dermatitis, toe damage |
| | 7 | Absence of disease | On farm mortality, culls on farm, enlarged crops, eye pathologies, respiratory infections, enteritis, parasites, comb abnormalities |
| | 8 | Absence of pain induced by management procedures | Beak trimming |
| Appropriate behaviour | 9 | Expression of social behaviours | Aggressive behaviour, plumage damage, comb pecking wounds |

**Laying
hens**

60

| | | | |
|--|----|--------------------------------|--|
| | 10 | Expression of other behaviours | Use of nest boxes, use of litter, enrichment measures, free range, cover on the range, covered veranda |
| | 11 | Good human-animal relationship | Avoidance distance test (ADT) |
| | 12 | Positive emotional state | Novel object test (NOT), qualitative behaviour assessment (QBA) |