

TONDEUR VTCA

Veterinary Training, Consultancy and Advice

Carcass abnormalities in broilers: an Iberian case

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Topics

- **Introduction**
- **Field visits**
- **Skeletal disorders**
- **Skin integrity**
- **Hemorrhages**
- **Mineral nutrients**
- **Actualities in regulations**

Introduction

Objective poultry abattoirs:

**“to produce saleable
chicken carcasses, meat, products
with no health hazards
for poultry, animals and humans”**

Dutch criteria

- **Dead on arrival: $< 0.5\%$**
- **Total condemned carcasses like poly-serositis, ascites, poly-arthritis, cachexia, hepatitis: $< 1.0\%$**
- **Partial condemnations – skin, bone, hemorrhages, contamination: $< 1.0\%$**
- **Atypical or unknown: $< 0.5\%$**
- **Trauma: $< 2\%$ (welfare)**
- **No proper de-bleeding: zero**

Highly contagious poultry diseases

Standards and Protocols
OIE, EU, regional, national

- 1. Avian Influenza = Bird Flu**
(highly and low pathogenic)
- 2. Newcastle Disease = Pseudo-fowl-plague**

Other HP poultry diseases

- **Gumboro disease = IBD**
- **Infectious Bronchitis = IBV**
- **Infectious Laryngo Tracheitis = ILT**
- **Fowl typhoid = Salmonella gallinarum**
- **Salmonella Pullorum**
- **Acute Coryza = Pasteurellosis**
- **CRD = Mycoplasmosis**
- **.....**

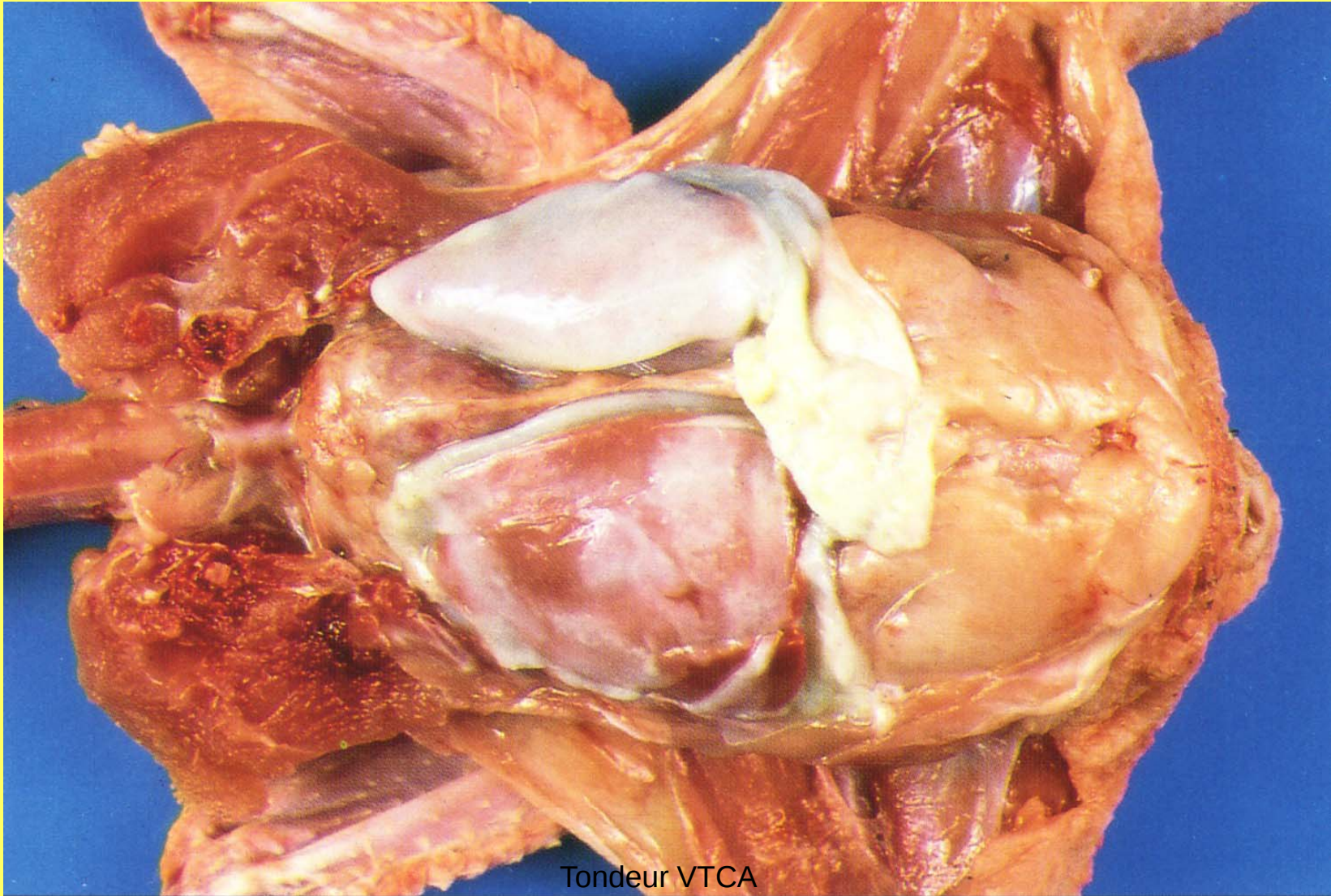
Public Health Hazards

- **Zoonotic pathogens:** AI, ND, Salmonella, Campylobacter, Ornithosis, E.coli, Staphylococci,
- **Residues of drugs:** antibiotics, AGP, chemotherapeutics, coccidiostats, hormones,
- **Toxins:** aflatoxin, mycotoxin, heavy metals,
- **Contaminants:** fungicides, pesticides, GMO,
- **Drug resistant bacteria:** ESBL, MRSA, EHEC, Klebsiella, Salmonella,

Pathologic lesions in carcass and organs

- **Poly-serositis**
- **Hydrops ascites**
- **Hepatitis**
- **Dermatitis**
- **(Peri)-Arthritis, (Teno)-Synovitis**
- **Tumors**
- **Cachexia**

Poly-serositis



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Poly-serositis

- **Airsacculitis**
- **Pleuritis**
- **Peritonitis**
- **Pericarditis**
- **Perihepatitis**

Poly-serositis

- **Pathogens: E.coli, Mycoplasma, IBV, ORT, SHS, TRT, ILT, mild NDV**
- **Air quality: dust, ammonia, humidity**
- **Environment: temperature, season**
- **Stocking density**
- **Stress, Immuno-suppression**

ORT = Ornithobacterium Rhino -Tracheale



21/04/2009

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Hydrops Ascites



Hydrops Ascites

- **Shortage of oxygen**
- **Fast-growing breeds**
- **More in males**
- **Energy level in feed**
- **Poor ventilation**
- **Cold environment**

Joint and Tendon inflammations

- **Arthritis**
- **Peri - arthritis**
- **Synovitis**
- **Teno - synovitis**
- **Tendon ruptures**
- **Perosis = slipped tendon**
- **Pseudo-perosis = twisted bone**

Leg inflammations

- **Pathogens: Mycoplasma, Reo-virus, Staphylococcus, Salmonella, E.coli,**
- **Heavy body weight**
- **Lack of exercise**
- **Genetic predisposition**

Cachexia



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Poorly debleeding



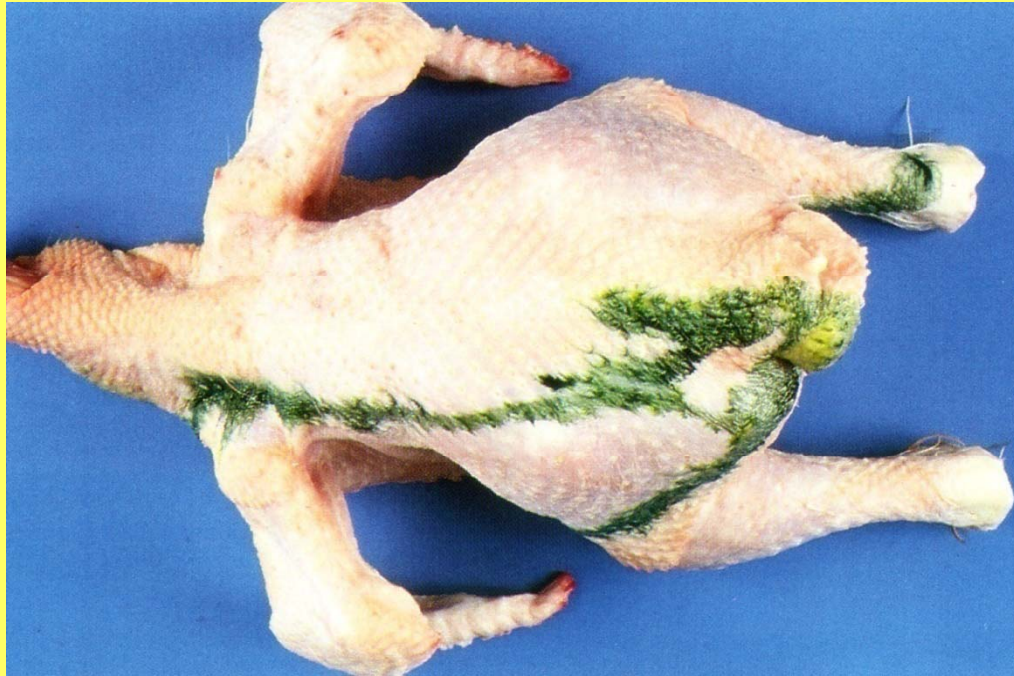
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Over-scalding



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Contamination



Bile
Faeces
Dirt from floors
Grease, oil
Paint



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Trauma lesions

- **Fractures**
- **Luxations, pseudo-luxations**
- **Bleedings**
- **Bruises**
- **Ruptured skin**
- **Nail scratches on hips**

Skin lesions

- **Dermatitis**
- **Subcutaneous dermatitis**
- **Cellulitis**
- **Hock and Podo-dermatitis**
- **Litter spots**
- **Ammonia burn**
- **Breast blisters**

Post-mortem inspection

- **Carcass plus its visceral organs**
- **Directly after evisceration**
- **Under supervision of official veterinarian**
- **Independent auxiliary meat inspectors**
- **Pathological lesions – category 3**
- **Sales quality lesions – B-grade**
- **Trimming at later stage in processing**

Condemnations

- **Dead upon arrival – 0.1%**
- **Complete carcasses – 0.5%**
- **Organ parts – in kg**
- **Feedback to abattoir management**
- **Feedback to broiler farmer**
- **Bonus-malus payment system**
- **In the Netherlands: >500,000 birds/year**
- **Carcass quality: skin, hemorrhages, podo-hock dermatitis**

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Studytour poultry abattoirs

- **Investigate actual and most problematic carcass and organ condemnations**
- **November 2010 – July 2011**
- **10 abattoirs in Spain and Portugal**
- **Wim Tondeur + Zinpro A.N. Inc + SETNA**
- **Quality staff, nutritionist**
- **Reporting**

Points of attention

- **Pathological lesions**
- **Hemorrhages in muscles and skin**
- **Skin integrity**
- **Bone quality**
- **Slaughter process: de-loading, hanging, stunning, bleeding, scalding, plucking, B-quality carcasses, internal organs**
- **Post mortem on condemned carcasses**

Findings: pathological lesions

- **Airsacculitis, poly-serositis: very low numbers**
- **Septicemia, toxinaemie: very few**
- **Hepatitis, nephritis: very few**
- **Hydrops ascites: low numbers**
- **Cachexia: only few**
- **Joint and tendon inflammations: rare**

Skin integrity

- **Podo-dermatitis – 10x**
- **Skin ruptures – 9x**
- **Thin epidermis – 7x**
- **Scabby hips – 5x**
- **Skin bleedings – 3x**
- **Litter spots – 3x**
- **Subcutaneous dermatitis – 3x**
- **Dermatitis, cellulitis – 2x**

Skeletal disorders

- **Dislocations, luxations, “Pop-out” – 10x**
- **Bone fractures – 8x**
- **Epiphysiolysis – 6x**
- **Tibial dyschondroplasia – 6x**

Hemorrhages

- **Bleeding in breast muscles – 9x**
- **Bleeding in wings – 4x**
- **Bleeding in drumstick – 2x**
- **Petechial bleedings – 1x**

Various other abnormalities

- **Oily broiler syndrome – 3x**
- **Marble striated muscles – 3x**
- **Green muscle disease – 2x**
- **Teno-synovitis – 2x**
- **PSE meat – 1x**
- **Insufficient stunning – 1x**
- **Poor uniformity – 1x**
- **Dead on arrival – 1x**

“Pop-out” - Epiphysiolysis



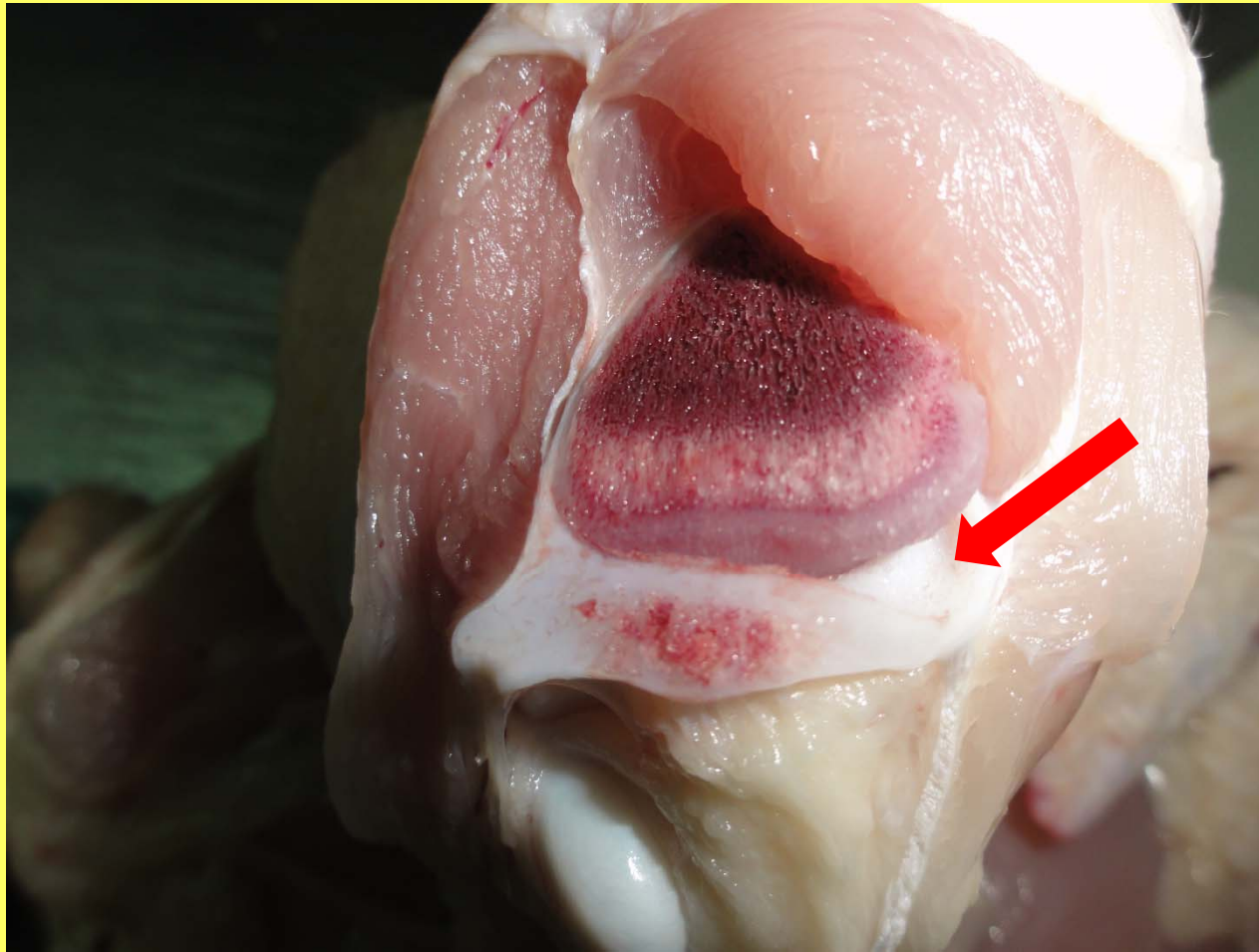
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Epiphysiolytic – distal humerus



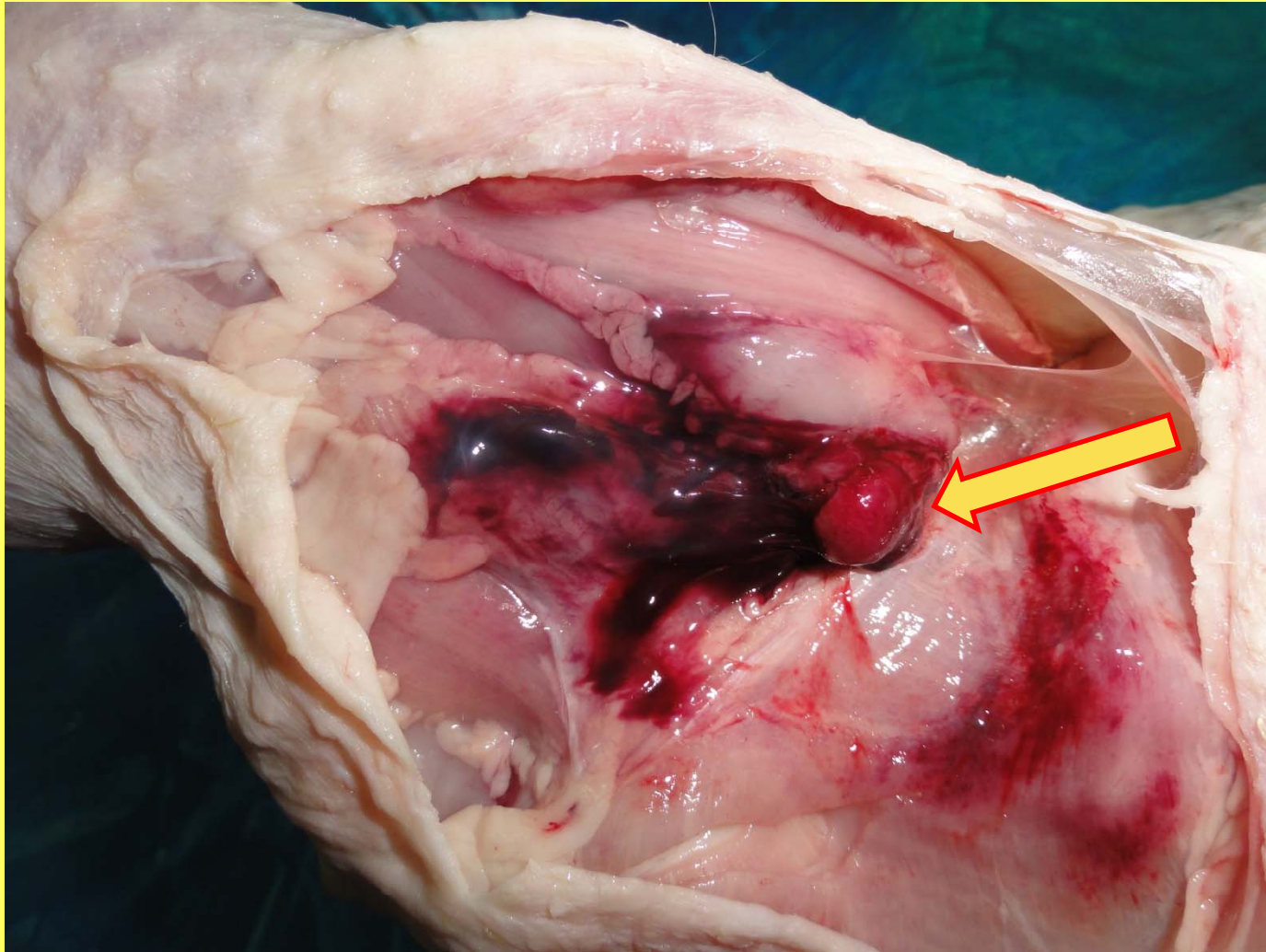
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Epiphysiolysis – tibia head



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Femur head necrosis

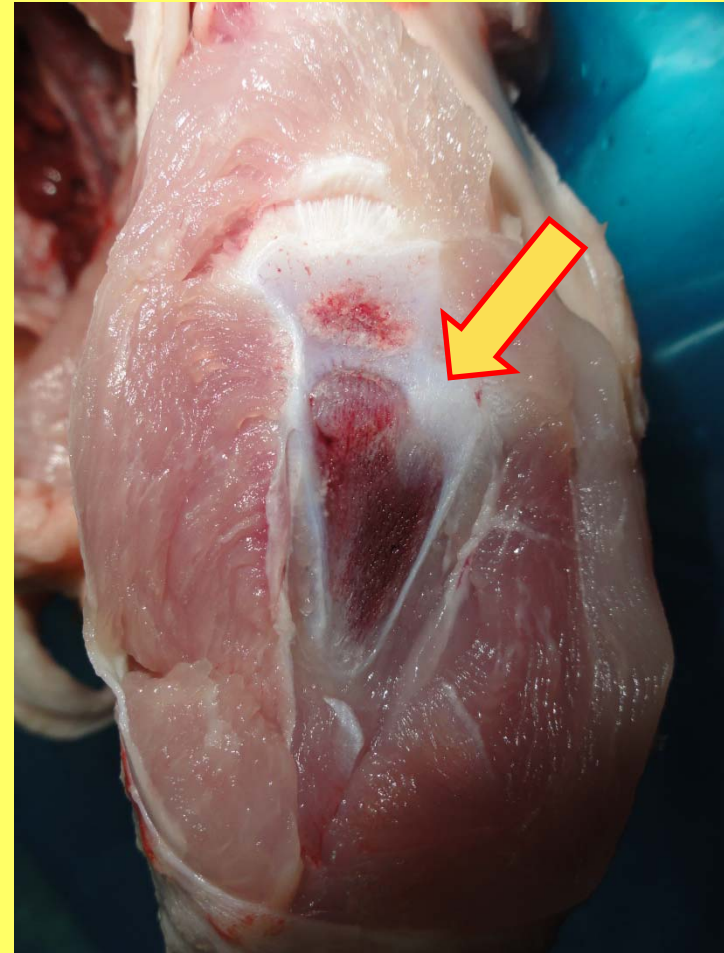
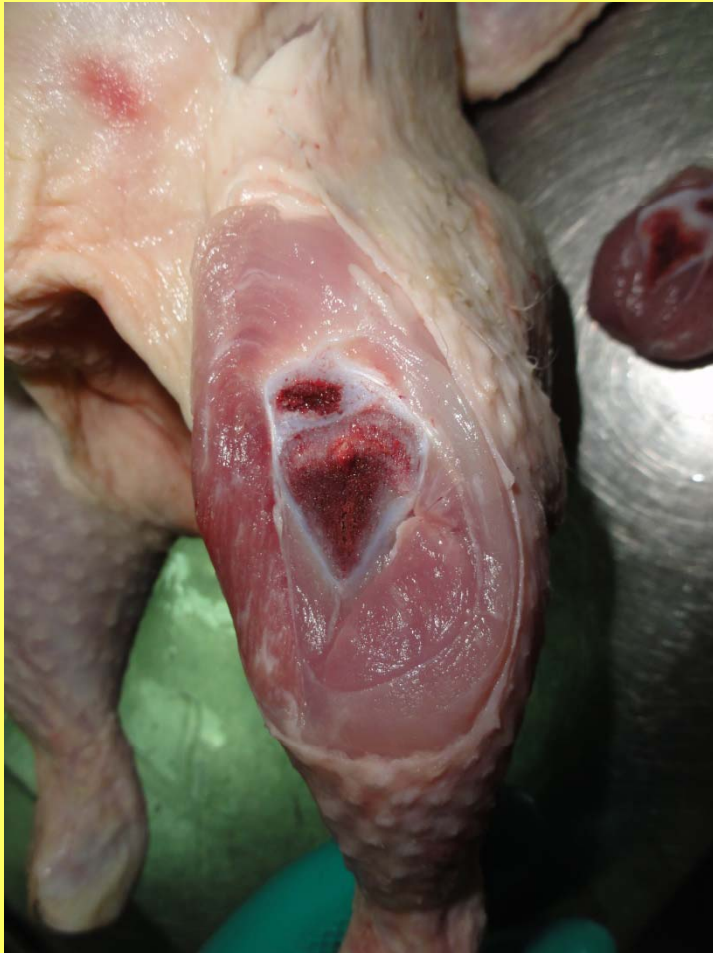


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Epiphysiolyis (“Pop-out”)

- **Dislocation on the epiphyseal cartilage (growth line)**
- **Pseudo-luxation**
- **Wing: humerus, radius, ulna, wish bones**
- **Leg: femur, tibia, pelvic bones**
- **Without bleedings: de-feathering**
- **With bleedings: catching, handling**
- **Incidences: 5% - 10% - 20%**

Tibial Dyschondroplasia (TD)

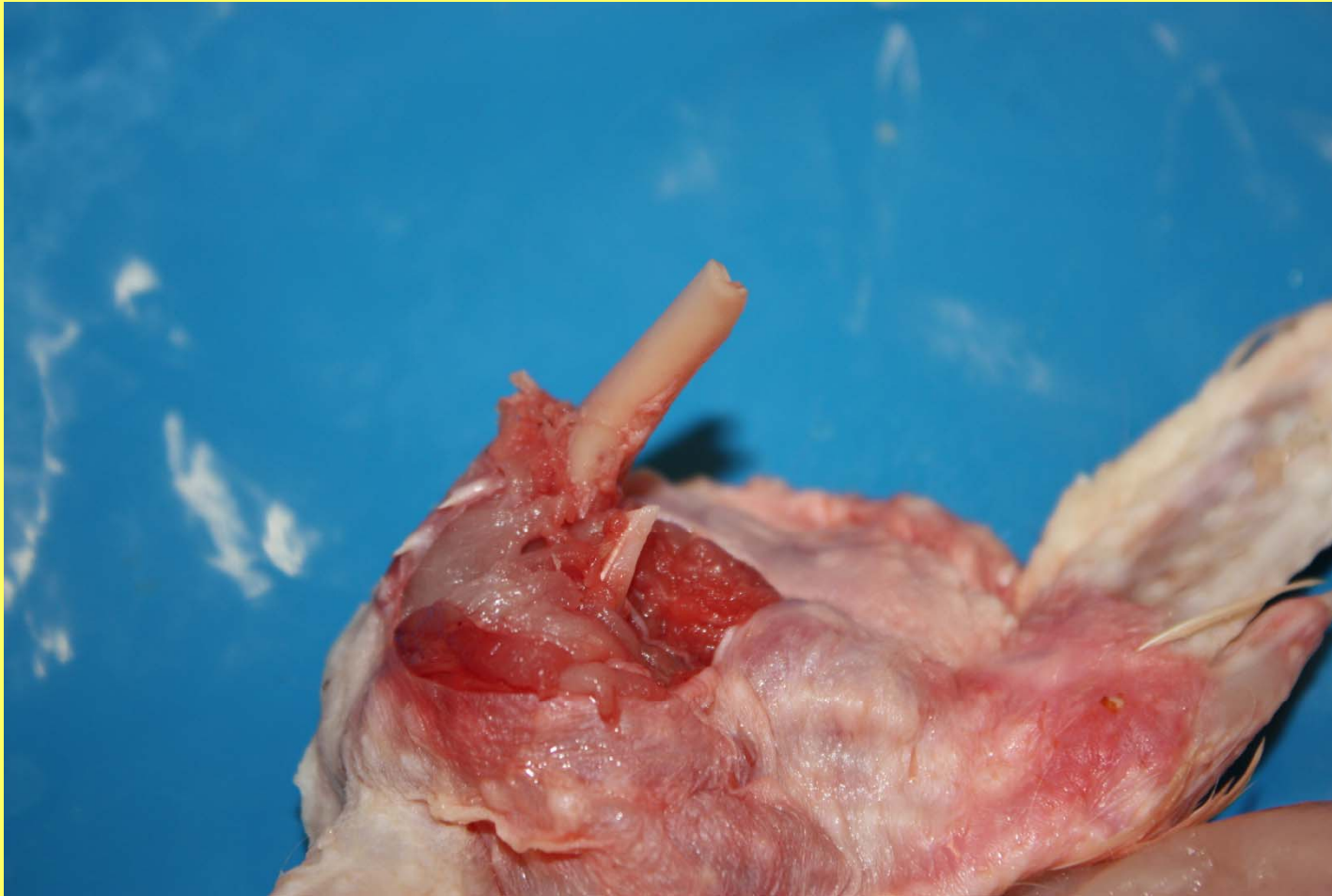


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TD = Tibial Dyschondroplasia

- **Cartilage plug at the epiphyseal growth line**
- **No good endochondral calcification**
- **Doubled lifespan of chondrocytes**
- **Endoplasmatic stress**
- **Hypoxia due to lack of vascularization**
- **Genetic influence**

Bone fracture – from plucker



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Bone fracture: 4-6 hours old



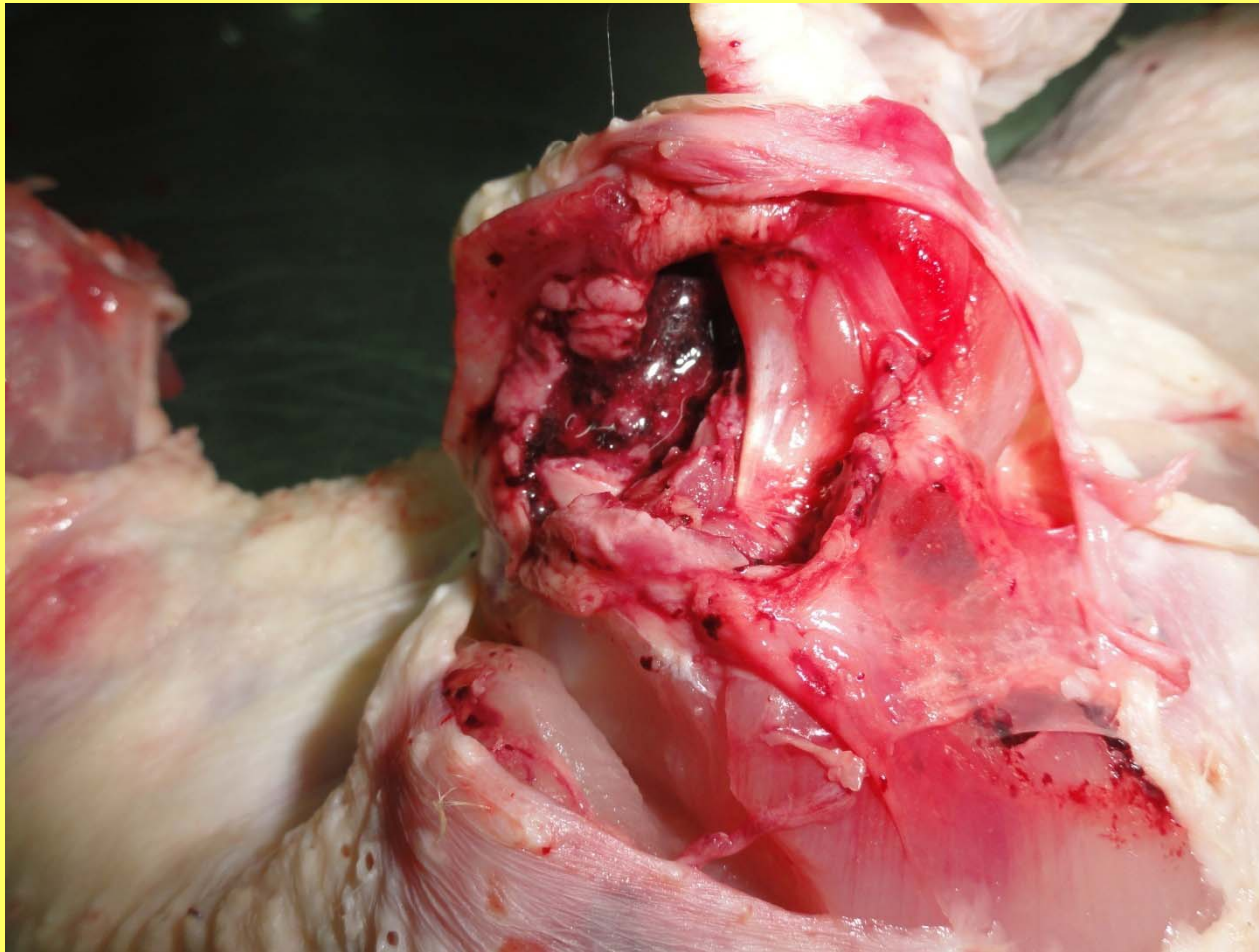
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Fresh bleeding near shoulder



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Fracture/luxation in shoulder joint



Bone fractures and luxations

- **Trauma: catching, loading, transport, de-loading, hanging in shackles**
- **Bone quality – poor calcification, skeletal disorders**
- **Heavy body weight**
- **Little exercise, overstocking**
- **Animal welfare**

Careful handling



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Bone growth

- **Genetic factors: metabolism and ossification process**
- **Vitamins: D₃, A, C, E, biotin, niacin, panthotenic acid, pyridoxine, choline, folic acid**
- **Minerals: calcium, phosphorous, zinc, manganese, magnesium, selenium, copper**
- **Digestion and absorption of nutrients**

Pathological factors

- **Pathogens: Enterococci, E.coli, Staphylococci, Reo-virus, Mycoplasma,**
- **Toxins: mycotoxins, fungicides, antabuse, homocysteine, cysteine, histidine**
- **Management: light program, litter, floor, growth rate, air composition, bio-security**

Podo-dermatitis



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Hock - dermatitis

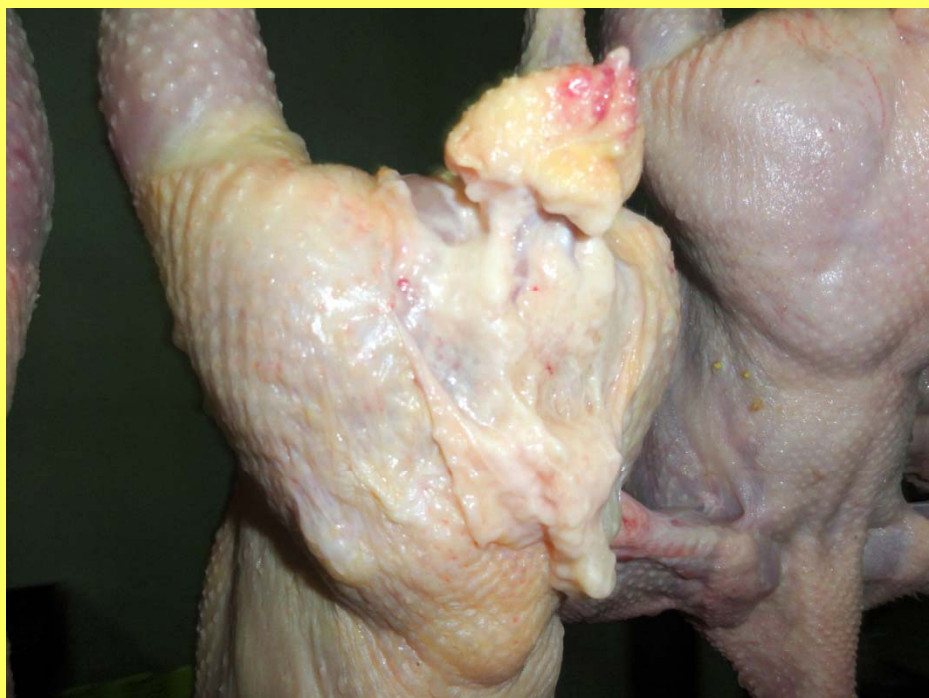


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Hock and podo-dermatitis

- **Paws for animal & human consumption**
- **Litter type and condition**
- **Pathogens - inflammation**
- **Animal welfare**
- **EC directive 2007/43/EU**
- **Stocking density: 33 – 39 – 42 kg/u.s.m.**
- **Grading and scoring**

Ruptured thigh skin



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Ruptured breast skin



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Thin epidermis – drip loss



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Skin disorders

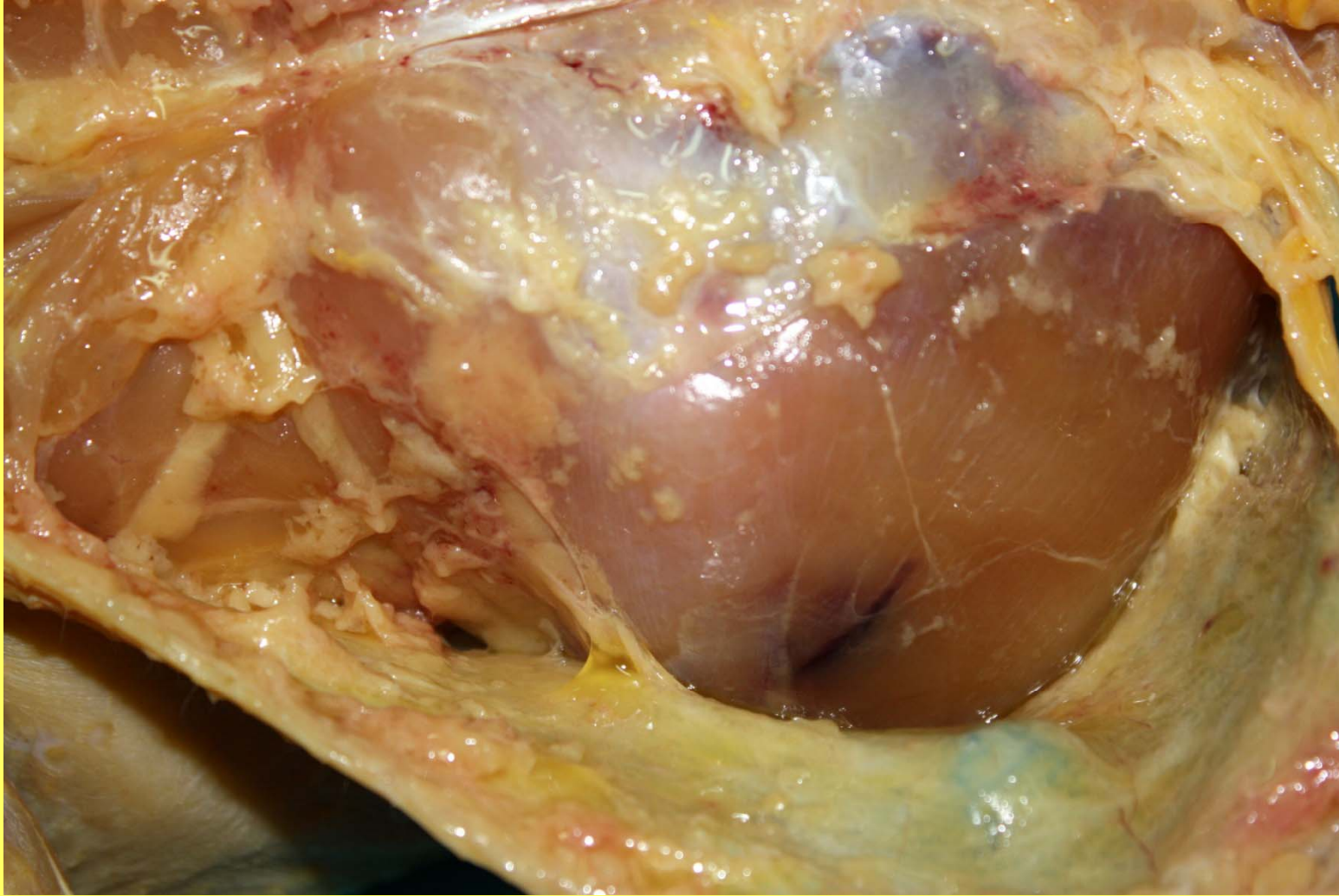
- **Skin rupturing during de-feathering**
- **Epidermal keratinized layer removed**
- **Dry-out and drip loss during storage**
- **Skin scratches**
- **Cellulitis**
- **Dermatitis**
- **Ammonia burn, litter spots**

Subcutaneous fat



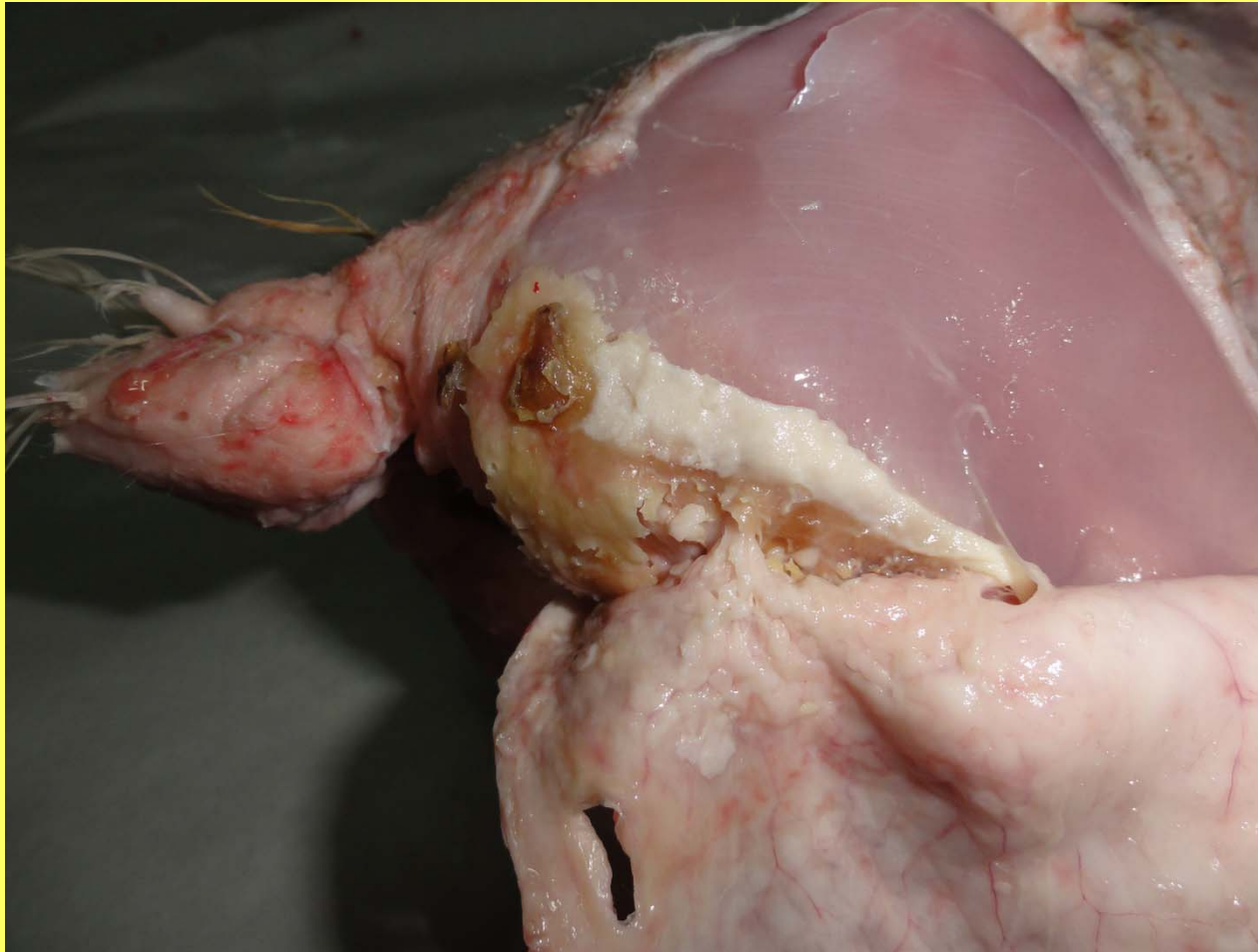
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OBS = Oily Bird Syndrome



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Subcutaneous dermatitis



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Skin properties

- **Epidermis, dermis, sub-cutis**
- **Collagen: formed by fibroblasts, gives tensile strength and rigidity**
- **Elastin: tension and elasticity of dermis and sub-cutis**
- **Keratinization of epidermis: thickness**
- **Macrophages for local defense**

Weaker skin

- **Less cross-linking between collagen fibers**
- **Amino-acid hydroxy-proline high in collagen**
- **Diets with meat meal, iron, vitamin C, zinc, copper**
- **Supplements of L-proline, glutamic acid**
- **Females: more insoluble collagen, lower total protein contents, more fats in skin**
- **High energy level in feed causes more fatty carcasses and skin rupturing**

Weaker skin - 2

- **Slow and poor feathering: genetic factors**
- **Thigh skin is weaker than breast skin**
- **High energy diets: wide calorie/protein ratio**
- **Higher fat contents in skin**
- **Females have less tensile skin than males**
- **Young animals have less tensile skin**
- **Coccidiostat Stenerol^R (halofuginone)**
- **Influence of environmental conditions**

Hemorrhage - breast



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Hemorrhage - drumstick



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Hemorrhage - wings



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Hemorrhages

- **Trauma in the last 8 hours of life**
- **Catching, loading, transport, de-loading, hanging in shackles**
- **In breast muscles & skin, drumstick, thigh, wings, tail**
- **Superficial – extensive**
- **Coagulated – non coagulated**
- **Trauma: minor - extreme**

Bloodvessel integrity

- **Less active animals – untrained muscles:
ad-lib feeding, stocking density, heavy body weight, high environment temperature**
- **Degree of capillarization in muscles is relatively low – large muscle fiber diameter:
less diffusion with oxygen and nutrients**
- **Limited developed connective tissue**
- **Sudden and extreme exercise, (heat) stress:
overloading of untrained muscles**

Bloodvessel integrity - 2

- **High blood pressure, heart rate, viscosity of blood (hematocrit, PCV)**
- **Damaged endothelial cell layer by toxins and free radicals**
- **Strangulation of blood vessels by fast muscle growth, tight fascia and sternum (green muscle disease)**
- **Electrical stunning – extreme muscle contractions**

Marble meat syndrome



Mineral nutrients

For good **skin** integrity:

- Vitamin C and E
- Carotenoids, polyphenols
- Proline, glutamic acid, glycine, alanine
- Iron, selenium, zinc

Mineral nutrients - 2

For good **blood vessel** integrity:

- Vitamin A, C and E
- Iron, magnesium, potassium
- Zinc and Manganese

Mineral nutrients - 3

For good **bone** integrity:

- Calcium, phosphorous,
- Vitamin D3 = cholecalciferol
- Zinc, manganese
- Iron, copper, fluor, selenium

Mineral supplements

- **Inorganic: oxide, sulphate**
- **Organic: amino-acids, proteinate, chelate, polysaccharide, propionate**
- **Better absorption of organic minerals**
- **Zinc is first limiting element**
- **Zinc and manganese improves feed conversion and daily gain of broilers**

Blood vessel penetration

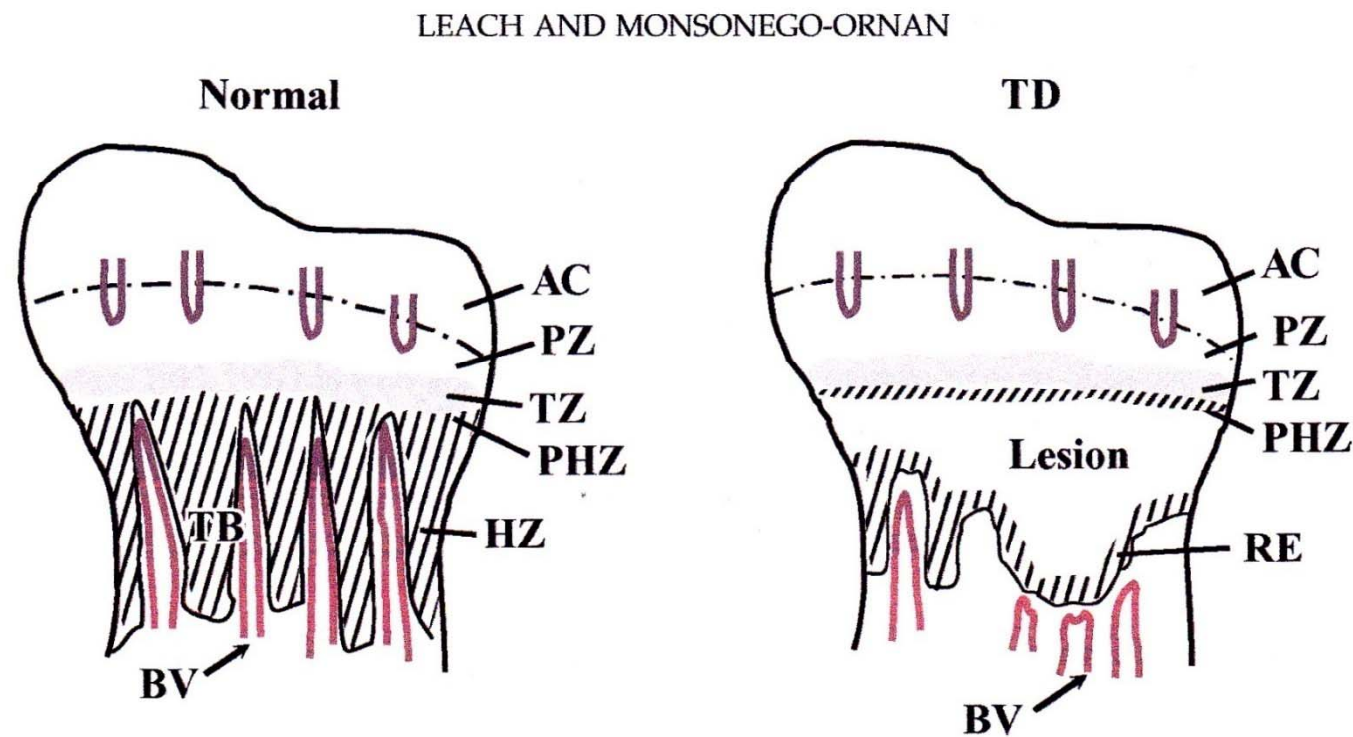
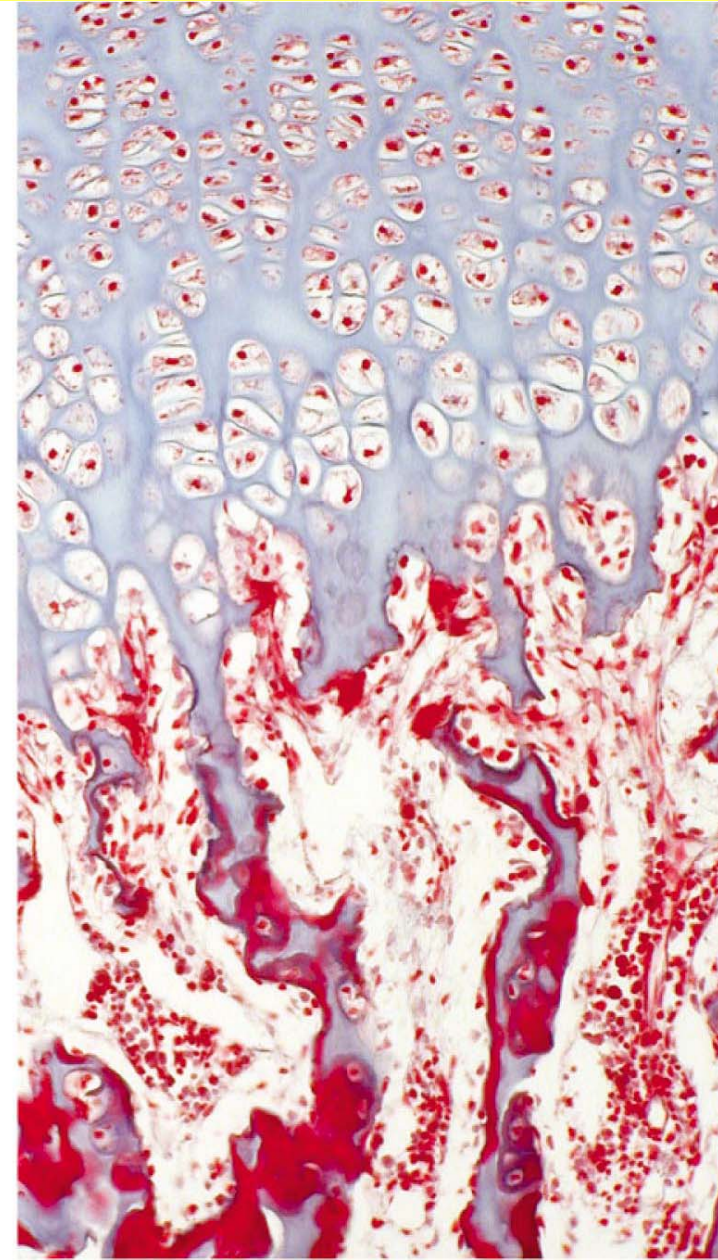
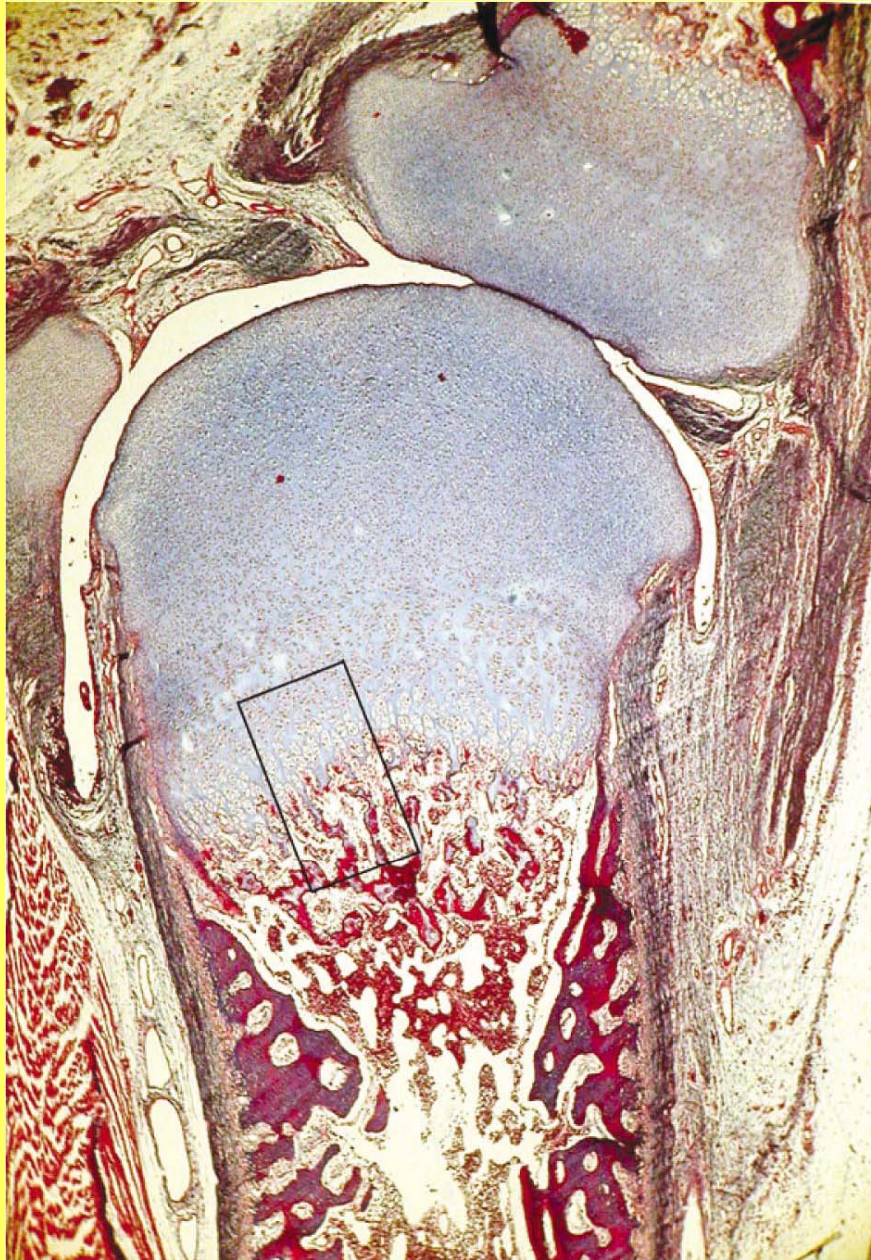


Figure 1. Diagram of the proximal end of the tibia from a normal chicken and a chicken with tibial dyschondroplasia (TD). Note the differences in penetration of the metaphyseal blood vessels. Shading depicts differences in expression genes associated with chondrocyte hypertrophy, such as type X collagen, osteopontin, and bone sialoprotein. Abbreviations: AC = articular cartilage; PZ = proliferative zone; TZ = transition zone; PHZ = prehypertrophic zone; HZ = hypertrophic zone; BV = metaphyseal blood vessels; TB = trabecular bone; RE = resorbing edge.



Source: **"Modelling cartilage mechanobiology"**

By Dennis R. Carter and Marcy Wong, *Phil. Trans. R. Soc. Lond. B* 2003, vol 358, 1461-1471

Oxidative Stress

- **Lipids high in poly-unsaturated fatty acids (PUFA) like in fishmeal, oils**
- **Selenium deficiency**
- **Formation of free radicals: superoxide anion, hydroxyl radical, nitric oxide**
- **Damage of phospholipids in cell membranes**
- **Damage of amino-acids, proteins, nucleic acids**
- **Damage of intestinal barrier of enterocytes**
- **Damage of endothelial cells in blood vessels**

Anti-oxidants

- **Natural: Vitamin E and C, carotenes, flavonoids, non-flavonic phenols**
- **Synthetic: derivatives with phenolic structures**
- **Anti-oxidant enzymes SOD: zinc, manganese and copper incorporated**

Ante-mortem inspection



Food Chain Information (FCI)

- **24 – 78 hours prior to planned slaughter**
- **Broiler farmer to abattoir management**
- **Flock data: breed, age, numbers, origin,**
- **Diseases and mortality during growing**
- **Medication, vaccination, feed additives**
- **Blood titer test results: ND, AI,**
- **Lab tests: Salmonella, Campylobacter**
- **Approval to be given by official veterinarian**

Stunning

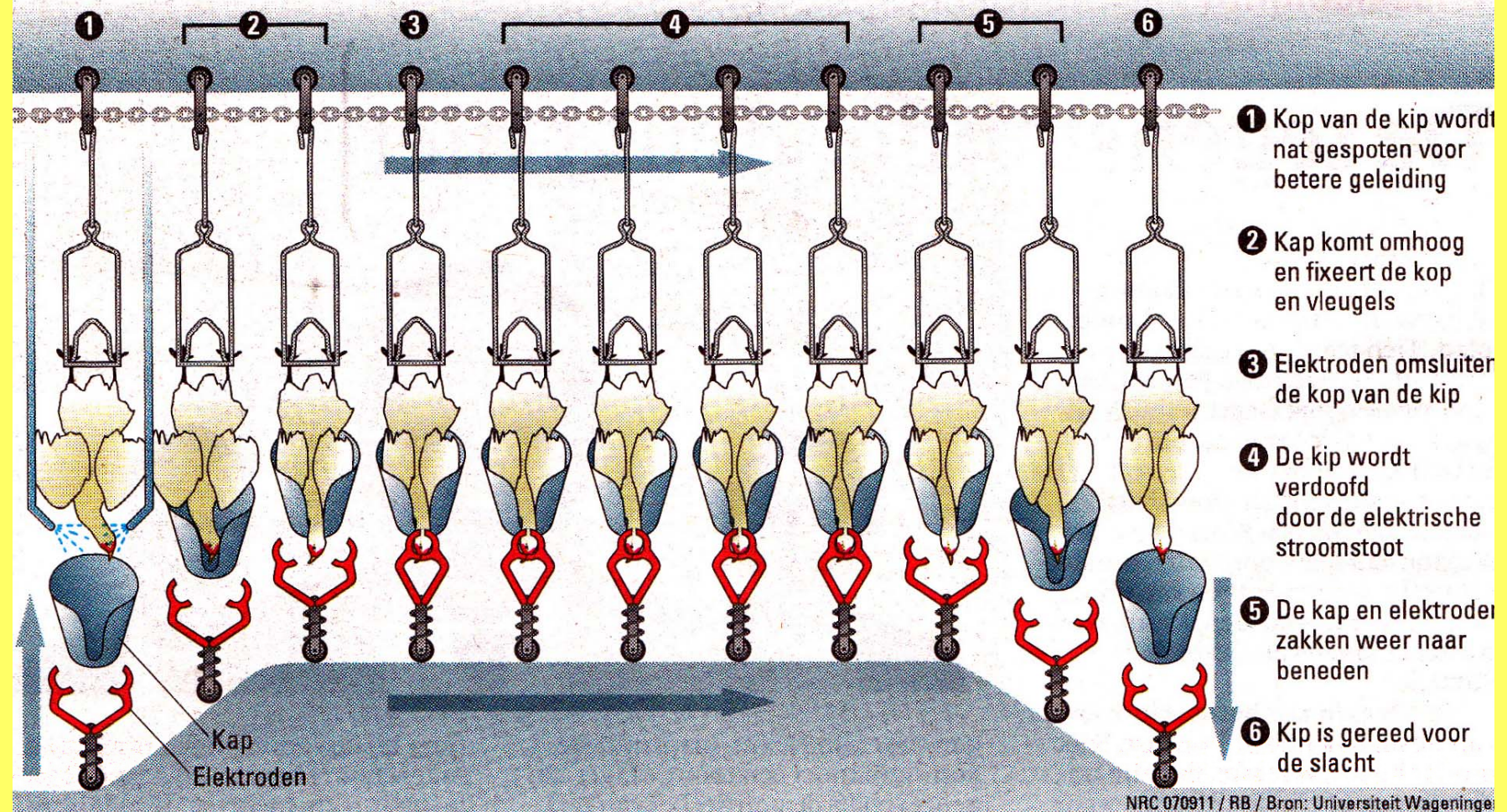
- Animal welfare
- Electric – new standards per 01-01-2012

Frequency (Hz)	Broiler, broiler breeders
< 200 Hz	100 mA
200 – 400 Hz	100 - <u>150</u> mA
400 – 1500 Hz	200 mA

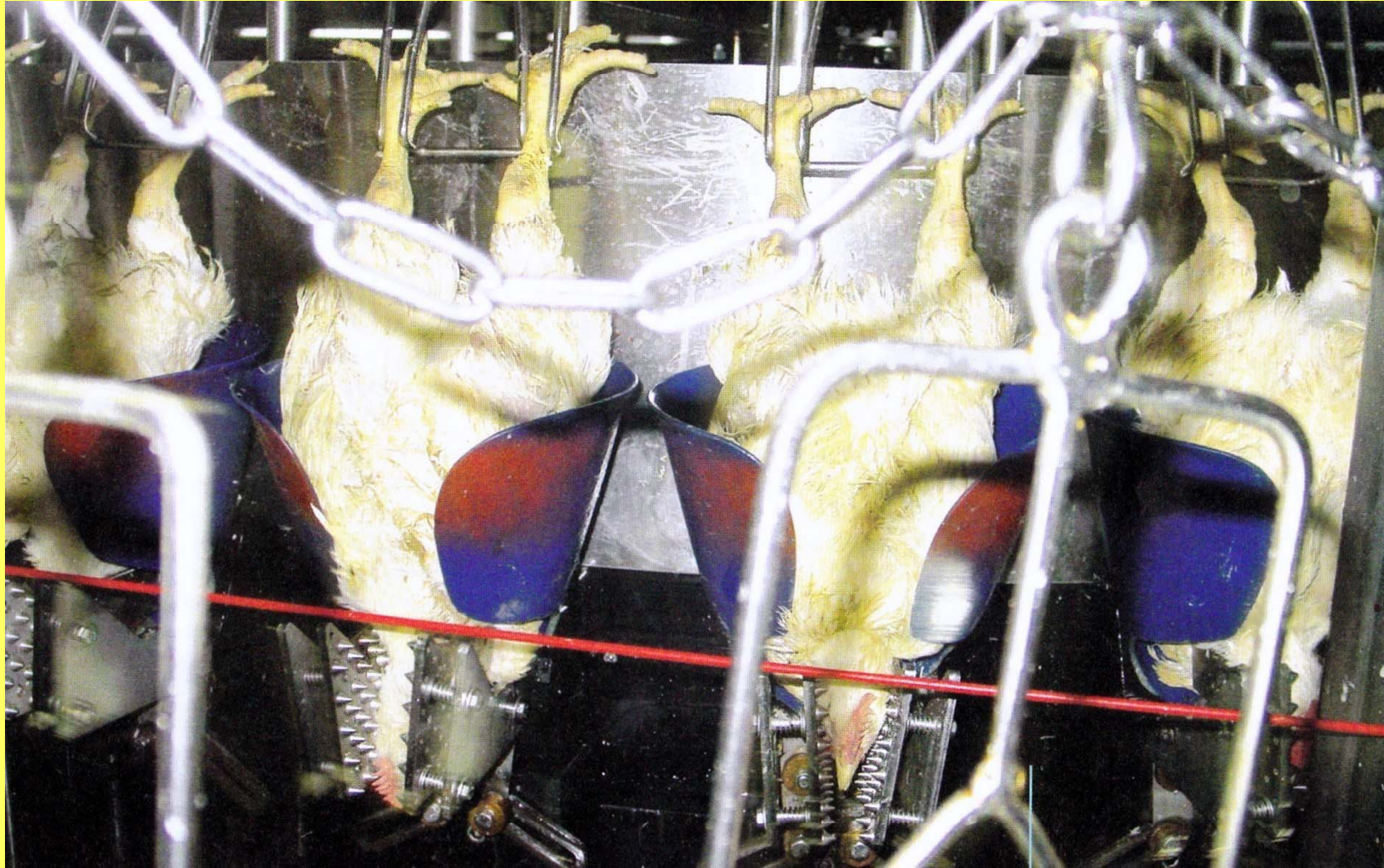
- Ritual: halal, kosher
- Gas stunning
- New technology: individual, magnetic

Individual stunning

In nieuw type verdovingscarroussel worden kippen individueel verdoofd



New stunning machine



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EC directive 2007/43/EU

- **Animal welfare - broilers**
- **Stocking density for broilers:**
 - <33 kg live body weight per usable sqm**
 - <36 kg live body weight per usable sqm**
 - <42 kg live body weight per usable sqm**
- **Scoring system hock, podo-dermatitis**
- **Light schedules**

Scorekaart voetzoollaesies vleeskuikens (versie 1.2)



Klasse 0 - glad, geen laesie
Class 0 - smooth, no lesion



Klasse 0 - kleine verkleuring
Class 0 - small discolouration



Klasse 0 - bijna genezen laesie (litteken)
Class 0 - almost healed lesion, scar



Klasse 1 - oppervlakkige laesie, verkleuring
Class 1 - superficial lesion, discolouration



Klasse 1 - donkere papillen, geen ontsteking
Class 1 - dark papillae, no ulceration



Klasse 1 - aanzienlijke verkleuring
Class 1 - substantial discolouration



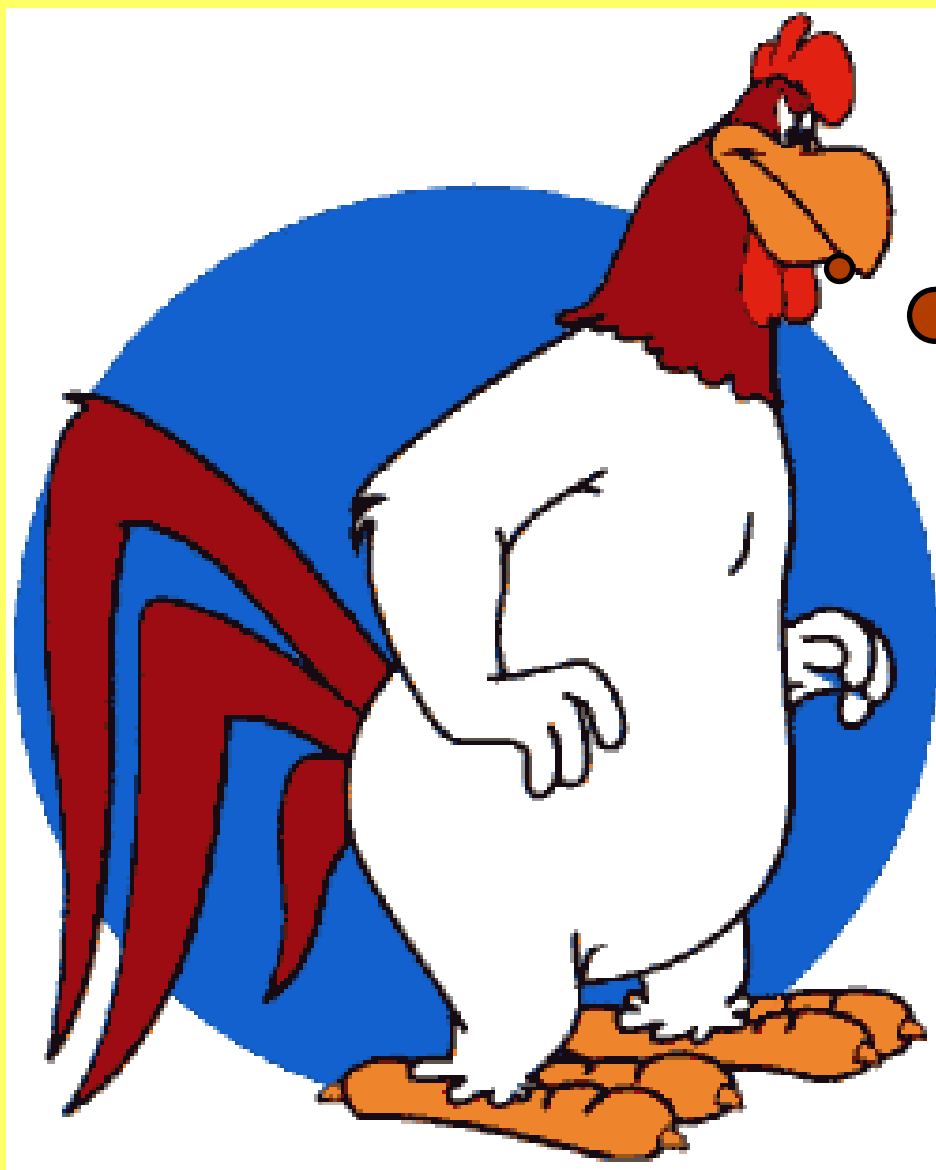
Klasse 2 - donkere papillen en ontsteking
Class 2 - dark papillae and ulcer



Klasse 2 - ontsteking bedekt met korst
Class 2 - ulcer covered by crust



Klasse 2 - ontsteking/bumble foot, gezwollen
Class 2 - abscess/bumble foot swollen



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