SOCIETÀ ITALIANA DI BUIATRIA

per la salute, il benessere, le produzioni del bovino

S.I.S.Vet

WORKSHOP SIB - SISVet

La valutazione in azienda del benessere della bovina da latte: un approccio multilaterale per una produzione sostenibile e consapevole

Brescia, 25 Maggio 2017 – Fondazione Iniziative Zooprofilattiche e Zootecniche

PROCEEDING

RUMINANTIA®

Libero confronto d'idee

La generale crisi dell'allevamento bovino da latte richiede interventi di ricostruzione della fiducia del mondo dei consumatori nei settori dell'etica delle produzioni e della sicurezza alimentare. In quest'ottica, la valutazione e la conseguente certificazione delle condizioni di salute e benessere degli animali rivestono un ruolo fondamentale. Nell'Unione Europea e in tutto il mondo, esistono differenti approcci e visioni relativamente a come rilevare il benessere degli animali da latte e sono allo studio numerosi strumenti da offrire sia agli allevatori che ai medici veterinari ed ai consulenti aziendali.

La maggior parte degli approcci per la valutazione del benessere del bovino da latte si basa sulla valutazione di come gli animali si relazionano con l'ambiente ed elaborano strategie di adattamento a differenti livelli. L'esito finale di tale adattamento ha ricadute sulla sfera etologica ed è rilevabile mediante l'osservazione o la registrazione di determinati comportamenti.

Pertanto, alla luce dei significativi progressi fatti sulla comprensione dell'etologia della bovina da latte, questo workshop si propone di verificarne lo stato dell'arte e discutere se esista o meno un comportamento "normale" di questo animale, da utilizzare come base per la valutazione "sul campo" del benessere, e di fornire alla comunità scientifica lo stimolo per completare le conoscenze sull'argomento.

Inoltre, si intende porre a confronto gli approcci utilizzati per verificare il benessere di questi animali e, in ultima analisi, dare agli allevatori gli strumenti e le soluzioni per migliorarlo. In questo senso, nel corso del workshop le proposte e le soluzioni avanzate in ambiti Istituzionali avranno modo di confrontarsi con altre visioni e con le valutazioni degli operatori di campo. Lo scopo ultimo, quindi, è di aprire al confronto il mondo accademico, quello istituzionale degli Istituti Zooprofilattici e quello dei Veterinari e dei consulenti aziendali.

Comitato Scientifico-Organizzatore:

Nominativo	**Ruolo Società Scientifica**	**Affiliazione**
Bartolomeo Biolatti	Presidente SISVET	Università di Torino
Alessandro Fantini	Presidente SIB	
Gianfranco Gabai	Comitato Scientifico SISVET	Università di Padova
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Andrea Formigoni	Comitato Scientifico SISVET	Università di Bologna
Erminio Trevisi	Comitato Scientifico SISVET	Università Cattolica, Piacenza
Ileana Schiavon	Comitato Scientifico SIB	IZS-VE, Padova
Gianluca Neglia	Comitato Scientifico SIB	Università di Napoli Federico II
Maurizio Monaci	Comitato Scientifico SIB	Università di Perugia

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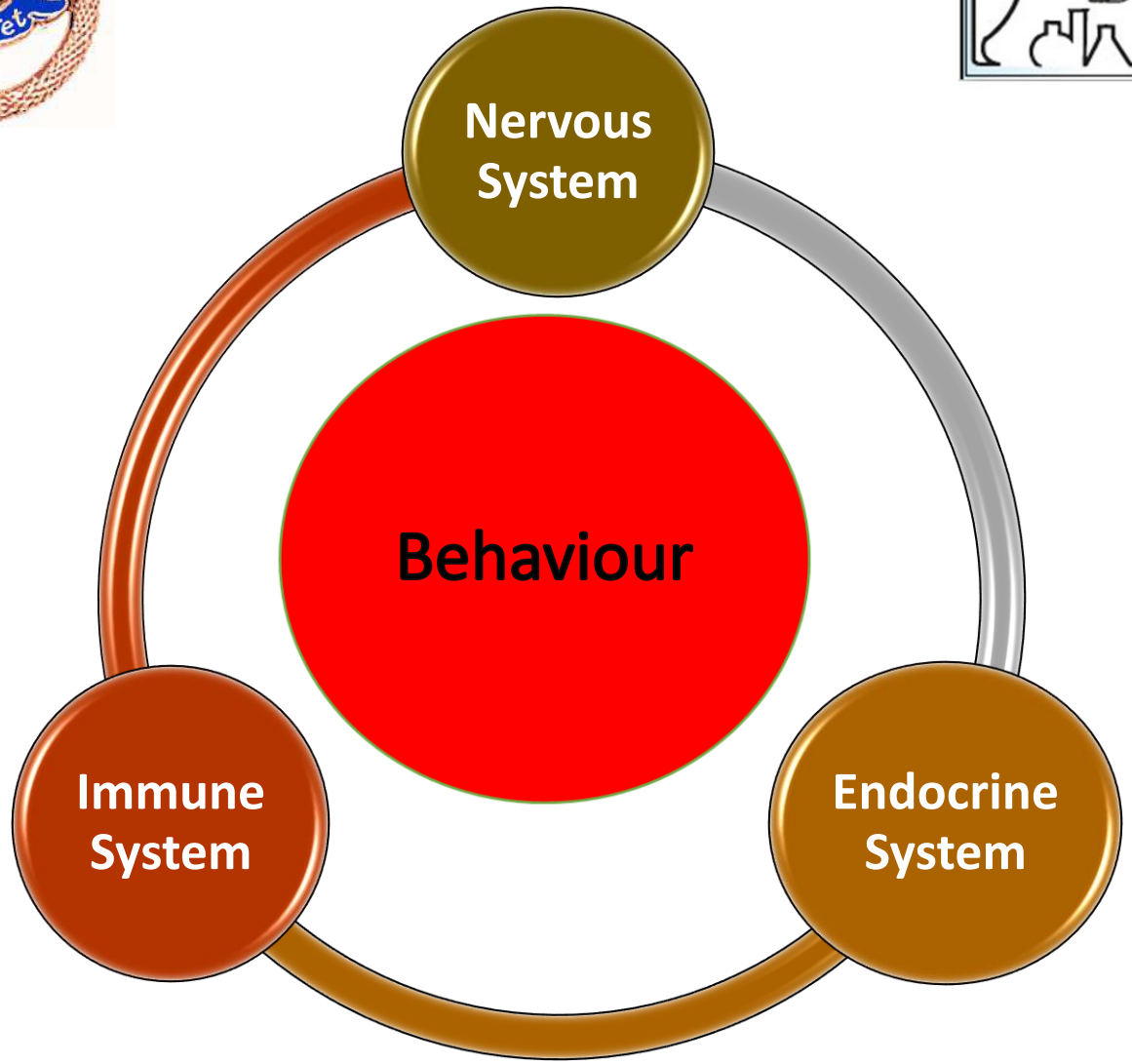
Giovedì 25 Maggio 2017

Fondazione Iniziative Zooprofilattiche e Zootecniche di Brescia

Workshop's Rational

- **Behaviour observation**: probably the "**front line**" for assessing wellbeing:
  - Adaptation to the environment - Coping strategies
- The dairy cow is not a sort of **wild bovine**
- Do we know enough about **dairy cow**'s behaviour?
  - We know a lot about (and actually exploit) some types of behaviour (reproductive b., feeding b., some aspects of the social b., etc)
- Can we define the **"normal"** behaviour for the dairy cow?


Nervous System
Behaviour
Immune System
Endocrine System

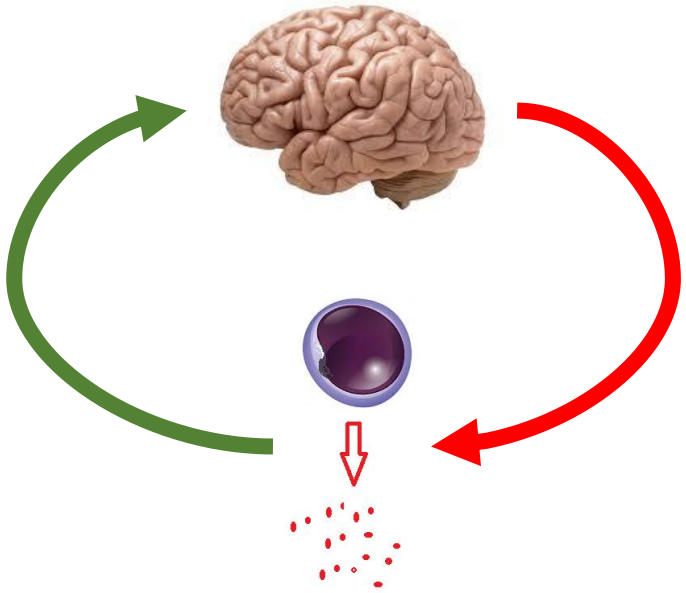
Eisenberger et al., 2017 “Inflammation and Social Behavior”
Neuropsychopharmacology 42, 242-253

Altered Social Behaviour:

- Increased sensitivity to social threats
- Increased sensitivity to social connections

Threats to social connections:

- Isolation
- Rejection
- Social conflicts

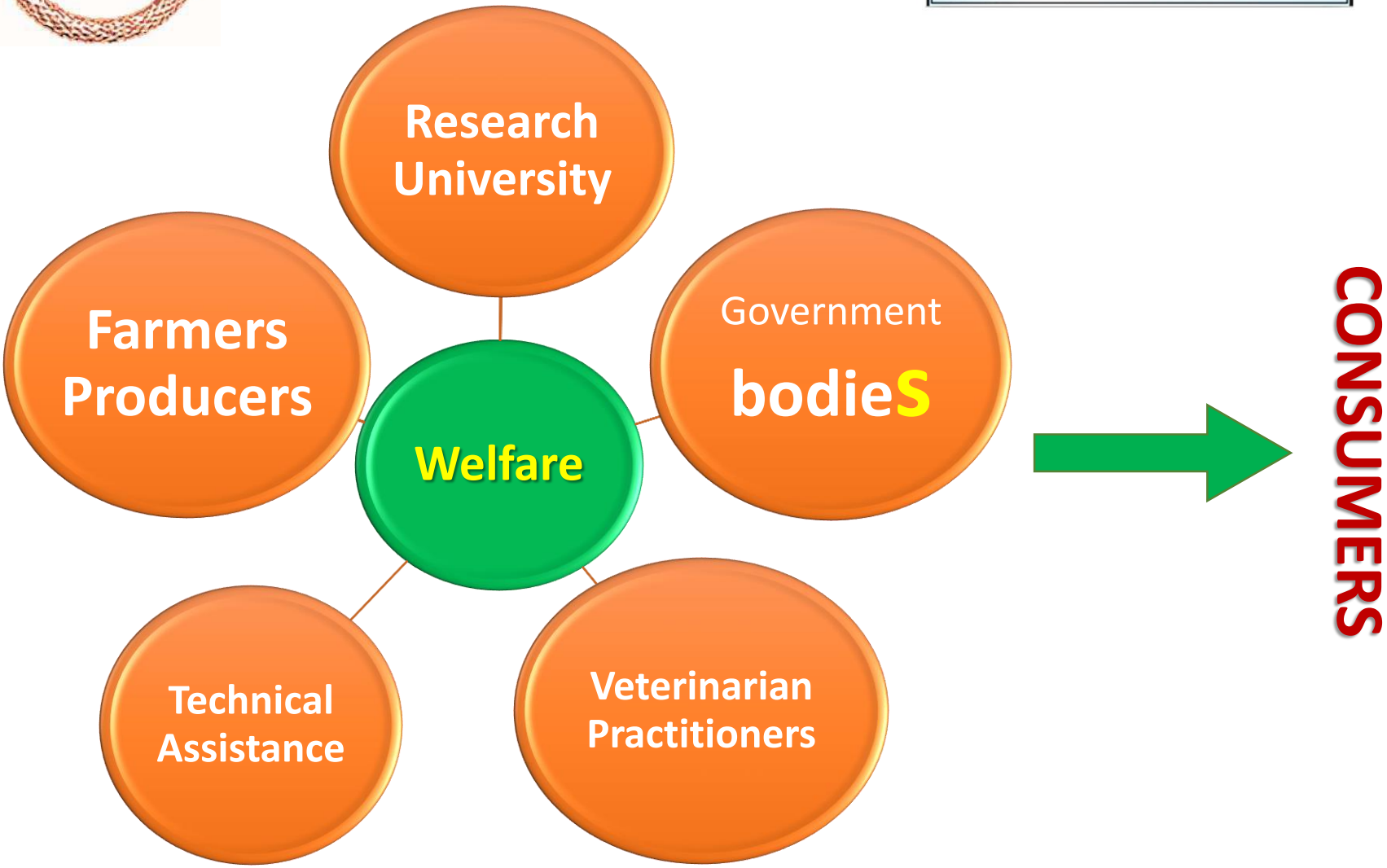


- Vagus Nerve
- Blood-Brain Barrier

- Sympathetic Nervous System
- Hypothalamus-Pituitary-Adrenal axis

Proinflammatory Cytokines

Multi-actor approach



Ethology applied to cattle :
from description of activities
to the understanding of their emotions and welfare

Alice de Boyer des Roches & Isabelle Veissier

Université de Lyon, VetAgro Sup, UMR1213 Herbivores,
69280, Marcy l'Etoile, France
INRA, UMR1213 Herbivores,
63122 Saint-Genès-Champanelle, France

May 25th, 2017

Bos taurus

Progenitor : *Bos primigenius*

Domestication: 8,500 years BC
→ Meat, Work, Milk


Koller, 1868

Breeds

- Before 19th century : different genotypes to cope with climate / vegetation
- End of 19th century : Selection of breeds starts
  → New phenotypes = changes in physiology + anatomy but not in behavior

Today :

- Specialized breeds
- Dual-purpose breeds



Outline

1. Sensory abilities
2. Cognitive abilities
3. Social behaviour and human-animal relationships
4. Biological Rythms and Space
5. Welfare assessment

3

Outline

1. Sensory abilities
2. Cognitive abilities
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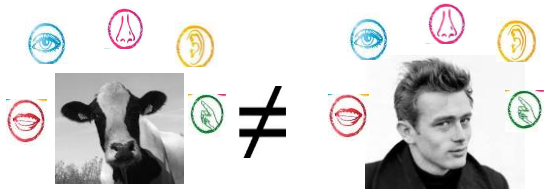
4

External environment is perceived through sensory faculties

- 5 senses :
- Cattle differ considerably from humans !



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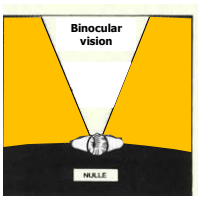
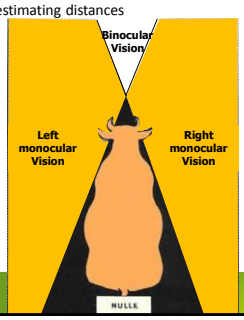
Sight

Vision = dominant sens

Field Vision

- Eyes on the lateral part of the head → Visual field : 330°
- Mostly monocular vision = Difficulties in estimating distances





6

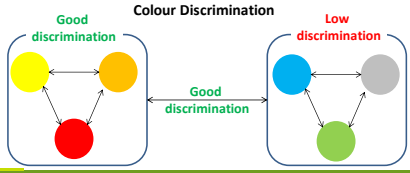
Sight

Vision = dominant sens

Colours

- Dichromatic colour vision = Cattle can distinguish different colours
- Colour discrimination :
  - Good for colours in long wavelength: red, orange, yellow
  - Lower for colours in shorter wavelength : blue, grey and green

Colour Discrimination



Phillips, 2002

Sight

Vision = dominant sens

Movements & light contrasts

- **Cattle more sensitive to seeing sudden movement**
- **Cattle are sensitive** to anything that has **high contrast of light and dark**.

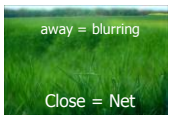
Grandin.com

Sight

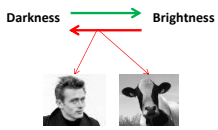
Vision = dominant sens

Image quality

- Basic **shape discrimination** is possible (Baldwin, 1981).
- Cattle may be **myopic** (Rohler, 1962)
- **Visual acuity (=perception of details) is :**
  - less than what is possible in humans
  - better in vertical plane
  - better for moving objects
- **Little ability** to **accomodate (low and slow)**
- **Little ability in brightness discrimination**



Acuity :
Human : 20/20
Cow : 20/200



30 s 3 minutes !

Sight

Can a cow tell the differences between people ?

- Cattle can recognize people by :
  - Their faces (Rybarczyk et al, 2001)
  - The color of the coverall (Munksgaard et al, 2001)
- Cattle can discriminate people by their height

Hearing

Hearing = particular importance (intraspecies communication)

Frequency

- Cattle have a broad hearing range, from 23 Hz to 40,000 Hz
- Optimum frequency : 8kHz

Intensity

- Cattle can hear sound from -11dB

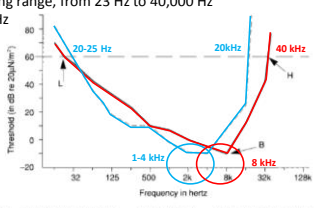


Fig. 6.3 Hearing curve in cattle and humans. For cattle B is the best hearing frequency, H is the high frequency hearing limit and L is the low-frequency hearing limit (Heffner & Mastarton, 1990).

Phillips, 2002

Olfaction

Olfaction = particular importance (intraspecies communication)

Odour detection :

- Neurons in the nasal cavity
- Vomeronasal organ (hydrated low-volatile compounds in urine)

Pheromones :

Chemical substance produced and released into the environment by an animal, affecting the behaviour or physiology of other of its/other species

Pheromone convey :

- **Oestrous** pheromones are mainly released from the body surface (genital region, hindquarters)
- **Fear**:
  - present in urine *(Boissy et al, 1998)*
  - Present in the blood *(Terlouw et al, 1998)*

Phillips, 2002

Taste

In cattle :

- **Sweet taste** = positive hedonic value
- **Umami taste** = positive hedonic value
- **Bitter taste** = indifference then negative hedonic value
- **Sour taste** = positive at low intensity / negative at high intensity
- **Salty taste** = depends on the mineral status of the animal

Ginane et al, 2011

Taste develops in utero (mid term)

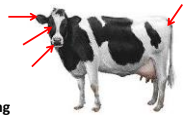
The maternal diet can affect the dietary preferences of the offspring

Tactile Sense

Receptors on the skin :

- Mechano-receptors = movement and force
- Thermo-receptors = temperature
- Nociceptor = damaging condition

Sensitive zones

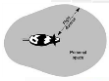


Self / Allo - grooming

© delaval

Phillips, 2002

Flight zone and point of balance



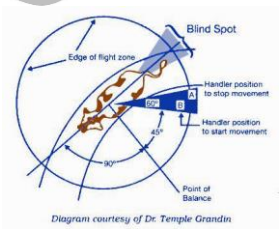


Diagram courtesy of Dr. Temple Grandin

The actual flight zone:

- Vary depending on how tame the animal is
- is affected by the type and frequency of human interaction

grandin.com

Outline

Cattle have cognitive abilities

Cognition

Mechanisms by which animals aquire, process, store and act on information from the environment *(Shettleworth, 1998)*

Cognitive process play important roles in behaviour

→ Species may differ in their cognitive abilities as a result of differing ecological pressures and evolutionary trajectories

Study of cognition

- Sensory systems and perception («Umwelt»; *Von Uexkull*)
- Learning and memory
- Decision making
- Navigation
- Communication and language
- Reasoning

Cattle can learn and memorise

Learning can be explained by few processes :

- **Classical conditionning** *(Pavlov)*
  = association between novel stimulus (sound) and unconditioned stimulus (food)
- **Instrumental conditionning / Operant conditioning** *(Thorndike)*
  = relationships between stimuli and responses based on the consequences (reward/punishment) of their action

Cattle can learn and memorise

Instrumental conditionning / Operant conditioning

Red screen : +
White screen : -

http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0080556#s5

Neave et al, 2013

Cattle can learn and memorise

Instrumental conditionning / Operant conditioning

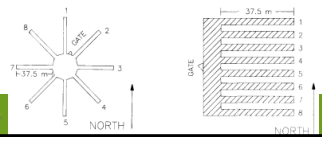
Vocal order : «come»

Video : de Boyer des Roches & Otz, 2016

Cattle have spatial memory

Spatial Memory : ability to remember location

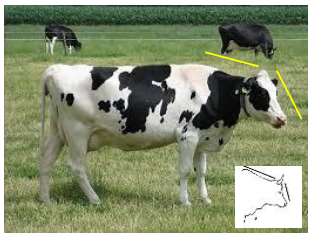
- Heifers quickly learn which side of a modified T maze contains grain. *(Kovalcik et al, 1986)*
- Cattle can learn that food will not be in a location they previously visited even if visits were separated by 8 h, but not by longer intervals in radial and parallel-arm mazes *(Bailey et al, 1989)*
-



Cattle communicate

Visual signals : main pathway used by cattle to communicate
→ Body and Head Postures

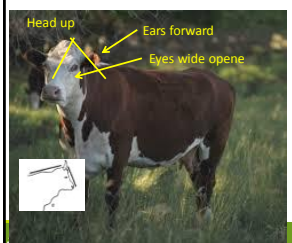
Neutral



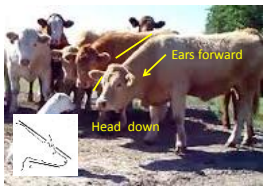
Cattle communicate

Visual signals : main pathway used by cattle to communicate
→ Body and Head Postures

Vigilance / Alert



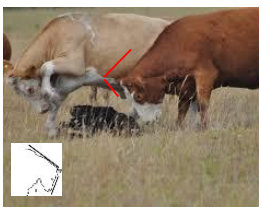
Approach / Exploration

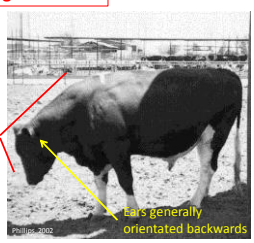


Cattle communicate

Visual signals : main pathway used by cattle to communicate
→ Body and Head Postures

Agression

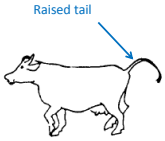


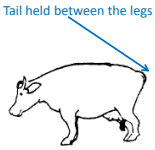


Cattle communicate

Visual signals : main pathway used by cattle to communicate
→ Body and Head Postures

Flight | **Fear / Submission**





Kiley-Worthington, 1976

Assessing emotions

Animals are sentient beings *(Dawkins, 2001)*
= recognition that they have **emotional capacities,** and that **they attempt to :**

Minimize exposure to situations eliciting **negative emotions** (fear, frustration, distress, anxiety)

Seek situations eliciting **positive emotions** (pleasure and joy)

→ **Better understanding of the range and depth of emotions that animal experience is essential in order to safeguard and to improve their welfare**

Dawkins, (1990), Duncan, (1996)

Assessing emotions

Emotion

= an **intense** but **short lived affective response** to an event associated with **specific body changes.**

≠

Sensation

= physical consequence of exposure to particular stimuli (e.g. heat, pressure)

Feeling

= internal state with no specific reference to external reaction

Boissy et al, 2007
Boissy & Erhard, 2014

Assessing emotions

Emotion

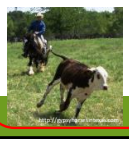
= an **intense** but **short lived affective response t**o an event associated with **specific body changes.**
It is described by:

1 Subjective component
= emotional experience

2 Expressive components

The emotional experience of animals is inferred from :

Motor/Behavioral

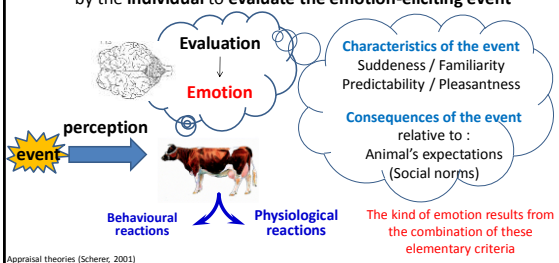


Physiological

Dantzer, 1988

Assessing emotions

An **emotion** arises from the **cognitive process** engaged by the **individual** to **evaluate the emotion-eliciting event**



Appraisal theories (Scherer, 2001)

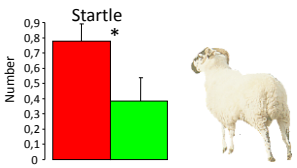
→ Testing the relevance of these characteristics in animals by elaborating experimental situations in which one elementary characteristic is prominent

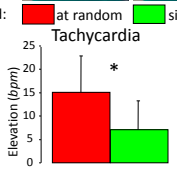
Assessing emotions

✓ **Predictability**

10 food deliveries
with 5 deliveries followed by a sudden event

The sudden event occurred: at random | signalled





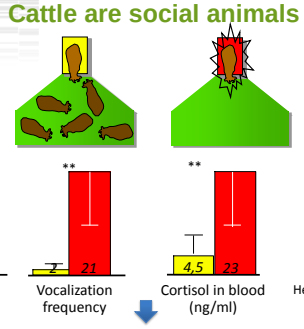
Greiveldinger et al. (2007)

↳ The predictability of a sudden event reduces the reactions to suddenness

Outline

1. Sensory abilities
2. Cognitive abilities
3. Social behaviour and human-animal relationships
4. Biological Rythms and Space
5. Welfare assessment

Cattle are social animals



Social isolation induces stress

Boissy et Le Neindre, 1997

Cows recognize each other

Cattle are able to discriminate photo of cattle vs other species

Coulon et al., 2007

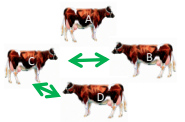
Cattle are able to :
- Discriminate individuals
- Recognize familiar individuals

Coulon et al., 2009

Cattle are able to recognize 50-70 herdmates *Fraser and Broom, 1990*

Cattle share positive relationships

Non agonistic and **non sexual behaviour** towards particular individuals :



- **preferential positive interactions** (grooming
- **synchronization of activities**
- **spatial proximity**

Philips, 2002

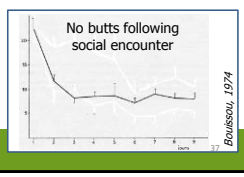
Dominant – Subordinate hierarchy

⇨ **Dominance relationship** :

- **Priority** for limited ressources (water, food, resting place)
- **Avoidance reaction** by subordinate

➔ **Dominant- Subordinate Hierarchy** (≠ Leadership !)

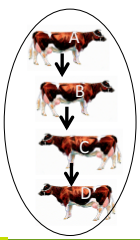
Set of all dominance relationships in the herd
- Stable in time
- Systematic
- Fast set up

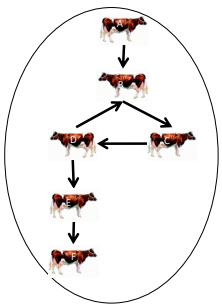


Dominant – Subordinate hierarchy

➔ **Dominant- Subordinate Hierarchy**

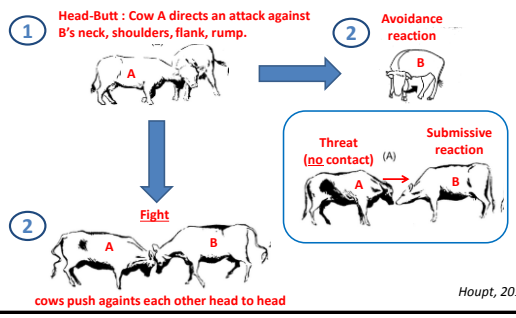
Different Patterns





Cattle display agonistic Interactions

Agonistic interactions : head butt, fight, avoidance reactions etc

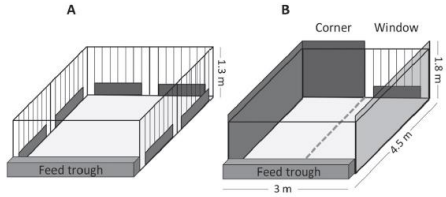


Houpt, 2011

Maternal Behavior

- Domesticated cows often leave the herd to calve *(Lidfors et al., 1994)*

→ when provided a covered area in the barn, do dairy cows seek isolation at calving ?

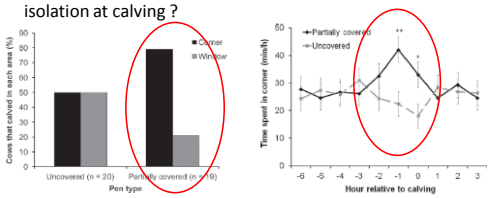


Proodfoot et al, 2014

Maternal Behavior

- Domesticated cows often leave the herd to calve *(Lidfors et al., 1994)*

→ when provided a covered area in the barn, do dairy cows seek isolation at calving ?



Periparturient cows seek seclusion to calve

→ Adding a secluded area to maternity pen to improve welfare

Proodfoot et al, 2014

Maternal Behavior

- Contact between the cow and the calf after birth results in bonding
- Long-lasting bonds : Cows do not break the bond with the yearling calf when the new calf is born
- Weaning is less stressfull (for the calf and the cow) when it is performed early (1d *vs* 2w) (Flower and Weary, 2001)

43

Social isolation of dairy calves

- **Behavioral problems** :
  - More fearful *(Boe & Faerevik, 2013)*
  - Less dominant when mixted later in life *(Veissier et al., 1994)*
- **Coping with novelty**
  - More reactive to startling stimuli *(Veissier et al, 1997)*
  - Development of self-directed oral behavior *(Veissier et al, 1997)*
  - More reactive to environnemental and social novelty *(Jensen et al, 1997)*
- **Cognition**
  - Impaired behavioral flexibility *(Gaillard et al., 2014)*
  - Lower learning capacities *(Meagher et al., 2015)*

Human-animal relationships

Human-animal relationships is based on the **history** of regular **inter-individual interactions** (animal – human).

Human-animal interactions :

- **Observations** : visual interactions
- **Movements** : visual, tactile and auditory interactions
- **Situation** in which animals must be **restrained** (management/health procedures)

History of interactions → *Conditionning* : Association between humans and rewarding/punishing events → Development of stimulus-specific responses

Hemsworth & Boivin, 2011

Human-animal relationships

Age at which handling occurs is most influential on HAR :

- Early Age
- Just after weaning

Subsequent human contact can modify early learning effects

Hemsworth & Boivin, 2011

Human-animal relationships

Positive interactions

- **Talking gently**
- **Strocking** applied to a manner that is similar to intraspecific allogrooming → ↘HR & relaxed body postures *(Schmied et al., 2008)*

Negative interactions

- Yelling, striking, using prods, etc…
- → Presence of a negative handler at milking: ↘ milk yield *(Rushen et al, 1999)*

→ Field of positive emotions in handling is still largely unexplored…

e.g. Rectal palpation in dairy cow :

- Rectal palpation induces stress in dairy cow (restlessness + ↗ H.R.)
- Such stress can be reduced by :
  - → Previous positive handling
  - → Positive and gentle interactions during the procedure *(Waiblinger et al, 2004)*

Hemsworth & Boivin, 2011

Genetic selection for temperament trait in cattle

Temperament :

- An animal's response to alarming / challenging situations
- Consistency of response within the animal

Temperament traits and their impact :

- **Handling temperament**
  - Risk of injury to the animal itself, handlers and other animals
  - Performances (growth, feeding efficiency, meat quality / milking process, residual milk)
- **Maternal aggressiveness**
  - Extensive environment : advantages
  - Directed towards stockperson = problematic

Haskell et al, 2014

Genetic variation between and within breed

Variations in Handling ease :

- **Between species** *Bos taurus* > *Bos indicus*
- **Between *Bos taurus* breeds** :
  - handling *e.g.* *Angus* > *Simmental* *(Gauly et al., 2001)*
  - milking temperament (dairy breeds) *e.g.* *Jersey* > *Ayrshire* > *Holstein* *(Sewalem et al, 2010)*
  - No difference in avoidance test *(de Boyer des Roches et al, 2016)*

→ More likely to be due to **differences in the way cattle were raised**
→ **Sire** has a **strong effect** on the **reactivity** of cows in the milking parlor

Boissy et al. 2005

Outline

Time Budget of dairy cow

Lying down / Resting :
12-14 hours
- 7,5 h lying down + ruminating (6-13 bouts)
- 4-5 h sleeping (different bouts)

Eating :
3-6 hours (9-14 meals per day)

It varies with :

- Production level
- Housing system
- Facilities
- Practices
- ….

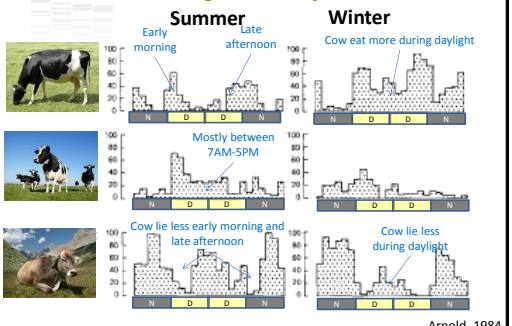
Standing / Walking :
2-3 hours

Synchronisation of the activities !

Drinking :
30 min

Grant, 2009

Time Budget of dairy cow



Arnold, 1984

Cattle motivation to graze

- **Grazing :** locomotion behavior + feeding behavior
- Cows are **highly motivated to walk** *(Veissier et al, 2008)*
- **Benefits of indoor systems for animal welfare :**
  - Protection from predators
  - Reduce exposure to extreme weather conditions *(Schütz et al, 2010)*
  - Provision of nutritionally balances diet througout the year *(Algers et al, 2009)*
- **Benefits of grazing for animal welfare :**
  - Performing natural behaviour *(Kilgour, 2012)*
  - ↘ prevalence of lameness *(Hernando-Mendo et al, 2007)*
  - ↘ incidence of udder-related issues *(Washburn et al, 2002)*
  - ↗ cleanliness *(Nielsen et al, 2011)*

Cattle motivation to graze

- **When provided free-day time access to pasture** during the summer, **cows go and remain at pasture** *(Shepley et al, 2017)*
- **Factors** :
  - **Climate**
  - **Previous experience** during **lactation / rearing** *(Legrand et al, 2009; Charlton et al, 2011)*
  - Importance of the **quality of pasture**

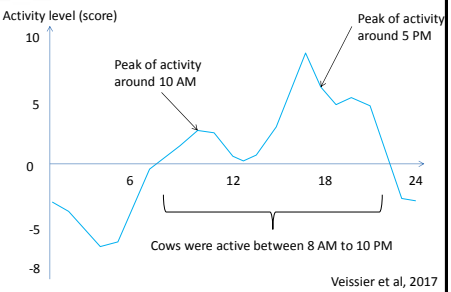
→ **Importance of the controllability** for the cow **to go to pasture**

- **Providing haylage on pasture** in addition to good pasture management may allow **for high producing cows** to meet energy and nutrient requirements

Early modification of the circadian organization of cow activity in relation to disease and estrus

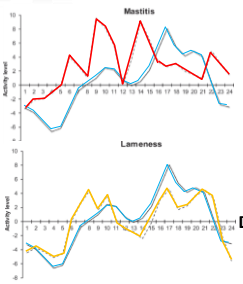
CowView

Localisation in real time
→ Activity of the animal



Veissier et al, 2017

Early modification of the circadian organization of cow activity in relation to disease



Mastitis :
Cows are more active during the day

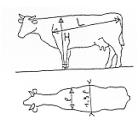
Lameness :
↘ activity **during the day**
↗ activity **during the night**
Daily variations less marked

Veissier et al, 2017

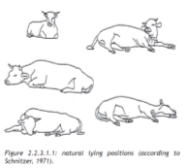
→ **Precision livestock farming technologies for new practices of welfare and health management**

Space and Ergonomy

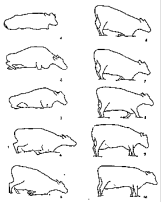
Animals dimensions



Animals postures



Animals Movements



CIGR, 2014

Space and Ergonomy

Animals Movements

Clic at 1.14

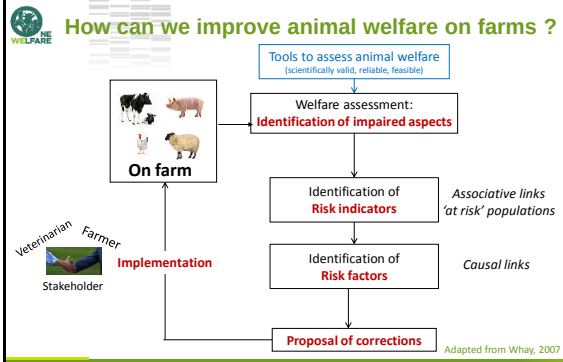
Video : http://www.livestockresearch.com/

Space and Ergonomy

Outline

1. Sensory abilities
2. Cognitive abilities
3. Social behaviour and human-animal relationships
4. Biological Rythms and space
5. Welfare assessment

How can we improve animal welfare on farms ?

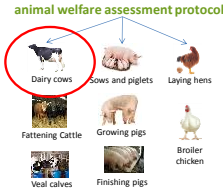


How can we improve animal welfare on farms ?

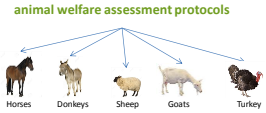
Welfare Quality 2004-2009

awin 2009-2014

Developing on-farm animal welfare assessment protocols



Developing on-farm animal welfare assessment protocols



How can we improve animal welfare on farms ?

Christoph Winkler

If you wish more information :

alice.deboyerdesroches@vetagro-sup.fr

Animal Welfare Team
at UMR 1213
Herbivores

http://www1.clermont.inra.fr/urh/

Workshop SIB-SISVet, Brescia

Assessing animal welfare: from concepts to real measures

Christoph Winckler

University of Natural Resources and Life Sciences, Vienna
Department of Sustainable Agricultural Systems

Why on-farm welfare assessment?

Individual farmer/vet interest

- Decision support
- Monitoring

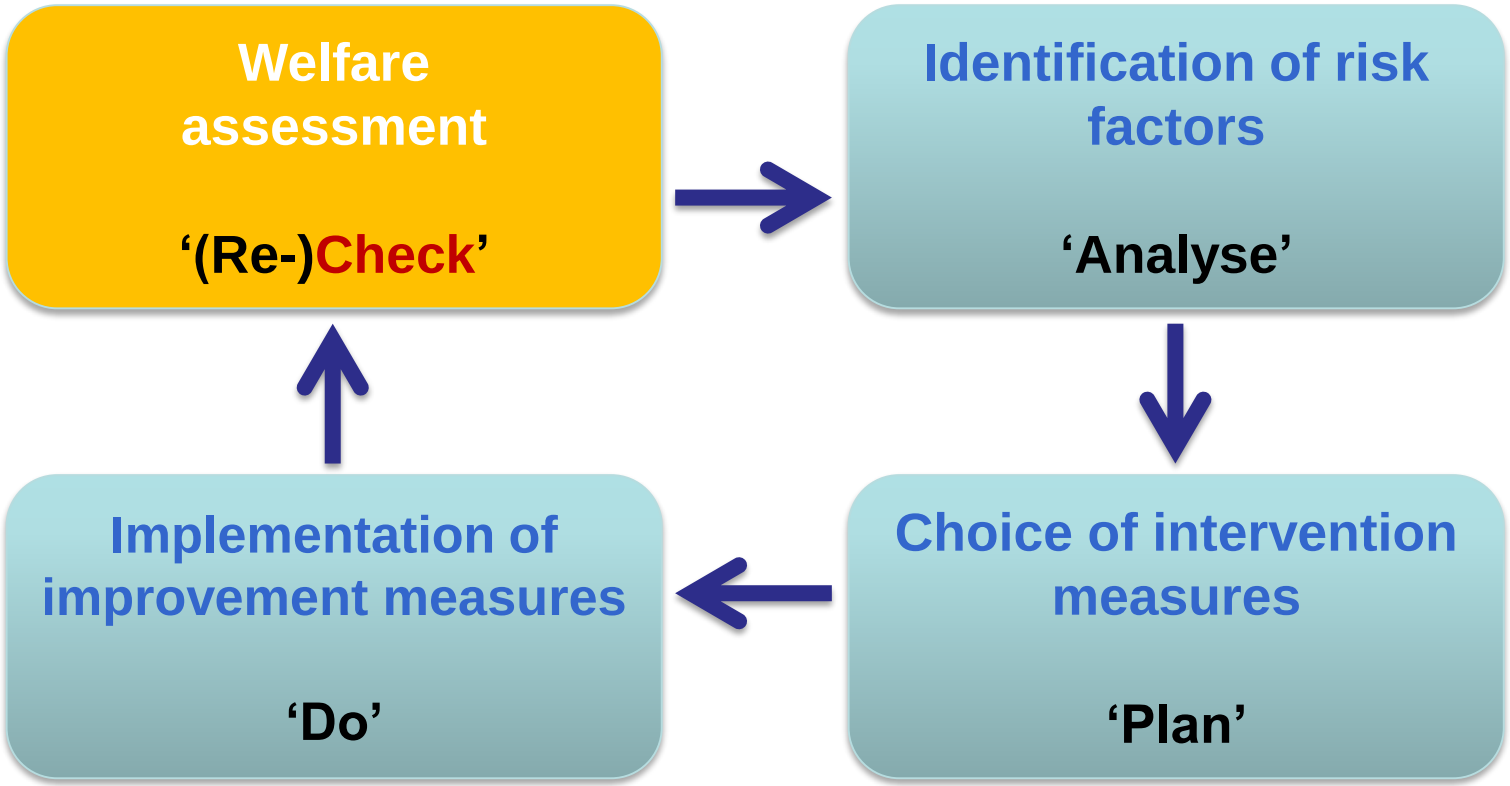
Producer group interest

- Farm assurance
- Strategic development of the industry
- Communication to the public

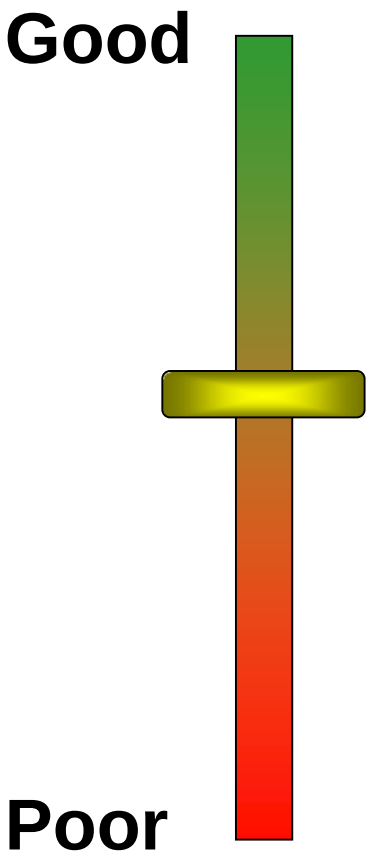
Societal and consumer interest

- Food quality, sustainability

Journey to welfare improvement



How do you feel today?

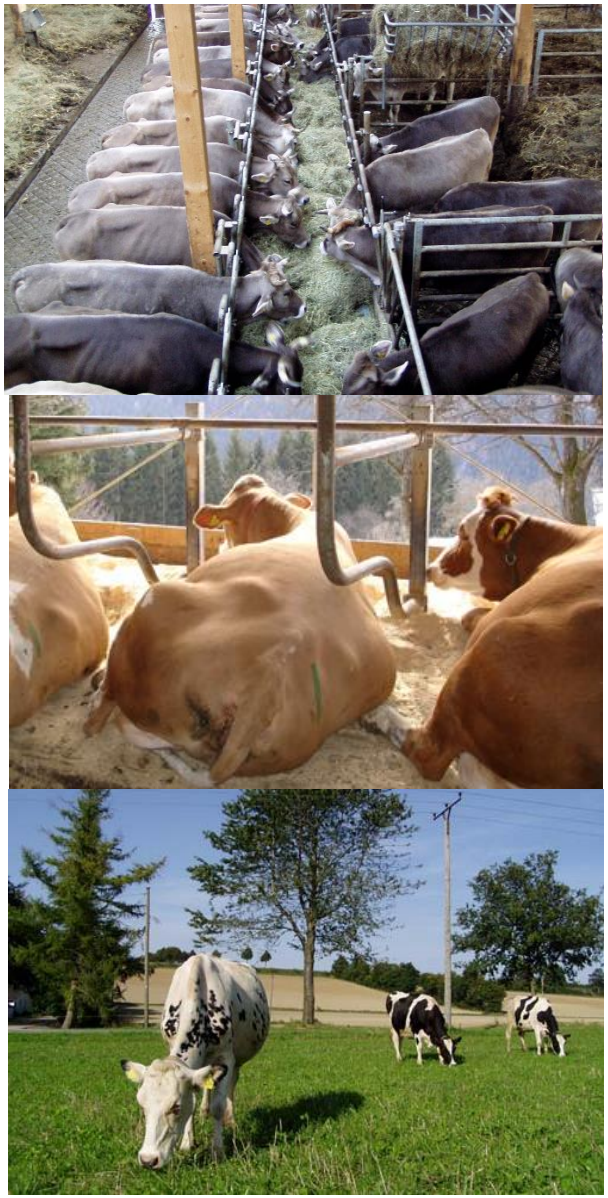


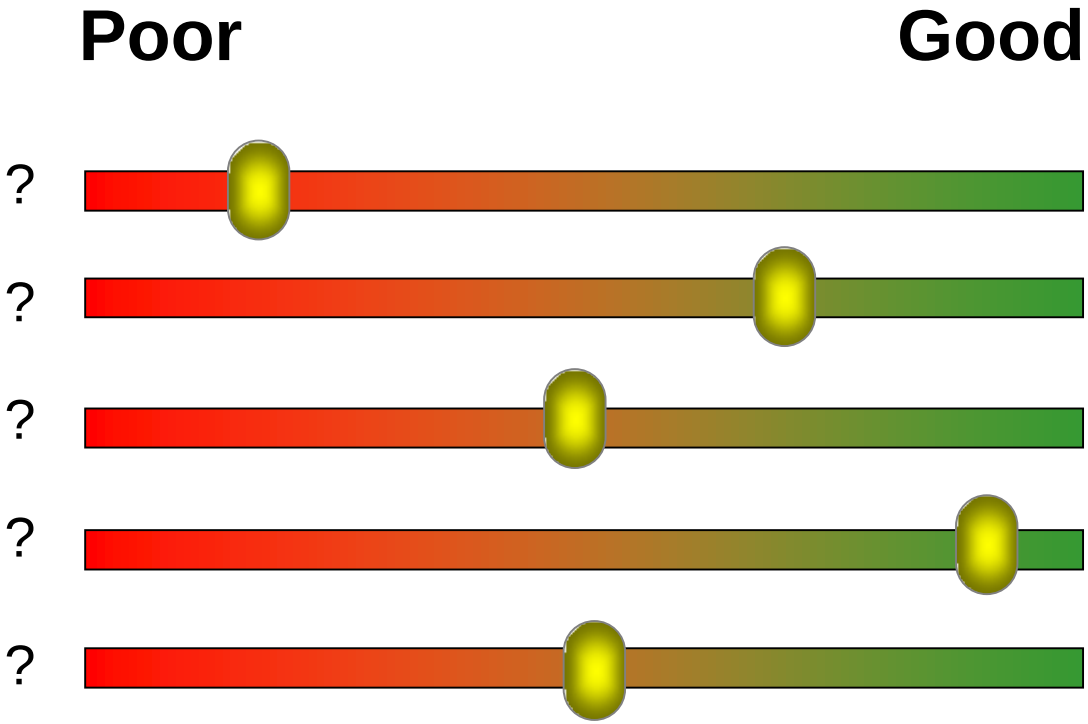
- Fantastic
- Quite good
- Reasonably well
- OK
- Not very well
- Miserable
- Terrible

Why?

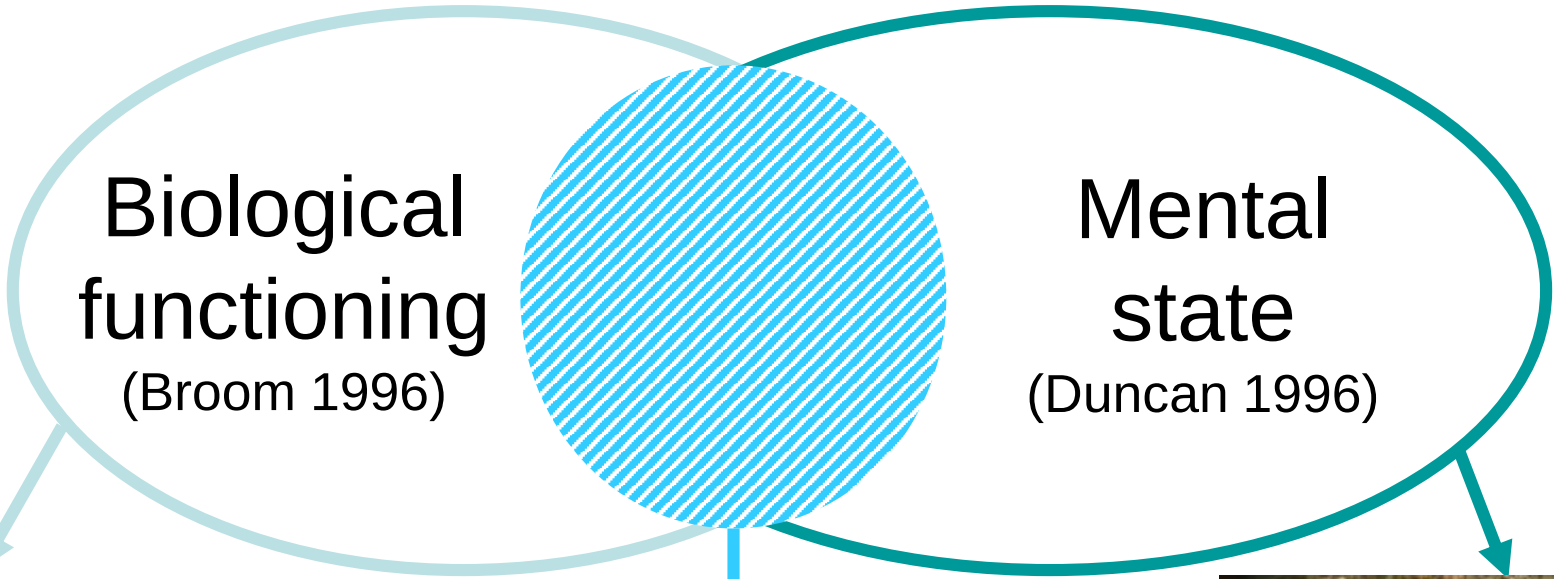
Why?


Poor
Good
Chair comfort
Hunger
Hot / cold
Social relationships
Health state
Total




Poor
Good
?
?
?
?
?

Concepts of animal welfare



‘fitness’

e.g. subclinical disorders

e.g.
clinical diseases, lesions, wounds

Concepts of animal welfare

Biological functioning
(Broom 1996)

Mental state
(Duncan 1996)

‘Naturalness’
(Fraser 2003)

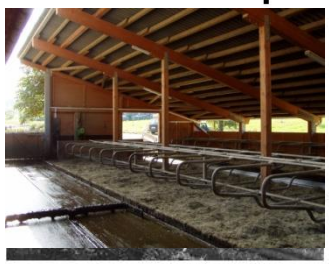
ability to perform normal behaviour, integrity

→ Measure all aspects, but do not measure everything

But how?

Progress in on-farm welfare assessment: Outcome-based vs. resource-based

Influencing factors
= indirect parameters



Housing

Management

Genetics, ...

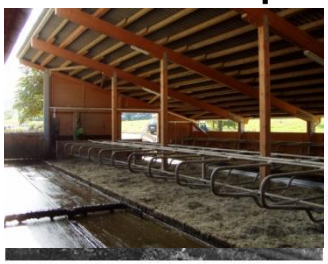
WELFARE?

e.g. Animal Needs Index (Bartussek 2001)

Progress in on-farm welfare assessment: Outcome-based vs. resource-based

Influencing factors
= indirect parameters

Output
= direct parameters

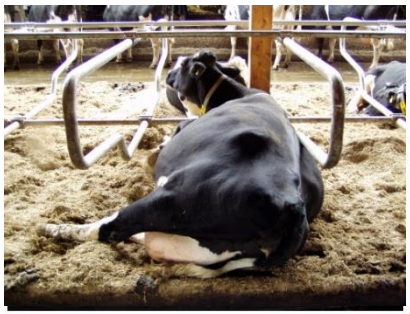


Housing

Management

Genetics, ...

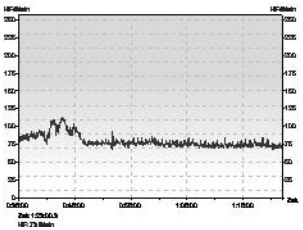
WELFARE?



Health, injuries

Behaviour

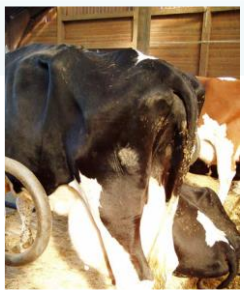
Physiology



Selected welfare indicators in Austrian farms

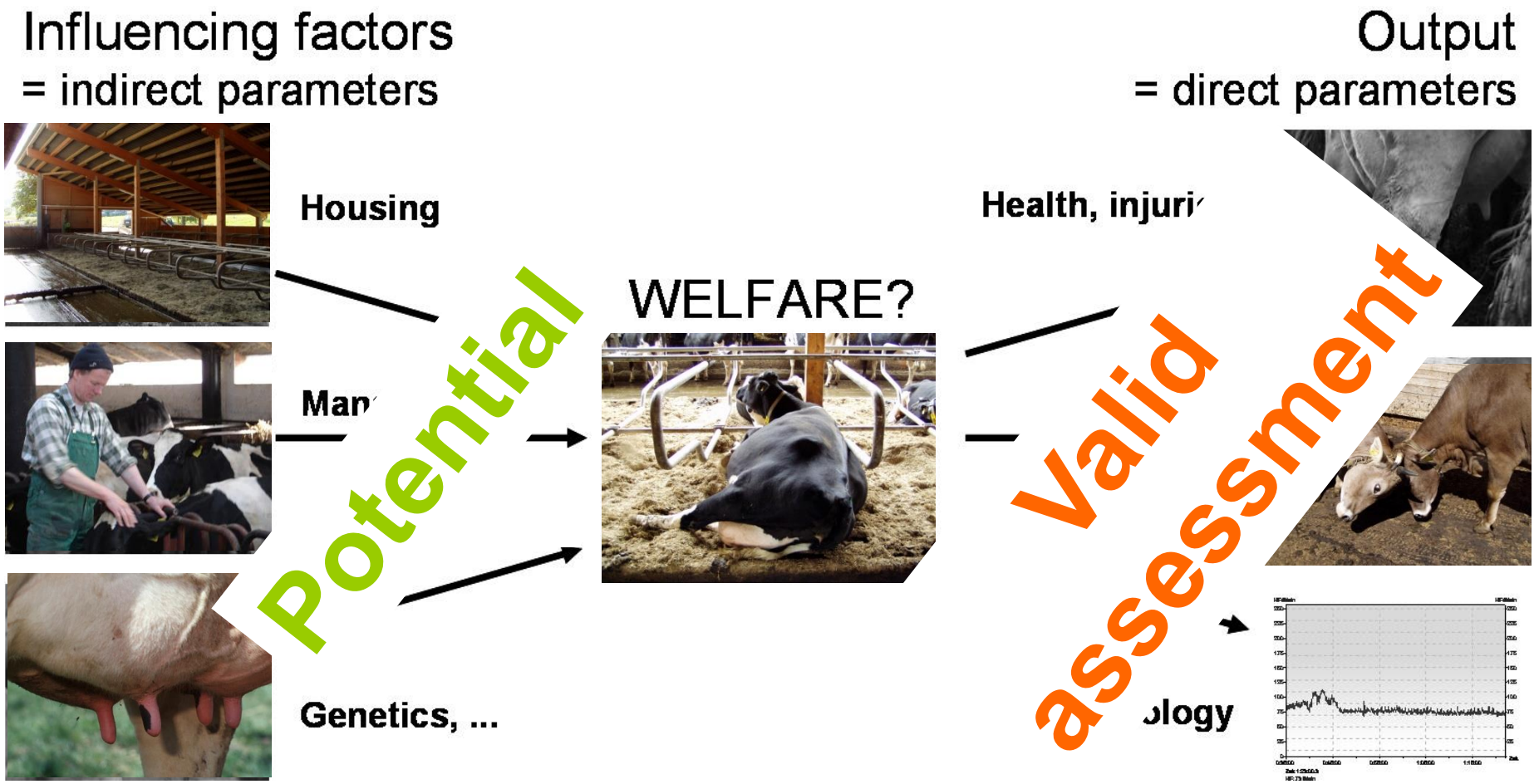
N=35; cubicle loose housing, > 24 cows

	% very lean animals	% lame	% hock lesions	mastitis incidence	agonistic inter-actions
Median	4 %	39 %	8 %	11 %	1.3/cow*h
Min-Max	0-9	13-71	0-50	0-40	0.1-4.7



Tremetsberger, submitted

Progress in on-farm welfare assessment: Outcome-based vs. resource-based

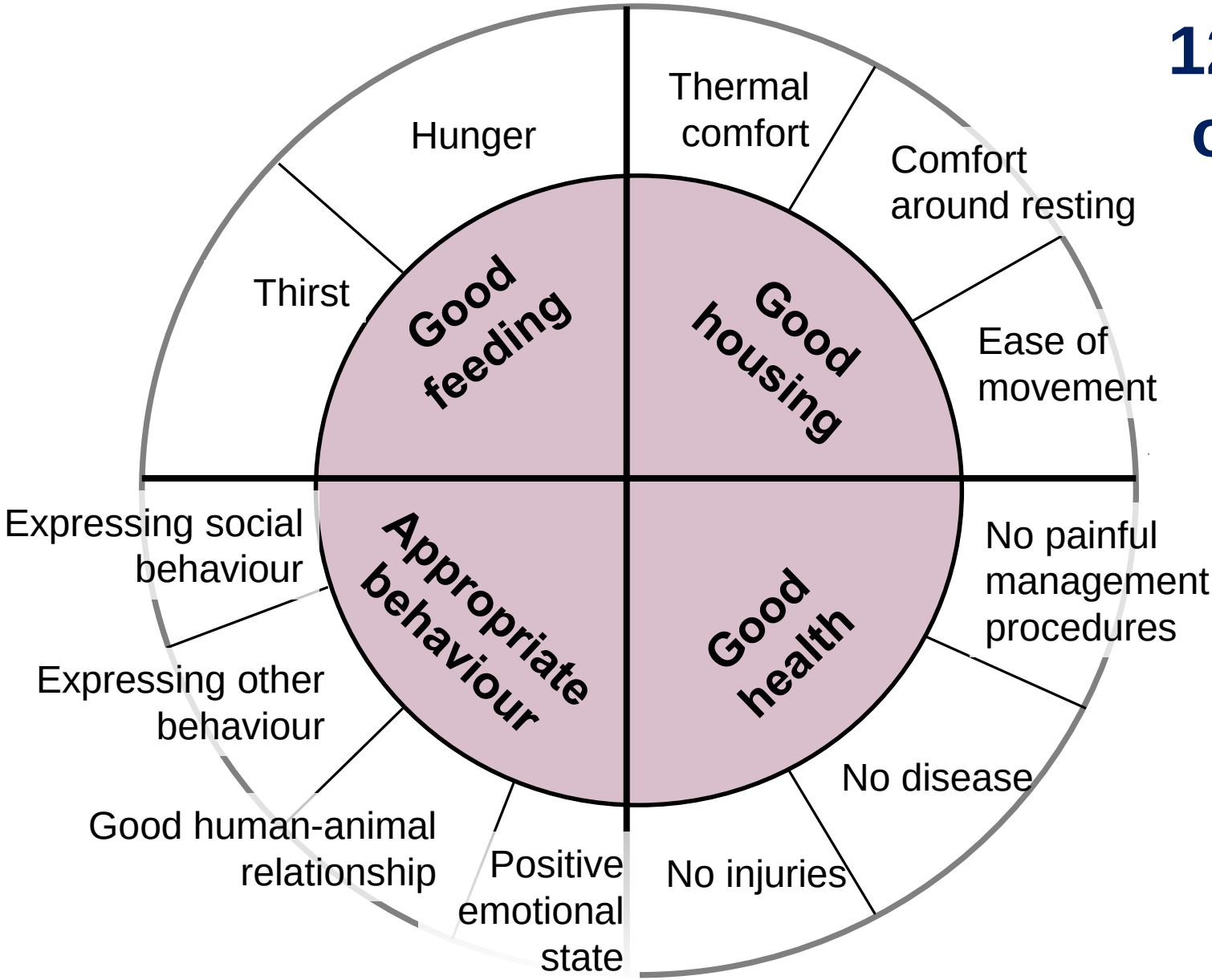


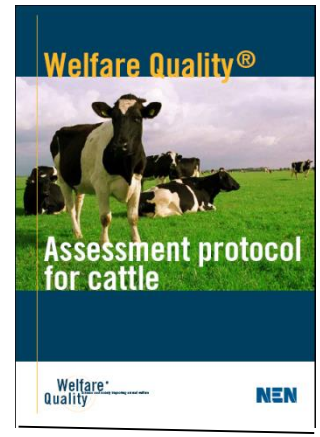
Comprehensive on-farm welfare assessment systems

- comprehensive, multidimensional protocols
- mainly animal-based measures, combined with few resource-based measures

awin
ANIMAL WELFARE INDICATORS

12 criteria of animal welfare in WQ®





Biological functioning

Production diseases

Biological functioning

- Lameness
- (Sub)clinical mastitis
- Metabolic disorders
- Body condition

Production diseases

Biological functioning

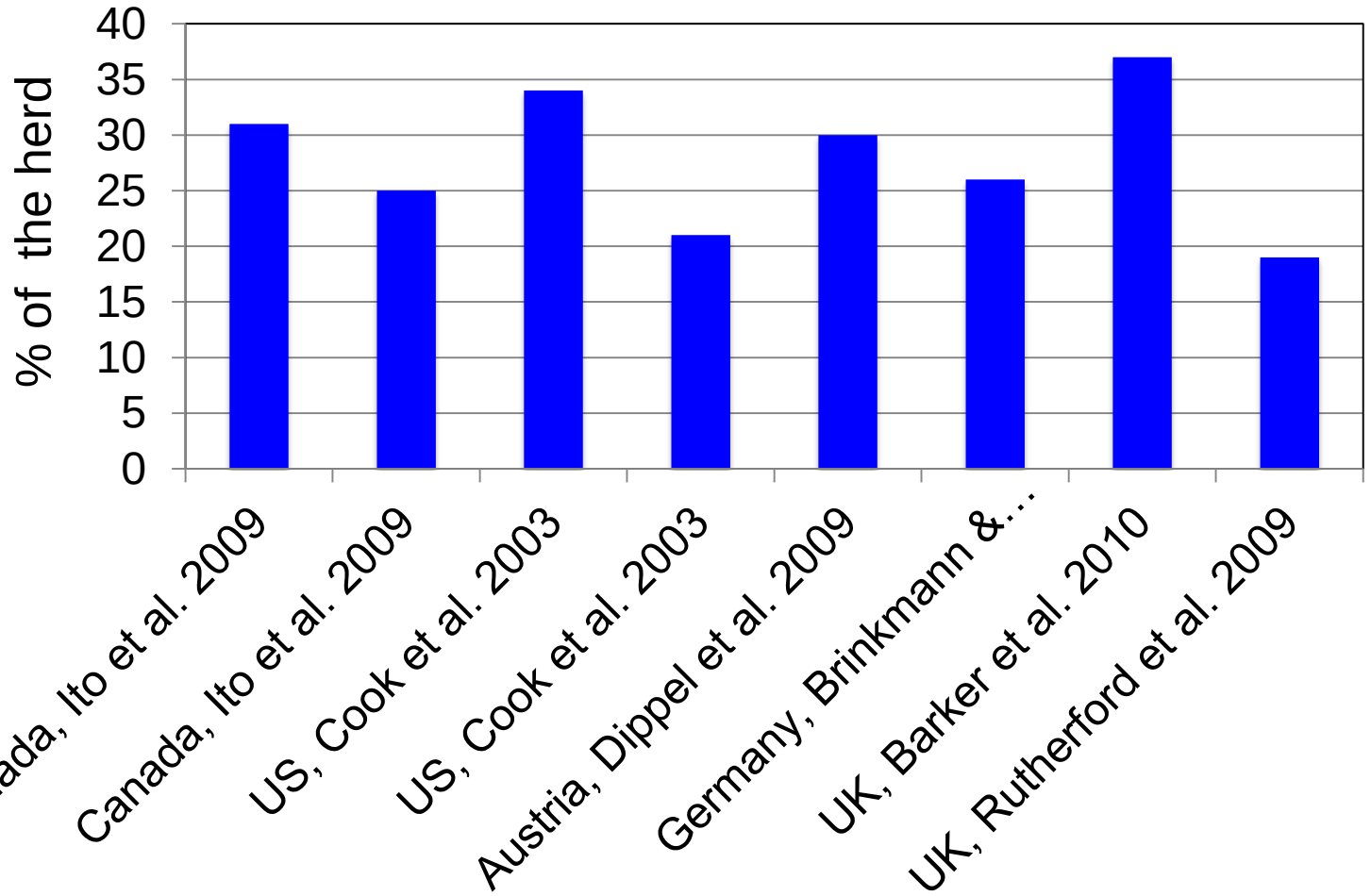
- **Lameness**
- (Sub)clinical mastitis
- Metabolic disorders
- Body condition

Lameness

Convincing face and construct validity:

- Pain very likely cause (Rushen et al. 2007)
- Impairment of mobility and of access to resources (Borderas et al. 2008)
- Association with reduced yield, fertility and longevity

Lameness prevalence

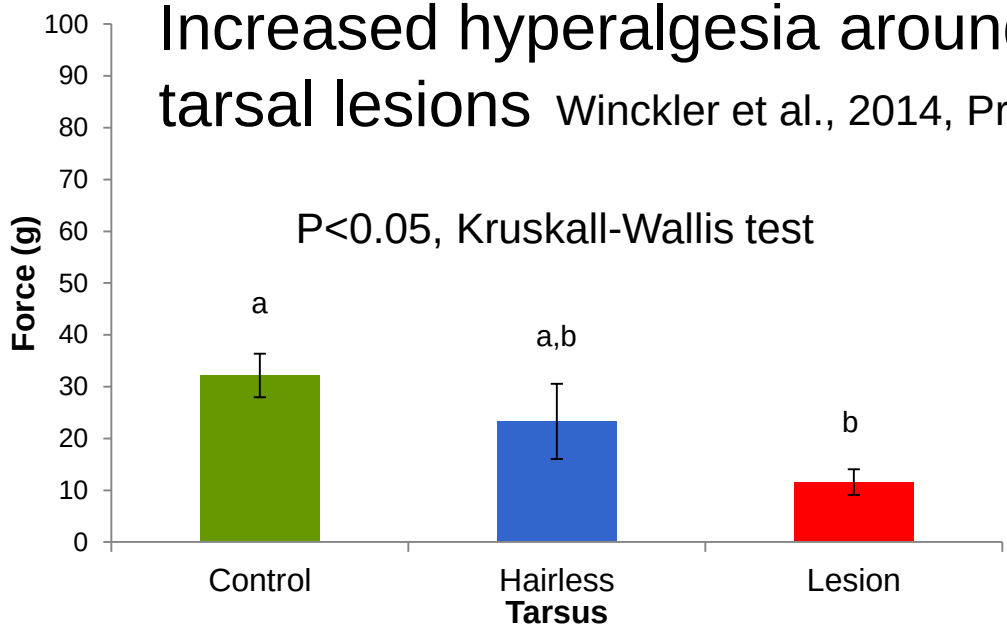


Health state and beyond

Biological functioning

- Other clinical diseases
- Alterations of the integument (e.g. hock lesions, swellings)

Increased hyperalgesia around tarsal lesions Winckler et al., 2014, Proc. ISAE



Health state and beyond

Biological functioning

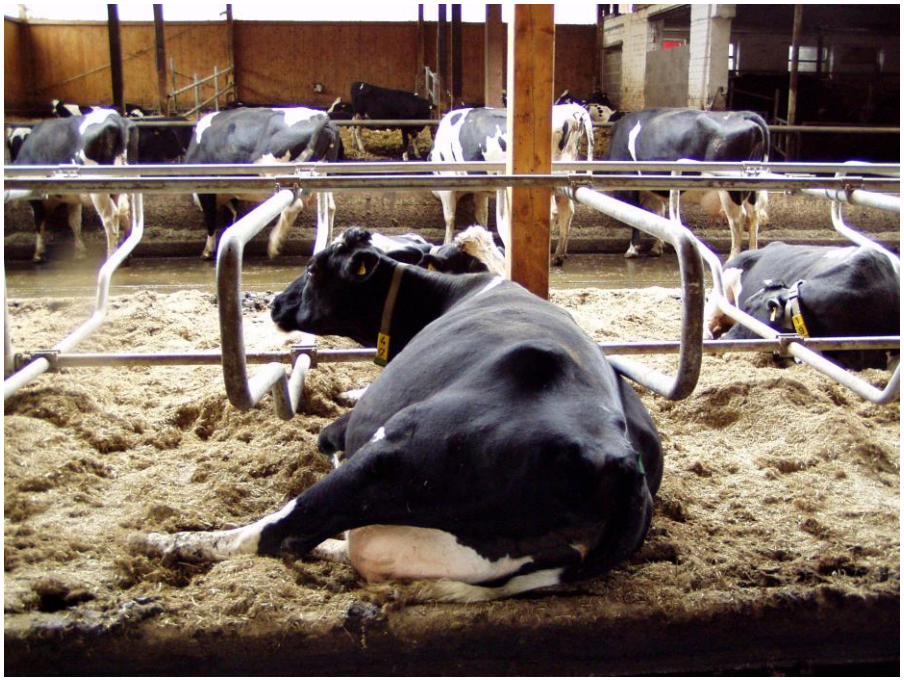
- Other clinical diseases
- Alterations of the integument (e.g. hock lesions, swellings)
- Cleanliness
- Mortality, (reasons of) unvoluntary cullings
- Fertility, longevity


Naturalness

Normal behaviour

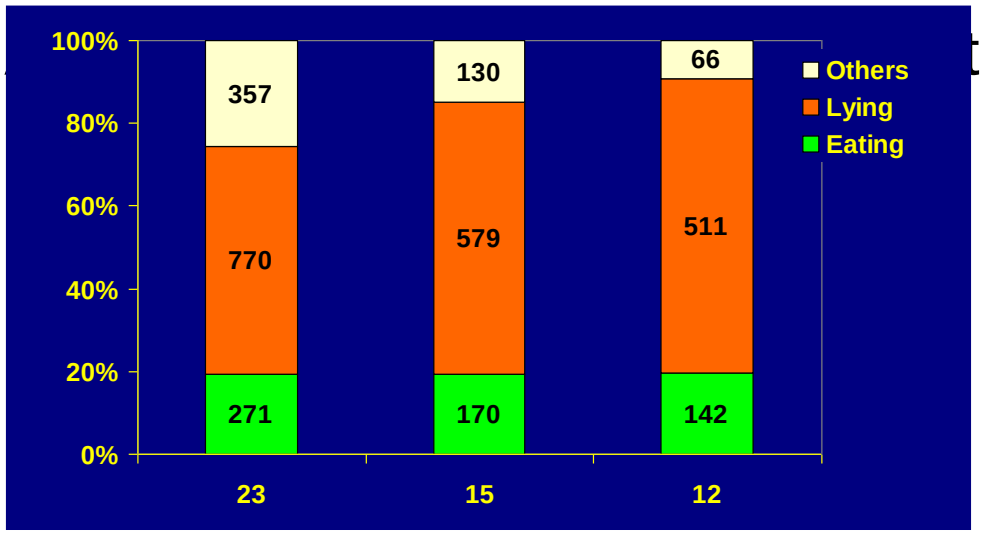
Naturalness

- Time budgets - high priority behaviours such as lying, feeding, rumination



Lying time

Naturalness

- Pregnant heifers showed an inelastic demand for rest of about 12-13h/24h (Jensen et al. 2005)
- High (relative) priority for lying when access to resources limited (Munksgaard et al. 2005)
- 

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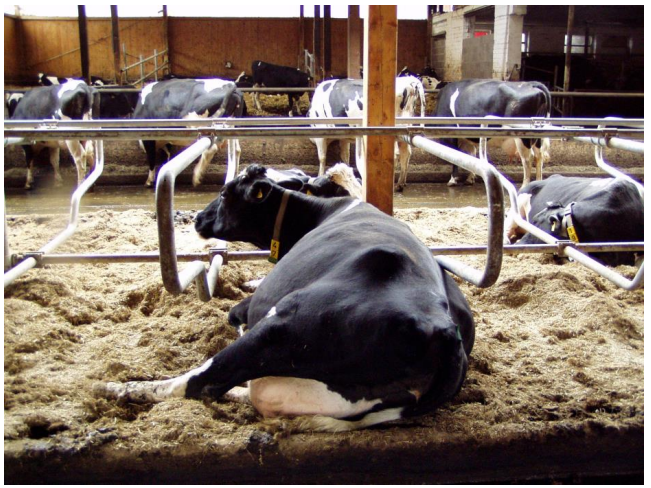


h of access to resources

Normal behaviour

Naturalness

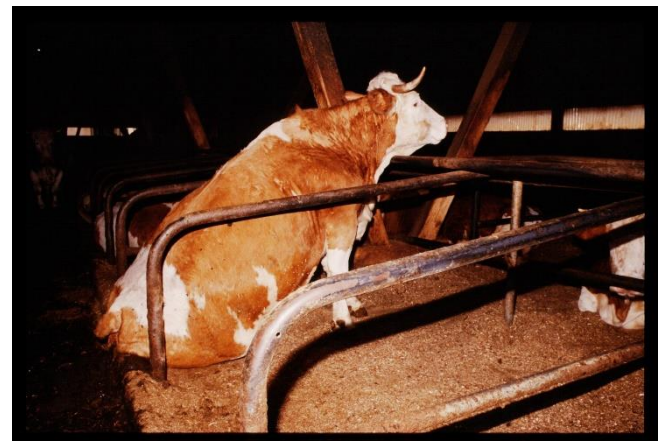
- Time budgets - high priority behaviours such as lying, rumination
- Incidence of unwanted behaviours, e.g. **agonistic interactions**

  - unstable social relations
  - impaired access to resources
  - risk of injuries

Normal behaviour

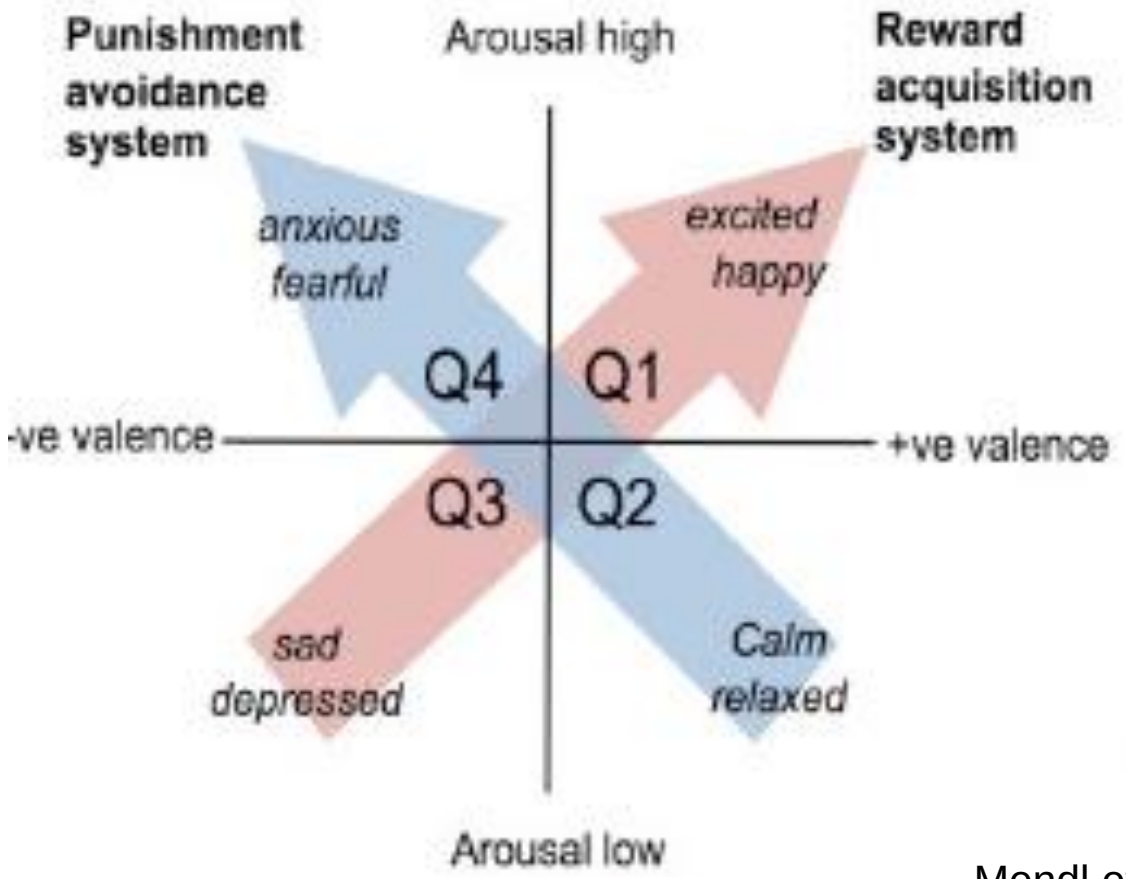
Naturalness

- Time budgets - high priority behaviours such as lying, rumination
- Incidence of unwanted behaviours, e.g. agonistic interactions
- Incidence of abnormal behaviours, e.g. stereotypies, altered sequence of behaviours




Mental state

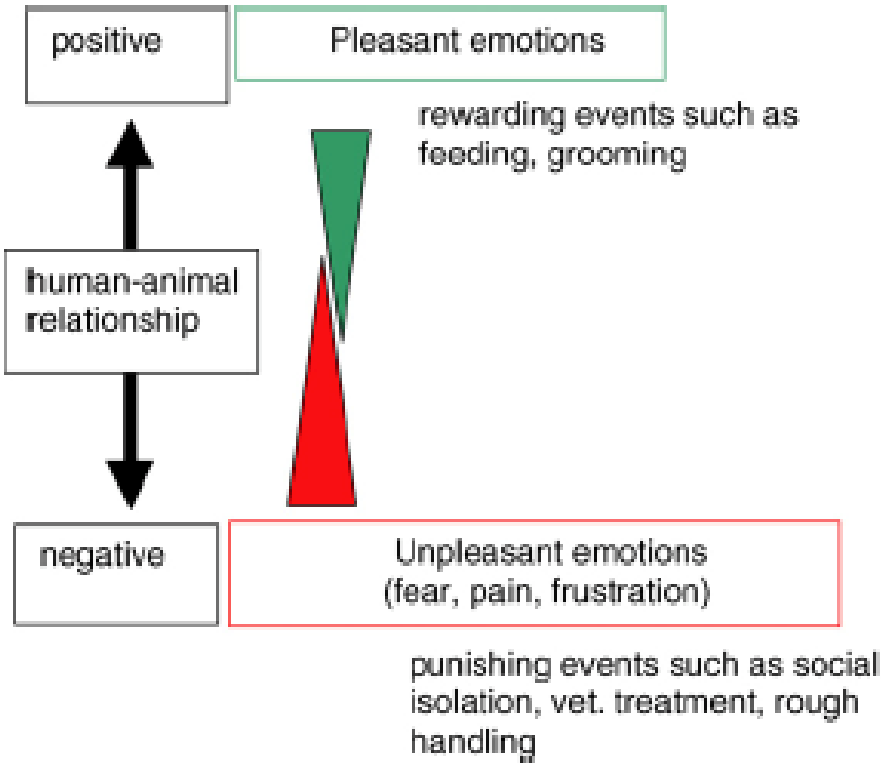
Valid measures of emotional state



Mendl et al., 2011

Human-animal relationship

Mental state



- Reduced milk yield
- Impaired milk let down
- Chronic and acute stress responses
- Traumatic incidents

Waiblinger et al., 2007

Human-animal relationship

Mental state

- Avoidance or approach tests

Human-animal relationship

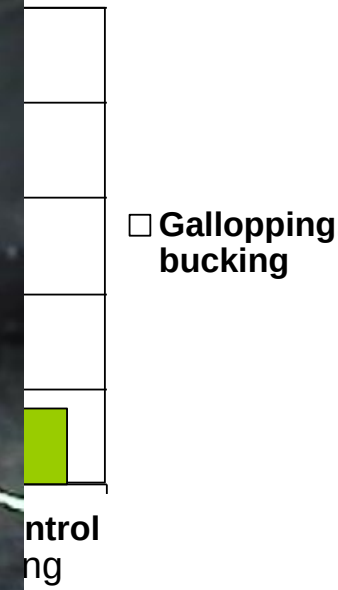
Mental state

- Avoidance or approach tests

Indicators of positive emotional state

Mental state

- Play be
  - rewar
  - only c
    favou
  - reduc
    situati
    disbu



sen et al., 1999

Indicators of positive emotional state

Mental state

Less clear-cut measures: e.g. **social licking**

- Expected to be associated with positive feelings.
- Cattle in herds with ⇧ social licking are feeling better than in herds with ⇩ social licking?

Indicators of positive emotional state

Mental state

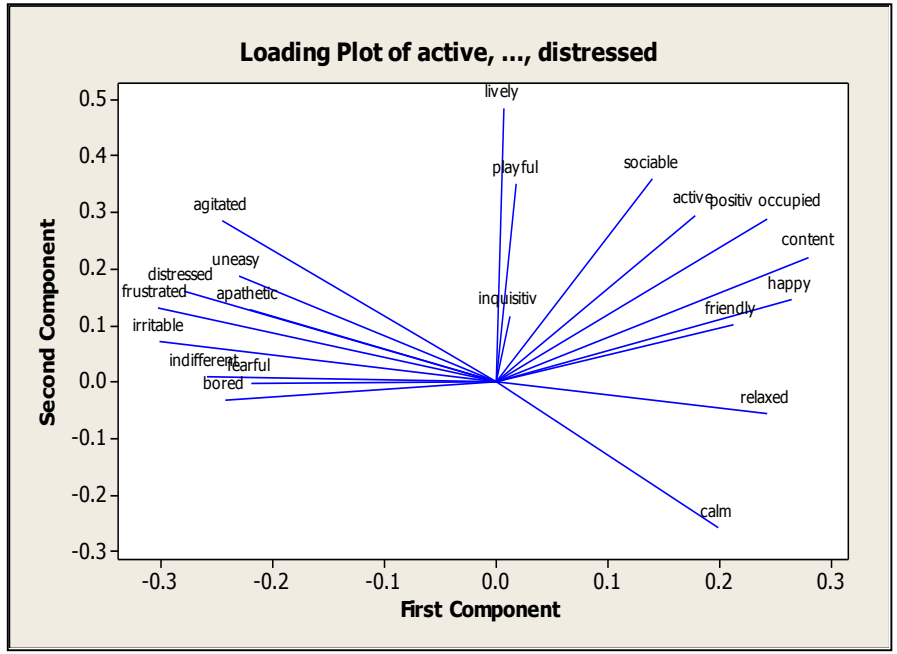
Less clear-cut measures: e.g. **social licking**

- Expected to be associated with positive feelings.
- but may in certain cases merely **alleviate poor welfare**
  → attempts to **reduce social tension**
  → reflect **boredom or oral understimulation**

Indicators of positive emotional state

Mental state

Promising measures: **assessment of body language through Qualitative Behaviour Assessment**
(e.g. Wemelsfelder et al. 2001, Andreasen et al. 2012)



Assessment protocols in practice

Assessment protocols in practice

- Mostly focus on health aspects
- Level of comprehensiveness may be explained by
  - purpose (labelling, monitoring, identification of poor welfare farms
  - availability of resources, e.g. time needed

Assessment protocols in practice

www.assurewel.org

AssureWel protocol for dairy cattle

Measures
1. Mobility/lameness
2. Body condition
3. Cleanliness
4. Hair loss, lesions
5. Swellings
6. Broken tails
7. Response to stockperson
8. Cows needing further care
9. Mastitis
10. Calf/heifer survivability
11. Cull and casualty cows

Soil Association

RSPCA ASSURED

ASSURED FOOD STANDARDS Red Tractor Assurance

Conclusions

- Measure all aspects – but do not measure everything
- Choice of measures depends on the intended use and on the resources available
- Claims with regard to welfare should relate to what has actually been covered in the assessment protocol

Thank you

European Animal Health & Welfare Research

COLLABORATIVE WORKING GROUP

What needs for AW research in the dairy sector?

Marina Bagni – MoH Italy
CWG AHW coordinator

DairyCare

Collaborating Working Group on Animal Health and Welfare Research (CWG AHW)

- The CWG AHW was formed in response to an initiative of the EU Standing Committee on Agricultural Research (SCAR).
- The CWG first met in Brussels in December 2005 and involves almost thirty funding organisations in over twenty countries.

Aim

Provide a forum leading to improved collaboration on research prioritisation and procurement, creating the necessary critical mass and focus to deliver the animal health and welfare research needs of our policy makers and the European livestock industry.

CWG AHW activities

- Share information on research projects
- Coordinate research activities Developing SRAs
- Work towards mutual research funding activities, in the field of animal health, fish health and those conditions which pose a threat to human health (also participating in ERA-Nets)
- Liaising with industry

Research coordination on AH and AW

- Research is fundamental to ensure the development of adequate disease prevention and control tools and to make better use of already available evidences
- Despite the EU policy push toward research and innovation, the vast majority of public research in Europe is still funded at national level
- The different funding bodies often operate independently and are guided by local priorities
- The progressive reduction of public funding, as well as the enhanced need of preparedness for emergent diseases, make fundamental the prioritisation of research and the prevention of unnecessary duplication

Setting of the basis for an European SRA on animal welfare

Mapping, from relevant and reliable information sources, of emerging research gaps on animal welfare, to define research priorities to be agreed by a broad number of stakeholders, including farmers, the industry, and researchers

- Research gap analysis on animal welfare (desk study)
- Prioritisation by research experts and funders
- Focus group with the industry to define an Agenda and a roadmap

Why?

- Increasingly wide gap between research and industry, particularly for what concern animal welfare science
- Lack of agreed SRAs on the issue
- The divergence of aims between involved parties might pose dangers to progresses in the sector

Ultimate goals

1. Identify gaps on animal welfare
2. Improve/ establish a proper communication platform between the involved actors
3. Create new synergies between public and private in order to promote research as an investment in the future (put it at centre of EU plan for smart, sustainable and inclusive growth and jobs).

Methodology:

Time schedule

1. Desk study → ***Draft circulated April 2016***
   Final draft July 2016

2. Prioritisation of the research needs
   - CWG AHW → ***October 2016***

3. Identification of main prioritisation outcomes → ***October/November 2016***

4. Focus group → ***November 2016***

Desk study

- Documents issued by international bodies, leaving out scientific publication, in order to start from positions being already agreed by a significant part of the sector rather than on opinion of individual subjects.
- Only documents that refer explicitly to having identified research gaps or research needs were considered.
- Identified research needs inserted in a dedicated table

Desk study: sources

EFSA

DG SANTE

COPA-COGECA

ANIHWA ERA-Net

EU COMMISSION

FVE

National experts networks

	Early life	Breeding stock	Rearing: indoor housing	Rearing: outdoor housing	Rearing: general	Transport	Slaughter	Killing	Other
Cattle_ Dairy									
Cattle_ Meat									
Equids									
Fish									
Fur									
Pigs									
Poultry_ Broiler									
Poultry_ Laying Hens									
Poultry_ Other									
Rabbits									
Reindeer									
Sheep_ Dairy									
Sheep_ Meat									

Desk study: preliminary results

437 research needs identified

- 207 rearing (indoor and outdoor)
- 84 slaughtering/killing
- 53 transport
- 36 specific for young animals
- 32 specific for breeding stock
- 25 other specific issue

Swine Poultry Cattle Rabbits Small ruminants Equid Fish Fur Reindeer

Prioritisation of the research needs

For each criteria, experts a scoring varying between 1 (low) and 5 (high) is to be provided

1. Species
2. Topic
3. Research needs
   a. AW score
   b. Urgency score

Identification of main prioritisation outcomes

- Ranking of the identified research needs
- Analysis of the selected needs, collecting background information and identifying strengths and weaknesses of each of them
- Aim of this analysis is to obtain objective, concise and precise communication outcomes, to be passed over to the focus group in the next step

Focus Group

- It is a form of qualitative research
- Small group, homogenous for background and interests
- Semi-structured interview (facilitator)
- All conversation recorded and analysed remotely

Focus Group composition

Country	First Name	Surname	Organisation
UK	Chris	Knight	DairyCare
UK	David	Main	Bristol
Italy	Valentina	Lorenzi	IZS LER
Italy	Enrico	Giacomini	IZS LER
Italy	Nicolò	Cinotti	UnaItalia
Italy	Valentina	Pizzamiglio	Consorzio Parmigiano Reggiano
UK	Paul	Cook	Fai Farms
UK	Malcolm	Mitchell	SRUC
UK	Sandra	Edwards	Newcastle University
UK	Caryl	Williams	Defra
Italy	Stefano	Messori	OIE
Italy	Marina	Bagni	Ministry of Health
UK	Richard	Kempsey	Stonegate
UK	Katja	Stoddard	AHDB Pork

Species ranking

- Scoring for 1 (low priority) to 5 (high priority)
- Average values 5-4: **High priority**
- Average value 3: **Medium priority**
- Average value below 3: **Low priority**
- Species of high priority were selected

Species	Average	Ranking
PIGS	5	1
POULTRY_ Laying hens	4	2
POULTRY_ Broiler	4	3
CATTLE_ Dairy	4	4
FISH	3	5
CATTLE_ Meat	3	6
POULTRY_ Other	3	6
EQUIDS	3	7
SHEEP_ Meat	3	8
SHEEP_ Dairy	3	9
RABBITS	3	10
FUR	2	11
REINDEER	2	12

Topic ranking: dairy cattle

	Average
Rearing: indoor housing	4,1
Rearing: general	4,1
Breeding stock	3,7
Early life	3,4
Rearing: outdoor housing	3,2
Transport	3,1
Slaughtering	3,1
Killing	2,4
Other	1,0

All topics being ranked **higher than 3.5** were selected

Prioritisation outcomes: dairy cattle

		AW	URGENCY
Rearing: indoor housing	limited amount of scientific data linking the period per day of being tied in a tie stall to levels of disease and overall impact on welfare (EFSA 2009a)	**4,3**	**2,8**
Rearing: general	There is a need for in-depth analysis of the particular causes of lameness and development of automated locomotion scoring technology (ANIHWA 2015a)	**4,0**	**3,8**
Rearing: general	Research is needed to develop new ways to identify and quantify the complex links between (input) factors and welfare outcomes (consequences). This research would help in the choice of optimum combinations of measures for future welfare assessments. Such analyses will require access to large data sets.(EFSA 2012c)	**4,0**	**3,6**
Rearing: general	The effect on welfare of subclinical mastitis (demonstrated by increases in SCC without visible changes in the milk or the udder) should be further investigated (EFSA 2015b)	**4,0**	**4,0**
Rearing: general	A centralised database (platform) should be created where information on ABMs, sources and relevant documents, can be stored and shared. This platform would also promote communication and collaboration among scientists and with stakeholders (EFSA 2015c)	**4,0**	**4,2**
Rearing: indoor housing	Since leg and foot disorders are the major welfare problem for dairy cattle and leg and foot disorders are a problem even in well managed cubicle houses, alternatives to cubicles e.g. straw yards and improvements to cubicle house design should be considered (2009c)	**4,0**	**3,4**

General: main outcomes

- Investigate reliable welfare indicators, being suitable to be automatically collected, thus resolving the problem of data harmonisation.
- Develop studies to investigate the economic advantage of earlier assessment of welfare related issues, as to support the availability of farmers and other commercial stakeholders in sharing data.
- Foster innovation and promote new approaches to solve problems that have been already identified but still lack adequate control measures (e.g. there is no necessity of new studies about the effects of dust levels at farm but focus on innovative ways to reduce dust).
- Develop new research on positive welfare to build an evidence-base on the matter; although it would be a long way from being taken up by industry, it is important for the research pipeline to be set in to assess if moving forward or dismiss it.

Dairy cattle: main outcomes

- Investigate reliable indicators and biomarkers for dairy cattle lameness, especially for subclinical cases.
- Develop studies to investigate the peri-partum period for the reduction of subclinical and production diseases focusing also on immunological competencies.

What use for the outcomes?

- Feed into the new H2020 WP
  - SFS-09-2018: Increasing animal welfare
- Providing inputs to national SRAs
- Increase of communication between industry and researchers

Thank you for your attention!

Azione UE-COST “DairyCare”: biologia e tecnologia a supporto del benessere della bovina da latte

Gianfranco Gabai
gianfranco.gabai@unipd.it

DIPARTIMENTO DI BIOMEDICINA COMPARATA E ALIMENTAZIONE

UNIVERSITÀ DEGLI STUDI DI PADOVA

Outline

- *UE-COST action DairyCare*
  - *General information*
  - *Philosophy behind DairyCare*
  - *Deliverables*
- *Biomarkers & Activity-based welfare indicators*
  - *Life-cycle of a biomarker & validation*
- *Can technology be a player in a welfare assessment system?*

COST action 1308 “DairyCare”

What is DairyCare?

- A researcher network focused on dairy animal health and welfare
- Funded by COST:
  - approx. 141K € this year
- More than 650 members, more than 30 countries
- Multidisciplinary
  - Biologists, ethologists, engineers, computer scientists, etc etc
- Organising and funding scientific conferences, researcher exchanges and other activities

DairyCare Objectives

- Note: COST does not fund actual research
- To improve the wellbeing of dairy animals through two mechanisms:
- Accelerated development and application of relevant biotechnologies that will assist and promote good husbandry
- Wider dissemination of best-practices

DairyCare Philosophy

VS.

How important is the individual?

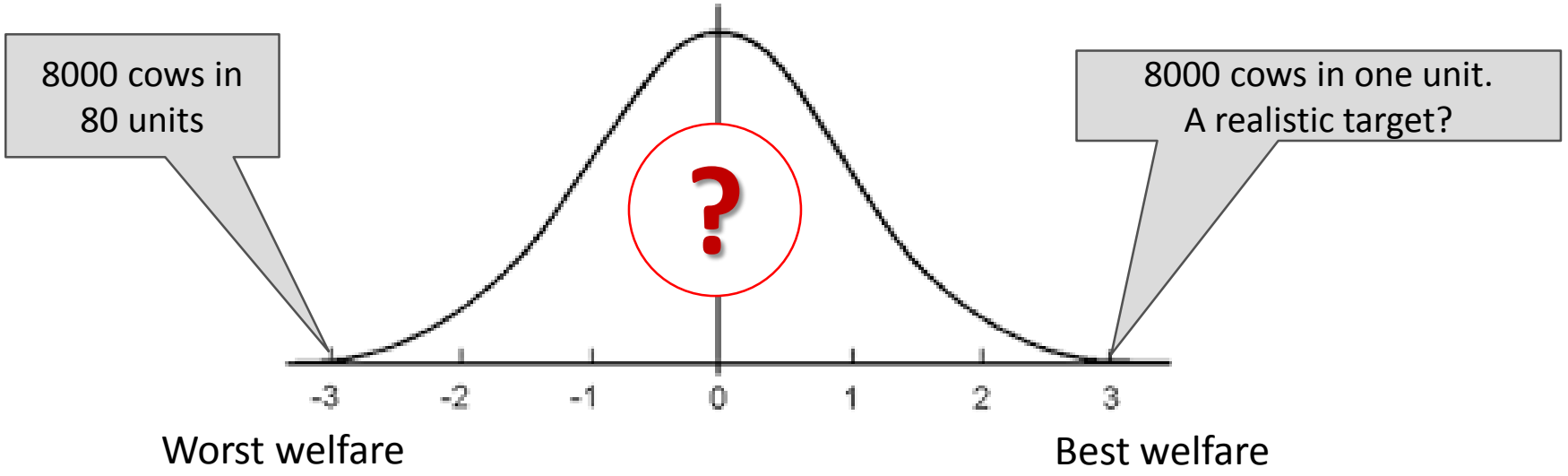
We may have that opportunity!

DairyCare Philosophy

Can we understand how an animal actually "feels"?
Can we "measure" welfare?
Is "good husbandry" more than absence of disease?

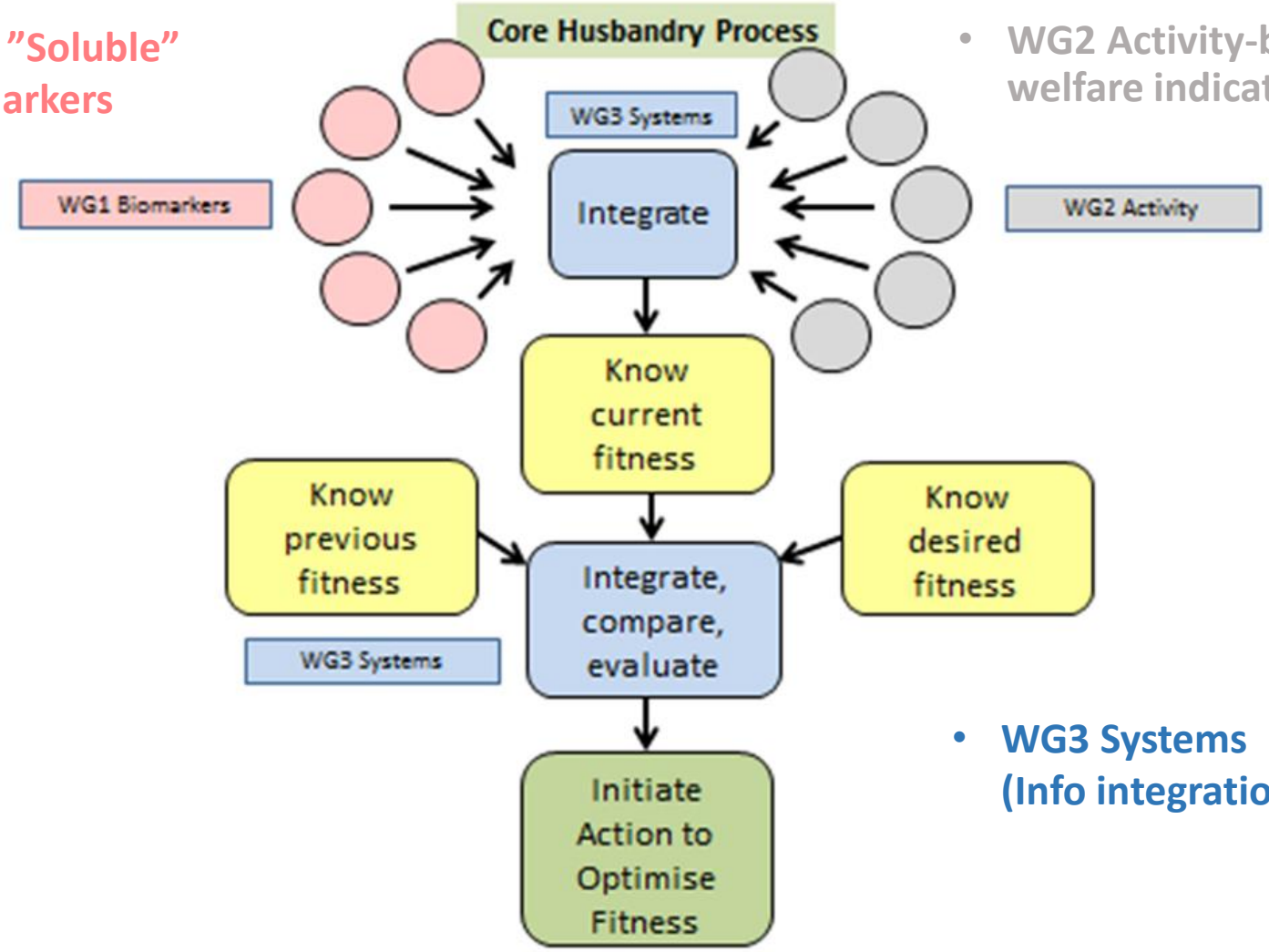
DairyCare Philosophy

- Can we & How do we achieve good management in large units?
- Can the cow remain an individual?



DairyCare Structure

- WG1 ”Soluble” Biomarkers



- WG2 Activity-based welfare indicators

- WG3 Systems (Info integration)

DairyCare Deliverables

Knowledge translated into effective decision making

DairyCare Deliverables

COST Action FA1308

DairyCare

HPA axis, cortisol and other stress biomarkers

This bulletin reports on the first dedicated DairyCare Working Group 1 (WG1) Meeting held in Bern (CH) on 14th-15th September 2015.

During this meeting, the question whether it is worthwhile measuring cortisol as a biomarker of stress was critically debated. In fact, cortisol is quite frequently measured because it is considered as a stress biomarker; however, laboratories running cortisol assays find that results are often contradictory. It is not always realised that cortisol as a representative of glucocorticoids also plays a role in glucose metabolism independent of the presence of a particular stress situation. Both "social stress" and "physical stress" activate the HPA axis, though via different pathways. The resulting patterns of cortisol release can be different in term of duration and intensity depending on the type of stressor.

- Is it possible that for most experimental questions, cortisol measurement could be omitted, and researchers should try to find other biomarkers for stress?
- How could cortisol measurement be combined with other parameters (e.g.: behaviour) to better define stress?

Having this in mind, when we ask whether a biomarker is useful, we need to define "useful for what?" In other words, can cortisol measured once a day detect which cows in a herd have a problem, or can cortisol measured regularly and repeatedly detect changes indicative of a problem developing in an individual cow? Perhaps, cortisol has more applicability for the second scenario than for the first, and this applicability might be greater if measured in "accumulation" matrices. Indeed, where should cortisol be measured (blood, milk, hair, saliva, faeces, sweat) and how often should measures be taken?

Experts and participants of this workshop unanimously agreed on the following obtained achievements:

Cortisol data should be interpreted with caution, as a reduction in cortisol does not mean a reduction in stress; indeed, a great importance has the animal's coping style and habituation.

Cortisol response to ACTH challenge can be used for selecting more robust animals.

Milk can be considered a preferential site of sampling in dairy cows to point out short-term stimulation of the HPA axis, although further studies are needed to understand

COST is supported by the EU Framework Programme Horizon 2020

COST Association
Avenue Louise 149 | 1050 Brussels, Belgium
t: +32 (0)2 533 3800 | f: +32 (0)2 533 3890
office@cost.eu | www.cost.eu

COST Action FA1308

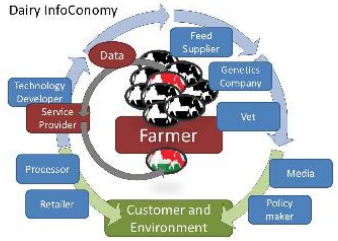
DairyCare

DAIRY INFOCONOMY

Prospects for a Data-Based Circular BioEconomy in the Dairy Sector Driven by Innovations in Dairy Animal Health and Welfare Monitoring

DairyCare is a COST Action (FA1308) in dairy animal health and welfare which started in 2014 and will finish in 2018. DairyCare's main scientific objective is to improve wellbeing through accelerated development and application of animal-centric technologies that assist and promote good husbandry.

State of the art in animal sensing has advanced to the point where data collection is no longer the first-limiting factor. The same sensors that enable estrous detection can also monitor feeding behaviour and will soon be able to detect lameness. Other sensors provide information about rumen function, drinking, social interactions and much more. Nevertheless, significant problems remain. Data integration, interpretation, ownership and application are complex issues that currently limit the value and potential benefits of these sensing technologies. Here we propose a new approach that aims to maximise the value of system-based information for the dairy farmer, consumer and environment, reflecting the societal importance attached to the circular bioeconomies of the future.



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t: +32 (0)2 533 3800 | f: +32 (0)2 533 3890
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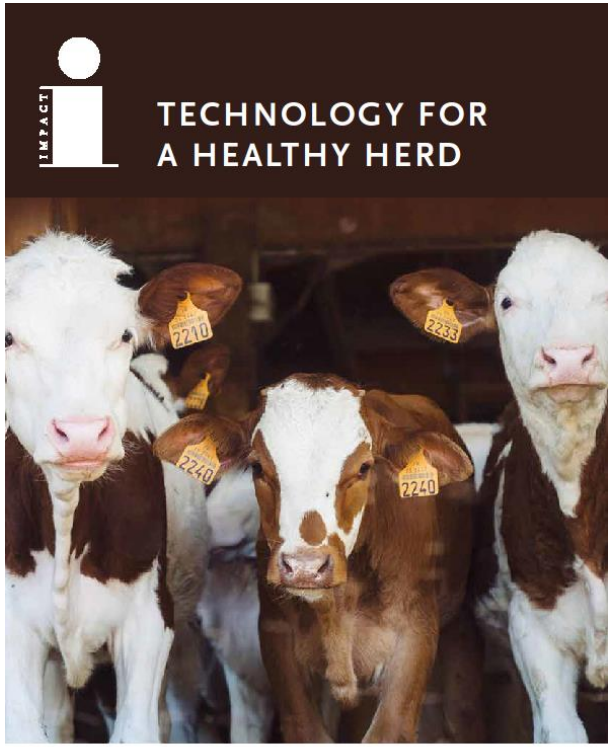
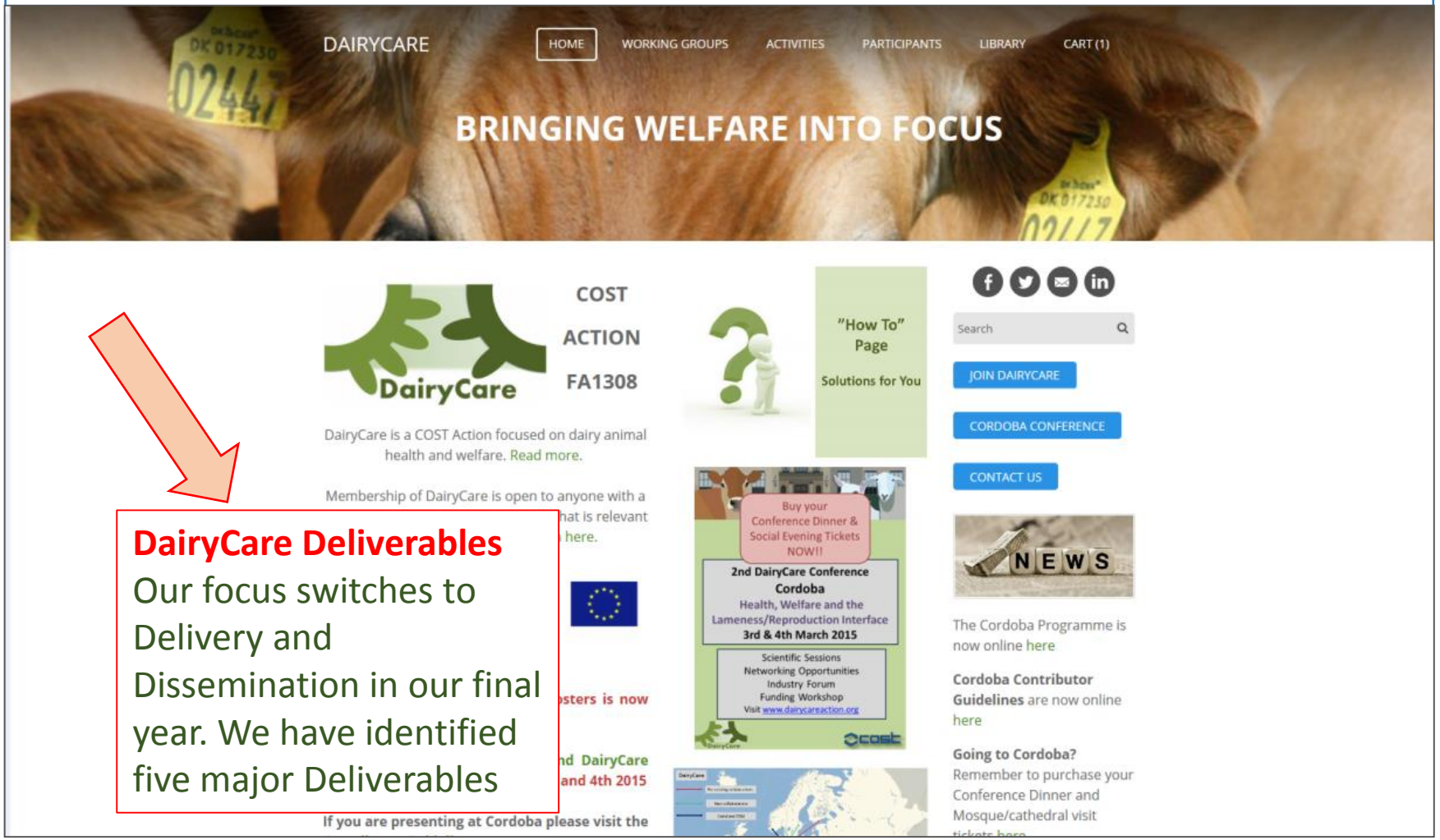


EUROPEAN COOPERATION IN SCIENCE AND TECHNOLOGY

WWW.DAIRYCAREACTION.ORG

DairyCare Deliverables

www.dairycareaction.org



DairyCare Deliverables

Our focus switches to Delivery and Dissemination in our final year. We have identified five major Deliverables

DairyCare: Review in Journal of Dairy Research

Journal of Dairy Research (2016) **83** 136–147.

doi:10.1017/S0022029916000261

Engineering to support wellbeing of dairy animals

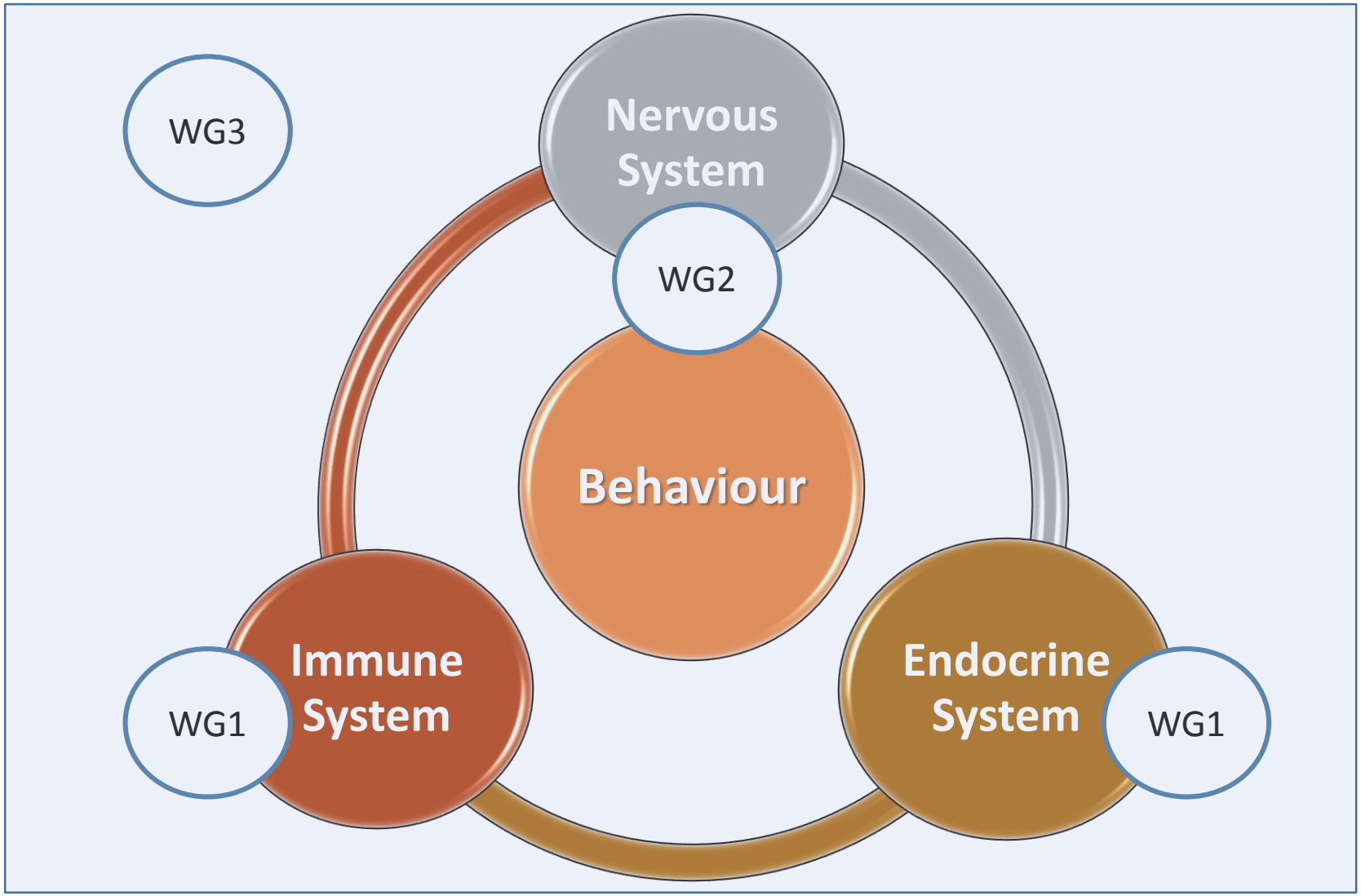
Gerardo Caja[1]*, Andreia Castro-Costa[1] and Christopher H. Knight[2]

[1] Group of Research in Ruminants (G2R), Department of Animal and Food Sciences, Universitat Autonoma de Barcelona, Bellaterra, Spain
[2] University of Copenhagen IKVH, Dyrlægevej 100, 1870 Frb C, Denmark

Received 17 March 2016; accepted for publication 18 April 2016

www.journalofdairyresearch.org

System Biology & Behaviour



Biomarkers - Definition

"A characteristic that is **objectively measured** and evaluated as an indicator of normal biological processes, pathogenic processes, or pharmacologic response to a therapeutic intervention"

Clinical Endpoint

- A characteristic or variable that reflects how a subject (patient) feels, **functions**, or survives.

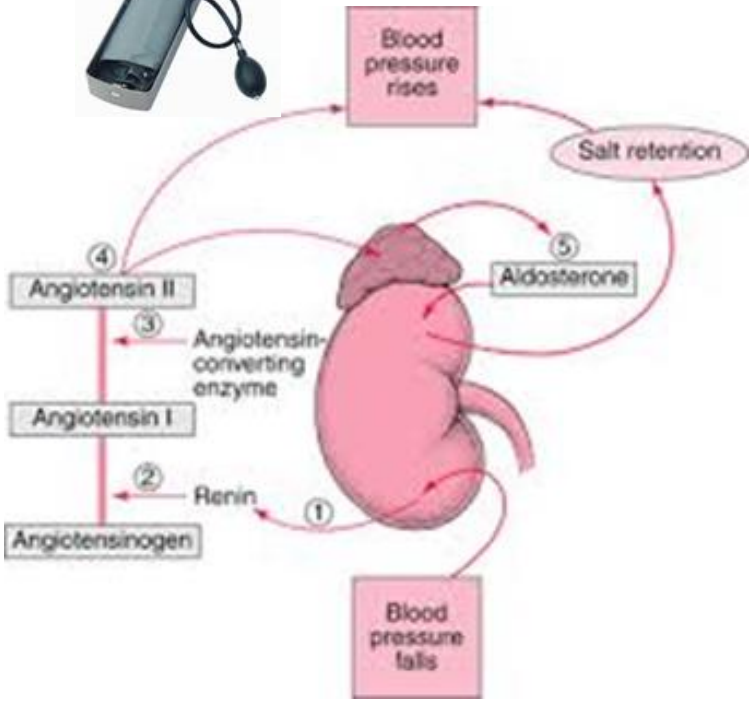
Surrogate Endpoint

- A biomarker that is intended to substitute for a Clinical Endpoint;
- Expected to predict clinical benefit based on epidemiologic, patho-physiologic, therapeutic or other scientific evidence.

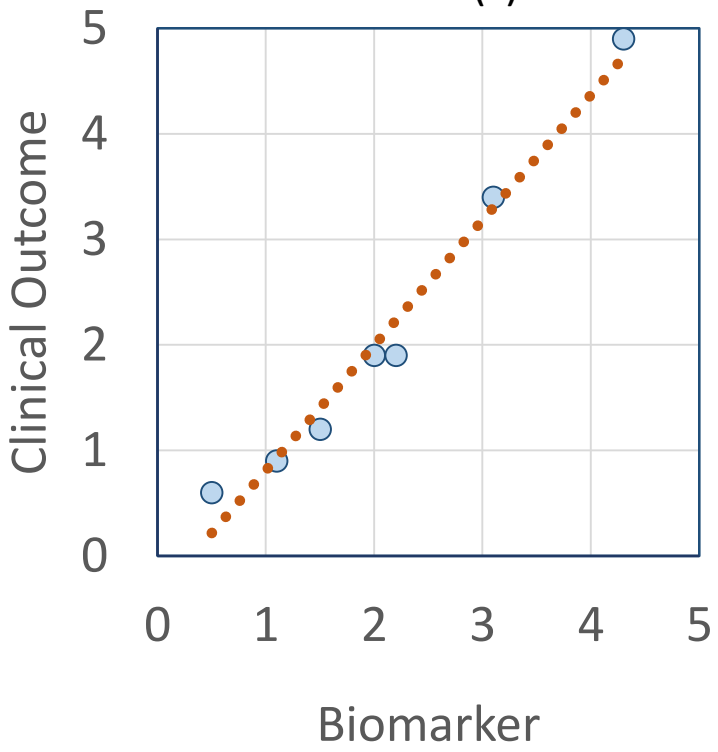
Biomarkers Definition Group (2001), Clin. Pharmacol. Ther., 69:89-95.

Biomarkers - Criteria

Associated with biological mechanism(s)



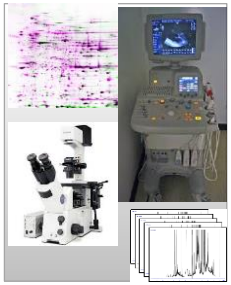
Potentially correlated with clinical outcome(s)



Life-Cycle of a Biomarker

Degree of Evidence Required

Exploration



- Research
- Multiple platforms

Demonstration

- Emerging biomarker
- Develop & validate assay
- Diagnostic criteria

Characterization

- Established biomarker
- Proper statistics
- Narrow scope
  - Purpose
- Enabling decisions

Surrogacy

- Substitute for clinical outcomes

Arterial Pressure

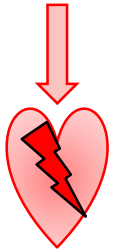
1896. Scipione Riva-Rocci

1913. Theodore C. Janeway
"A clinical study of hypertensive cardiovascular disease"

≈ 8,000 people

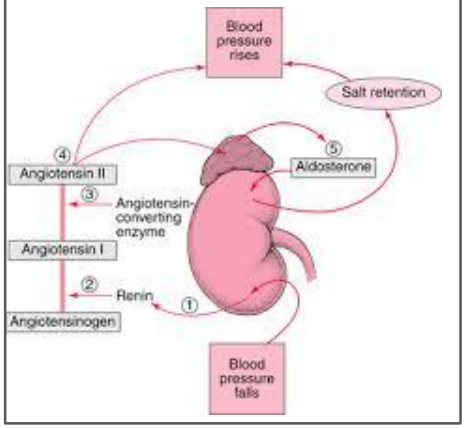
11%

Systolic Pressure
>160 mm Hg

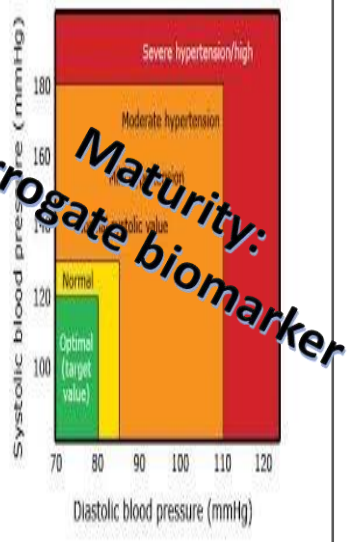


Survival:
4-5 yrs

1939.
RAAS discovery



1973. High Blood Pressure Education Program



Maturity: surrogate biomarker

Life-cycle>100 years

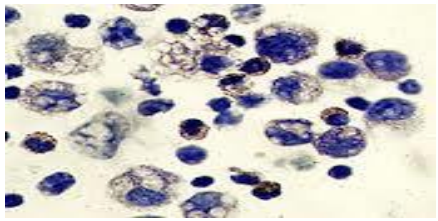
Existing Biomarker Technologies

Increasing parity

Day to day

Milking interval

Somatic Cell Count



Established
Old/Mature
Surrogate ?

More than a quarter affected

Time of the year

Mammary Infection/Pathogens

SCC > 200,000 cells/mL

Lactation phase

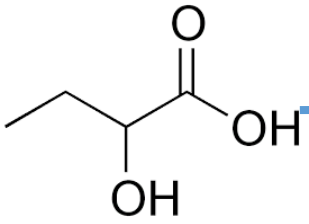
Nutrition/ Toxins

Physiological stress

Systemic diseases

Existing Biomarker Technologies

β-hydroxybutyrate



Gold Standard:
Blood BOHB ≥ 1,400 µM

Several methods available:
- Urine & Milk
- Laboratory & "cow-side"

Specific biomarkers for risk of Sub-Clinical Ketosis

Increased risk of Displaced Abomasum and early culling

Helps to make clinical decisions

Evaluation at the herd level

Oetzel, 2004 –Vet Clin Food Anim, 20:651-674

1st DairyCare Conference
(Copenhagen, August 22nd & 23rd 2014)

Metabolomic

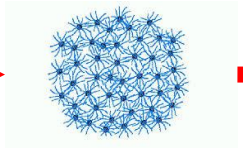
Proteomic

Nutrition

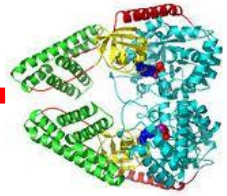
Physiology

Disease (mastitis)

Infancy Biomarker

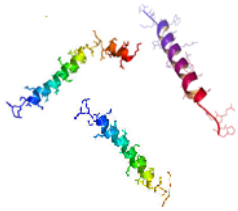


casein



enzymes

bacteria



Peptidomic

Speakers:

- David Eckersall
- Kasper Hettinga
- Andrè M. Almeida

1st DairyCare Conference
(Copenhagen, August 22nd & 23rd 2014)

Adipokines as Biomarkers of Metabolic Health?

- Accessible (blood, body fluids)
- Specific assay available
- Tonic secretion
- Long half-life
- Unaffected by short-term "perturbations" (e.g.: feed intake, stress, etc.)

- Reference values
- Best time for sampling
- Predictive values for metabolic disease
- Sensitivity/Specificity data
- Non-invasive sampling (milk, saliva)

1st DairyCare Conference
(Copenhagen, August 22nd & 23rd 2014)

Robotic Sensing

Cameras

Laser scanners

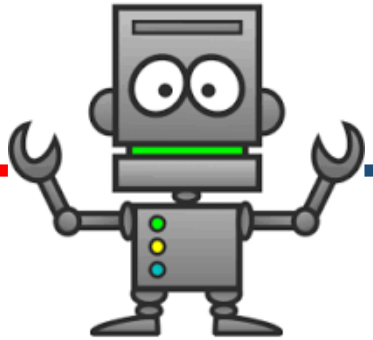
Distance measurement devices

Robotic Sampling

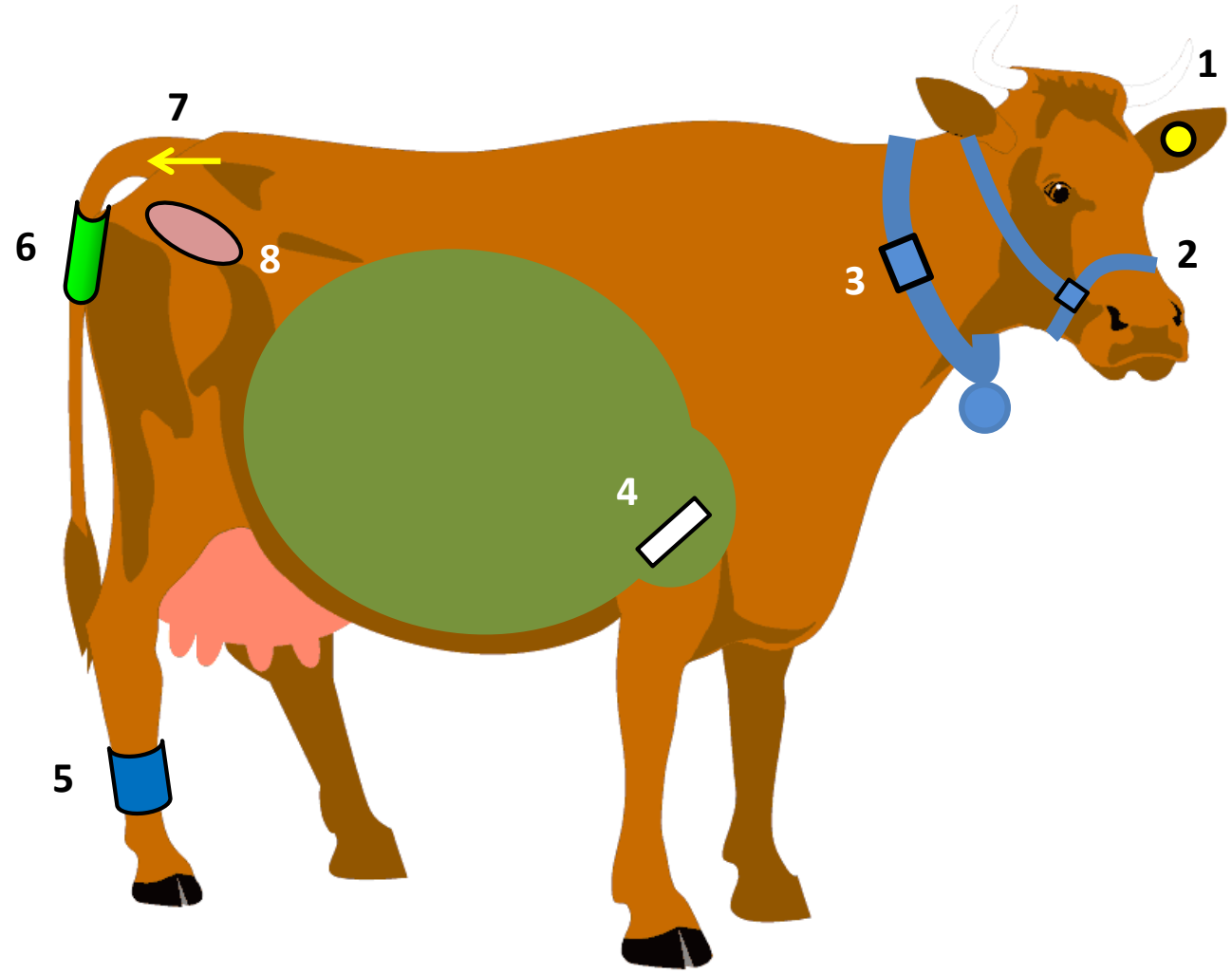
Saliva

Sweat

Hair



WG2: Activity-based welfare indicators



Sensors in:

- Ear
- Head collar
- Neck collar
- Rumen
- Leg collar
- Tail collar
- Tail head
- Vulva

2nd DairyCare Conference
Cordoba, March 3rd & 4th 2015

Lameness - 3rd most economically important health issue

Metabolic disorders

Laminitis

Sole Ulcer

White Line Disease

Sub-clinica

Toe Ulcer

Foreign Bodies

Double Sole

Slipper Foot

Horizontal

Corkscrew Claw

Fissures

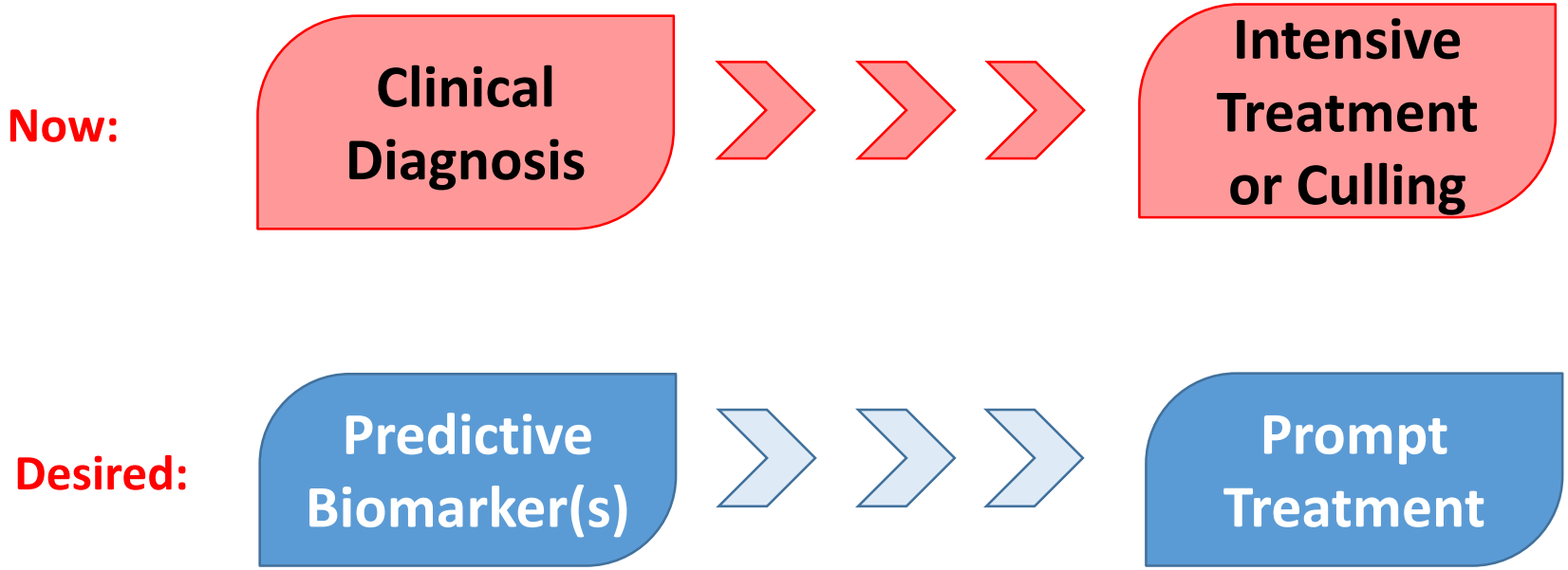
Vertical

Lameness

A clinical sign with many possible aetiologies.

Claw Capsule	
Interdigital Space	Interdigital dermatitis, phlegmon, …
Bones and Joints	Spondylosis, Luxations, Hip Dysplasia, Septic Arthritis, …
Neurologic Disorders	Various Paralysis

2nd DairyCare Conference
Cordoba, March 3rd & 4th 2015



2nd DairyCare Conference
Cordoba, March 3rd & 4th 2015

P.E. Almeida's Group
Michigan State, USA

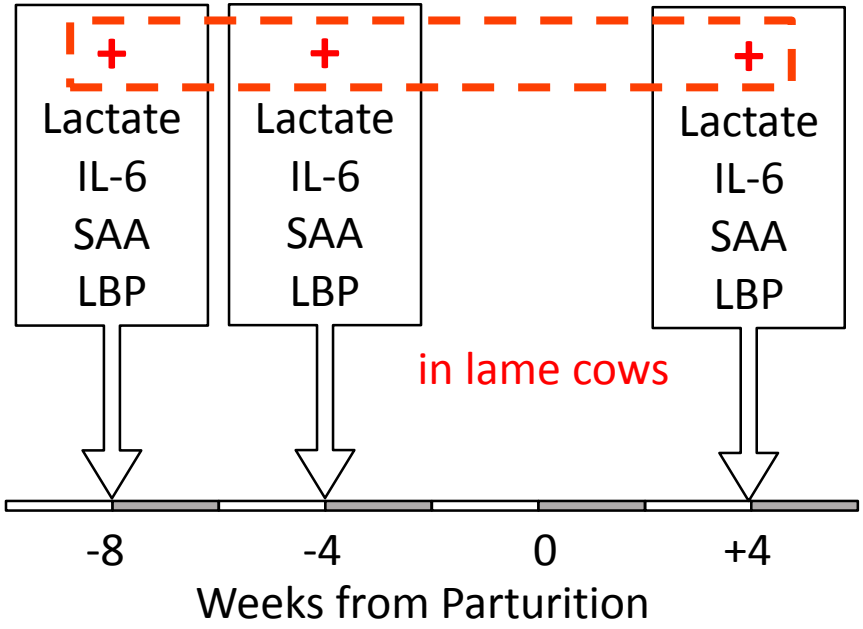
DHEA ÷ Cortisol

or DHEA & Cortisol

Micro Array-Based Gene Expression in PBMC:

- IL-2
- IL-10
- MMP-13
- […]

G. Zhang et al. 2014
Univ. of Alberta, Can



2nd DairyCare Conference
Cordoba, March 3rd & 4th 2015

iCEROBOTiCS

PRODUCTS RESEARCH ABOUT US SUPPORT NEWS CONTACT

ICEROBOTICS POSTER ON LAMENESS DETECTION PRESENTED AT DAIRYCARE CONFERENCE

March 3, 2015 by IceRobotics

Validation of the CowAlert system to automatically detect lameness in dairy cattle

Activity combined with lying/standing time may be predictive of lameness

Assisting good husbandry

In-depth Analysis

Data Recording

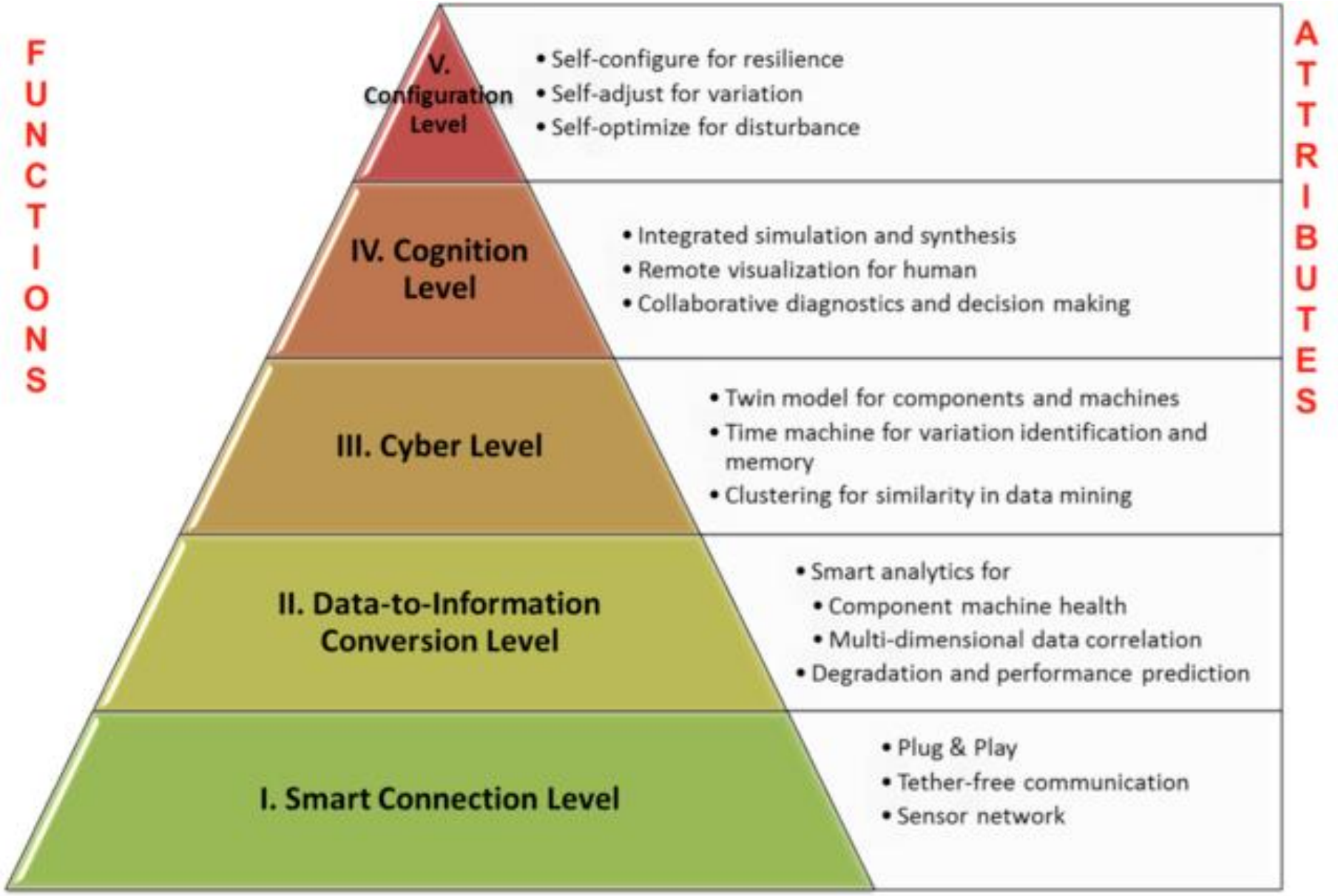
Look for Evidence of Change(s)

Environmental Monitoring

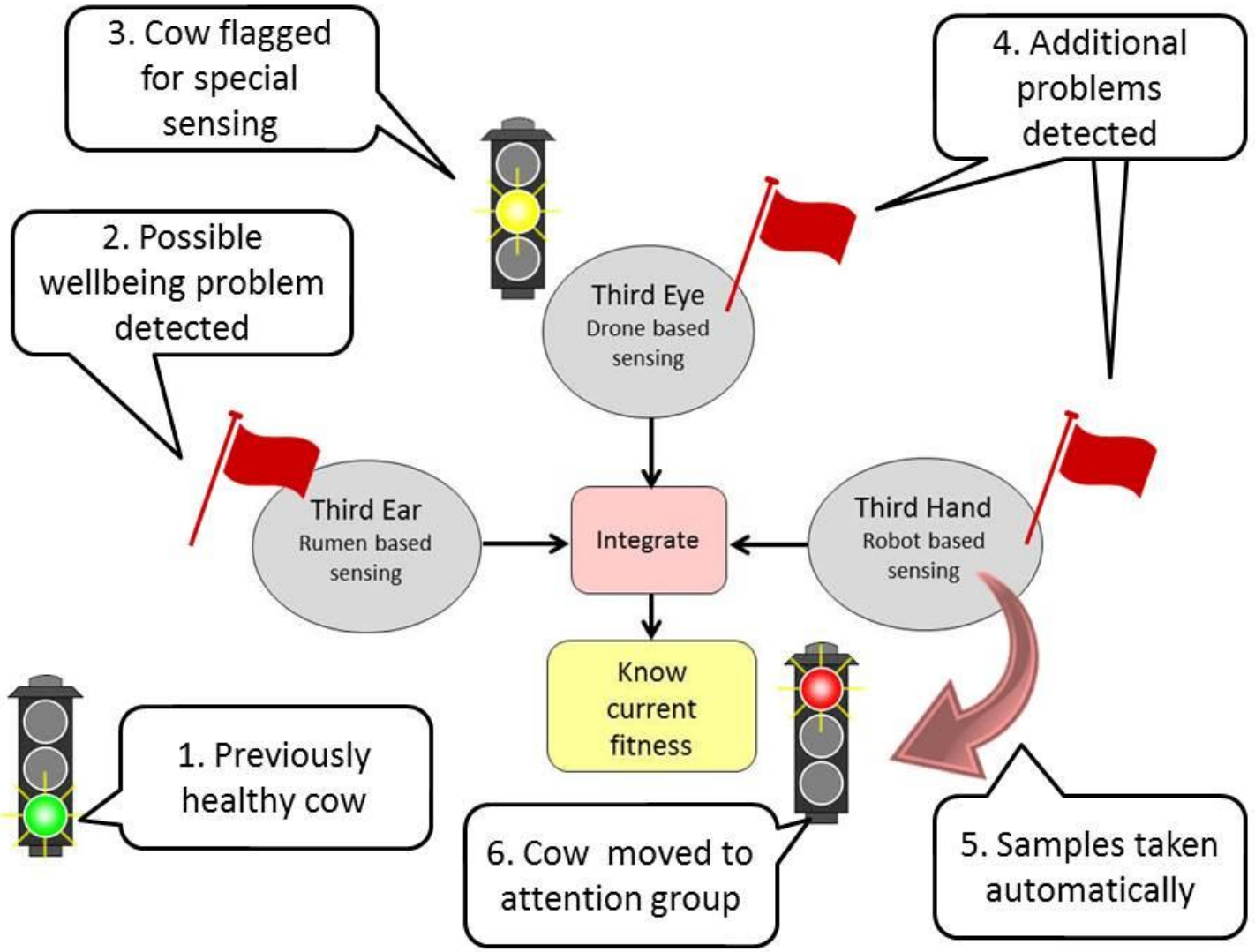
Wearable devices

Non-Wearable devices

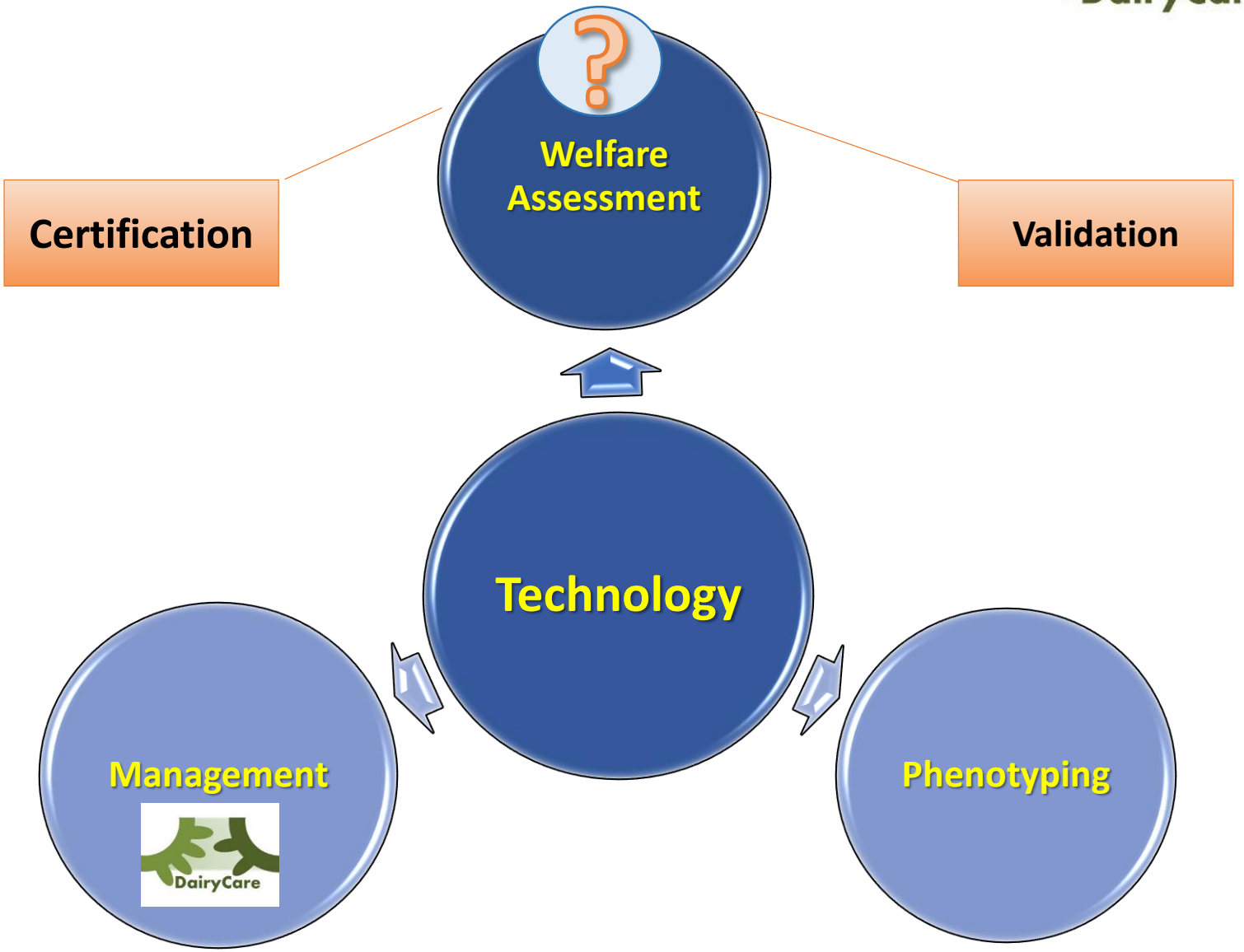
Internet of Things (IoT) & Animal Welfare Monitoring



DairyCare: ”Third Sense” Progressive Integration Model



Technological Aids




Thank
You

CReNBA

Centro di Ref. Naz. per il Benessere Animale

ISTITUTO ZOOPROFILATTICO SPERIMENTALE DELLA LOMBARDIA E DELL'EMILIA ROMAGNA "BRUNO UBERTINI" ENTE SANITARIO DI DIRITTO PUBBLICO

LA NOSTRA ESPERIENZA, LA VOSTRA **SICUREZZA.**

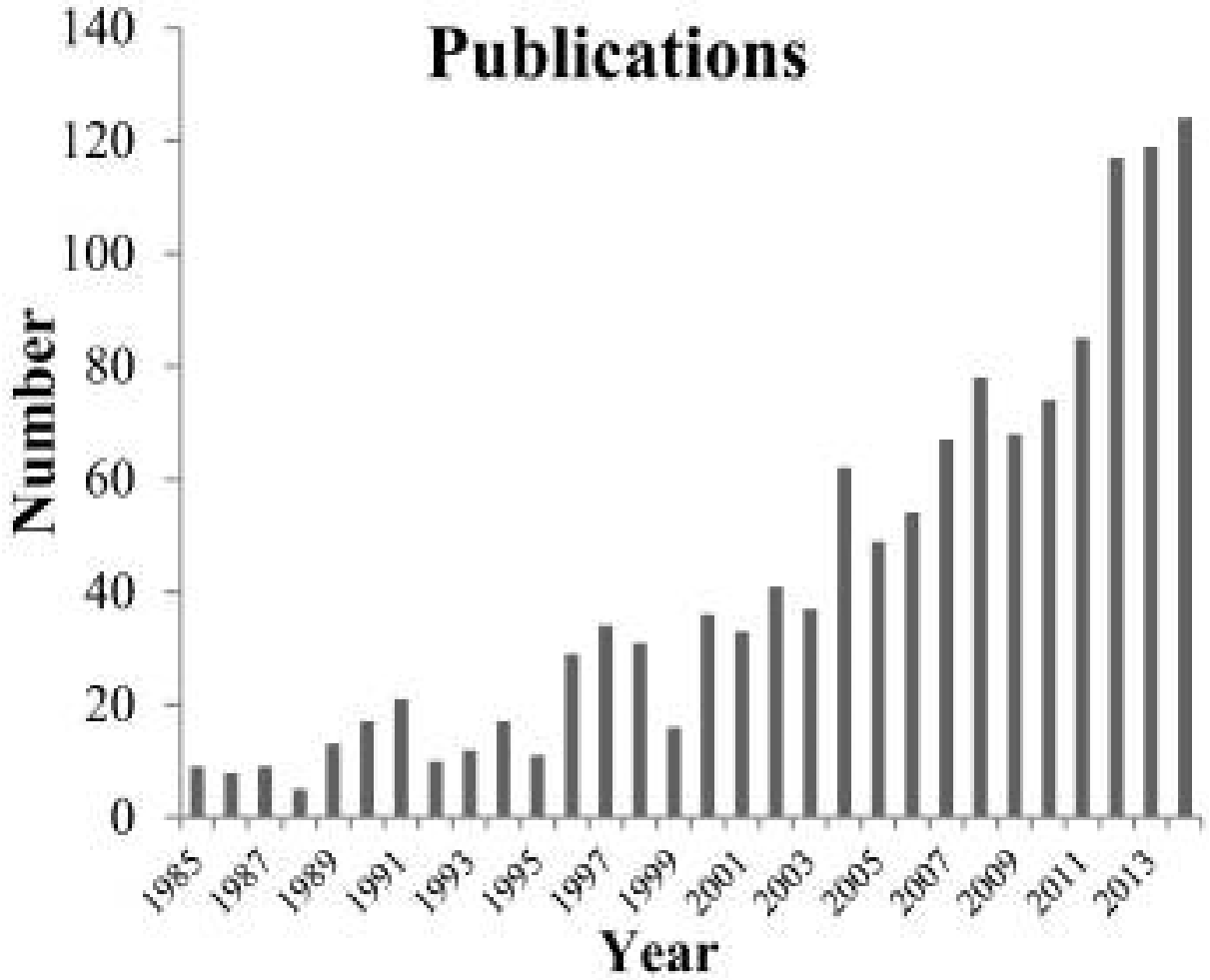
UTILIZZO DI INDICATORI COMPORTAMENTALI NELLA VALUTAZIONE DEL BENESSERE BOVINO SECONDO IL CRENBA

Francesca Fusi

Workshop SIB - SISVET

Brescia, 25 Maggio 2017

Benessere Animale?



Number of publications of studies that include animal welfare and emotions over the time period 1985–2014 (Web of Science).

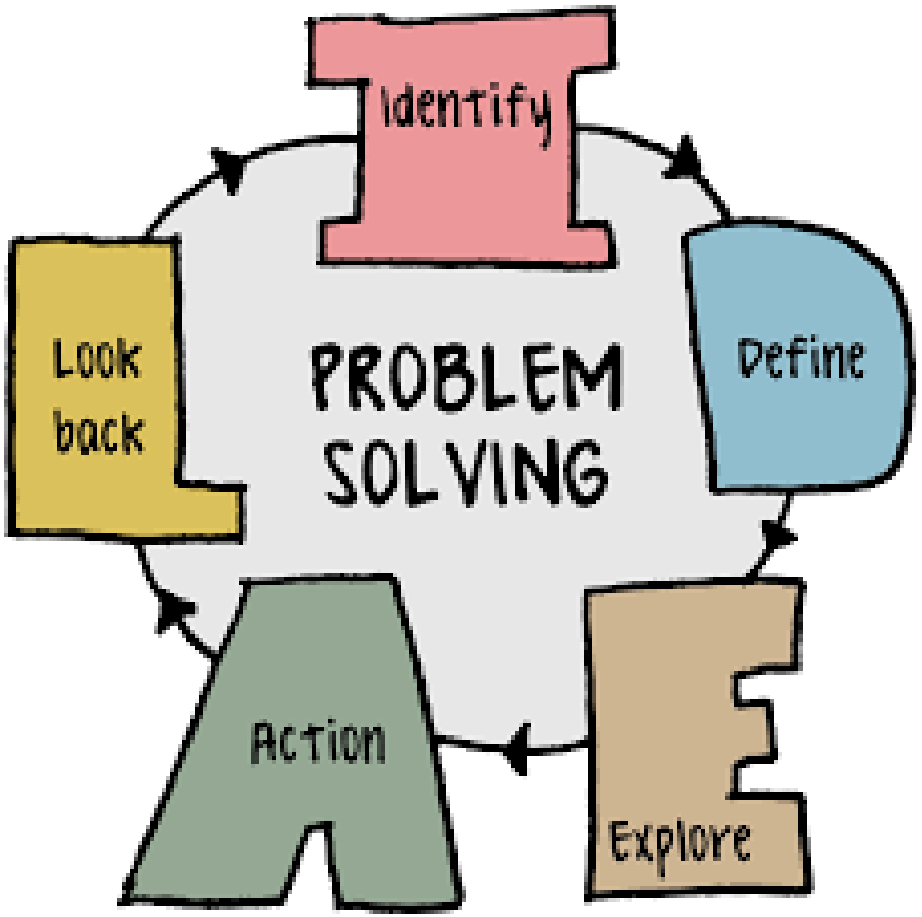
Marchant-Forde J.N., Front Vet Sci. 2015; 2: 16

Approccio indipendente

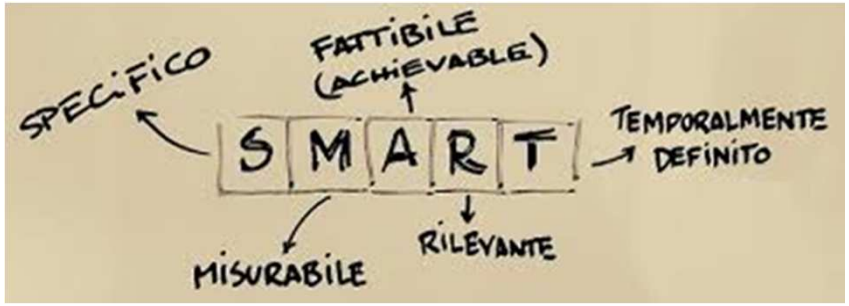
CReNBA

Supporto tecnico-scientifico MINSAN

Ricerca di base e applicata, nella **divulgazione scientifica** e nella **formazione** relativamente alla protezione degli animali



Elaborazione di uno strumento

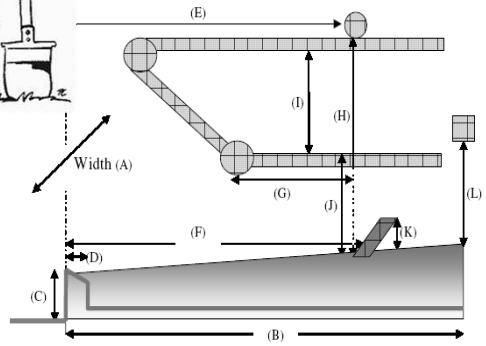


Elaborazione di uno strumento applicabile in allevamento

Valutazione contemporanea di

Pericoli e benefit
dell'allevamento

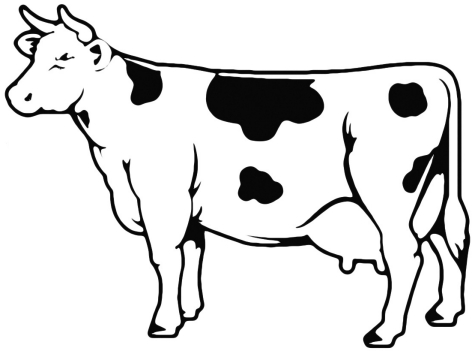
Conseguenze
dell'ambiente **misurabili**
sull'animale



Normativa minima e EFSA

Paura – frustrazione – dolore - malattia
ridotte funzioni biologiche

WQ ®
EFSA 2012 - «toolbox»
Strategia UE 2012-2015 Benessere Animale



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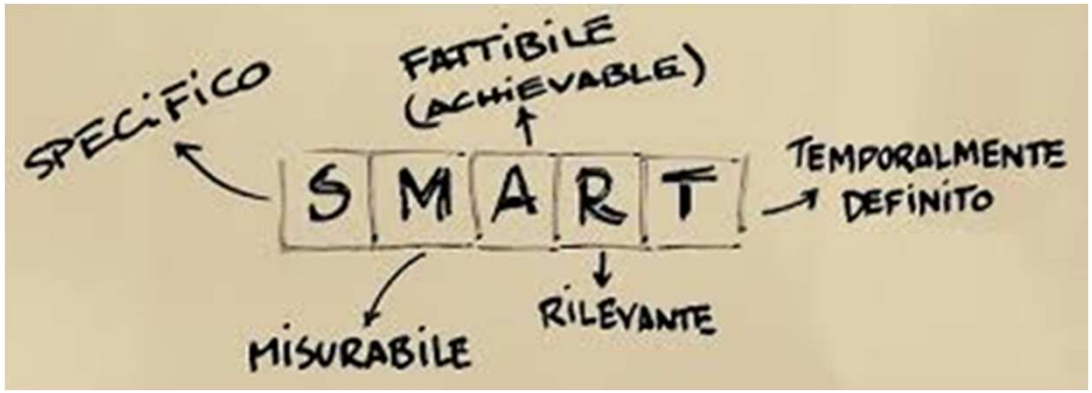
Elaborazione di uno strumento



EFSA 2012
on the use of animal-based measures to assess welfare of dairy cows

A 'toolbox' of valid and reliable animal-based measures, from which the most appropriate 'tool' or combination of tools can be selected.

(EFSA Journal 2012;10(1):2554)

COMUNICAZIONE DELLA COMMISSIONE AL PARLAMENTO EUROPEO, AL CONSIGLIO E AL COMITATO ECONOMICO E SOCIALE EUROPEO

sulla strategia dell'Unione europea per la protezione e il benessere degli animali 2012-2015

.. La diversità dei sistemi di allevamento, delle condizioni climatiche, della natura del suolo nei vari Stati membri ha creato **notevoli difficoltà all'atto di stabilire norme unitarie** e difficoltà ancora maggiori per garantirne la corretta applicazione.

.. Le condizioni inerenti al benessere degli animali nell'Unione NON CREANO le condizioni di parità necessarie per sostenere l'enorme attività economica che determina il trattamento degli animali nell'Unione europea.

.. La **Commissione** intende prendere in esame:
l'uso di indicatori di benessere degli animali basati su dati scientifici come mezzo per **semplificare il quadro giuridico** e consentire la flessibilità necessaria per migliorare la competitività degli allevatori.

Cos'è il benessere animale

Broom 1986

''Il benessere animale è dato dalla capacità di adattamento del soggetto all'ambiente''

Ci sono molti tipi di ambiente e di popolazioni → **Ci sono molti tipi di interazioni con l'ambiente** → **Ci sono varie misurazioni del benessere animale**

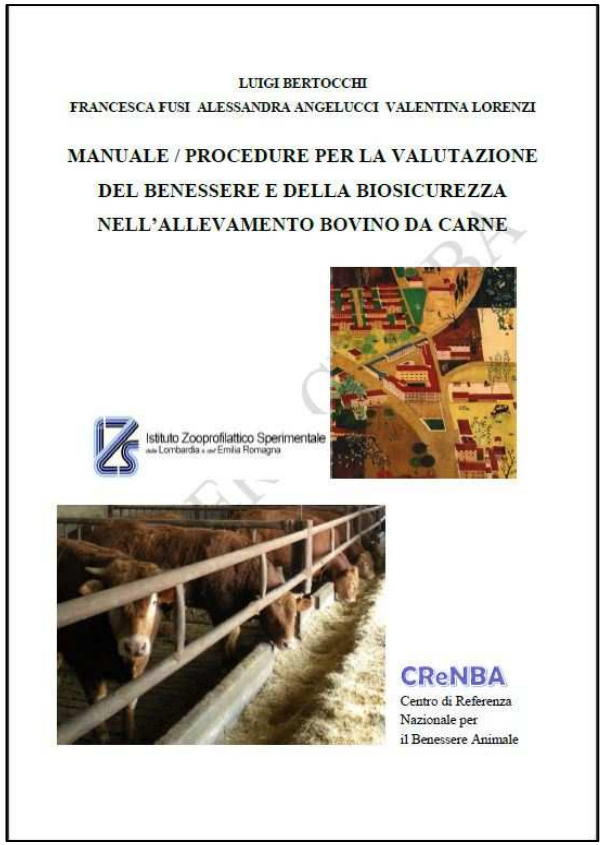
Bertocchi Luigi Istituto Zooprofilattico Sperimentale della Lombardia ed Emilia Romagna

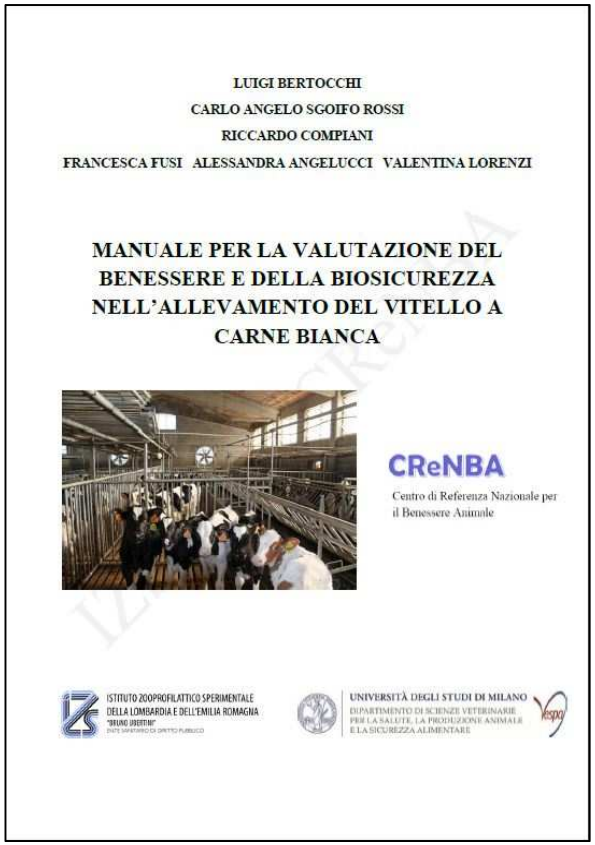
DISPONIBILI ON-LINE

www.izsler.it

CRENBA
CENTRO DI REFERENZA NAZIONALE
PER IL BENESSERE ANIMALE

Valutazioni del
Benessere Animale
e della
Biosicurezza >





Confronto & Collaborazioni internazionali

- Højlund Nielsen, Bodil, et al. “Use of animal based measures for the assessment of dairy cow welfare ANIBAM.” EFSA Supporting Publications 11.9 (2014).

- Poster presentations:

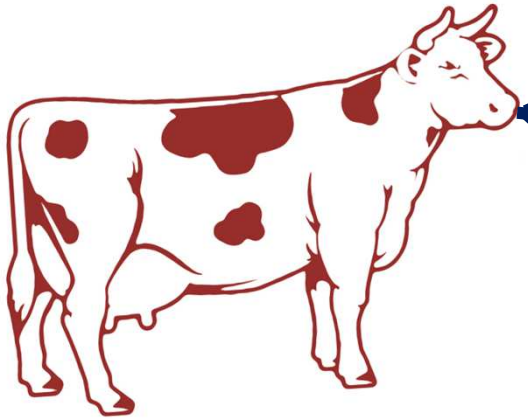
  Fourth DairyCare Conference 2016, Lisbon October 13th - 14th 2016 – P 13 – p.37
  Second DairyCare Conference 2015, Cordoba March 3rd-4th 2015 – P 1.7 - p.30
  Second DairyCare Conference 2015, Cordoba March 3rd-4th 2015 – P 1.27 - p.43-44
  Second DairyCare Conference 2015, Cordoba March 3rd-4th 2015 – P 2.9 - p.56-57
  First DairyCare Conference 2014 Copenhagen August 22-23 2014 - 1.3.13 -p.41-42

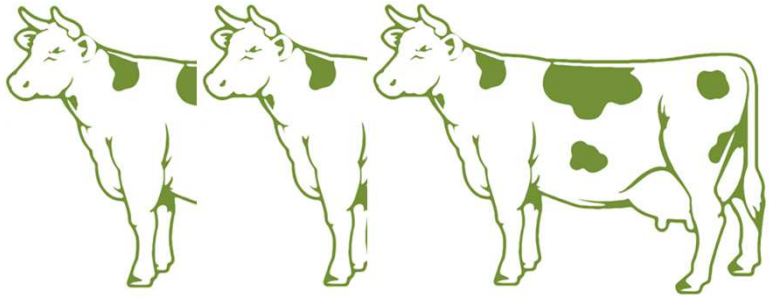
- European Animal Health & Welfare Collaborative Working Group

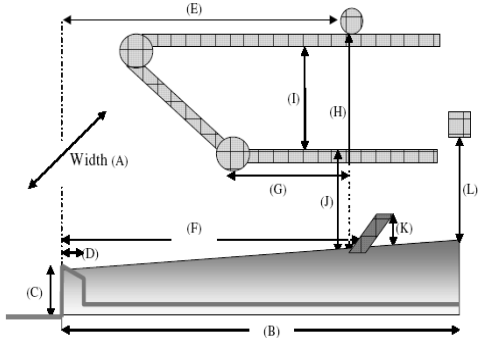
- Short term scientific mission DairyCare - Department of Environmental and Biological Sciences, University of Eastern Finland (UEF)

- Erasmus+ Program - University of Josip Juraj Strossmayer - Faculty of Agriculture in Osijek (Croatia)

Parametri Comportamentali







Fondamentale definire
la popolazione target

CReNBA

INTERAZIONE UOMO - ANIMALE

COSTANTE INTERAZIONE NEGATIVA

Avoidance Distance Test
(test di fuga – bovini adulti)

WelfareQuality® 2009

STRESS, PAURA, FRUSTRAZIONE

Human Approach Test
(approccio passivo – vitelli)

Brokkers et al. (2009)

INTERAZIONE UOMO - ANIMALE

"The quality of stockmanship has large effects on the welfare of cattle in any housing system.

A skillful stockperson can compensate for many bad effects of certain housing systems and a poor stockperson causes problems in an otherwise good system."

("Welfare of cattle kept for beef production"; SCAHAW, 2001 - Conclusion 79).

TEMPLE GRANDIN (http://www.grandin.com/)

- **Il fattore più significativo** che influenza il benessere degli animali è il **MANAGEMENT**

- Dove c'è un buon livello di benessere degli animali, c'è un **MANAGER che se ne preoccupa**

- Un buon MANAGER impone delle **regole** per mantenere un buon benessere; **i dipendenti sono formati** e **quelli che maltrattano gli animali sono puniti.**

- Il MANAGER efficiente è ben partecipe alle attività che giorno per giorno lo riguardano, ma **non è così coinvolto da abituarsi e desensibilizzarsi alla sofferenza degli animali**

- Le persone che ogni giorno gestiscono centinaia di animali possono diventare insensibili. **Hanno bisogno di un MANAGER FORTE che gli smuova la coscienza**

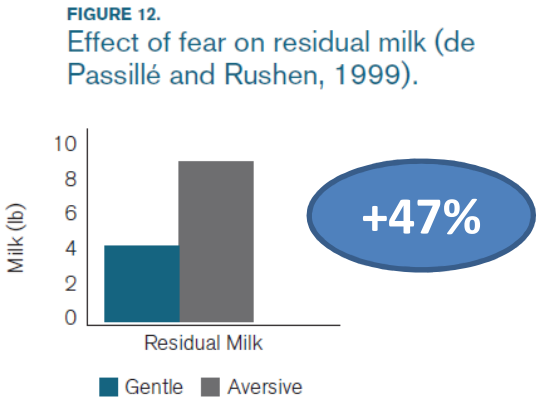
INTERAZIONE UOMO - ANIMALE

MUNGITORE CALMO
VS
MUNGITORE NERVOSO

MAGGIORE PRODUZIONE
+ 3,5 - 13% (Seabrook, 1984 e 1994)

ANIMALI MENO PAUROSI E NERVOSI
- 39% di tempo medio per entrare in stalla
- 6 volte defecazione in sala di mung.
(Seabrook, 1994)

MINOR LATTE RESIDUALE IN MAMMELLA



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INTERAZIONE ANIMALE - ANIMALE

- **Bovini animali gregari → gerarchia sociale**
  - stabilita da altezza, peso, età, sesso, presenza/assenza corna, razza, temperamento, anzianità nel gruppo
  - per evitare continue interazioni aggressive

- Condizionata anche dalle risorse ambientali
  - Scarsa **disponibilità di spazio**
  - Insufficiente **spazio in mangiatoia e abbeverata**
  - **Alimentazione**
  - Rimescolamento e creazione di nuovi **gruppi**

SCAHAW, 2001 – EFSA Journal 2012

INTERAZIONE ANIMALE - ANIMALE

- Interazione sociale positiva: **grooming reciproco**
  - Riduttore di tensione
  - Rafforza i legami sociali e stabilizza le relazioni tra soggetti
  - «auto-narcotizzazione»
  - associato a **sensazioni piacevoli e calmanti** sia per chi attua il comportamento sia per chi lo riceve.

(Welfare Quality® 2009, R11)

.. For on-farm welfare assessement in fattening bulls the inclusion of social licking and horning is recommended.

For dairy cattle, for none of the behaviours assessed it proved to be possible to reliably record them in single short-term observations.

(Welfare Quality® 2009, R11)

INTERAZIONE ANIMALE - AMBIENTE

TIME - BUDGET della BOVINA DA LATTE

ATTIVITÀ	ORE/GIORNO	(Grant and Albright, 2001 Grant, 2007 A. Gomez and N. Cook , 2010)
RIPOSO - IN DECUBITO	12-14 h	periodi in decubito da 50-60' ruminazione da 7 a 10 h
MANGIARE	3 - 5 h	da 9 a 14 pasti
BERE	0,5 h	da 4 a 18 litri/minuto
ATTIVITÀ VARIE	2 - 3 h	(stare in piedi, camminare, comportamento esplorativo, grooming, ecc.)
TOTALE	20,5 - 21,5 h	
MUNGITURA	2,5 – 3,5 h	

INTERAZIONE ANIMALE - AMBIENTE

BOVINE DA LATTE a stabulazione libera

Elemento di verifica – Adeguatezza dell'area di riposo (bovine in lattazione)	
Il conteggio degli animali in decubito va eseguito ad un minimo di 2 ore di distanza da eventi come la distribuzione dell'alimento o la mungitura. In caso di n° dubbio valutare l'attività e il modo in cui i soggetti sono in piedi oppure il disegno delle cuccette	
Cuccette o lettiera permanente scarsamente utilizzate (< del 50%)	**PERICOLO**
Utilizzo parziale delle cuccette o della lettiera permanente (fra 50 e 70 %)	**OK**
Utilizzo completo ed uniforme degli spazi di riposo a lettiera permanente o a cuccette (> 70%)	**BENEFIT**

A 2h dai grandi eventi aziendali, almeno:

- 50 - 70% di bovine in decubito
- 15 - 25% di bovine che mangiano e bevono;
- 15 - 25 % camminano per i corridoi e socializzano

Cuccette non confortevoli

UTILIZZO COMPLETO ED UNIFORME DELLE CUCCETTE

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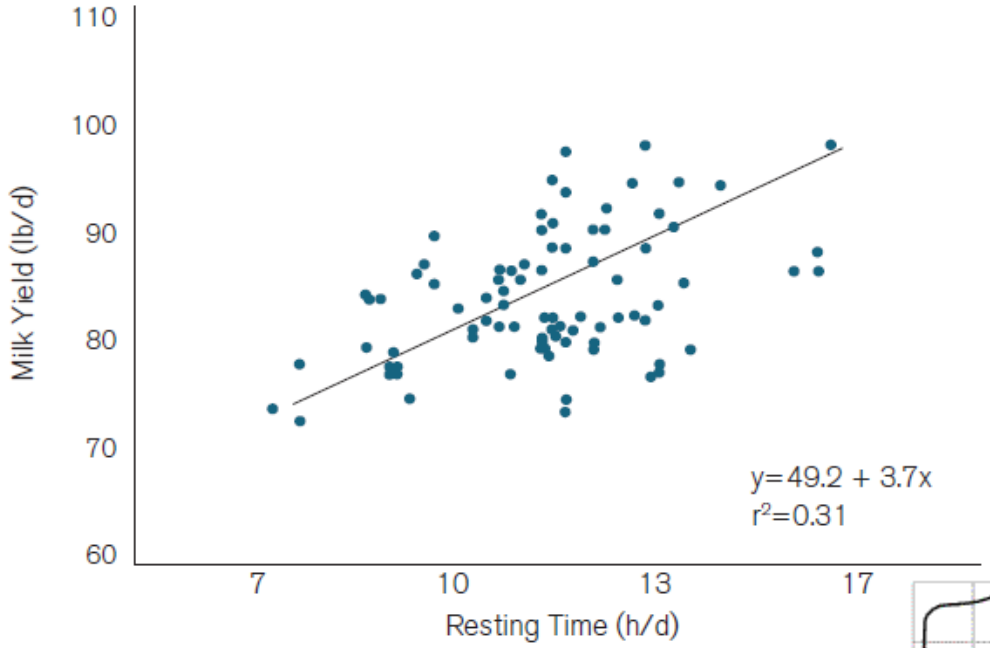
RIPOSO & PRODUZIONE

Figure 6. Relationship between milk yield (lb/d) and resting time (h/d) (Grant, 2007).

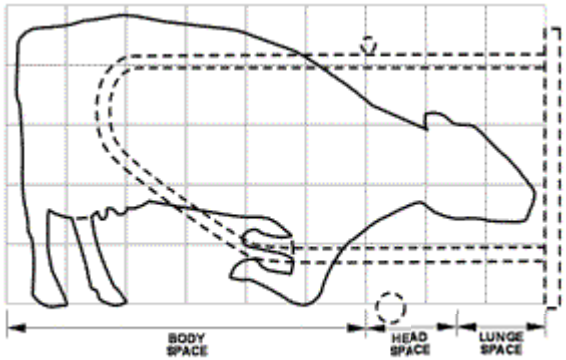


Ogni ora in più in decubito

+ 1-1,5 kg latte/capo/g

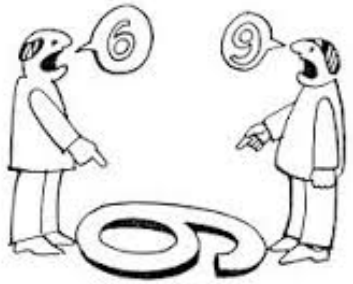
(oltre il minimo di 7 ore/g)

Albright and Arave, 1997
Grant, 2007

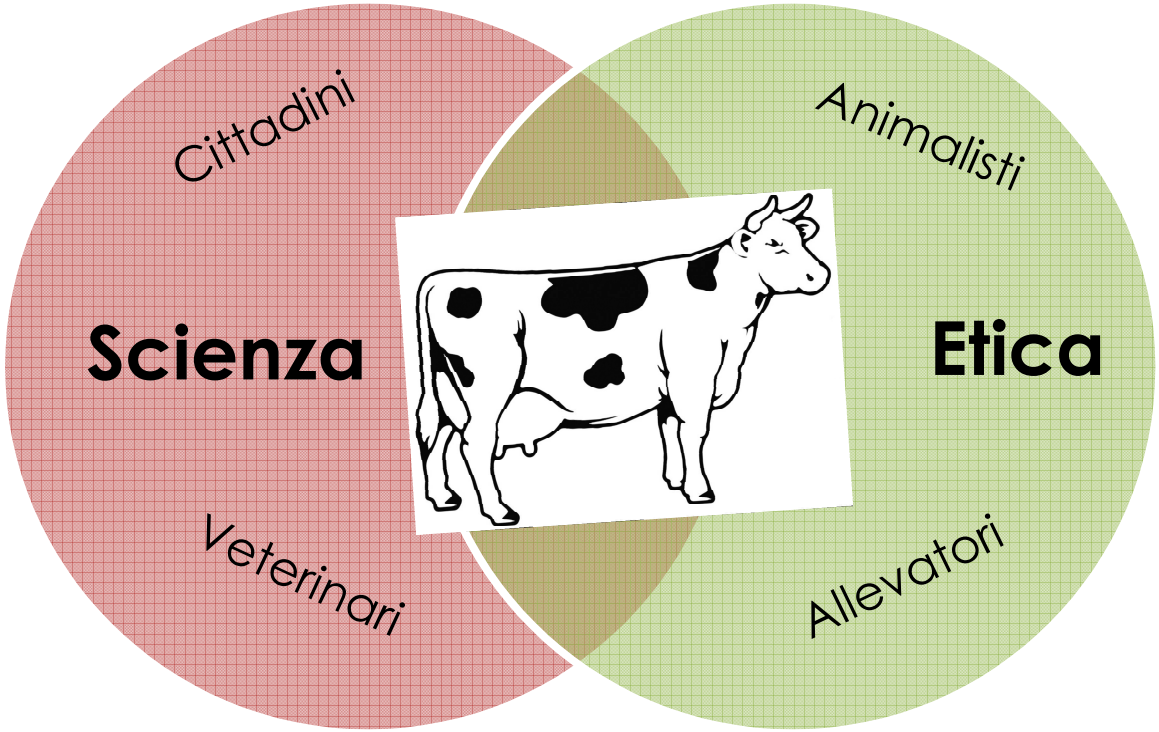


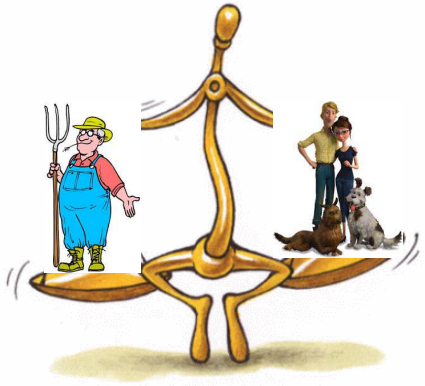
Considerazioni finali

Evitare INTERPRETAZIONI DIVERSE E SOGGETTIVE nella valutazione del benessere animale



Fondamentale è l'utilizzo di **indicatori animal-based**





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Grazie per l'attenzione

FRANCESCA FUSI

francesca.fusi@izsler.it

030/2290250

Bertocchi Luigi luigi.bertocchi@izsler.it

Lorenzi Valentina - Angelucci Alessandra - Strano Rosa Maria - Ginestreti Jessica - Ferrara Giandomenico

ISTITUTO ZOOPROFILATTICO SPERIMENTALE
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"BRUNO UBERTINI"
ENTE SANITARIO DI DIRITTO PUBBLICO

Sede Centrale Brescia
Via Bianchi, 9 - 25124 Brescia - Italy
T. +39 030 2290.1 - **F**. +39 030 2425251
info@izsler.it - www.izsler.it

Il rischio benessere misurato dall'Associazione Italiana Allevatori

La valutazione in azienda del benessere della bovina da latte: un approccio multilaterale per una produzione sostenibile e consapevole

dr.ssa Alessia Tondo – Ufficio Studi AIA

Workshop SIB - SISVet, Brescia, 25 Maggio 2017

Il Sistema Allevatori

AIA

BD centrale

Supervisione corretta esecuzione dei controlli

LSL - LGS - CPCM

ARA

Raccolta dati in azienda

Determinazioni analitiche

LABORATORI DI ANALISI

ANA

Calcolo indici genetici

Schemi di selezione

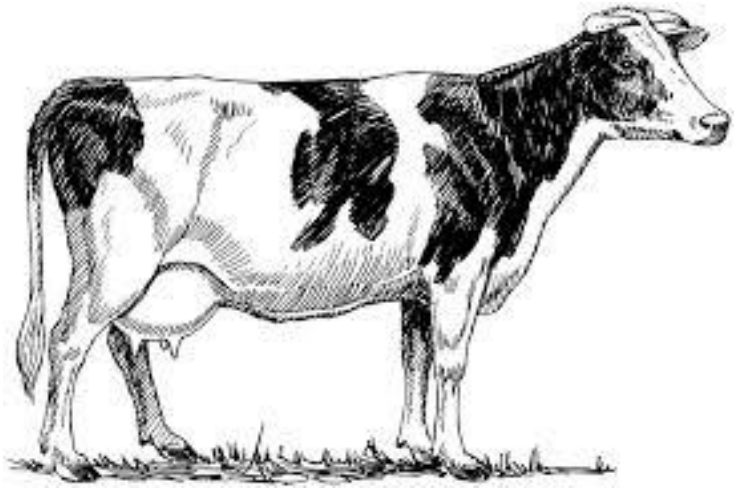
CENTRI GENETICI

Il Sistema Allevatori

Raccolta dato in azienda

Ingresso in azienda ad intervalli regolari

Raccolta dati individuali



Ciascuna vacca

Eventi riproduttivi e vitali
(Parti, Aborti, Fecondazioni, Ingressi, Uscite)

Produzione individuale

Campione individuale

Per ogni lattazione di ciascuna bovina viene registrato:

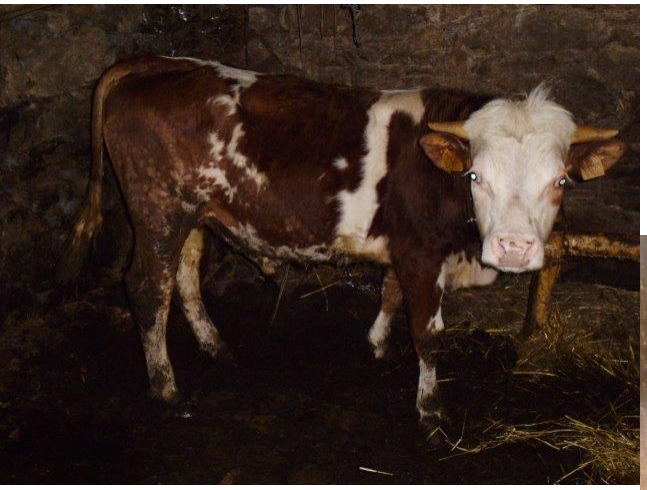
- data parto/aborto
- date fecondazioni
- date diagnosi gravidanza
- kg latte prodotti al giorno del controllo
- risultati analitici al giorno del controllo:
  - Grasso, proteina, lattosio, cellule somatiche
  - Urea
  - BHB (beta idrossibutirrato)
  - Acidi grassi

I dati vengono caricati nel sistema centrale ed elaborati

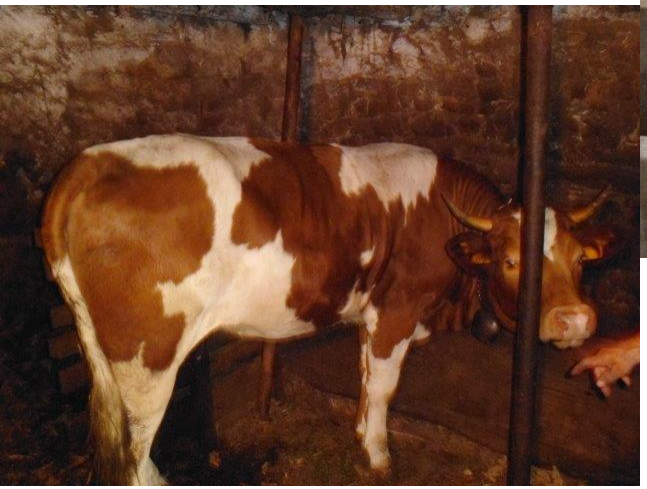
Elaborazioni sulle performance produttive, riproduttive e sanitarie individuali

Elaborazioni sulle performance produttive, riproduttive e sanitarie collettive … report benessere animale

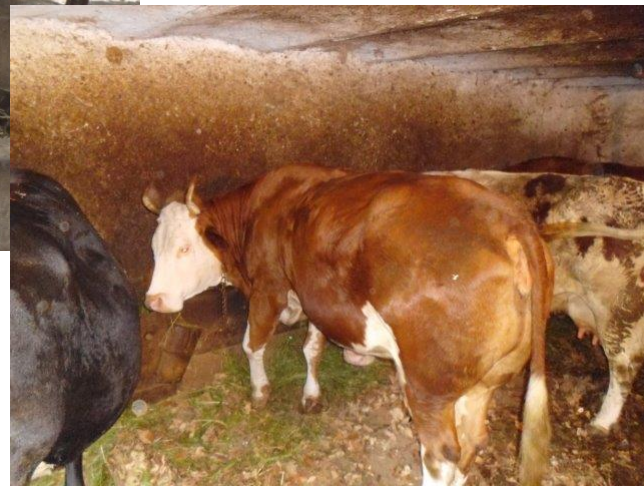
Valutazione del Benessere Animale



Struttura aziendale



Condizioni di stabulazione



Valutazione del Benessere Animale

Stato si salute degli animali

Conduzione aziendale

Valutazione del Benessere Animale

Struttura aziendale

Stato si salute degli animali

Condizioni di stabulazione

Conduzione aziendale

EFSA Panel on Animal Health and Welfare (AHAW) “Scientific Opinion on the use of animal-based measures to assess welfare of dairy cows”, (EFSA Journal 2012; 10(1):2554)

- La valutazione del benessere animale si deve basare su **misurazioni** animal-based
- I dati animal-based sono **indicatori precoci** di rischio di malessere per gli animali
- Una classificazione del benessere si deve basare su più indicatori misurati su un **lungo periodo**

EFSA Panel on Animal Health and Welfare (AHAW) “Scientific Opinion on the use of animal-based measures to assess welfare of dairy cows”, (EFSA Journal 2012; 10(1):2554)

- Il concetto di benessere animale definito nel progetto WQ® e le opinioni scientifiche dell’EFSA sono molto simili confermando una **convergenza** nella comunità scientifica nella definizione di benessere animale
- WQ®: welfare assessment approach
- EFSA: risk assessment approach

EFSA Panel on Animal Health and Welfare (AHAW) “Scientific Opinion on the use of animal-based measures to assess welfare of dairy cows”, (EFSA Journal 2012; 10(1):2554)

- EFSA propone una **fusione** dei due approcci in modo da esprimere il benessere sotto due importanti punti di vista:
  - Misure animal-based utilizzate per evidenziare problemi di benessere urgenti ed importanti
  - Misure basate su management e strutture utilizzate per evidenziare rischi che potenzialmente possono ridurre il benessere

EFSA Panel on Animal Health and Welfare (AHAW) “Scientific Opinion on the use of animal-based measures to assess welfare of dairy cows”, (EFSA Journal 2012; 10(1):2554)

- Indicatori di benessere animal-based:
  - Indicatori soggettivi
  - Indicatori oggettivi

EFSA Panel on Animal Health and Welfare (AHAW) “Scientific Opinion on the use of animal-based measures to assess welfare of dairy cows”, (EFSA Journal 2012; 10(1):2554)

- Indicatori animal-based **soggettivi**:
  - Propriamente basati sulla professione medica
  - Basati sulla raccolta della sintomatologie, lesioni, disturbi comportamentali da ricondurre a specifiche patologie che comportano una situazione di non benessere

EFSA Panel on Animal Health and Welfare (AHAW) “Scientific Opinion on the use of animal-based measures to assess welfare of dairy cows”, (EFSA Journal 2012; 10(1):2554)

- Indicatori animal-based **soggettivi**:
  - Lucentezza del pelo
  - Lesioni sugli arti
  - Qualità delle feci
  - Tipo di respirazione
  - Tipo di locomozione
  - Ecc.

  Formazione → standardizzazione raccolta dato

EFSA Panel on Animal Health and Welfare (AHAW) "Scientific Opinion on the use of animal-based measures to assess welfare of dairy cows", (EFSA Journal 2012; 10(1):2554)

	Descrizione	Scala
LOCOMOTION SCORE	Locomozione	1-5
HOOF SCORE (Dermatite interdigitale)	Patologie podali	1-3
HOOF SCORE (Dematite digitale)	Patologie podali	1-3
HOOF SCORE (Laminite)	Patologie podali	1.3
CLEANLINESS SCORE (Mammella)	Pulizia	1-5
CLEANLINESS SCORE (Arti)	Pulizia	1-5
RUMEN SCORE	Riempimento del rumine	1-5
DUNG o MANURE SCORE	Qualita' delle feci	1-5
BODY CONDITION SCORE	Stato di nutrizione	1-5
TEAT SCORE	Capezzoli	1-4
SKIN TENT TEST	Idratazione	1-3

INDICATORI SOGGETTIVI DI BENESSERE BASATI SUGLI ANIMALI (SCORE)

EFSA Panel on Animal Health and Welfare (AHAW) “Scientific Opinion on the use of animal-based measures to assess welfare of dairy cows”, (EFSA Journal 2012; 10(1):2554)

- Indicatori animal-based **oggettivi**:
  - Si basano su vere e proprie misurazioni
  - Capacità di interpretazione del dato misurato in base agli studi scientifici
  - Esprimono la performance riproduttiva, produttiva e sanitaria del singolo capo

EFSA Panel on Animal Health and Welfare (AHAW) "Scientific Opinion on the use of animal-based measures to assess welfare of dairy cows", (EFSA Journal 2012; 10(1):2554)

- Indicatori animal-based **oggettivi**:

Raccomandazione (EFSA,2009b)	**Misura animal-based**	**Misura non animal-based**
Corretta alimentazione	• **Profilo metabolico**-βOHB • **Composizione del latte**-%Gr, %Pr, %GR/%Pr • **Fertilità**- CR, interparto, DaysOpen, n. inseminazioni, DIM • **Chetosi**-corpi chetonici • **Acidosi (EFSA, 2009)**	• Composizione della dieta • Tipo di somministrazione

EFSA Panel on Animal Health and Welfare (AHAW) "Scientific Opinion on the use of animal-based measures to assess welfare of dairy cows", (EFSA Journal 2012; 10(1):2554)

- Indicatori animal-based **oggettivi**:

Raccomandazione (EFSA,2009b)	**Misura animal-based**	**Misura non animal-based**
Corretta routine di mungitura, mastiti	• **Monitoraggio routine di mungitura**-stimolazione, fore-stripping, pre-dipping, post-dipping, svuotamento mammella, livello del vuoto, rapporto di pulsazione (SCM) • **Cellule somatiche** • **Flusso di rilascio**	• Manutenzione della macchina • Struttura dell'impianto

EFSA Panel on Animal Health and Welfare (AHAW) "Scientific Opinion on the use of animal-based measures to assess welfare of dairy cows", (EFSA Journal 2012; 10(1):2554)

- Indicatori animal-based **oggettivi**:

Raccomandazione (EFSA,2009b)	**Misura animal-based**	**Misura non animal-based**
Disordini locomotori	• **Misura delle laminiti**	• Registrazione dati di mascalcia
Genetica e Riproduzione	• **Longevità** • **Indicatori** locomotori, mastiti, riproduttivi e disordini metabolici	• Indici genetici madre e padre

EFSA Panel on Animal Health and Welfare (AHAW) "Scientific Opinion Statement on the use of animal-based measures to assess the welfare of animals", (EFSA Journal 2012; 10(6):2767)

Fattori che influenzano il benessere animale:

- RISORSE A DISPOSIZIONE (resource-based measures)
- CONDUZIONE DELL'AZIENDA (management-based measures)

L'animale risponde ai fattori a seconda delle sue caratteristiche:

- MISURA DIRETTA SULL'ANIMALE (animal-based measures)

EFSA Panel on Animal Health and Welfare (AHAW) "Scientific Opinion Statement on the use of animal-based measures to assess the welfare of animals", (EFSA Journal 2012; 10(6):2767)

Risk assessment:

- Le risposte misurate sull'animale sono le conseguenze dell'azione dei fattori sugli animali i quali rispondono in maniera soggettiva (capacità di adattamento)

Necessità di **creare indicatori** che esprimano il livello di benessere aziendale utilizzando i dati misurati sugli animali

Indicatore composto in funzione di una serie di indicatori semplici legati ai parametri che meglio esprimono il livello globale di benessere animale

DETERMINAZIONE DI UN INDICATORE AZIENDALE DI BENESSERE ANIMALE

Metodo di calcolo:

- in che modo si possono trasformare le misurazioni effettuate sui singoli animali in un indicatore globale di benessere animale

Rappresentazione del benessere:

- quali sono i parametri che meglio sintetizzano il livello di benessere di un allevamento

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- quali sono i parametri che meglio sintetizzano il livello di benessere di un allevamento

Rappresentazione del benessere

- Fornire le indicazioni sulle performances utili a definire il risk assessment:
  - Disordini produttivi
  - Disordini riproduttivi
  - Disordini metabolici
  - Disturbi sanitari

Rappresentazione del benessere

RISCHIO DISTURBI PRODUTTIVI

Disordini Produttivi
differenza tra produzione effettiva e produzione potenziale
differenza tra produzione EVM rispetto alla media di stalla

RISCHIO DISTURBI RIPRODUTTIVI

Disordini Riproduttivi
tasso concepimento
% vacche mai fecondate
% vacche non gravide a 150 giorni dal parto
intervallo medio parto 1° fecondazione
intervallo medio parto concepimento
età media al 1° parto
prolungamento lunghezza media lattazioni

RISCHIO DISTURBI METABOLICI

Disordini Metabolici
% capi con grasso
% capi con proteine
% capi con LATTOSIO
% capi con UREA
rapporto % grasso/% proteina

RISCHIO DISTURBI SANITARI

Disturbi sanitari
cellule somatiche

Scelta per la misurazione del benessere animale aziendale

5 ambiti:

- Longevità
- Regolarità riproduttiva
- Sanità della mammella
- Dismetabolie: Chetosi subclinica
- Dismetabolie: Acidosi subclinica

Rappresentazione del benessere

- LONGEVITA':
  - Indicato da EFSA
  - Misurato come numero medio di lattazioni delle vacche presenti in stalla (**PAR**)
  - «la longevità funzionale si definisce come la capacità dell'animale di rimanere più a lungo in stalla, sano e senza problemi riproduttivi», *atti della Società Italiana di Buiatria – Vol. XXXII, 2000*

Rappresentazione del benessere

- REGOLARITA' RIPRODUTTIVA:
  - Indicato da EFSA
  - Misurato come lunghezza media della lattazione delle vacche in mungitura (**DIM**)
  - «i disordini riproduttivi possono dipendere da uno scarso benessere prolungato o transitorio come mancanza di estro, morte embrionale o aborto prematuro a causa dello stress durante il parto e nella prima fase della lattazione e possono anche essere la causa diretta di uno scarso benessere in particolare distocia, infezioni genitali associate a dolore o reazioni infiammatorie», *parere scientifico EFSA 2009b*

Rappresentazione del benessere

- REGOLARITA' RIPRODUTTIVA:
  - DIM ↔ Regolarità riproduttiva
  - «se l'efficienza riproduttiva diminuisce, il giorno medio in latte (DIM) aumenta», *atti della Società Italiana di Buiatria – Vol. XXXV, 2003*
  - Relazione tra giorni medi di lattazione e Pregnancy Rate, *Paul M. Fricke, Understanding the key to successful reproduction, University of Wisconsin, 2001*

Rappresentazione del benessere

- SANITA' DELLA MAMMELLA:
  - Indicato da EFSA
  - Misurata come media ponderata delle cellule individuali
  - Evidente relazione tra numero di cellule somatiche riscontrate nel latte e mastiti subcliniche e cliniche
  - Le **cellule nel latte individuale** sono indicatori di mastiti subcliniche

Rappresentazione del benessere

- DISMETABOLIE – CHETOSI SUBCLINICHE:
  - «il **rapporto %grasso/%proteina** è considerato un buon indicatore per la determinazione del rischio delle forme subcliniche di chetosi misurato sulle vacche ad inizio lattazione», *Duffield T., Bagg R. "Herd Level Indicators for the Prediction of High-Risk Dairy Herd for Subclinical Ketosis", in: 35th Annual Meeting of the American Association of Bovine Practitioners. Rome, GA; 2002, p. 175-76*
  - Misurata come percentuale di vacche che hanno avuto un rapporto Gr/Pr alto a inizio lattazione

Rappresentazione del benessere

- DISMETABOLIE – CHETOSI SUBCLINICHE:
  - Indicato da EFSA
  - «La chetosi subclinica è stata associata alla diminuzione della produzione di latte, peggioramento delle performance riproduttive, dislocazione dell'abomaso, metriti, mastiti e chetosi cliniche», *Duffield T., Bagg R. "Herd Level Indicators for the Prediction of High-Risk Dairy Herd for Subclinical Ketosis", in: 35th Annual Meeting of the American Association of Bovine Practitioners. Rome, GA; 2002, p. 175-76*

Rappresentazione del benessere

- DISMETABOLIE – ACIDOSI SUBCLINICA:
  - «Il rischio di acidosi subclinica viene misurato attraverso la percentuale di vacche che presentano una **forte depressione del grasso nel latte**», *Oetzel Garret R. "Subacute Ruminal Acidosis in Dairy Herds: Physiology, Pathophysiology, Milk Fat Responses, and Nutrition Management", AABP conference, 2007*
  - Misurato come percentuale di vacche in mungitura con %grasso basso

Rappresentazione del benessere

- DISMETABOLIE – ACIDOSI SUBCLINICA:
  - Indicato da EFSA
  - «L'acidosi subclinica viene collegata a malattie podali quali laminiti, ad un peggioramento delle condizioni generali di benessere fino alle forme cliniche che possono portare alla morte dell'animale», *Oetzel Garret R. "Subacute Ruminal Acidosis in Dairy Herds: Physiology, Pathophysiology, Milk Fat Responses, and Nutrition Management", AABP conference, 2007*

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Rappresentazione del benessere:

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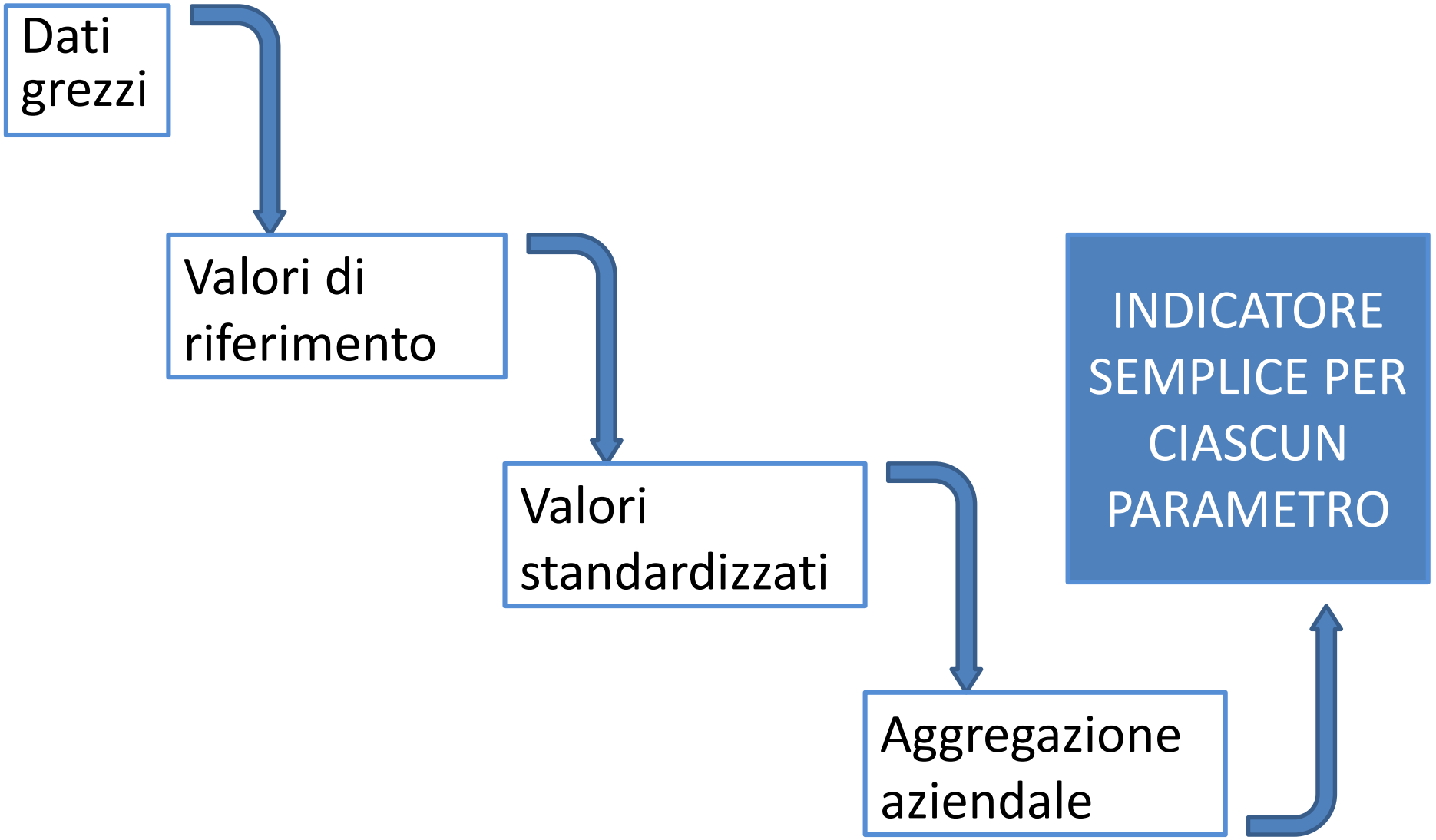
METODO DI CALCOLO – FASE 1

Determinazione di un **indicatore semplice** per ogni tipologia di parametro: la valutazione globale del livello di benessere animale parte dalla valutazione di ogni singolo parametro con cui si è scelto di valutare il benessere animale aziendale

SI VUOLE OTTENERE UNA
RAPPRESENTAZIONE SINTETICA DESCRITTIVA
DEI VALORI MISURATI SUI SINGOLI ANIMALI

METODO DI CALCOLO – FASE 1



METODO DI CALCOLO – FASE 1

MISURAZIONE DIRETTA SUGLI ANIMALI

Esempio:

Cellule somatiche nel latte

% grasso e proteina nel latte

Lunghezza delle lattazioni

ecc.

METODO DI CALCOLO – FASE 1

Misurazione diretta sugli animali

ELABORAZIONE DEI DATI

Calcolo dei **valori rappresentativi giornalieri**

a – medie aziendali (calcolate entro razza)

b – medie aziendali ponderate (calcolate entro razza)

c – valori individuali

METODO DI CALCOLO – FASE 1

Valori rappresentativi giornalieri

a – medie aziendali (calcolate entro razza)

es. media dei giorni in lattazione

b – medie aziendali ponderate (calcolate entro razza)

es. media delle cellule ponderata con le produzioni

c – valori individuali

es. rapporto %gr/%pr nel periparto

VALORI INIZIALI DA CUI COSTRUIRE L'INDICATORE

METODO DI CALCOLO – FASE 1

Valori rappresentativi giornalieri

ELABORAZIONE DEI DATI

Calcolo dei **valori standardizzati**

Applicazione di una funzione che trasforma i dati originali in valori adimensionali che variano in intervalli predefiniti

METODO DI CALCOLO – FASE 1

Valori standardizzati

Per ciascun parametro si ottengono valori:

- adimensionali
- confrontabili
- univocamente interpretabili

I valori che si ottengono devono indicare il raggiungimento di specifici livelli di rischio benessere

METODO DI CALCOLO – FASE 1

Valori standardizzati

Ciascun valore rappresentativo giornaliero indicherà il raggiungimento di uno stato di attenzione o di allarme in corrispondenza di specifici **valori soglia**

La relazione tra valore rappresentativo giornaliero e mancanza di benessere può essere di due tipi:

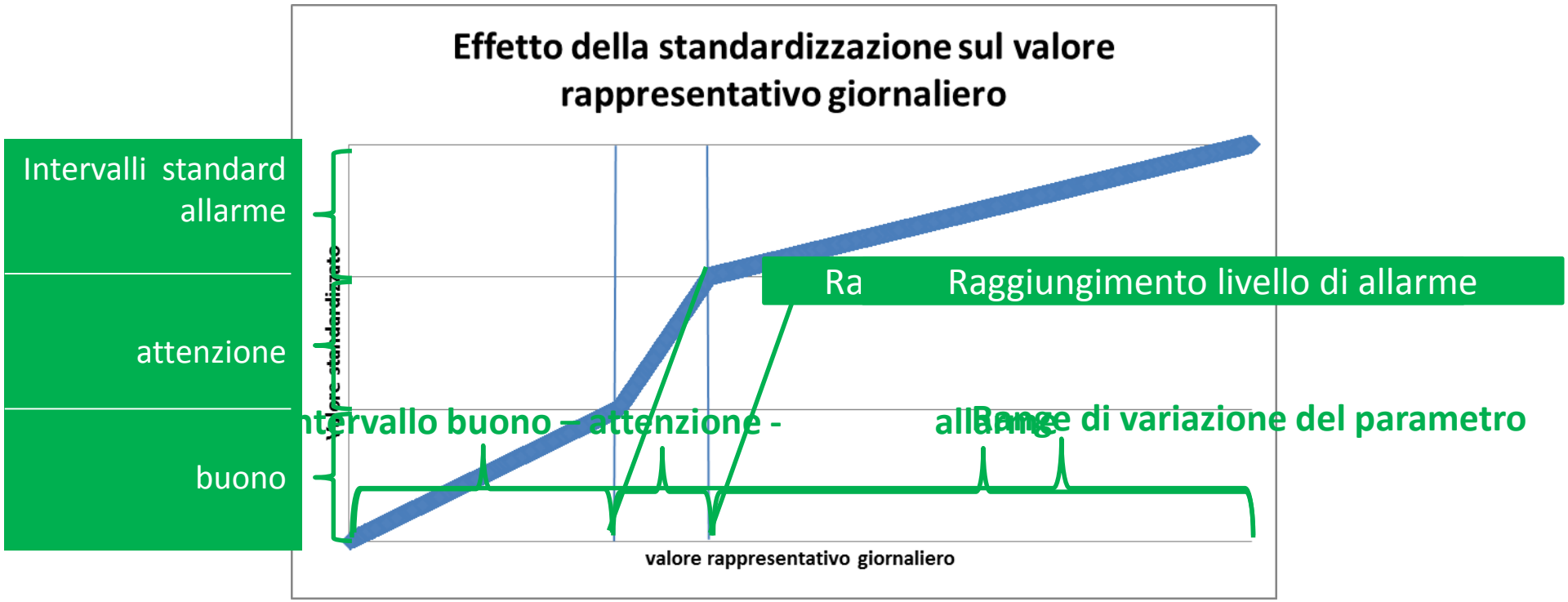
d – relazione diretta

e – relazione inversa

Applicazione di una funzione lineare a tratti

METODO DI CALCOLO – FASE 1

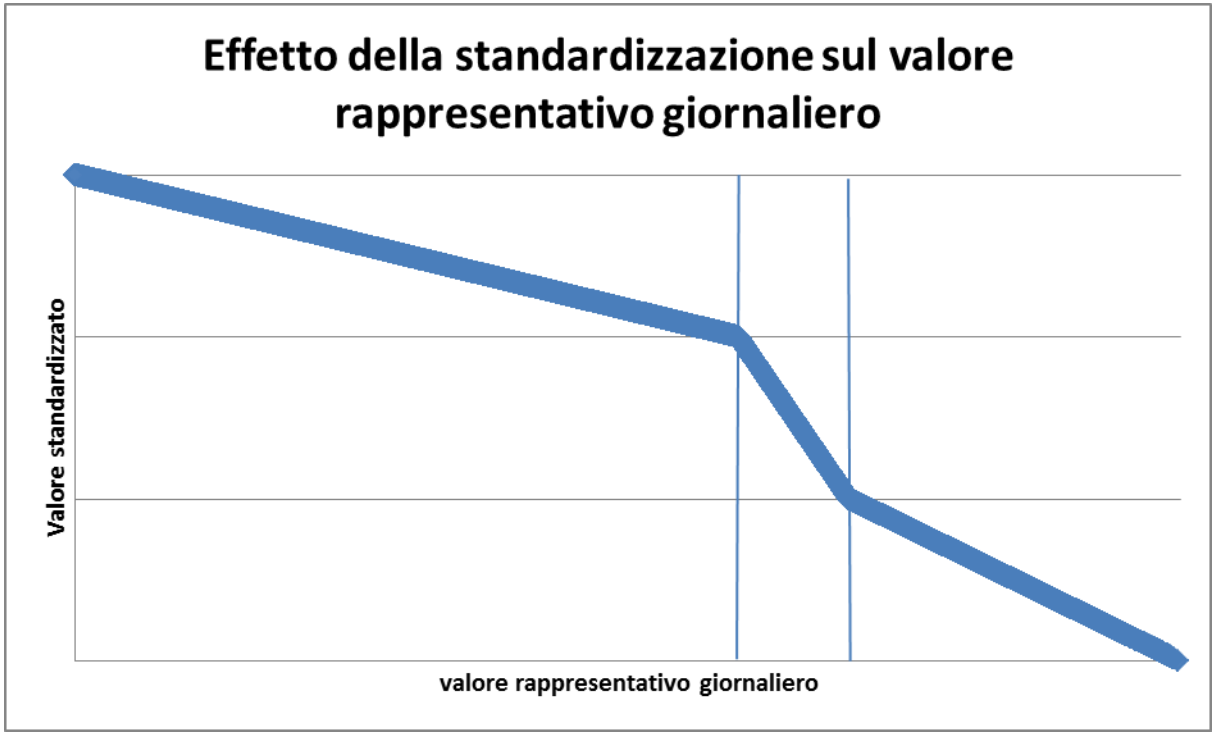
Applicazione della funzione lineare a tratti



Standardizzazione per il tipo di relazione diretta

METODO DI CALCOLO – FASE 1

Applicazione della funzione lineare a tratti



Standardizzazione per il tipo di relazione inversa

METODO DI CALCOLO – FASE 1

Da questo punto in poi si lavora con valori confrontabili

ELABORAZIONE DEI DATI

Calcolo di un **valore standardizzato aggregato**

Tipologia a e b – medie aziendali ponderate

Tipologia c – percentuale

METODO DI CALCOLO – FASE 1

Valore standardizzato aggregato

Medie aziendali ponderate con la numerosità di ciascuna razza

Percentuale dei capi che raggiungono il livello di allarme

METODO DI CALCOLO – FASE 1

Valore standardizzato aggregato

ELABORAZIONE DEI DATI

Calcolo dell'**indicatore semplice**

1 - Classificazione dell'azienda in base al valore standardizzato aggregato

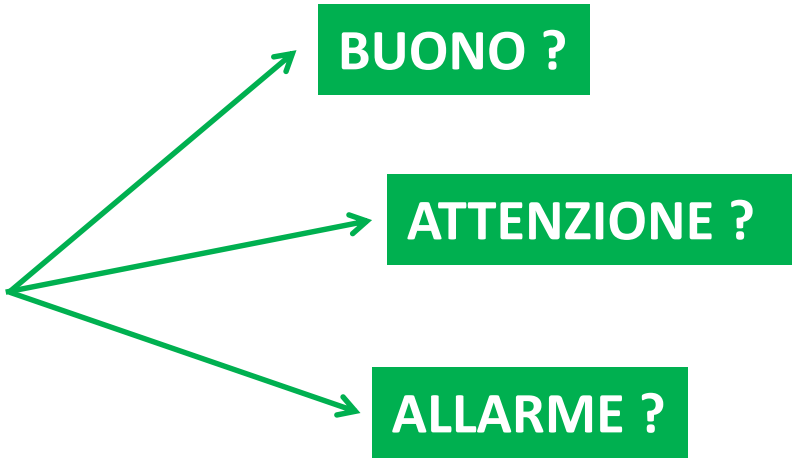
2 - Ridefinizione numerica dell'indicatore

METODO DI CALCOLO – FASE 1

Indicatore semplice di benessere

Classificazione dell'azienda:

ASSEGNAZIONE AZIENDA ALLA CLASSE DI BENESSERE CORRISPONDENTE



Per ciascun parametro relativamente al giorno di rilevamento

METODO DI CALCOLO – FASE 1

Indicatore semplice di benessere

Assegnazione del valore numerico all'indicatore:

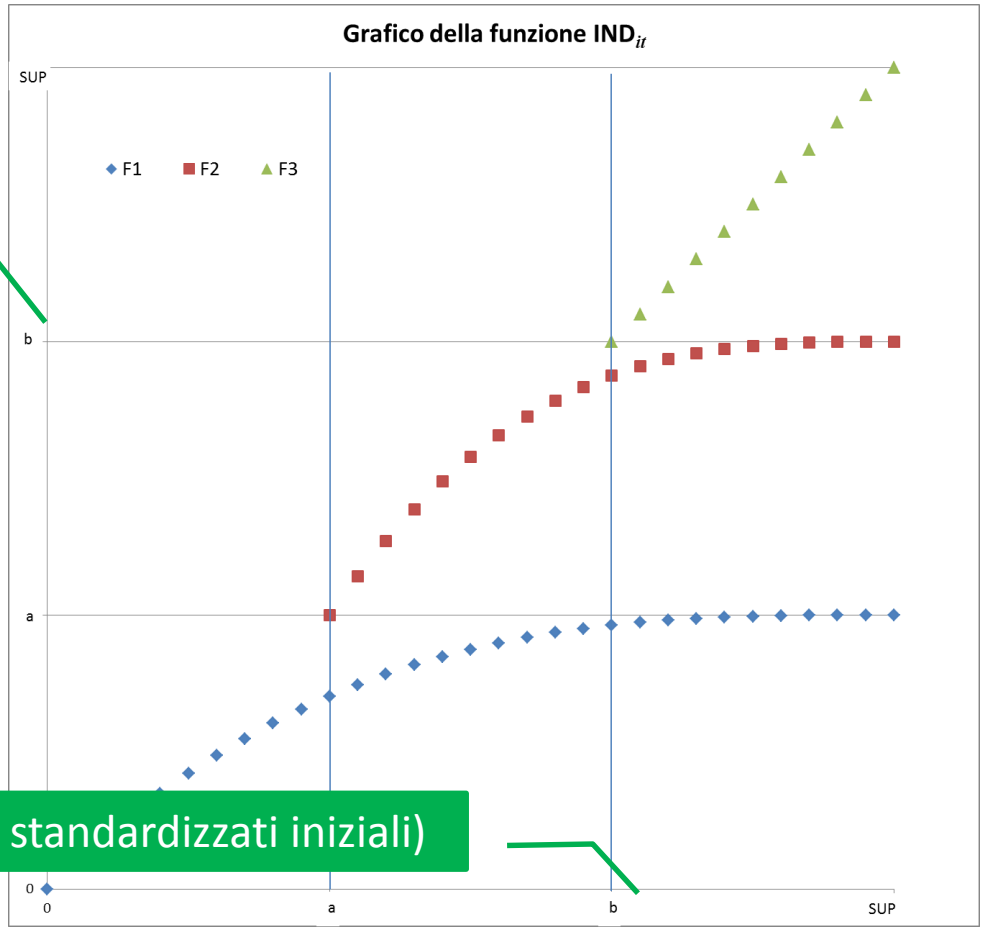
1. un valore all'interno dell'intervallo corrispondente alla classe di benessere aziendale
2. un valore dipendente dai valori standardizzati iniziali

Per ciascun parametro relativamente al giorno di rilevamento

METODO DI CALCOLO – FASE 1

Indicatore semplice di benessere

Valore dell'indicatore semplice



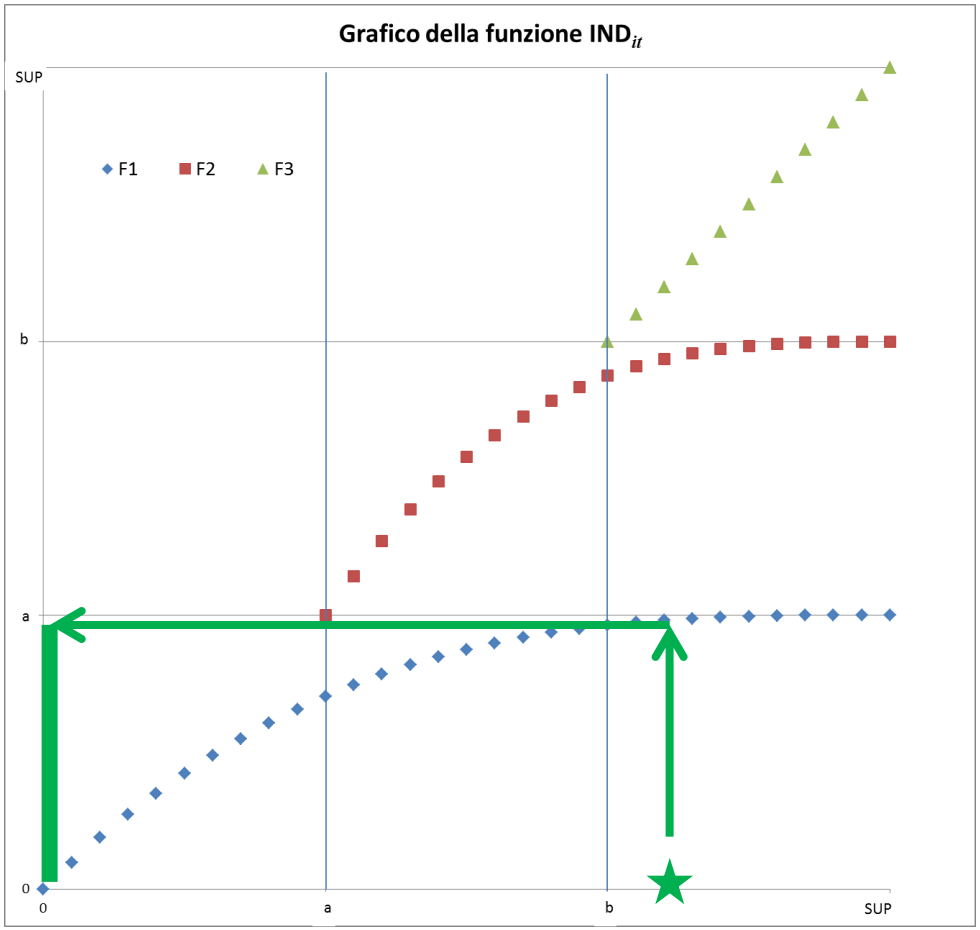
Per ciascun parametro relativamente al giorno di rilevamento

Max (valori standardizzati iniziali)

METODO DI CALCOLO – FASE 1

Indicatore semplice di benessere

Es.: CELLULE SOMATICHE
Azienda classificata **BUONA**



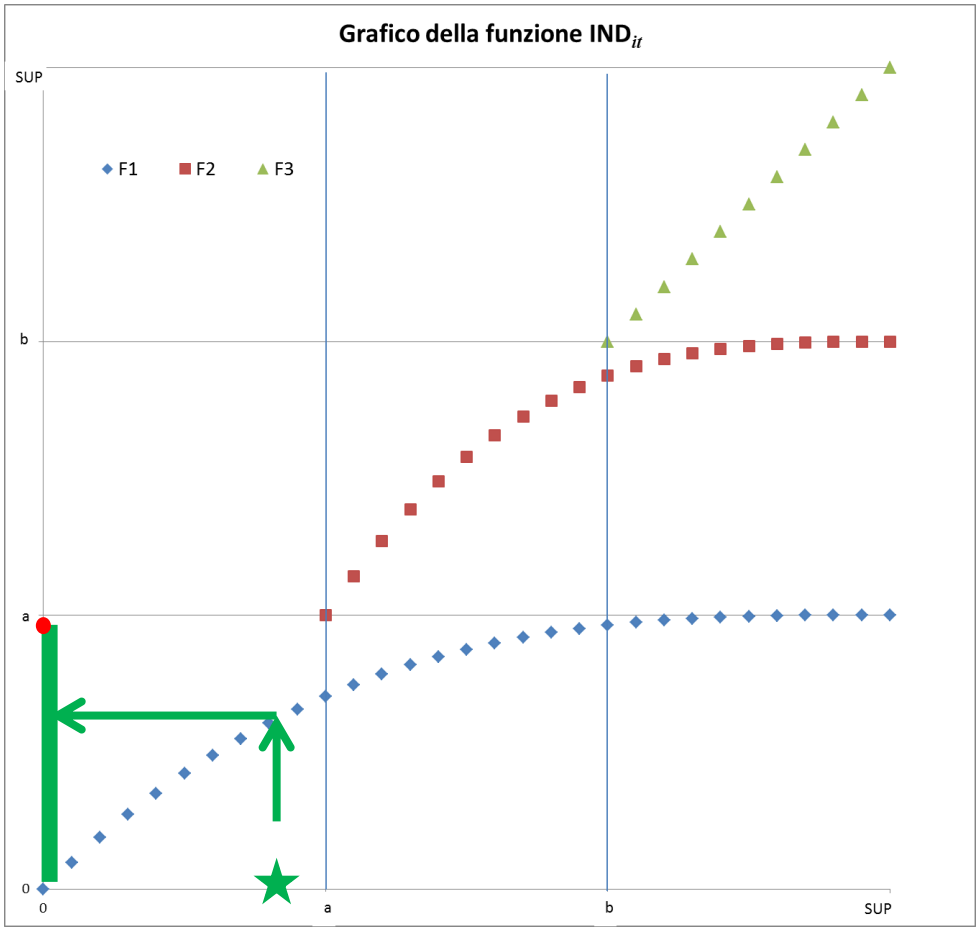
IND*it*

Per ciascun parametro relativamente al giorno di rilevamento

METODO DI CALCOLO – FASE 1

Indicatore semplice di benessere

Es.: CELLULE SOMATICHE
Azienda classificata **BUONA**



IND*it*

Per ciascun parametro relativamente al giorno di rilevamento

METODO DI CALCOLO – FASE 2

Indicatore semplice di benessere:

Un indicatore per ogni parametro e per ogni giorno di rilevazione

Indicatore semplice di benessere su lungo periodo:

media aritmetica degli indicatori semplici calcolati nel periodo voluto

METODO DI CALCOLO – FASE 3

AGGREGAZIONE DEGLI INDICATORI SEMPLICI SU LUNGO PERIODO

INDICATORE GLOBALE

METODO DI CALCOLO – FASE 3

INDICATORE GLOBALE

Conteggio degli indicatori che ricadono nelle varie classi di benessere

Esprime in forma sintetica il livello di rischio benessere animale aziendale sul periodo prescelto relativamente all'insieme dei parametri presi in esame

METODO DI CALCOLO – FASE 3

INDICATORE GLOBALE

Es: 5 indicatori - 3 classi di benessere

3 indicatori classe BUONO

2 indicatori classe ATTENZIONE

0 indicatori classe ALLARME

Valore dell'indicatore Globale:

023

METODO DI CALCOLO

Applicazione ai dati dei controlli funzionali

5 indicatori: DIM – PAR – SCC – KET – ACI

3 livelli di benessere:

BUONO	0 – 10
SUFFICIENTE	10 – 20
A RISCHIO	20 – 30

Indicatori	
DIM	Indicatore di regolarità riproduttiva
PAR	Indicatore di longevità
SCC	Indicatore di disturbi della mammella
KET	Indicatore di rischio di chetosi subclinica
ACI	Indicatore di rischio di acidosi subclinica

INDICATORE GLOBALE

Caso reale 1

BA01 - Monitoraggio rischio benessere animale

ANNO 2015								
INDICATORI MENSILI								
Mesi	Controllo	Sog. Pres.	Sog. Cont.	DIM	PAR	SCC	KET	ACI
gen	29-01-2015	182	156	13,22	17,74	30,00	9,92	9,81
feb								
mar	05-03-2015	185	164	17,12	17,82	24,96	9,92	9,68
apr	07-04-2015	184	161	18,00	18,30	22,32	9,94	9,78
mag	12-05-2015	181	155	18,86	18,26	30,00	9,94	9,75
giu	22-06-2015	170	151	19,92	18,01	24,50	9,94	9,79
lug	24-07-2015	162	139	19,71	18,32	20,72	9,94	9,80
ago								
set	04-09-2015	160	137	22,38	18,34	25,08	9,94	9,69
ott	13-10-2015	159	133	18,35	18,12	19,58	9,96	9,81
nov	16-11-2015	159	120	20,38	18,09	22,81	9,96	9,76
dic	21-12-2015	162	129	18,50	17,99	12,95	9,96	9,81

ANNO 2016								
INDICATORI MENSILI								
Controllo	Sog. Pres.	Sog. Cont.	DIM	PAR	SCC	KET	ACI	
26-01-2016	152	138	18,54	17,52	20,47	9,97	9,67	
02-03-2016	150	139	21,35	17,51	20,39	9,97	9,80	
07-04-2016	160	141	18,38	17,71	20,00	9,97	9,76	
13-05-2016	171	138	16,97	18,46	19,38	9,97	9,79	
17-06-2016	174	143	15,99	18,46	22,00	9,97	9,80	
25-07-2016	196	162	13,06	18,75	23,02	9,97	9,74	
26-09-2016	191	169	12,65	18,73	24,82	9,97	9,78	
09-11-2016	192	164	17,55	20,43	24,47	9,96	9,66	
16-12-2016	203	176	11,53	20,46	24,45	9,96	9,77	

INDICATORI ANNUALI							
Num. Cf	Sog. Pre.	Sog. Cnt	DIM	PAR	SCC	KET	ACI
10	170	144	18,64	18,10	23,29	9,94	9,77

INDICATORI ANNUALI							
Num. Cf	Sog. Pre.	Sog. Cnt	DIM	PAR	SCC	KET	ACI
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INDICATORE GLOBALE
122
Livello di benessere a Rischio

INDICATORE GLOBALE
122
Livello di benessere a Rischio

Legenda

Indicatori

- **DIM** Indicatore di regolarità riproduttiva
- **PAR** Indicatore di longevità
- **SCC** Indicatore di disturbi della mammella
- **KET** Indicatore di rischio di chetosi subclinica
- **ACI** Indicatore di rischio di acidosi subclinica

Interpretazione dei valori degli indicatori

- 20-30 = a Rischio
- 10-20 = Sufficiente
- 0-10 = Buono

Interpretazione dell'Indicatore Globale

0 0 0

numero di indicatori che ricadono nella classe buona

numero di indicatori che ricadono nella classe sufficiente

numero di indicatori che ricadono nella classe a rischio

es. **005** migliore condizione di benessere
500 peggiore condizione di benessere

INDICATORE GLOBALE

Caso reale 1

INDICATORI ANNUALI							
Num. Cf	Sog. Pre.	Sog. Cnt	DIM	PAR	SCC	KET	ACI
10	170	144	18,64	18,10	23,29	9,94	9,77

INDICATORE GLOBALE
122
Livello di benessere a Rischio

INDICATORI ANNUALI							
Num. Cf	Sog. Pre.	Sog. Cnt	DIM	PAR	SCC	KET	ACI
9	176	152	16,22	18,67	22,11	9,97	9,75

INDICATORE GLOBALE
122
Livello di benessere a Rischio

BUONO	0 – 10
SUFFICIENTE	10 – 20
A RISCHIO	20 – 30

INDICATORE GLOBALE

Caso reale 1

	ANNO 2015							
	INDICATORI MENSILI							
Mesi	Controllo	Sog. Pres.	Sog. Cont.	DIM	PAR	SCC	KET	ACI
gen	29-01-2015	182	156	13,22	17,74	30,00	9,92	9,81
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	ANNO 2016							
	INDICATORI MENSILI							
	Controllo	Sog. Pres.	Sog. Cont.	DIM	PAR	SCC	KET	ACI
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122

BUONO	0 – 10
SUFFICIENTE	10 – 20
A RISCHIO	20 – 30

INDICATORE GLOBALE

Caso reale 2

	ANNO 2015							
	INDICATORI MENSILI							
Mesi	Controllo	Sog. Pres.	Sog. Cont.	DIM	PAR	SCC	KET	ACI
gen	09-01-2015	178	149	17,40	22,00	9,00	9,93	9,80
feb	16-02-2015	177	22	17,64	22,00	19,32	9,93	9,63
mar	23-03-2015	179	141	19,54	22,00	9,88	9,93	9,72
apr	27-04-2015	182	159	19,99	25,00	5,23	9,96	9,77
mag	29-05-2015	185	159	20,00	19,84	6,91	9,93	6,92
giu								
lug	03-07-2015	191	165	20,00	19,84	18,17	9,93	9,77
ago								
set	07-09-2015	187	155	30,00	19,84	6,07	9,96	9,77
ott	14-10-2015	180	149	30,00	19,84	5,02	9,96	9,73
nov	27-11-2015	177	153	21,31	19,47	10,31	9,96	9,81
dic								

	ANNO 2016							
	INDICATORI MENSILI							
Controllo	Sog. Pres.	Sog. Cont.	DIM	PAR	SCC	KET	ACI	
04-01-2016	174	136	20,44	18,06	4,11	9,96	9,77	
12-02-2016	173	144	17,90	17,99	5,81	9,96	9,80	
22-03-2016	176	153	17,27	18,04	19,90	9,96	9,72	
26-04-2016	172	150	20,46	18,17	5,55	9,96	9,80	
31-05-2016	176	142	18,67	18,32	11,91	9,96	6,86	
07-07-2016	178	143	21,80	18,33	11,91	25,13	9,72	
02-09-2016	178	139	23,53	17,90	20,87	25,13	9,65	
07-10-2016	182	139	17,19	17,93	22,10	24,50	9,69	
15-11-2016	177	144	19,16	17,87	15,04	9,94	9,65	
22-12-2016	182	140	9,98	17,74	5,22	9,95	9,66	

INDICATORI ANNUALI							
Num. Cf	Sog. Pre.	Sog. Cnt	DIM	PAR	SCC	KET	ACI
9	181	139	21,76	21,09	9,99	9,94	9,44

INDICATORI ANNUALI							
Num. Cf	Sog. Pre.	Sog. Cnt	DIM	PAR	SCC	KET	ACI
10	176	143	18,64	18,04	12,24	14,45	9,43

INDICATORE GLOBALE
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Livello di benessere a Rischio

INDICATORE GLOBALE
041
Livello di benessere Sufficiente

INDICATORE GLOBALE

Caso reale 3

	ANNO 2015							
	INDICATORI MENSILI							
Mesi	Controllo	Sog. Pres.	Sog. Cont.	DIM	PAR	SCC	KET	ACI
gen	01-01-2015	33	24	20,00	18,75	19,91	9,77	6,94
feb	02-02-2015	36	32	20,00	18,75	26,36	9,95	6,86
mar	04-03-2015	36	32	14,89	18,75	20,82	9,95	6,52
apr	03-04-2015	36	29	12,60	18,75	5,65	9,95	6,71
mag	04-05-2015	34	29	15,56	18,75	28,13	9,79	9,72
giu	01-06-2015	33	30	17,59	18,75	5,36	9,79	6,86
lug	02-07-2015	33	29	16,45	16,53	6,67	9,79	6,97
ago								
set	01-09-2015	33	27	17,51	15,78	21,46	9,79	6,53
ott	05-10-2015	33	28	21,52	15,23	5,99	9,79	6,47
nov	05-11-2015	31	27	20,82	15,50	22,31	9,79	6,79
dic	03-12-2015	31	25	20,75	15,19	21,41	9,79	6,82

	ANNO 2016							
	INDICATORI MENSILI							
	Controllo	Sog. Pres.	Sog. Cont.	DIM	PAR	SCC	KET	ACI
gen	18-01-2016	31	28	20,65	14,21	5,44	9,79	9,75
feb	15-02-2016	31	29	19,61	15,19	13,28	23,25	6,74
mar	18-03-2016	31	28	19,98	15,50	5,70	23,25	6,95
apr	14-04-2016	31	28	20,00	15,19	23,28	23,25	9,72
mag	13-05-2016	32	27	20,00	15,64	20,72	23,25	7,02
giu	14-06-2016	33	28	20,00	15,23	26,95	23,25	6,91
lug	15-07-2016	35	31	20,00	15,53	18,92	9,89	6,82
ago								
set	15-09-2016	36	28	17,11	15,15	17,15	9,89	6,90
ott	18-10-2016	35	26	12,82	14,99	21,68	9,89	6,72
nov	18-11-2016	35	28	7,02	14,12	24,23	9,89	6,50
dic	15-12-2016	36	31	6,96	13,06	20,55	9,89	6,81

INDICATORI ANNUALI							
Num. Cf	Sog. Pre.	Sog. Cnt	DIM	PAR	SCC	KET	ACI
11	33	28	17,97	17,34	16,73	9,83	7,02

INDICATORI ANNUALI							
Num. Cf	Sog. Pre.	Sog. Cnt	DIM	PAR	SCC	KET	ACI
11	33	28	16,74	14,89	17,99	15,95	7,35

INDICATORE GLOBALE
032
Livello di benessere Sufficiente

INDICATORE GLOBALE
041
Livello di benessere Sufficiente

INDICATORE GLOBALE

Caso reale 4

	ANNO 2015							
	INDICATORI MENSILI							
Mesi	Controllo	Sog. Pres.	Sog. Cont.	DIM	PAR	SCC	KET	ACI
gen	02-01-2015	45	37	18,61	12,71	6,70	9,95	6,90
feb	05-02-2015	46	37	23,09	14,53	26,93	9,87	6,78
mar	07-03-2015	43	32	26,94	14,88	3,90	9,87	21,97
apr	03-04-2015	44	35	30,00	14,88	18,92	9,87	6,85
mag	05-05-2015	43	33	30,00	14,88	28,73	9,87	6,71
giu	01-06-2015	43	32	30,00	14,88	6,54	9,87	9,79
lug	03-07-2015	42	33	30,00	17,04	22,05	9,87	21,45
ago								
set	04-09-2015	42	30	26,85	14,21	25,01	9,87	9,66
ott	05-10-2015	44	35	13,91	12,97	19,04	9,87	9,77
nov	11-11-2015	44	40	14,42	11,43	14,96	9,87	9,79
dic	07-12-2015	44	37	7,22	11,43	14,54	9,74	9,68

	ANNO 2016							
	INDICATORI MENSILI							
Mesi	Controllo	Sog. Pres.	Sog. Cont.	DIM	PAR	SCC	KET	ACI
gen	25-01-2016	47	40	11,16	11,43	17,31	9,74	9,80
feb	26-02-2016	50	46	11,04	7,04	16,42	9,74	9,79
mar	31-03-2016	53	50	15,15	12,49	18,98	9,74	6,79
apr								
mag	02-05-2016	54	51	18,78	15,78	6,39	9,74	9,71
giu	01-06-2016	56	49	19,23	16,68	4,37	9,74	9,80
lug	01-07-2016	58	47	23,35	17,34	6,95	9,74	9,75
ago								
set	02-09-2016	56	40	19,22	15,78	14,25	9,69	9,72
ott	03-10-2016	57	41	19,74	14,46	4,82	9,69	21,93
nov	02-11-2016	59	47	19,51	14,88	17,17	9,69	9,76
dic	02-12-2016	56	44	18,56	15,78	6,65	9,69	21,41

INDICATORI ANNUALI							
Num. Cf	Sog. Pre.	Sog. Cnt	DIM	PAR	SCC	KET	ACI
11	43	34	22,82	13,99	17,03	9,87	10,85

INDICATORI ANNUALI							
Num. Cf	Sog. Pre.	Sog. Cnt	DIM	PAR	SCC	KET	ACI
10	54	45	17,57	14,17	11,33	9,72	11,85

INDICATORE GLOBALE
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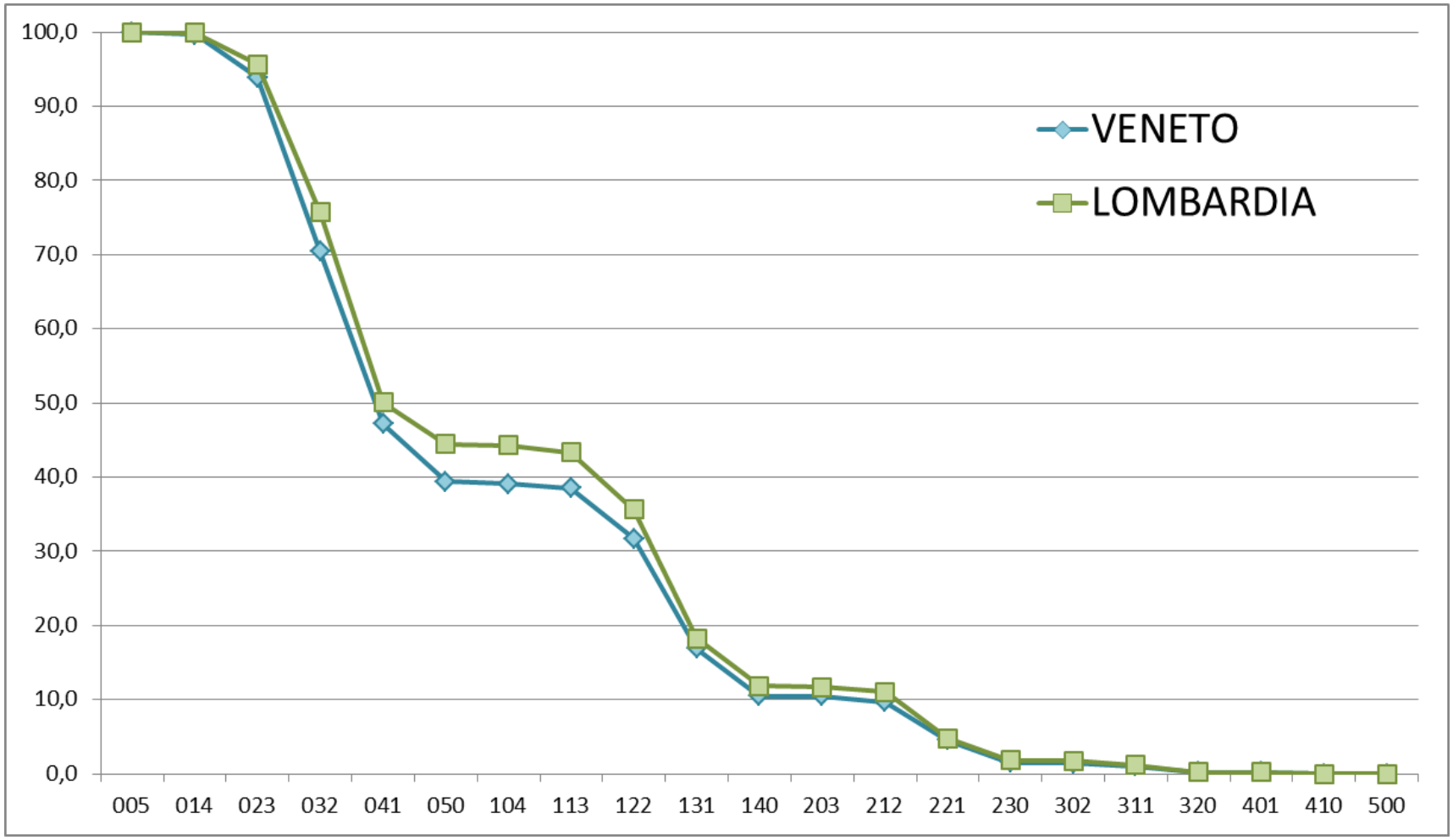
Livello di benessere a Rischio

INDICATORE GLOBALE
041
Livello di benessere Sufficiente

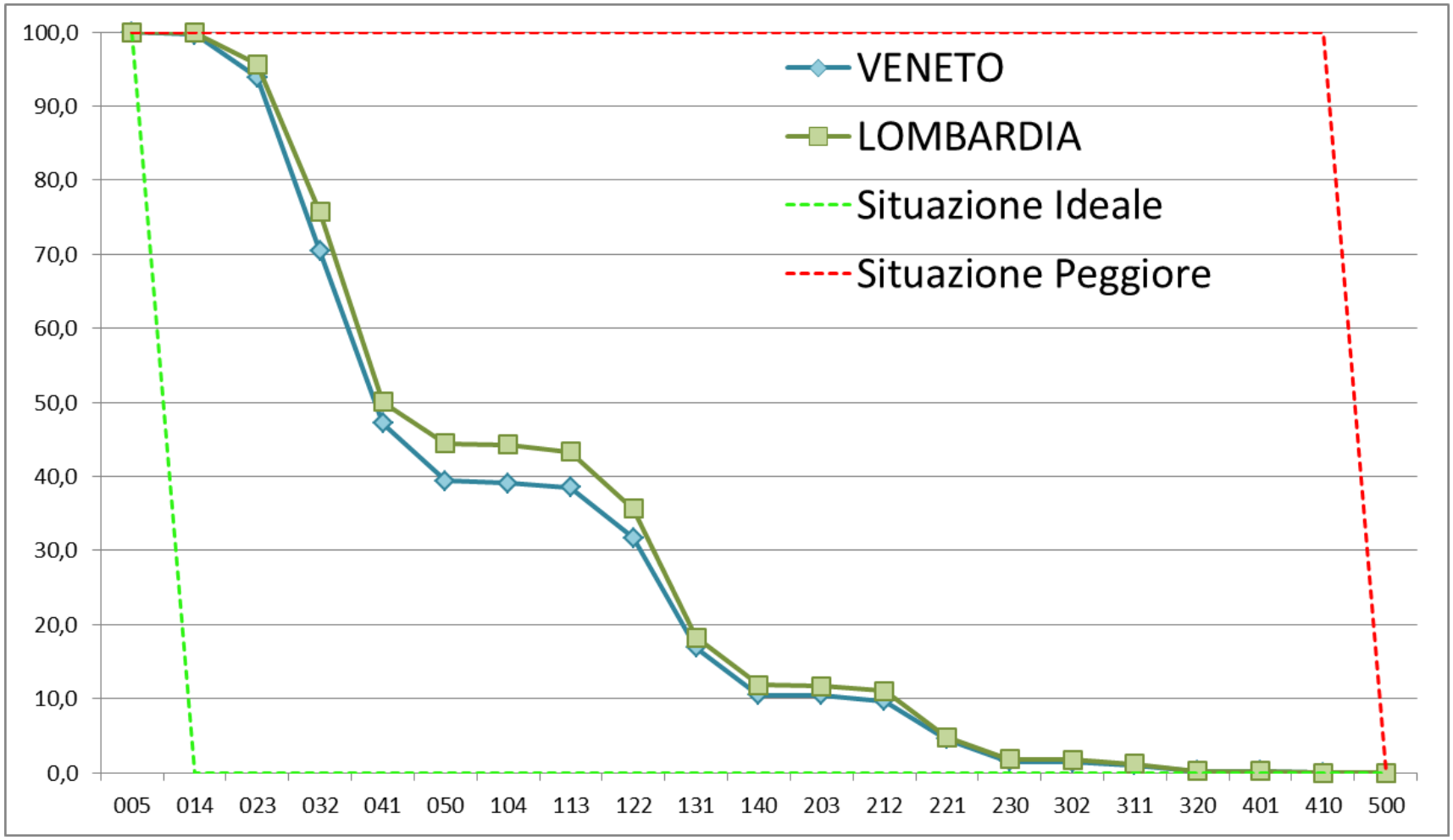
INDICATORE GLOBALE

Confronto Veneto Lombardia



INDICATORE GLOBALE

Confronto Veneto Lombardia



METODO DI CALCOLO – FASE 3

INDICATORE GLOBALE

Si basa sui dati dei controlli funzionali

EFSA Panel on Animal Health and Welfare (AHAW) "Scientific Opinion Statement on the use of animal-based measures to assess the welfare of animals", (EFSA Journal 2012; 10(6):2767)

«La determinazione del livello di benessere animale generale di un allevamento richiede che l'osservazione degli animali debba essere supportata dalla registrazione delle performances produttive, riproduttive e sanitarie. Ciò è necessario in quanto non è possibile ottenere una indicazione sufficiente del benessere e della qualità dell'allevamento da osservazioni fatte in una breve visita.»

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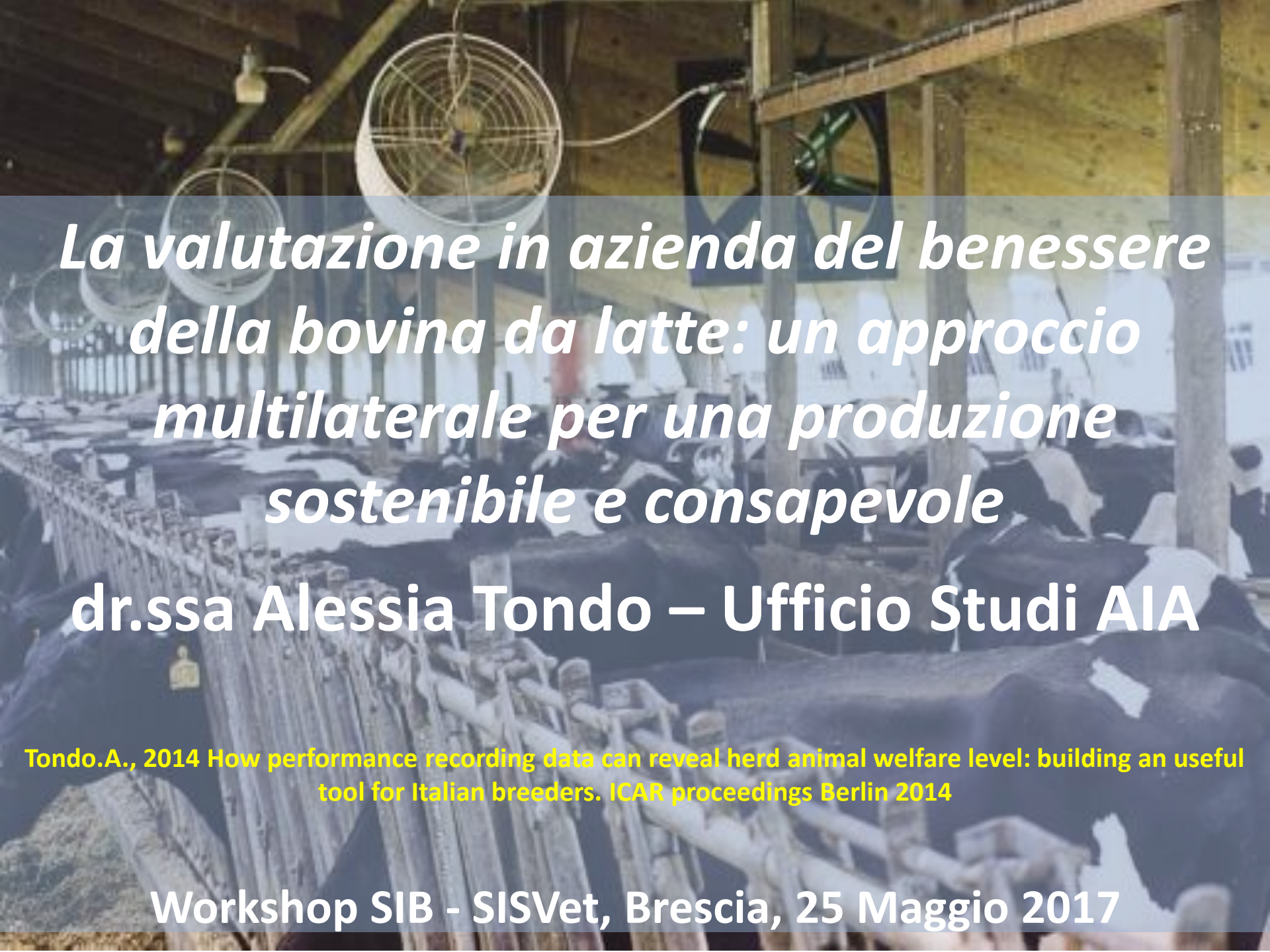
«La determinazione del livello di benessere animale generale di un allevamento richiede che l'osservazione degli animali debba essere supportata dalla registrazione delle performances produttive, riproduttive e sanitarie. Ciò è necessario in quanto non è possibile ottenere una indicazione sufficiente del benessere e della qualità dell'allevamento da osservazioni fatte in una breve visita.»



La valutazione in azienda del benessere della bovina da latte: un approccio multilaterale per una produzione sostenibile e consapevole

dr.ssa Alessia Tondo – Ufficio Studi AIA

Tondo.A., 2014 How performance recording data can reveal herd animal welfare level: building an useful tool for Italian breeders. ICAR proceedings Berlin 2014

Workshop SIB - SISVet, Brescia, 25 Maggio 2017

Workshop SIB-SISVet

"La valutazione in azienda del benessere della bovina da latte "

Sistema Diagnostico Integrato Benessere (SDIB / IDSW): valutare il benessere per migliorare la gestione delle bovine

Erminio Trevisi

Michele Premi, Luigi Calamari

Istituto di Zootecnica,
Facoltà di Scienze Agrarie, Alimentari e Ambientali
Università Cattolica S. Cuore
erminio.trevisi@unicatt.it

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Summary

- **Foreword:**
  - ANIMAL WELFARE (AW) in breeding: obligation, necessity or responsibility?
  - AW: definition (adaptation) and measurement
- **The model SDIB / IDSW:**
  - How does it work
  - Validation
  - Working on the farm
- **Final remarks**

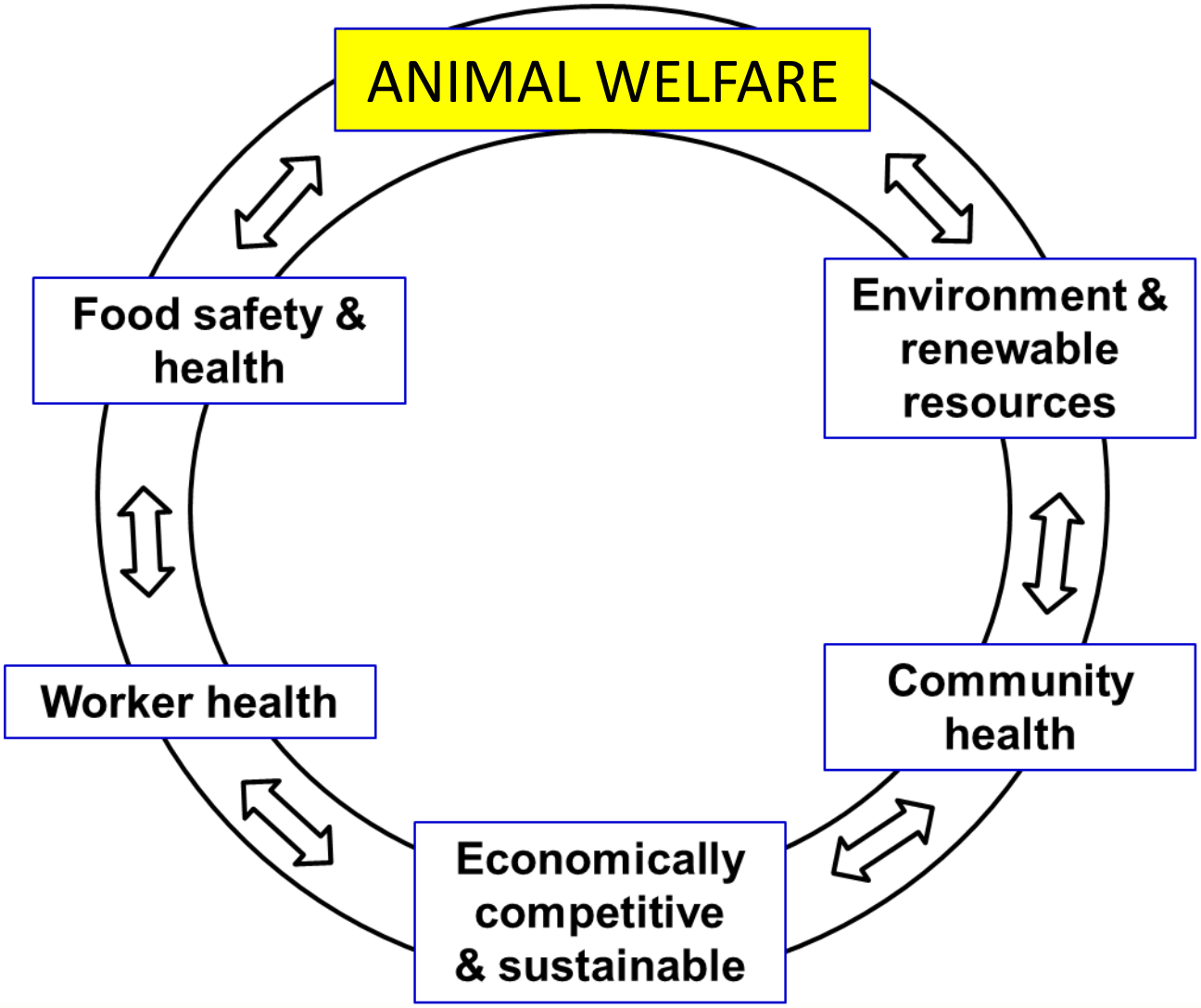
AW: the context

"Man has dominion over the animals whether we like it or not. Wherever we share space on the planet, and this includes all but the most inaccessible regions of land sea and air, it is we, no they that determine where and how they will live.
We may elect to put hens in a battery cage or establish a game reserve to preserve the tiger but in each case the decision is ours, no theirs. We make a pet of the hamster but poison the rat. These are very human decision … they reflect our own will to survive, … .
It is impossible, however, to avoid the issue that both the chicken and the tiger are living on our terms"

Webster, 1994

AW is essential in breeding systems

The **Animal Welfare** is essential in sustainable animal production systems, but unlikely the opinions on AW are many and different.

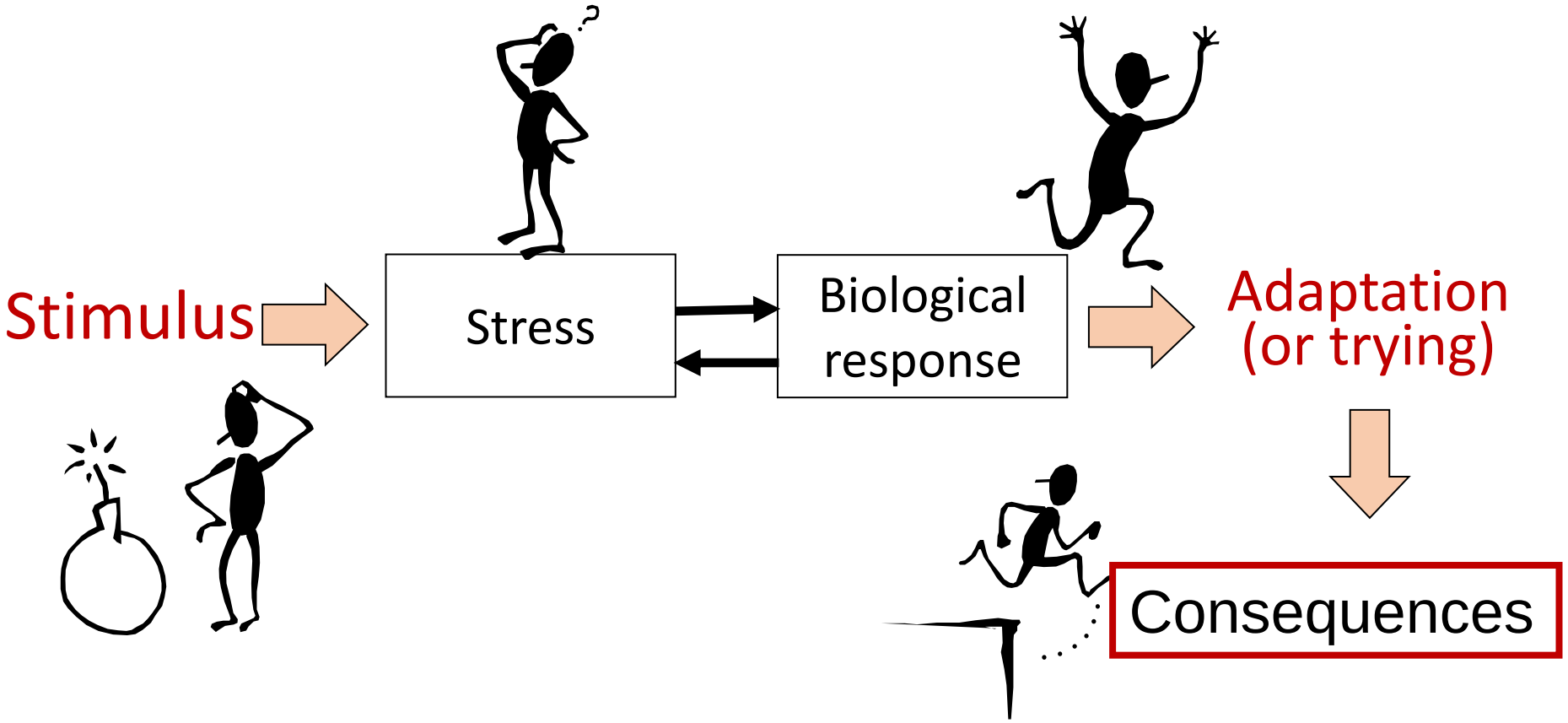


Definition of AW in breeding systems

- ✓ **5 Freedoms** use descriptive terms: appropriate, sufficient, proper, conditions, treatments.
- ✓ **5 Freedoms**, but **9 conditions**: hunger, thirst, discomfort, pain, injury, disease, expression of normal behavioral, fear, distress (*McCulloch, 2013*)
- ✓ The AW assessment must consider the condition of the body and mind (*Carenzi e Verga, 2007*)

There is an impartial and shared definition of AW?
In accordance to the definition, it is designed the AW measurement

The assessment of the AW means the measurement of the adaptability (i.e. the answer to stress)

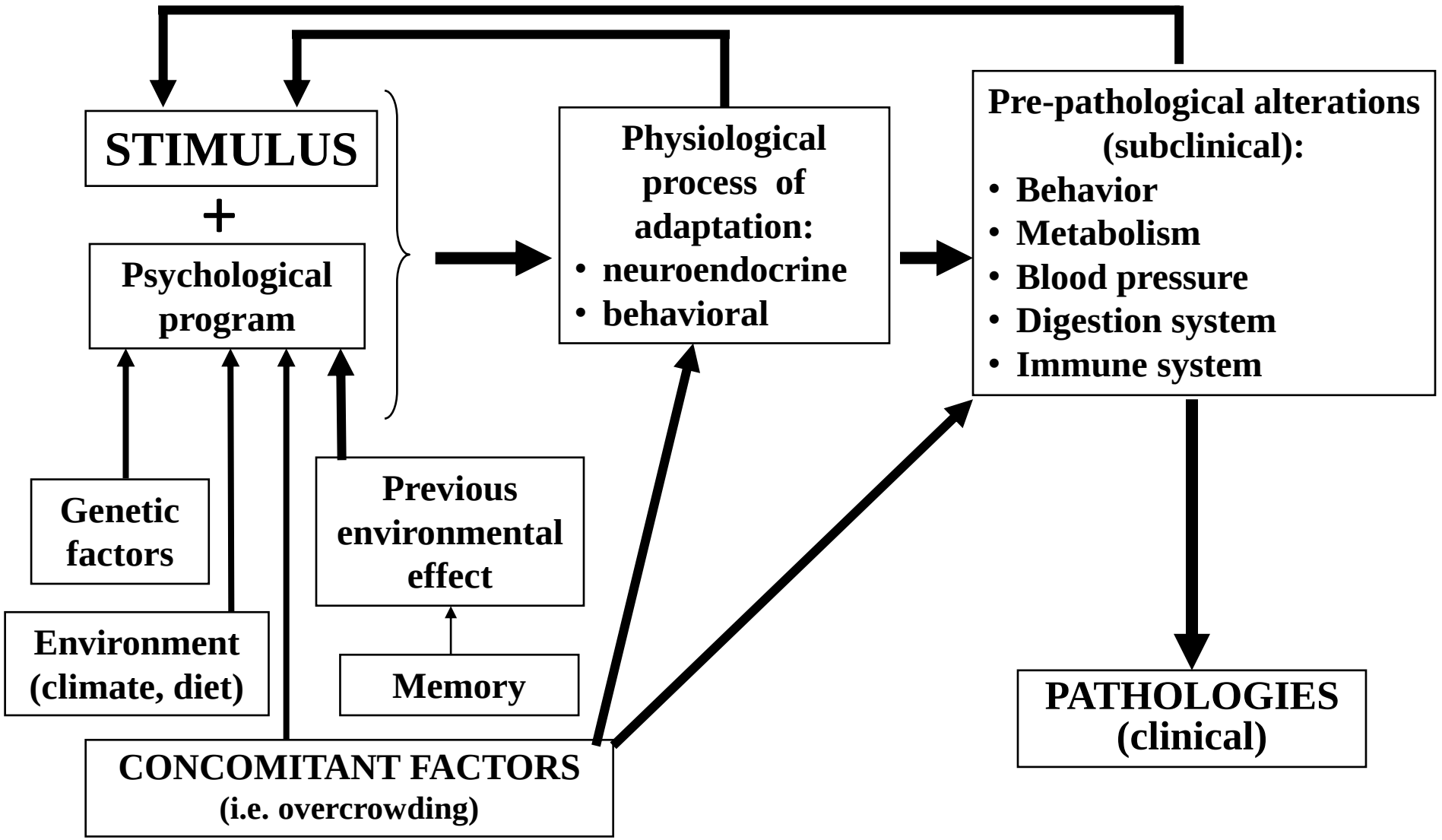


ADAPTATION: Modification of the behavior (in some extent persistent) that takes place as a result of the experience

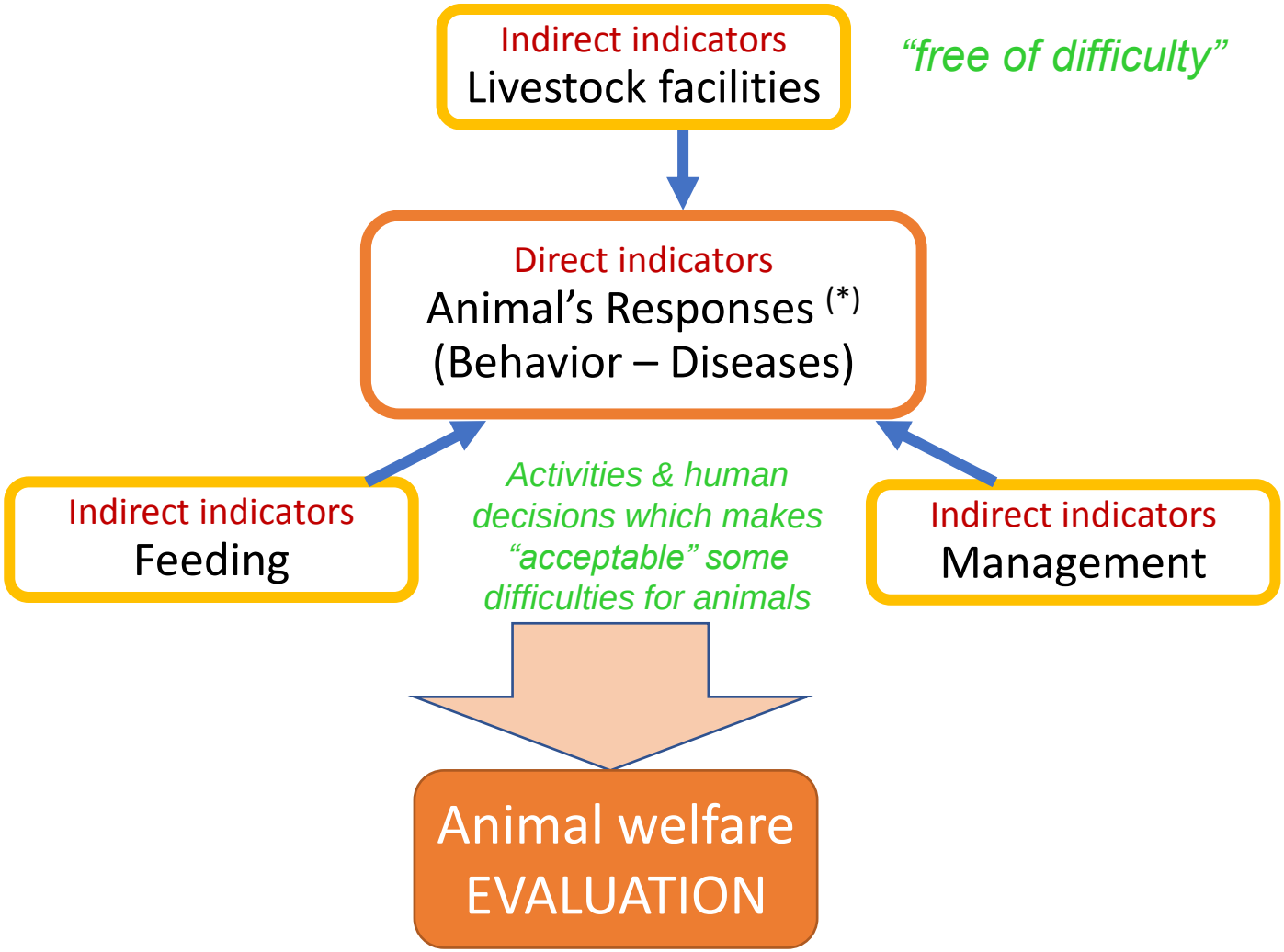
(*Hilgard et al., 1982*)

Animal "adaptability"

Consequences of stress on the immune system and the onset of pathologies (*Mormède e Dantzer, 1988; modified*).



«Components» of adaptation in livestock



(*)

PHYSIOLOGICAL
Body T°, metabolites, hormones, immunity

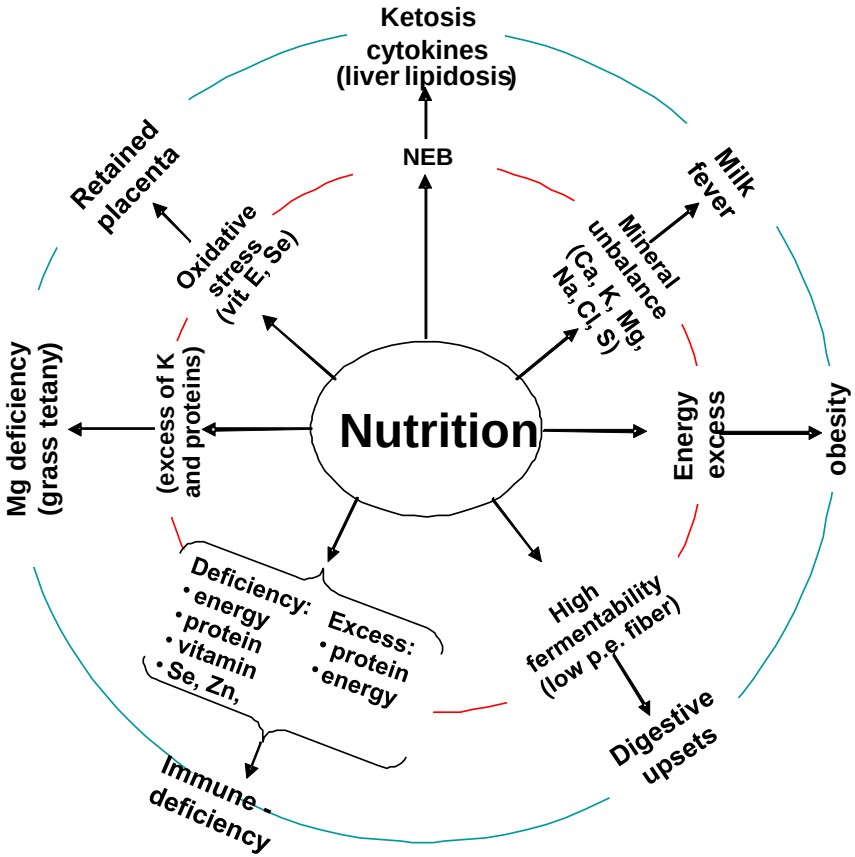
BEHAVIOURAL
Disorders, anomalies, stereotypes

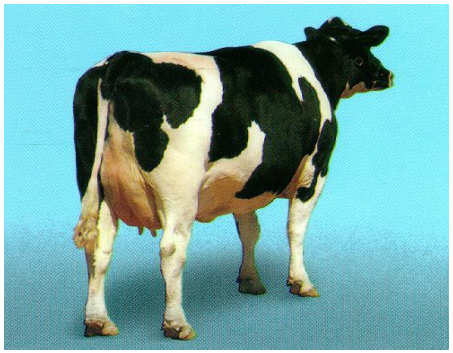
PATHOLOGICAL
Dismetabolies, viruses, parasites

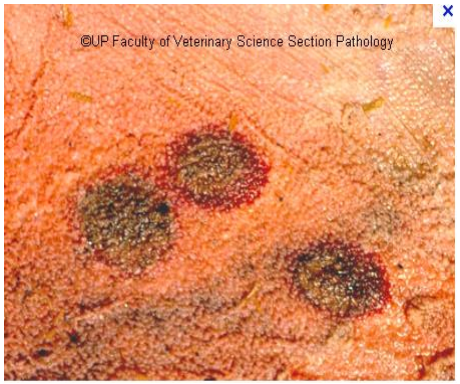
FUNCTIONAL
Milk production & composition, weight, BCS, fertility

Diet influences AW: hunger, thirst, malnutrition, pain, suffering

Fig 2: Cu deficiency in lambs. Note the characteristic position of a lamb with enzootic ataxia or swayback.







Unsuitable diets (unbalanced, contaminated feeds) impair health (↓ performance: body fitness, metabolism, immunity) and AW *(Bertoni et al., 2016)*

IDSW model

Calamari & Bertoni, IJAS 2009, 8:301-323

IDSW = Integrated Diagnostic System of Welfare

Aims:

- To assess all the items in a single examination (easy measurements)
- To standardize the assessment (objective and repeatable)
- Results help the farmer to take decisions

Clusters (3)	Environment	Feeding	Animal
Components (7)	2	2	3
Aspects (21)	6	5	10
Indicators (78)	35	15	28

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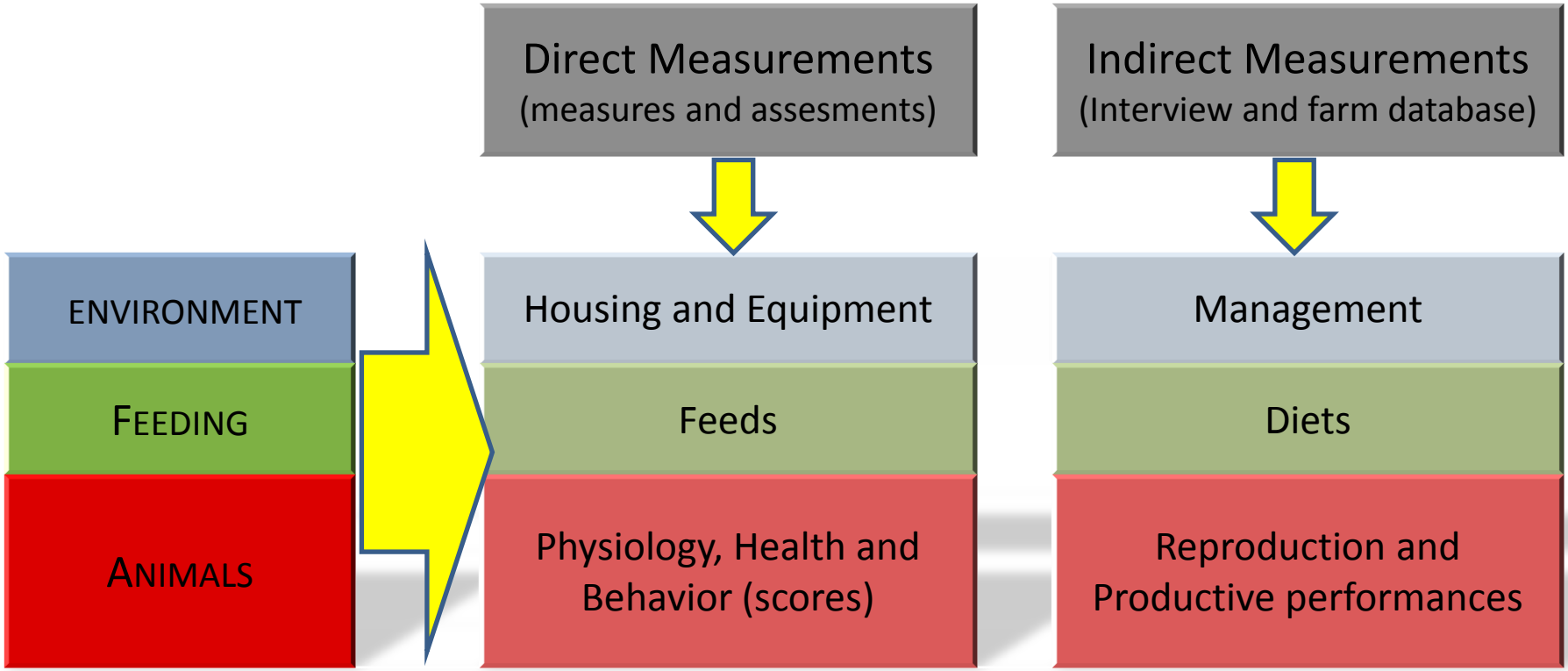
IDSW Measurements



IDSW model

Calamari & Bertoni, IJAS 2009, 8:301-323

✦ Assessment:

- **Score** of each **Indicators** = as % of the optimal condition ➔ the sum of all indicators included in the same aspect reveals the suitability of the **Aspect** itself
- **Score** of each **Aspect =** as % of the optimal condition ➔ the sum of all Aspect included in the same Component reveals the suitability of the **Component** itself
- **Score** of each **Component =** as % of the optimal condition ➔ the sum of all Component included in the same Cluster reveals the suitability of the **Cluster** itself
- **IDSW score** = sum of the 3 Clusters (in case one resulted not suitable, the herd receives a negative assessment)

Clusters	**Environment [30 %]**		**Feeding [30 %]**		**Animal [40 %]**		
Components	**[18 %]**	**[12 %]**	**[18 %]**	**[12 %]**	**[24 %]**	**[8 %]**	**[8 %]**

Cluster: Environment (30 points)

Housing & Equipment [18]				Management [12]	
Buildings [6]	Space availability [4]	Microclimatic conditions [4]	Equipment [4]	Buildings & equipment [6]	Animal management [6]
General characteristics [0.60]	Cubature (0.80)	Minimum volume ventilation [0.50]	Milking parlor (dimension) [0.60]	Feeding area hygiene [0.60]	Dry cows [1.10]
Opening for ventilation & illumination [0.66]	Area [1.60]	Winter thermal balance [0.50]	Milking parlor (adequacy) [1.20]	Resting area hygiene [2.10]	Steaming up [1.10
Floor slippering [0.78]	Resting area [1.20]	Summer thermal balance [1.50]	Water availability [0.40]	Watering system hygiene [2.10]	Calving cows [1.10]
Passage-way (availability) [0.78]	Bunk space [0.40]	Cooling systems [1.50]	Lighting [0.30]	Milking system maintenance [0.72]	Lactating cows [1.10]
Feeding area (accessibility to feed) [0.78]			Cooling system in milking parlor and waiting area [0.80]	Feeding systems maintenance [0.48]	Primiparous cows [0.25]
Resting area (type and size) [1.80]			Foot bath [0.30]		Primiparous cows [0.25]
External areas [0.60]			Enrichment [0.40]		Calves [0.85]
					Dehorning [0.25]

Cluster: Environment

I. Housing & equipment assessment:

- Facilities dimensions and characteristics
- Microclimatic conditions
- Lighting systems
- Watering systems
- Cooling devices
- Milking parlour

II. Management assessment:

- Facilities hygiene
- Watering system hygiene
- Milking system hygiene
- Milking system maintenance
- Feeding system maintenance
- Animal management

Cluster: Feeding [30 points]

Feeds [18]			Feeding [12]	
Storage [4]	Quality [10]	Supply management [4]	Before calving [5]	After calving [7]
Building and system to store silage [2.0] Building and system to store hay [1.0] Building and system to store concentrate [1.0]	Silage evaluation [4.0] Hay evaluation [4.0] Concentrate evaluation [1.0] Feed analysis [1.0]	Systems for feed distribution [2.0] TMR characteristics (physical characteristics)* [2.0] Sequence feed distribution* [2.0] * alternative scores, according to the method used for the feed distribution in the farm (TMR or traditional method).	Dry cows (DMI, energy, crude protein, vitaminic integration) [3.0] Steaming up cows (DMI, energy, crude protein, vitaminic integration) [2.0]	Early lactation (DMI, energy, crude protein, NDF, starch) [3.0] Mid lactation (DMI, energy, crude protein, NDF, starch) [2.0] Late lactation (DMI, energy, crude protein, NDF, starch) [2.0]

Cluster: Feeding

I. Feeds assessment:

- Storage procedures
- Availability (storage area commensurate to the number of bred animals)
- Quality: health and hygiene features (pathogens, mould, unusual fermentations presence) and nutritional parameters

II. Diet assessment:

- Feed management and feeding system (traditional or TMR)
- Dry period diet (DMI, energy and protein requirements addressing, close-up)
- Lactation diets (DMI, % starch and % fiber, protein fraction)




Cluster: Animal [40 points]

Physiology, health and reproduction [24]					
External aspect [5]	Gut functionality [4]	Udder [4]	Limb & Feet [4]	Reproduction [3]	Disease [4]
BCS* [2.00] Coat and coughing and/or nose mucus* [0.50] Cleanliness score* [1.50] Injuries (neck, shoulders, spinal column, pelvis, ribs)* [0.60] External parasites* [0.40]	Rumination score** [2.00] Feces score* [2.00]	Teat score** [2.00] Injuries to teats, udder and blind quarters** [0.80] SCC of bulk milk [1.20]	Foot score* [1.50] Trimming score* [1.50] Injuries to the knee, hock lesion and swollen* [1.00]	Fertility status index*** [2.40] Abortion and mortality at birth [0.60]	Retained placenta, milk fever, abomasum displacement [4.00]

* Evaluated on a representative N° of cows (dry, early & late lactating cows)

** Evaluated on a representative N° of cows (early & late lactating cows)

*** Calculated considering: culling rate, conception rate (total & at 1st insemination), calving interval

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Cluster: Animal [40 points]

Productive performances [8]		Behavior [8]	
Production [4]	Milk composition [4]	Interaction animal - human [3]	Interaction animal - environment [7]
Milk yield per lactation (4.00)	Fat content of bulk milk [3.00] Protein content of bulk milk [1.00]	Withdrawal when observer approaches the manger [0.50] Voluntary animal approach test [0.50] Avoidance test [0.50] Animal reactions to the observer inspection* [0.50] Social interactions among groups [0.50] Stereotypies [0.50]	Difficulty on get up [1.00] Cow comfort index (CCI)[1] + Stall use index (SUI)[2] + Abnormal position of animals lying in cubicle (PAC)[3] [3.2] Distribution of the animals in the pen [0.80]

* Evaluated on a representative N° of cows (dry, early & late lactating cows)

[1]**CCI** = Cow comfort index optimum > 100%
(n° cows correctly lying in cubicle / cows in cubicle) x 100

[2]**SUI** = Stall usage index optimum > 85%
(n° cows correctly lying in bedding area / cows not in manger) x 100

[3]**PAC** = Position abnormal cows optimum > 80%
(n° cows correctly lying in bedding area / total cows) x 100

Cluster: Animal

I. 6-10 cows per group:

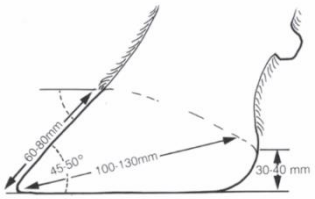
- Early lactation (20-120 DIM)
- Late lactation (>200 DIM)
- Dry period (central phase)

II. Measurements:

- Nutritional conditions BCS (*ADAS, 1987*)
- Coat, injuries and external parasites
- Lachrymation and nose mucus
- Cleanliness score *(Faye e Barnouin, 1985)*
- Arts and feet:

- Foot score (foot disease, injuries, swelling of limbs) or Locomotion score *(Sprecher, 1997)*
- Trimming score

- Teat score *(Mein e al., 2001)*



IDSW: i.e. 6 farms

Cluster	Component	Farms					
		1	2	3	4	5	6
Environmental	Housing & Equipment	78,9	73,9	75,9	73,0	67,1	77,9
	Management	68,6	67,3	61,6	65,0	50,2	74,9
	TOTAL	74,8	71,2	70,2	69,8	60,4	76,7
Feeding	Feeds	68,7	68,5	73,2	64,2	70,7	61,7
	Feeding	63,6	59,9	66,3	70,1	66,2	56,5
	TOTAL	66,7	65,1	70,4	66,6	68,9	59,6
Animal	Physiology, health and reproduction	81,6	73,3	75,5	73,8	71,4	66,3
	Productive performances	76,0	83,7	87,3	71,6	75,3	71,1
	Behavior	60,6	81,0	52,4	64,0	68,7	45,1
	TOTAL	76,3	76,9	73,3	71,4	71,6	63,0
	Total IDSW score	73,0	71,7	71,5	69,5	67,4	66,1

Component score acceptable if > 60

Cluster score acceptable if > 70

IDSW score acceptable if > 75 (or all clusters acceptable)

IDSW validation

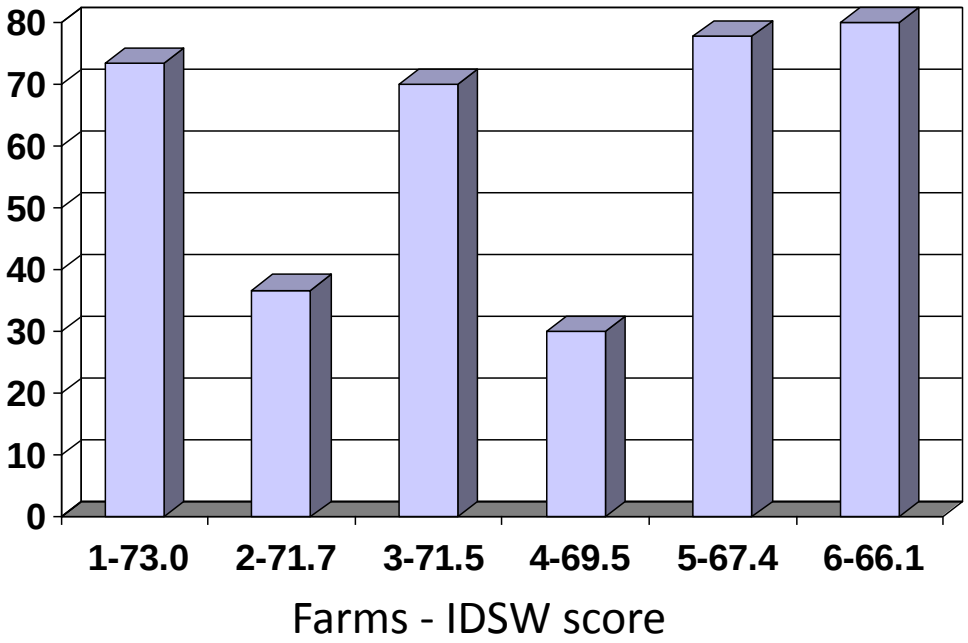
Objective data of validation could be themselves validated systems

Physiological indices of «welfare» or «adaptation»

- **Plasma Cortisol level**: i.e. % cows with basal Cortisol level > 5 ng/mL (limit of stress index)
- **Plasma K level**: i.e. % cows with K level > 3.8 mmol/L (limit of stress index)
- **Plasma APPs**: i.e. % cows with Hp > 0.2 g/L (index of antinfiammatory reactions of innate immune system)
- **PMP**: i.e. % cows with BHB level > 1.2 mmol/L (subclinical ketosis limit, but only in groups most at risk)

IDSW validation: Cortisol

% of cows with plasma Cortisol level > 5 ng/ml

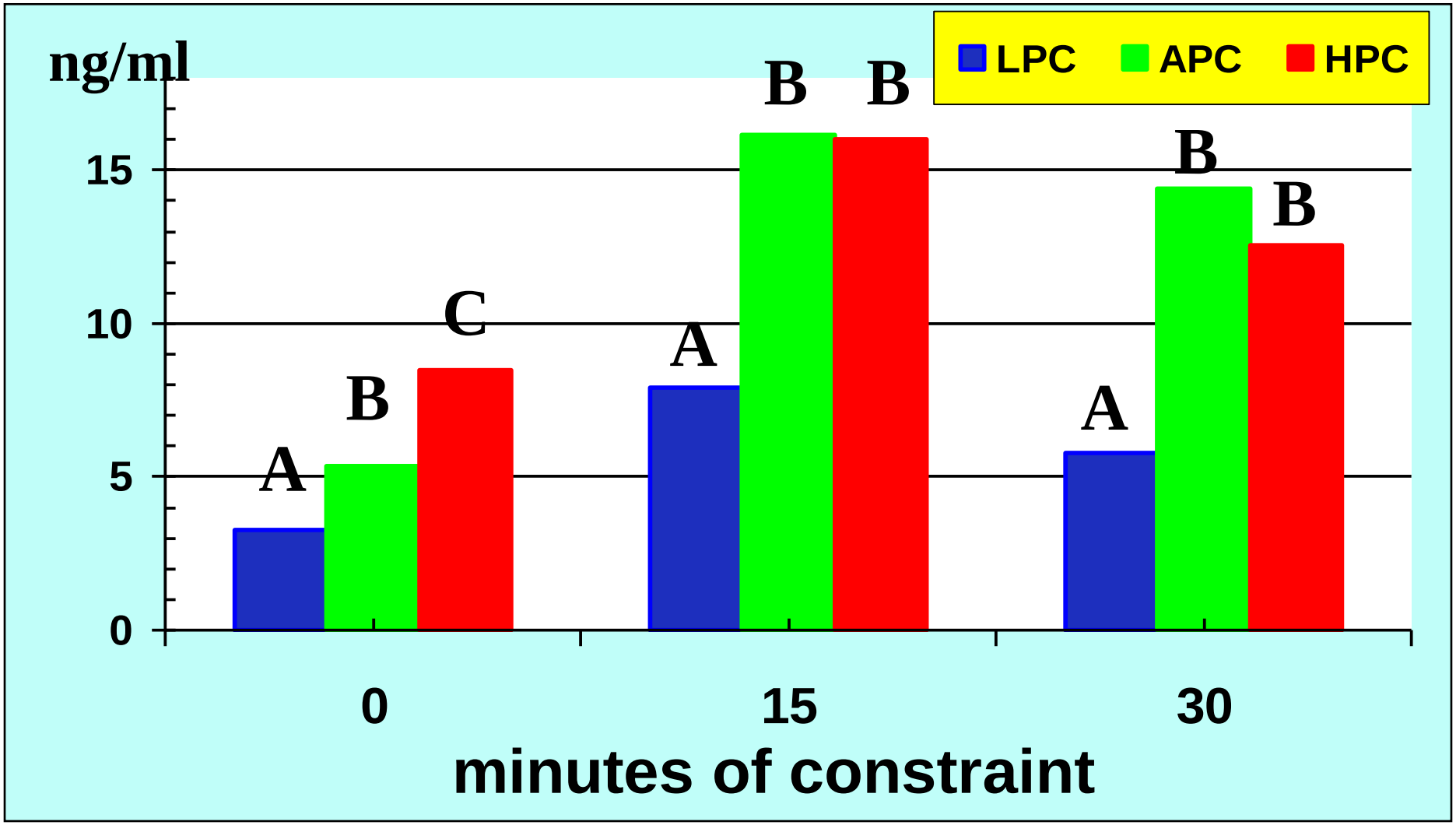


High cortisol levels are associated with stress (acute and/or chronic).

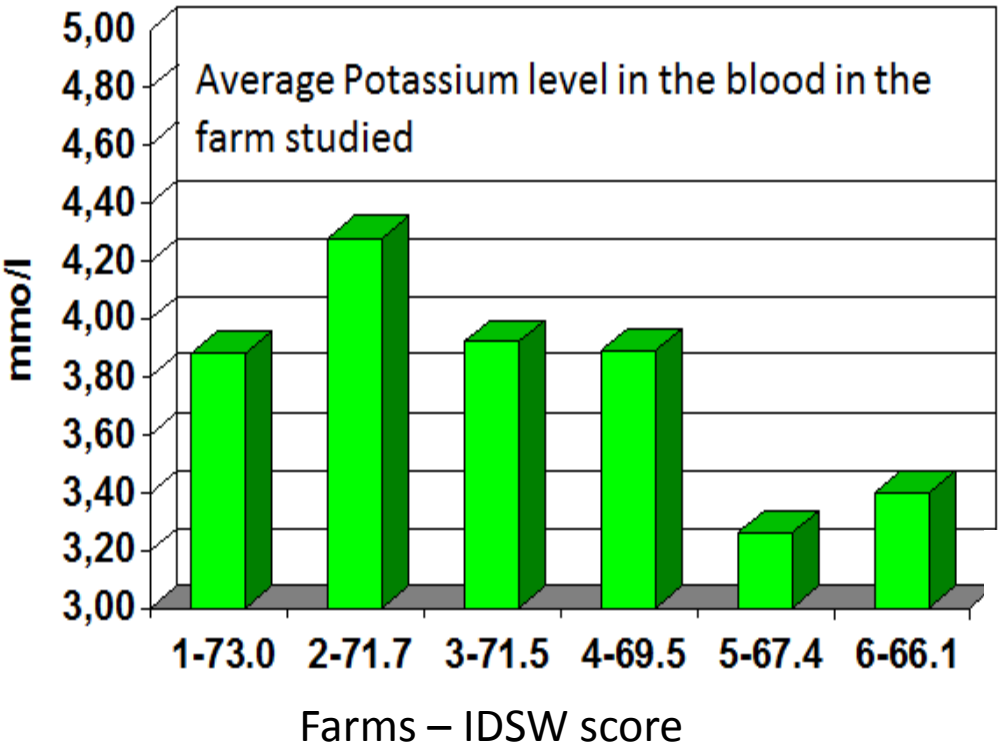
Basal bood samples have been carried out with appropriate protocol to avoid acute stress (sampling within 10 min from catch)

- Stress condition when Cortisol values > 5 ng/ml
- The interpretation of basal cortisol values is still debated. According to our experience, high basal values are due to higher stress conditions in breeding (Bertoni et al. 2005, Ital.J.Anim.Sci. 4: 200-202)

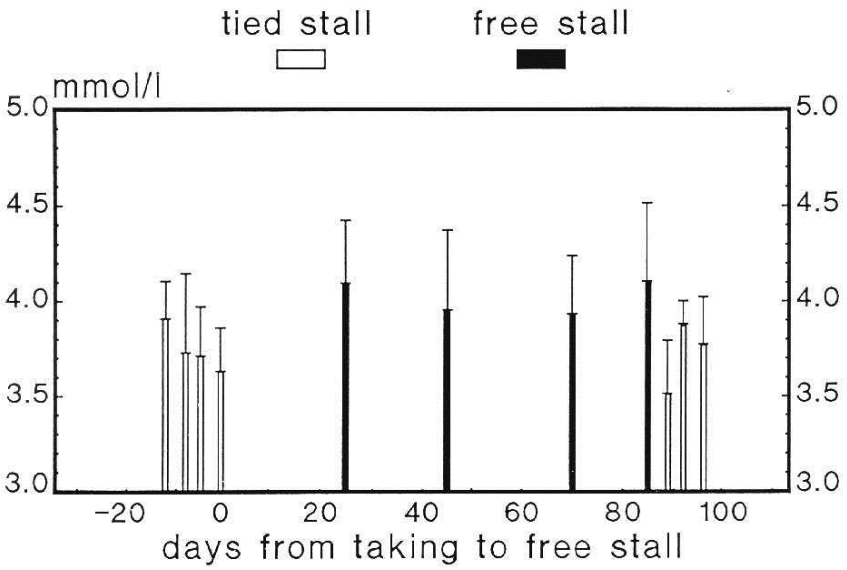
Cortisol interpretation:
effect of the interval between constraint & blood sampling



IDSW validation: plasma K



In farms 5 and 6, the % of subjects with K lower than the minimum limit of the reference range is particularly high



A low level of plasma K could be due to stress conditions and consequent increase of K renal excretion *(Trevisi et al., 1992)*

IDSW validation: Blood Index

(Premi et al., 2017)

Farms	Blood index (BI)	IDSW	Milk production (kg/l)
A	11.99	70.90	27.40
B	11.64	70.40	23.90
C	11.61	72.20	21.90
D	9.96	74.70	27.90
E	9.81	76.44	31.50
F	8.42	78.45	33.67

On the basis of energy, protein & mineral metabolism, enzymes activities and markers of inflammation determined from individual blood samples of each category.

The deviation from the reference range was used to calculate the Blood Index (BI).

A higher BI indicates a greater deviation of hematic parameter from the reference range (BAD), thus more severe alterations of biological functions, reflecting worst welfare conditions.

Inadequate Management Case-study 1

(Trevisi et al., 2004 - 55th Annual Meeting EAAP)

- IDSW assessment in a dairy cow farm (100 cows):
  - ✓ open housing system,
  - ✓ diet without silages (Parmigiano-Reggiano DOP),
  - ✓ high lever of health diseases (50% ketosis; 30% lamness)
- metabolic-inflammatory profile performed on 6 dry cows and 6 lactating cows
- After 12 months: repetition of the same checks

Inappropriate management
Case-study 1

PROBLEMS in cows	ERRORS observed
63.8% animals with 1 or more illnesses: foot diseases and injuries of limbs (38%); skin lesions and ectoparasites (22%);	• Uncomfortable cubicles • Slippery floors • Inadequate size of paddock • Insufficient N° of cubicles and feeding places
High somatic cells count; High % of teat sphincter calluses *(moreover, unsatisfactory performances: low production, low % fat & % protein in milk)*	• Inadequate milking procedure • Dirty cubicles
Anorexia / ketosis in postpartum Feeding mistakes *(low DMI, low protein content, particularly soluble fraction, high starch content, low buffers content)*	• ↑ of DMI in postpartum too slow • Inadequate management in the transition period

DIETS before & after the changes suggested by IDSW evaluation

DIET	Before		After	
	Dry	Early	Dry	Early
DMI (kg/cow/d)	11.4	17.8	11.8	20.3
UFL (U/kg s.s.)	0.65	0.93	0.68	0.92
CP (% s.s.)	11.6	13.29	11.5	16.8
Soluble Proteins (% CP)	23.4	22.1	25.7	24.5
Starch (% s.s.)	3.5	28.3	9.8	23.3
NDF (% s.s)	56.8	33.2	52.3	33.4

↑ 14% DMI in lactation

COWS SCORES: Case-study 1

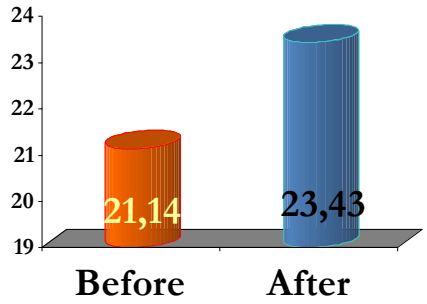
		Before		After		Judgment
	Scale	Dry (n=6)	Fresh (n=6)	Dry (n=6)	Fresh (n=6)	Before → After
BCS	0 - 5	2.40±0.4	1.94±0.4	2.31±0.3	2.20±0.2	*Improved*
Faeces	1 – 5	3.50±0.4	2.80±0.2	2.90±0.3	2.50±0.4	*Improved(?)*
Cleanliness#	0 – 5	2.88±0.6	2.13±1.0	3.83±1.4	3.25±1.5	*Worsened*
Teat##	0 – 4		2.64±1.0		3.17±1.0	*Improved*
Locomotion#	1 – 5	1.28±0.3	1.57±0.9	1.25±0.4	1.50±0.9	*Improved*
Trimming##	1 – 5	3.50±0.6	3.75±0.3	3.35±0.6	3.33±0.5	*Unchanged*

- *Improvement of body condition (fresh cows)*
- ↓ *of rough callosity*
- ↓ *faecal score in dry cows ⇨ more diet starch*
- ↓ *cleanliness ⇨ weather linked?*

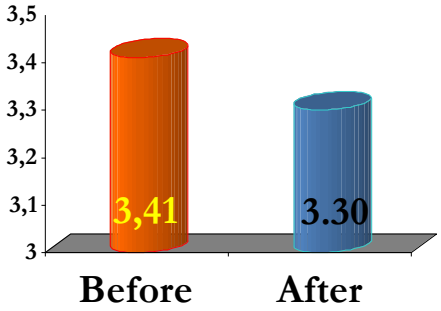
\# Higher values indicate a worse situation
\## Higher values indicate a better situation

Effect on milk and fertility
Case-study 1

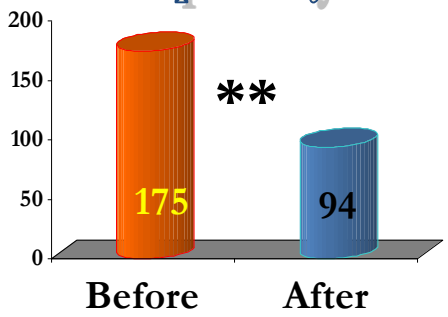
Milk Yield



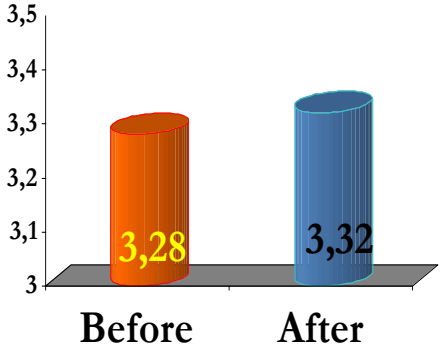
Fat %



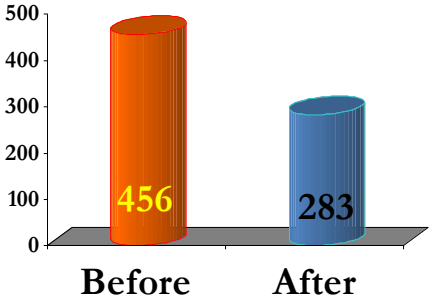
Open days



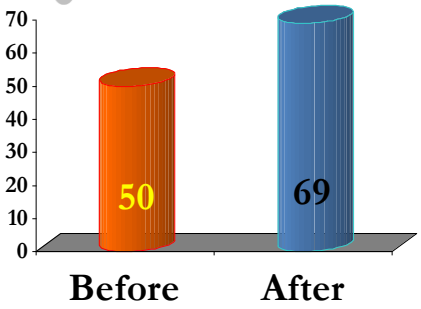
Protein %



SCC



Pregnant/first insemination

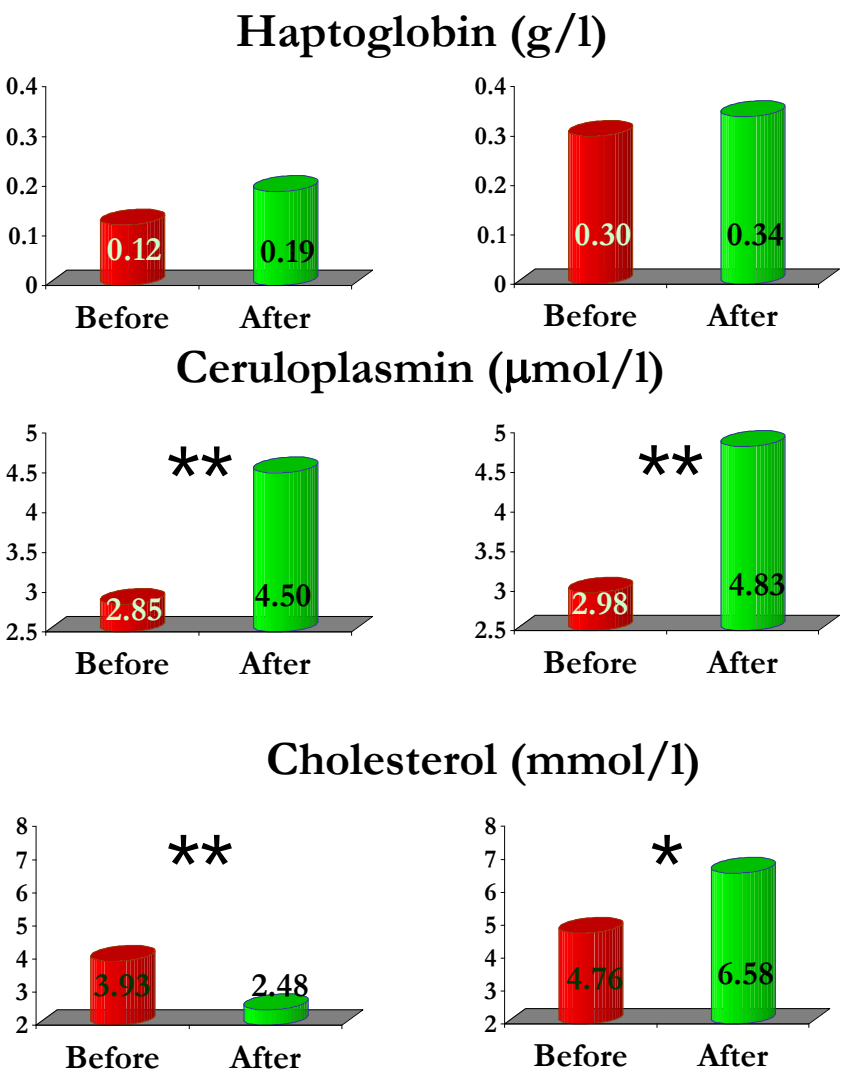


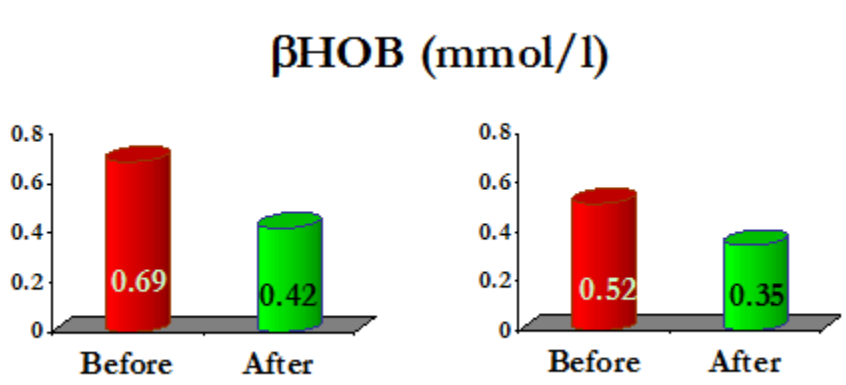
↑ of milk yield and ↓ of SCC

** p<0.01

Improve of reproductive indices

BLOOD: Case-study 1





* p<0.05 ** p<0.01

- ✓ posAPP ↑(?): i.e. CuCp
- ✓ negAPP ↑: i.e. cholesterol & albumin

  best liver functionality

- ✓ ↓ βHOB: less ketonemia

IDSW *Case study 2 (Prov. PC) 700 cows, GP cheese* *(Soriani, 2013)*

IDSW Score	**67,9**
Animal Cluster	67,7
Physiology, health and reproduction	63,6
Productive performances	82,0
Behavior	65,6
Enviroment Cluster	61,8
Housing & Equipment	65,3
Management	56,4
Feeding Cluster	74,2
Feeds	74,7
Feeding	73,5

Animal Cluster	67,7
Physiology, health and reproduction	63,6
External aspect	66,6
Gut functionality	84,0
Udder	64,8
Limb & Feet	79,3
Reproduction	28,9
Disease	48,7
Productive performances	82,0
Production	83,4
Milk composition	80,6
Behavior	65,6
Interaction animal – human	84,0
Interaction animal – environment	54,5

IDSW *Case study 2 (Prov. PC)*

(Soriani, 2013)

Corrective actions suggested by IDSW

Observation	Causes of AW reduction	Corrective actions suggested	Realized
Dry cows very dirty	Poor of straw in bedding area	Increase of straw distribution from 2 to 4 times a month	Yes
	Severe weather dry pens exposition	Install windbreak materials	Yes
Uncomfortable resting area	Insufficient size of resting area	n.Cow/n.Cubicle = 1	Yes
Uncomfortable milking parlour	Small entrance	Enlarge passage entrance	No
	Insufficient size of the waiting area	Enlarge the waiting area	Yes
	No cooling system in waiting area	Install a cooling system in waiting area	Yes
Excessive BCS at calving	High level of NEL & starch in dry diet	Decrease the NEL and starch content in the dry diet	Yes
	Lactation too long	Better diet for «late lactation»	Yes
Inadequate trimming score in dry period	Lactation too long	Control the trimming score at the medium of lactation	Yes

IDSW *Case study 2*

(Soriani, 2013)

	25/02/2010	*30/06/2010*	*12/11/2010*	*05/07/2012*
IDSW Score	**67,9**	**68,9**	**73,1**	**76,5**
Animal Cluster	67,7	69,2	75,8	78,0
Physiology, health & reproduction	63,6	68,1	75,0	74,1
Productive performances	82,0	79,5	78,8	79,5
Behavior	65,6	62,4	75,3	88,1
Environment Cluster	61,8	63,8	67,3	74,9
Housing & Equipment	65,3	67,1	67,6	76,5
Management	56,4	58,9	66,9	72,4
Feeding Cluster	74,2	73,5	75,2	76,1
Feeds	74,7	79,0	74,8	86,4
Feeding	73,5	65,2	75,7	60,6

IDSW *Case study 2 - (Soriani, 2013)*

Control	LFI	LAI
25/02/2010	-3.29	-0.26
30/06/2010	-2.67	-0.22
12/11/2010	-0.38	-0.06
05/07/2012	-0.13	0.54

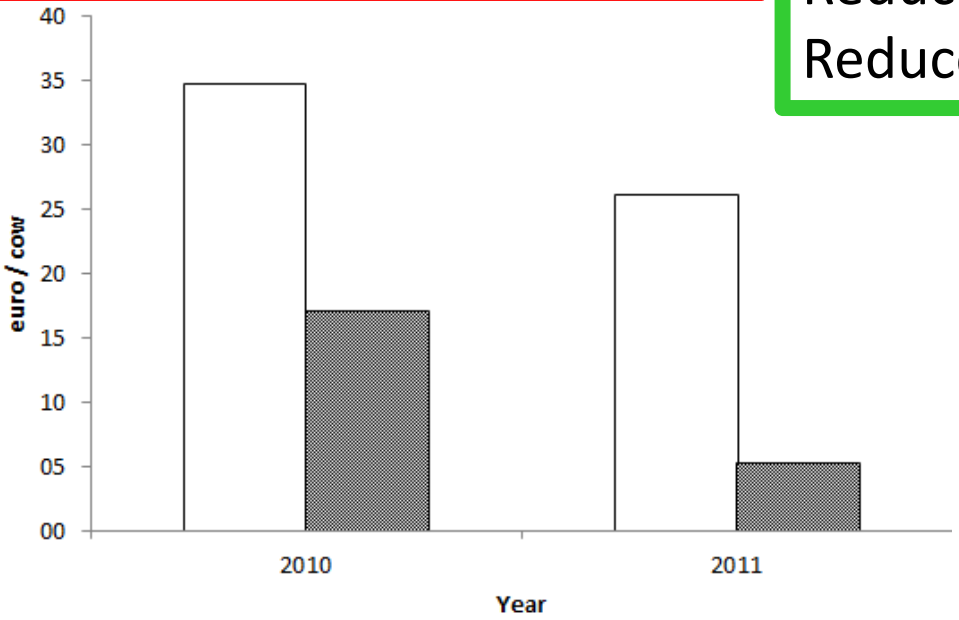
Major results

Improvement of the inflammatory response (better adaptability)

Reduced healthcare costs

Reduced % culling (15% vs 18% per year)

Reduced liter-milk cost



Annual costs of antibiotics (empty bar) and anti-inflammatory drugs (grey bar) expressed in €/cow before and after the introduction of corrective actions

Reduction in drugs costs after corrective actions suggested by IDSW

PERSPECTIVES of SDIB/IDSW

- The Animal Welfare is a requirement of animals
- The SDIB/IDSW model has the **aim to improve the efficiency of dairy farms** (considering various aspects: animal health, equipment, livestock profitability, diet), and assumes that the minimum level of the AW requested by law is guaranteed

DEVELOPMENTS:

- Combine the simplicity of the assessment with accuracy
- Promote a welfare assessments over time in farms to refine the breeding efficiency
- Currently underway the preparation of a software to speed up the assessments and suitable for consultants / breeders
- Refinement of measurements in different production contexts (e.g. grazing)

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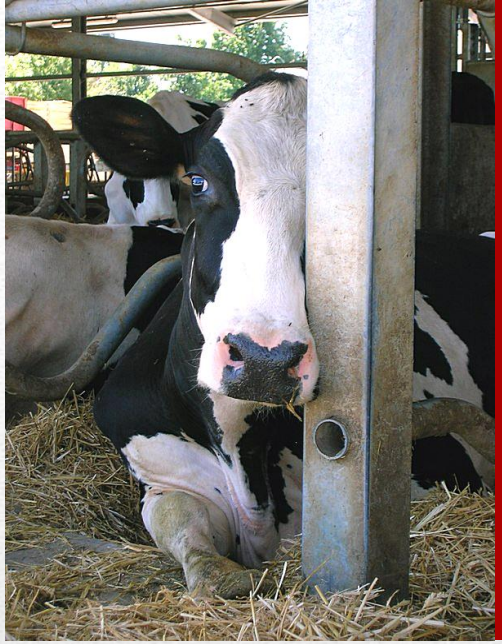
Questions?



WORKSHOP SIB-SISVET

La valutazione in azienda del benessere delle bovine da latte: un approccio multilaterale per una produzione sostenibile e consapevole

Brescia, 25 maggio 2017

Punti critici e soluzioni sostenibili in relazione al benessere animale : la metodologia IBA 2.0 – Indice di Benessere dell'Allevamento

Alessandro Gastaldo – *a.gastaldo@crpa.it* – +39 345 9573083

Fondazione CRPA Studi Ricerche (FCSR)
Viale Timavo 43/2 –Reggio Emilia
Sito internet. www.crpa.it

Che cos'è?

- **Sistema di valutazione del benessere animale in allevamento che attribuisce un indice (detto IBA) e una classe a una singola azienda**
- **Indice IBA = somma dei punteggi assegnati ai singoli parametri valutati (226!)**
- **Il valore dell'indice IBA posiziona l'azienda in uno dei 6 livelli prestabiliti di benessere animale (classe)**

Classe 1	Classe 2	Classe 3	Classe 4	Classe 5	Classe 6
Livello pessimo	Livello scarso	Livello sufficiente	Livello discreto	Livello buono	Livello ottimo

Come funziona?

1. Rilievo in allevamento

2. Dati in programma IBA

Indice IBA (punteggio)

Classe IBA (da 1 a 6)

Punti critici

Interventi migliorativi

Possibili costi

F.C.S.R.

Quante aziende sono state valutate con l'IBA?

Bovini da latte	Bovini da ingrasso	Suini	TOTALE
1.118	267	120	1.505

Metodo adottato in Regione Emilia-Romagna per misurare il livello minimo di benessere animale nei bovini per accedere alla Misura 215 - Pagamenti per il benessere animale (PSR)

A cosa serve?

1. Per **conoscere** il livello di benessere del proprio allevamento
2. Per **confrontarsi** con altre aziende
3. Per individuare le **criticità**
4. Per capire come **intervenire**, valutando la sostenibilità economica e l'**incidenza sui costi** di produzione dei possibili miglioramenti

A cosa NON serve?

- **Il sistema IBA (come tutti gli altri sistemi) non può servire a controllare se l'allevamento rispetta le norme**
- **Il controllo spetta soltanto ai servizi veterinari e non ad altri!**

Come avviene il rilievo in allevamento?

1. Parte generale → Parametri **gestionali**
2. Edificio → **Strutture** d'allevamento
3. Vacche in lattazione
4. Vacche in asciutta
5. Rimonta
6. Vitelli pre-svezzam.
7. Vitelli post-svezzam.

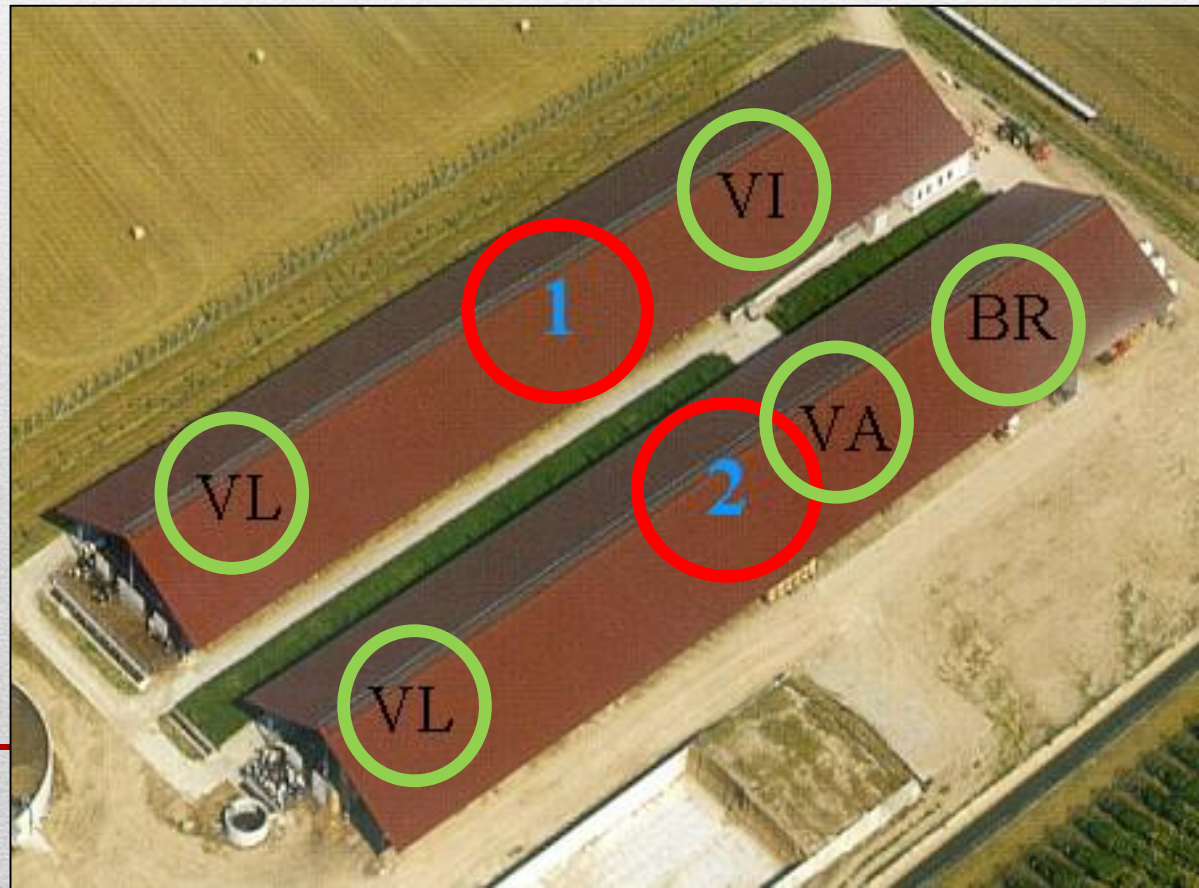
→ Sistemi di **stabulazione**

Quali schede utilizzare?

Schede da compilare:

- n. 1 scheda generale
- n. 2 schede edificio
- n. 2 schede VL
- n. 1 scheda VI
- n. 1 scheda VA
- n. 1 scheda BR

Durata:
da 2-4 ore



Quali rilievi vengono eseguiti?

- Parametri gestionali
- Strutture d'allevamento

→ Rilievi **indiretti**
(resources-based measures)

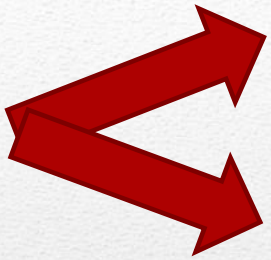
- Vacche in lattazione
- Vacche in asciutta
- Rimonta
- Vitelli pre-svezzam.
- Vitelli post-svezzam.

→ Rilievi **indiretti**
(resources-based measures)

→ Rilievi **diretti**
(animal-based measures)

Su cosa sono basati i rilievi?

Rilievi indiretti
(resources-based measures)



Opinioni EFSA (2009)

Recenti evidenze scientifiche

Rilievi diretti
(animal-based measures)

Protocollo europeo Welfare Quality

(al quale il CRPA ha partecipato come partner!)

GESTIONE - Principali parametri

- **Formazione** sul benessere degli addetti di stalla
- Piani di controllo per **mosche/roditori**
- Caratteristiche e n. di posti in zona **parto** e **infermeria**
- Quantità di **lettiera** in zona di riposo
- **Frequenza** di **asportazione** effluenti da corsie
- **zona d'attesa** e **poste di mungitura**
- **Mortalità** e indicatori **riproduttivi**

STRUTTURE - Principali parametri

- Indice di **densità** (rapporto peso vivo/superficie coperta)
- **Isolamento** termico del tetto
- **Ventilazione naturale** (rapporto peso vivo/aperture)
- **Illuminamento** (lux) nelle zone di stabulazione

VENTILAZIONE
Pessima = -10
Insufficiente = -5
Sufficiente = 0
Discreta = +5
Ottima = +10

INDICATORI SU ANIMALI

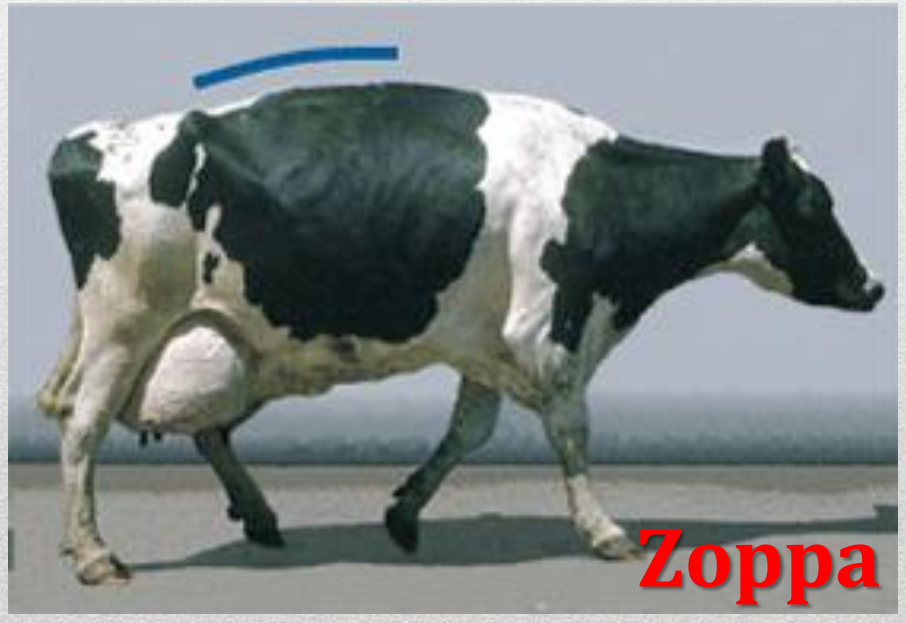
Rilievi su animali	Vacche in lattazione e asciutta	Bovini da rimonta	Vitelli
1.Pulizia	■	■	■
2.Locomotion score	■		
3.Alterazioni del manto	■	■	■
4.BCS	■		
5.Scoli nasali	■	■	■
6.Scoli oculari	■	■	■
7.Scoli vulvari	■		
8.Diarrea	■	■	■
9.Movimento in alzata	■		
10.Test di avvicinamento	■		
11.Cellule somatiche	■		

Indice di imbrattamento corporeo

- osservazione diretta di un **campione** di animali
- **%** di vacche, bovini da rimonta e vitelle **sporche**

Locomotion score (zoppia)

- osservazione diretta di un **campione** di animali
- **%** di vacche **zoppe/molto zoppe**



Alterazioni del manto (lesioni/gonfiori/aree prive di pelo)

- osservazione diretta di un **campione** di animali
- **%** di vacche **con una o più alterazioni del manto**

Movimento in fase di alzata

- osservazione diretta di un campione di animali
- % di bovine con difficoltà nella fase di alzata

0 = movimento fluido

1 = Piccola pausa sui carpi anteriori

2 = Lunga pausa su carpi anteriori

3 = Difficoltà grave nel movimento

SISTEMI DI STABULAZIONE – Rilievi indiretti

- Caratteristiche della **zona di riposo**
- **Superficie** di **stabulazione** interne ed esterne
- **Larghezza** e tipo di **pavimento** delle **corsie**
- Tipo e numero di **abbeveratoi**
- **Spazio** alla **mangiatoia** per ogni capo
- **Raffrescamento** di soccorso estivo (es. elicotteri)

Zona di riposo a cuccette

- N. di **cuccette**/n. **vacche**
- **Lunghezza** e **larghezza** cuccetta
- Sistemi **antiavanzamento**
- **Tipo** di battifianco
- **Superficie** di riposo (paglia, altro tipo di lettiera, con materassino)

Zona di alimentazione

N. di posti in rastrelliera/n. vacche

Spazio per singolo capo in rastrelliera

Acqua di bevanda

Raffrescamento di soccorso estivo

N. di «elicotteri»

N. di ventilatori tradizionali (con o senza doccette/nebulizzatori)

Il n. di ventilatori viene messo in relazione al n. di capi!

Indicatori per stabulazione fissa

Lunghezza/larghezza poste

Tipo di attacco

Pavimento delle poste

VACCHE - Punti critici

ZONA DI RIPOSO

1. **Posti** in cuccetta
2. **Passaggi** fra le cuccette
3. Tipo di **superficie** di riposo

ZONA DI ALIMENTAZIONE

4. **Posti** in rastrelliera
5. **Pavimenti** corsie

INVOLUCRO EDILIZIO

6. Ventilazione (con **ampliamento**)

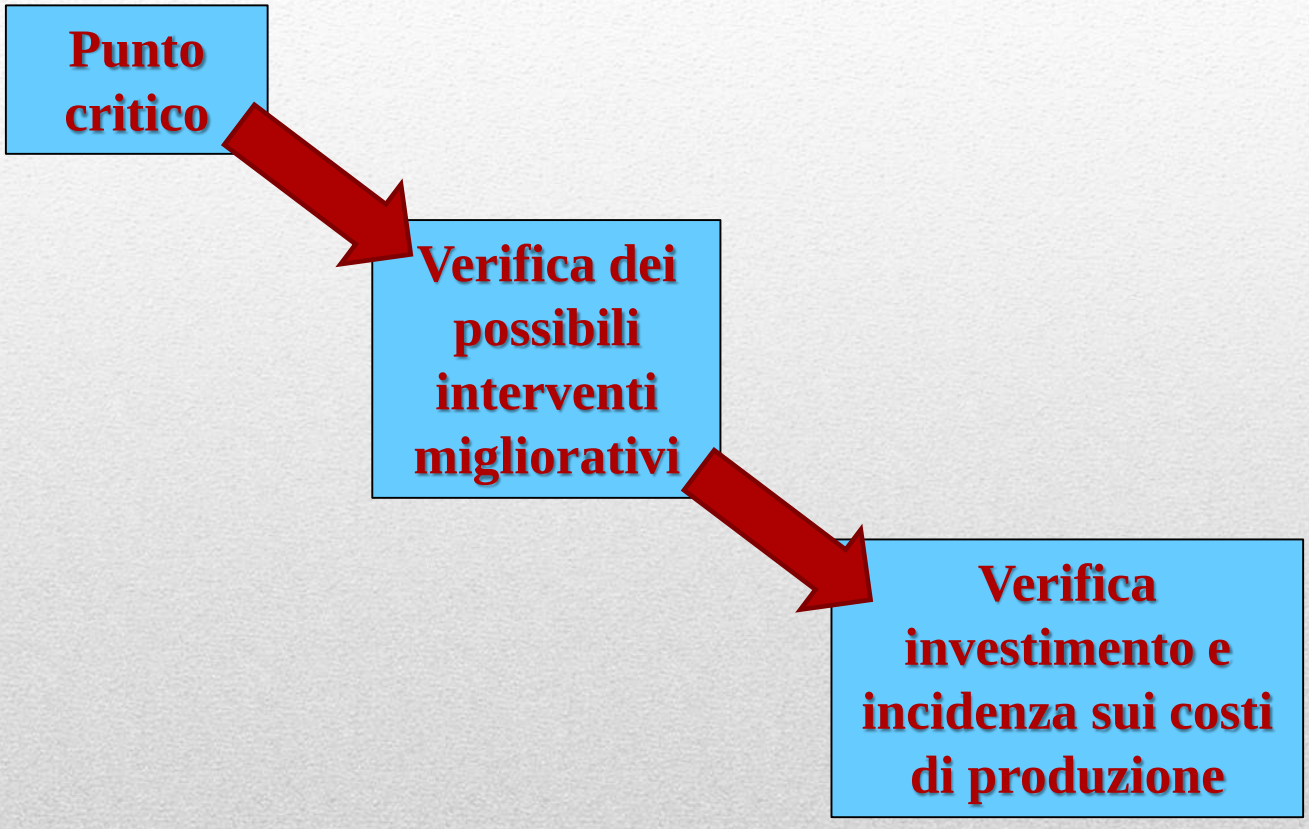
MANZE - Punti critici

1. Strutture d'allevamento e attrezzature
2. Superficie di stabulazione
3. Posti in rastrelliera
4. Quantitativi di lettiera

VITELLE - Punti critici

1. Superficie di stabulazione
2. Quantitativi di lettiera
3. Strutture non protette da caldo/freddo
4. Assenza di contatto visivo (box singoli)

Interventi migliorativi e costi



Benessere e costi di produzione

Punteggio e classe IBA ⟷ **Costi di produzione (€/litro di latte con metodologia MILK MONEY)**

Aziende con benessere elevato → **Aziende con costi di produzione più bassi**

CONCLUSIONE: chi investe CORRETTAMENTE in benessere aumenta il proprio reddito!

Investire in tecnici preparati

Affidarsi a professionisti capaci non solo di individuare i problemi , ma anche di risolverli con interventi migliorativi innovativi, veramente rispettosi del benessere animale e sostenibili economicamente!

GRAZIE!

a.gastaldo@crpa.it