Module 8

Disease and Production Measures of Animal Welfare

This lecture was first developed for **World Animal Protection** by Dr David Main (University of Bristol) in 2003. It was revised by **World Animal Protection** scientific advisors in 2012 using updates provided by Dr Caroline Hewson.

Free online resources

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www.animalmosaic.org/education/tertiary-education/

This module will show you

How disease, production and welfare are related to each other

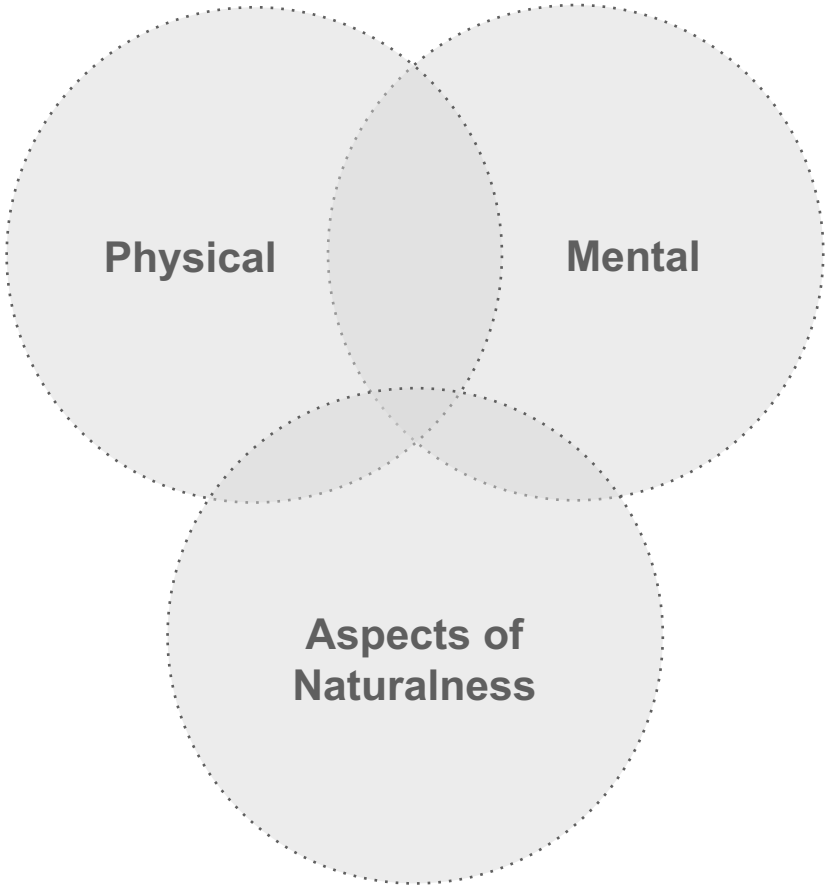
What measures of disease and production you can use when assessing physical functioning and related feelings

Disease and production

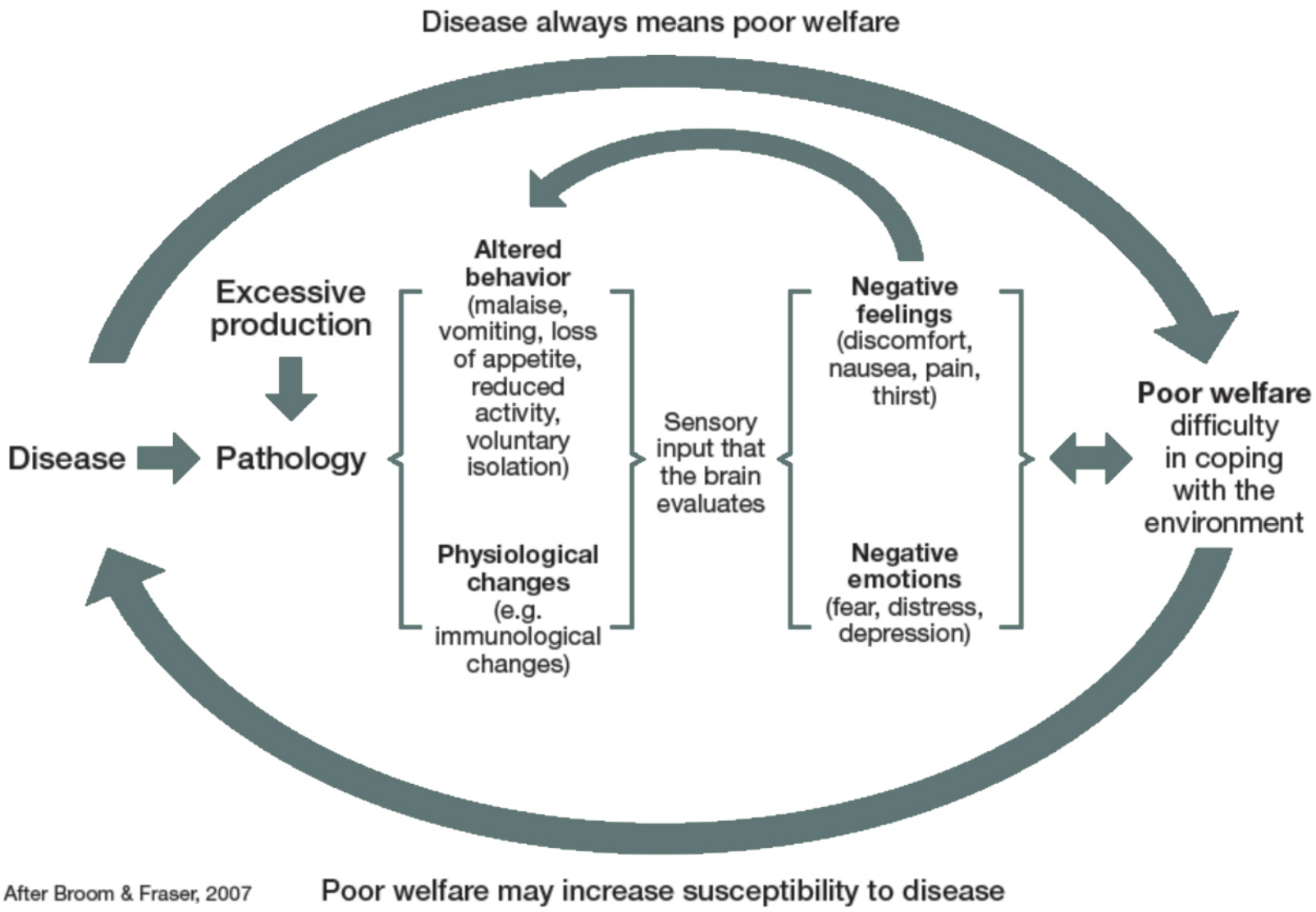
Disease = a physical or mental condition where normal function is disturbed or harmed (Cockram & Hughes, 2011)

Intensive (and excessive) production may place heavy demands on normal function, resulting in similar levels of disruption

Three approaches when considering animal welfare



After Appleby, M. C. (1999) and Fraser et al. (1997)


Disease always means poor welfare
Excessive production
Disease
Pathology
Altered behavior (malaise, vomiting, loss of appetite, reduced activity, voluntary isolation)
Physiological changes (e.g. immunological changes)
Sensory input that the brain evaluates
Negative feelings (discomfort, nausea, pain, thirst)
Negative emotions (fear, distress, depression)
Poor welfare difficulty in coping with the environment
After Broom & Fraser, 2007
Poor welfare may increase susceptibility to disease

Disease

Infectious

Prions, viruses, bacteria, fungi, parasites
(protozoa, helminths, insects)

Non-infectious

Metabolic (production-related)

Nutritional

Neoplastic

Autoimmune

Genetic, eg dogs (McGreevy & Bennett, 2010)

Why disease reduces welfare

Pain

Thirst, nausea, hunger (inability to compete for food)

Secondary problems

- Immobilised, so vulnerable ⇨ fear or distress, and risk of pressure sores and circulatory problems ⇨ pain, weakness

- Fatigue from immune response

Disease and pain

Pain (Livingston & Chambers, 2000)

Noxious stimuli:

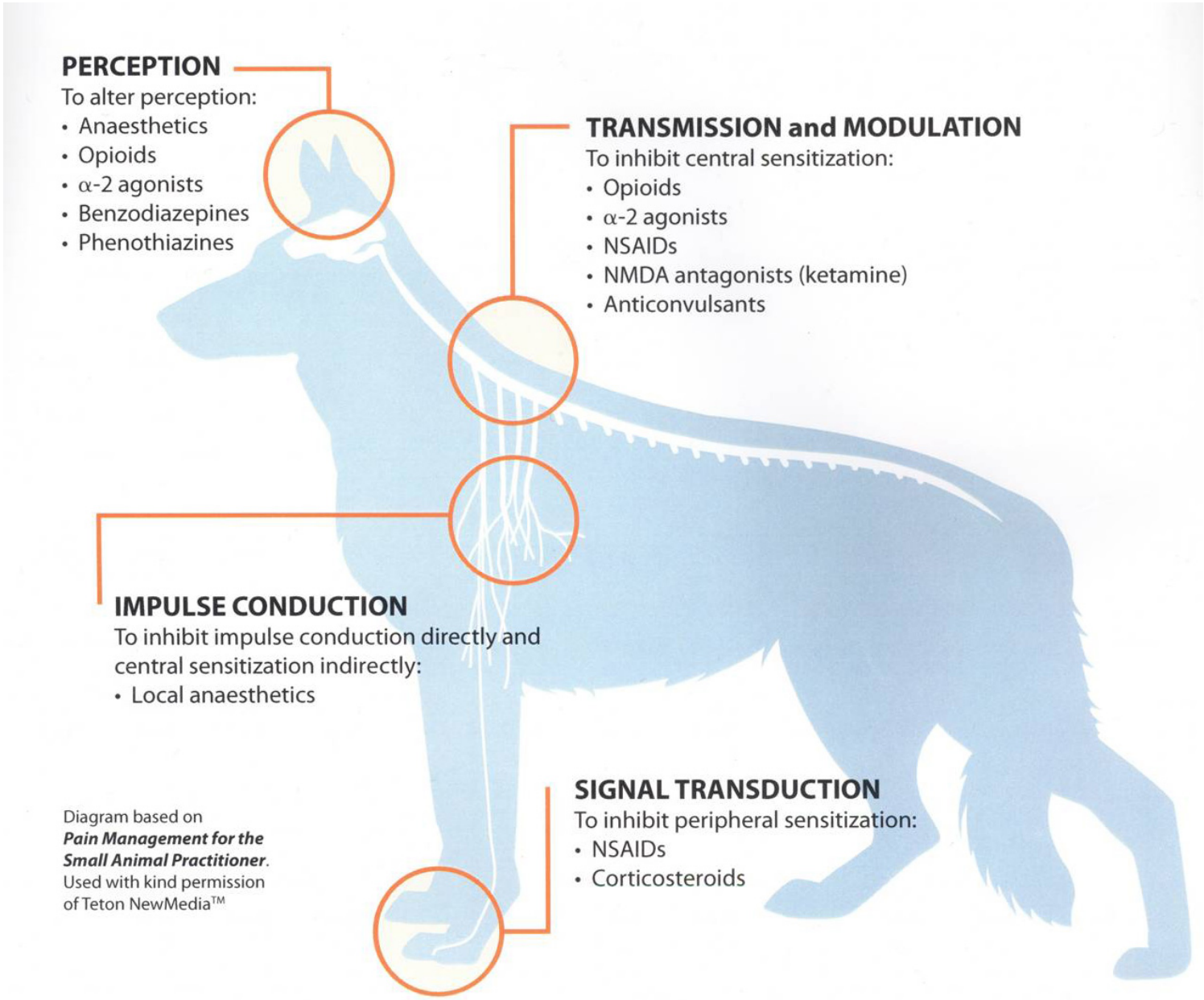
- Chemical, mechanical or thermal
- For example, disease and injury ⇨ inflammation ⇨ chemical and mechanical stimuli

Detected by nociceptors

Transmitted by myelinated and unmyelinated sensory nerve fibres to spinal cord

Transmitted from spinal cord to forebrain

Forebrain ⇨ experience of pain

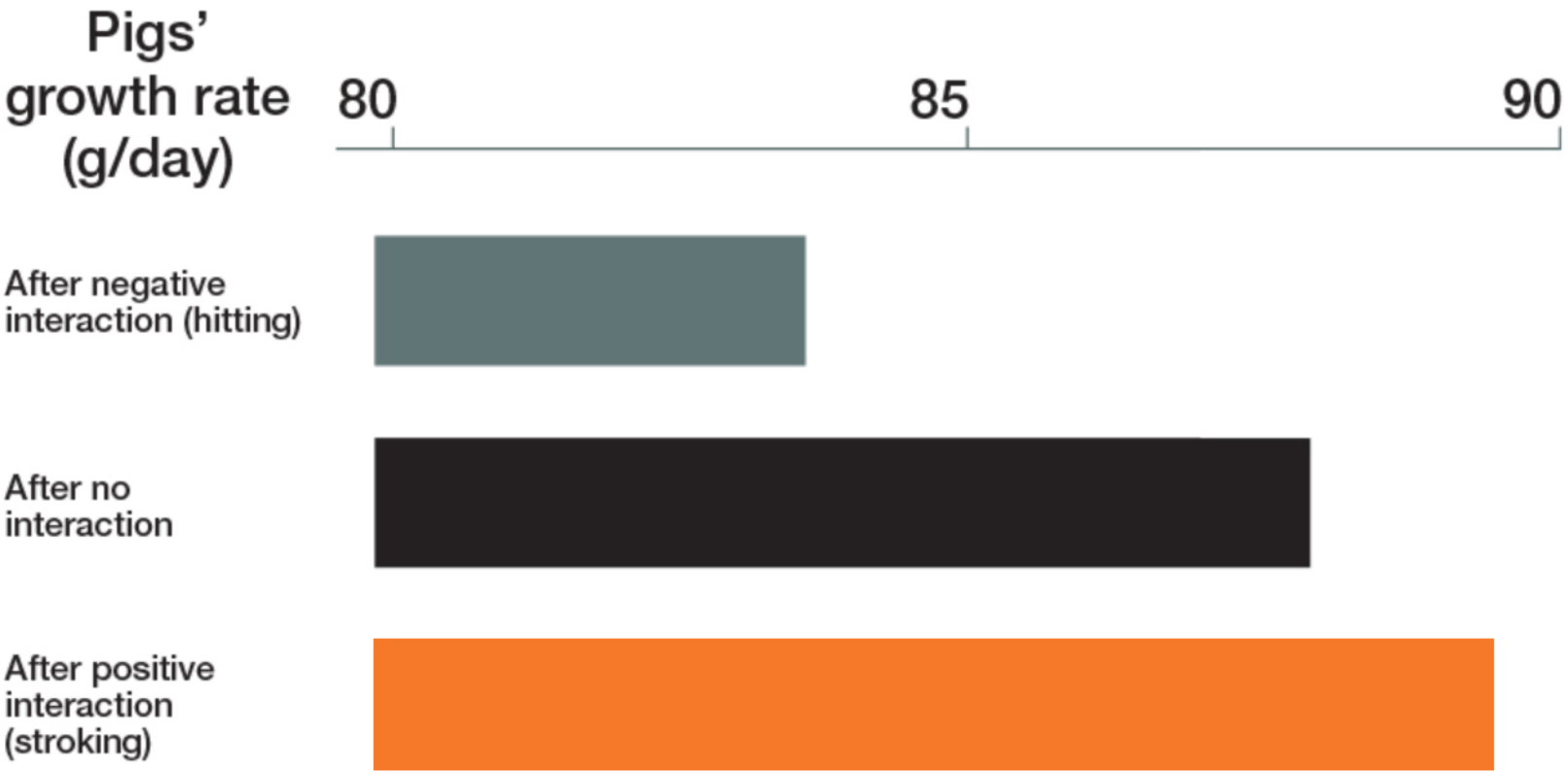


Disease and pain

Untreated pain can cause sensitisation of the pain pathway

- *Hyperalgesia*: heightened perception of existing pain
- *Allodynia*: pain response to a low-intensity, normally non-painful, stimulus
- Sensitisation of the central nervous system by an acute disease may persist for several months

Persistence of pain
(Ley et al., 1995)



Assessing pain
(Dobromylski et al., 2000)

Acute pain

- Posture, gait, demeanour, inappetence, increased respiratory and heart rate, grinding teeth, response to palpation, vocalisations, response to analgesia

Chronic pain

- Irritability, social withdrawal, aggression, weight loss

Other causes of pain

Injury, eg

- Routine procedures
- Fighting
- Slippery flooring
- Rough handling

Parturition

Markers of disease

Clinical signs

- Changes in behaviours: sickness behaviours, pain behaviours, eg lameness
- Physical changes: pale mucous membranes, swollen limb, elevated body temperature, reduced production, etc.
- Production measures: body condition score, body weight, fertility measures, etc.

Clinical pathology

- Laboratory tests – haematocrit, biochemistry, urinalysis, faecal culture, histopathology

Measures of disease

Incidence

- Number of *new* cases in a fixed time period divided by the number of animals at risk
- Usually annual
- Prevent new cases, e.g. by vaccination, improving hygiene, nutrition, etc.

Measures of disease

Prevalence

Proportion of animals affected by the disease at any point in time

For example, working equids

(Burn et al., 2010)

- Ectoparasite prevalence: 96 per cent in Guatemala vs. 67 per cent in the Gambia
- Gait abnormalities: 100 per cent in the Gambia vs. 33 per cent in Afghanistan

Production and welfare

Total output

- Milk
- Litter size
- Speed or weight carried (working animals)

Rate or frequency of production

- Growth rate
- Calving-to-conception period (cows)
- Number of litters per year (pigs, sheep)

Genetics and welfare

High production produces secondary effects, eg

Osteomalacia in laying hens
(Hocking et al., 2011)

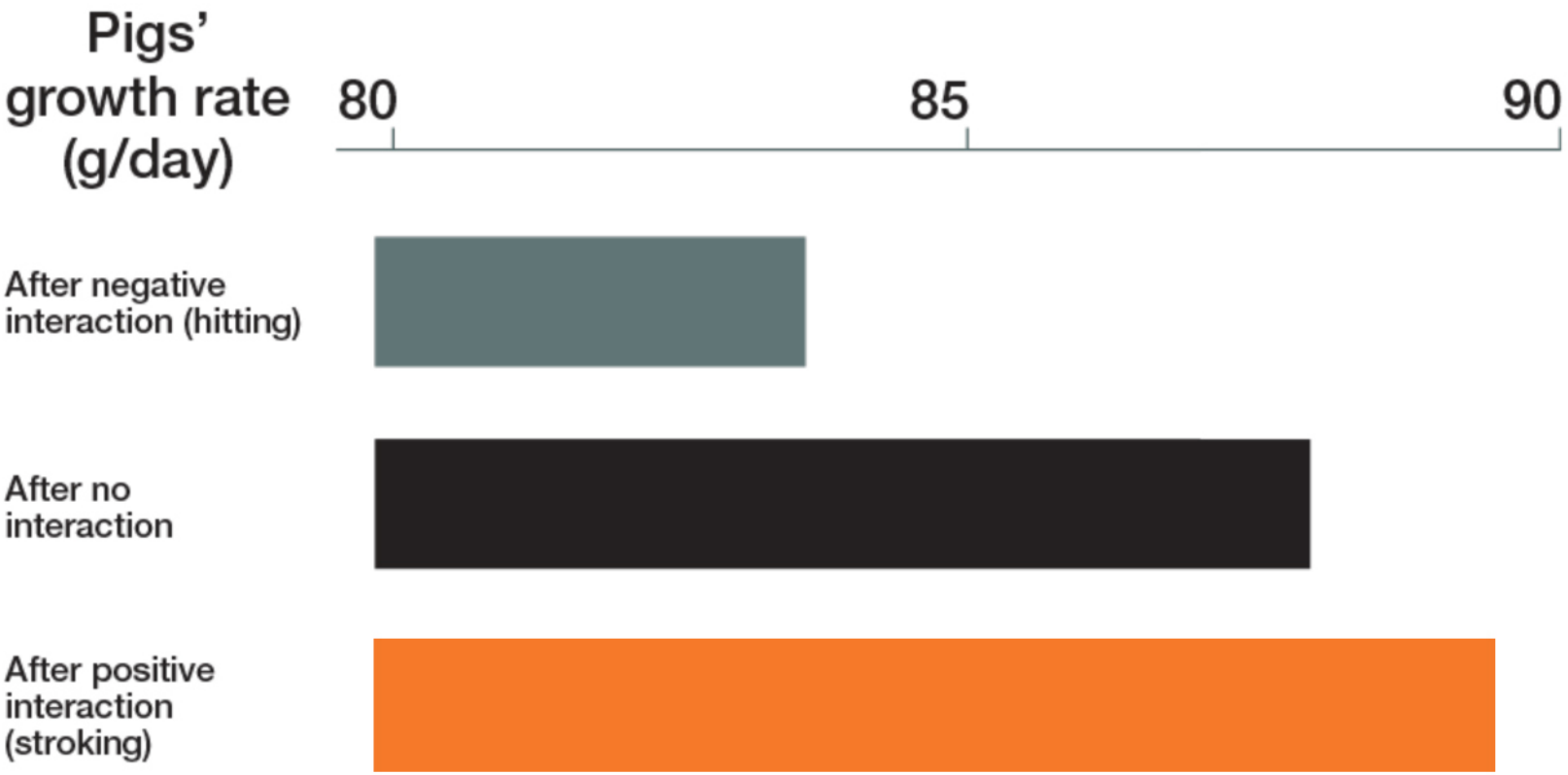
Metabolic exhaustion in high-producing dairy cows
(Oltenacu & Algers, 2005)

- Loss of body condition because conversion of food intake into milk is not efficient

Genetic correlation between high milk production and reduced fertility

Made worse in less intensive environments – i.e. decline in adaptability

Animal handling and welfare
(Gonyou et al., 1986)



Markers of production

Body condition score

Body weight and carcass weight

Average daily yield (milk)

Litter size

Measures of meat quality

Summary so far

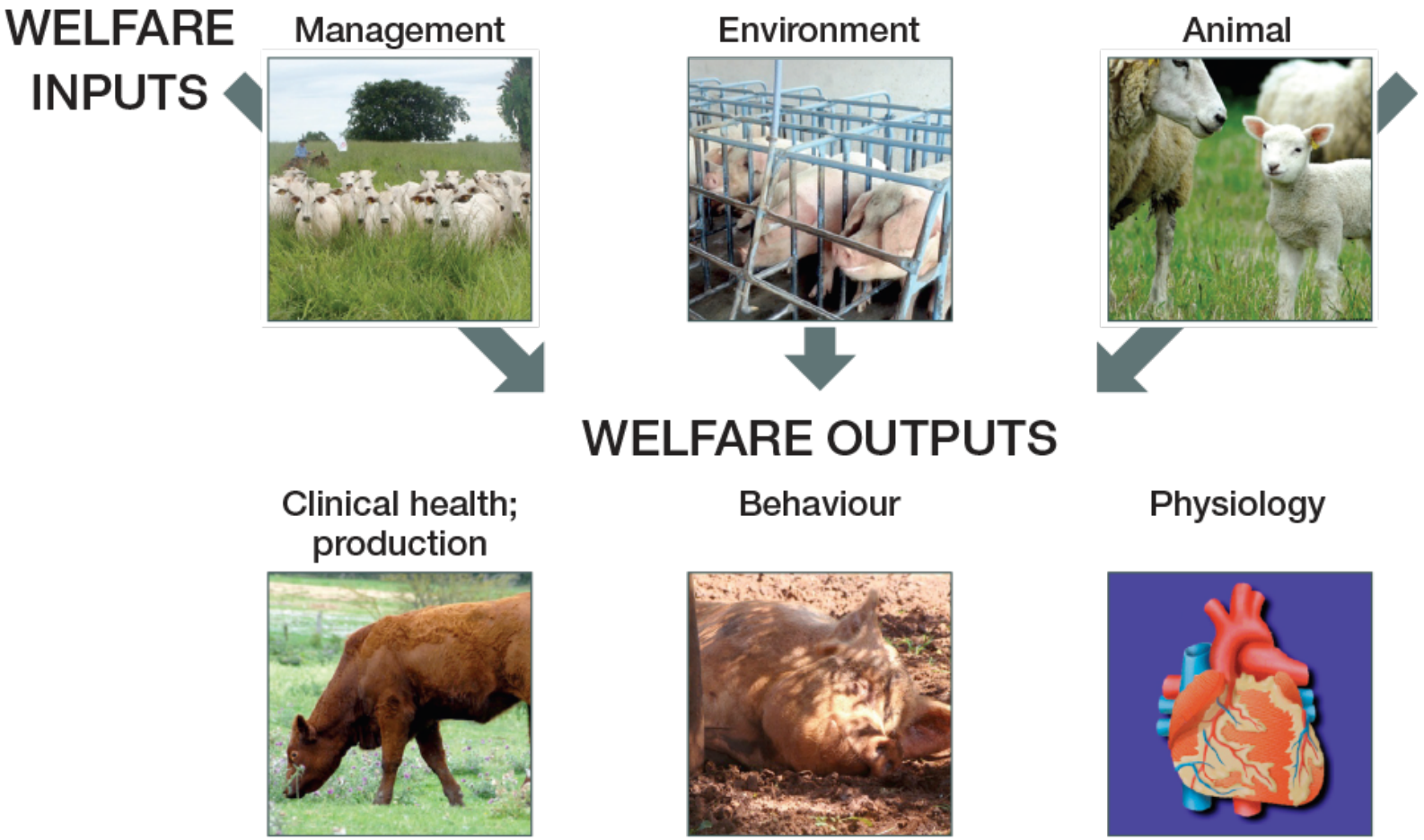
Why disease reduces welfare

- Negative feelings, especially pain

Why production can reduce welfare

- Metabolic demands can cause painful conditions and reduced bodily functioning

Welfare inputs and outputs



Disease and production measures of welfare

Welfare inputs, eg

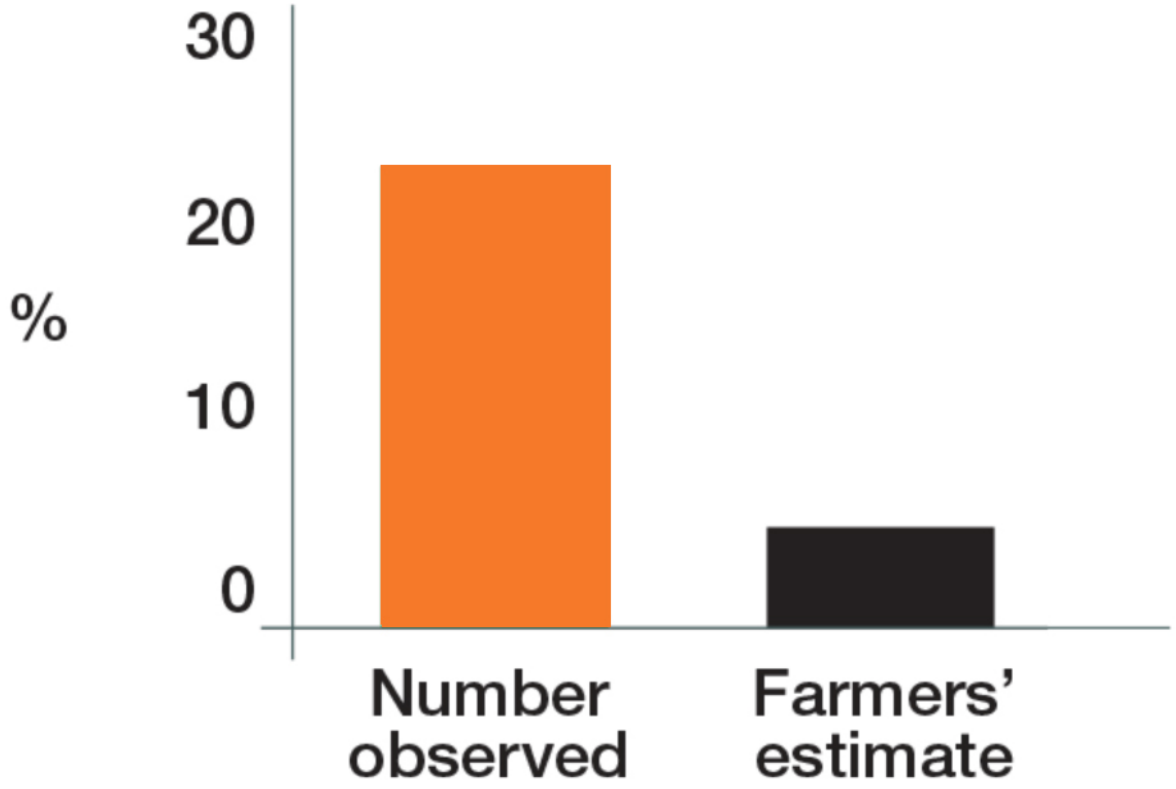
- Genetics
- Biosecurity
- Vaccinations
- Helminth control
- Nutrition
- Transport
- Group size
- Dairy hygiene
- Use of analgesics for routine procedures

Disease and production measures of welfare

Welfare outputs, eg

- Incidence/prevalence of lameness, mastitis, bruised carcasses, metabolic disease, culling, etc.
- Amount of antibiotics used
- Visits from the vet
- Somatic cell counts
- Production: fertility, growth rate, milk yield etc.

Perception of dairy cattle lameness
(Whay et al., 2003)



Summary

Disease and production can affect welfare by disrupting physical function and creating feelings of pain, fatigue, nausea, etc.

- Importance of pain pathway
- Role of genetics in production and secondary effects on welfare

Disease and production can be assessed using relevant welfare inputs and outputs

- Train the farmer to recognise diseases

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- **What did you like about it?**
- **What did you not like?**
- **Do you have any tips to share?**

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