UNDERSTANDING THE FIVE DOMAINS MODEL OF ANIMAL WELFARE

THE UNIVERSITY *of* EDINBURGH
The Royal (Dick) School
of Veterinary Studies

**The Jeanne Marchig International Centre
for Animal Welfare Education**

Summary

Brief history of animal welfare science

The evolution behind and details of the 'Five Domains' model

The Five Domains Model is an evolution of animal welfare science thinking that describes the integration of the physical and behavioural needs animals have and how that relates to their emotions (see more in Introduction module: Animal sentience). For many people familiar with animal welfare, the concept of the Five Domains Model may still be new. This module aims to outline why animal welfare science has progressed from the Five Freedoms to the Five Domains and explains the domains in more detail.

A very brief history of animal welfare as a science

Concerns over the welfare of farm animals increased in society since the publication of the book 'Animal Machines' by Ruth Harrison in 1964, which denounced how farmed animals were being raised for food production. The repercussions of this book led the British government to establish the Brambell Committee, to investigate the welfare of intensively farmed animals. The Brambell Report stated five essential freedoms that farm animals should experience: freedom to turn around, get up, lie down, scratch and stretch their limbs completely. This report led to the development of the oldest and best known conception of what constitutes animal welfare, the Five Freedoms.

Five Freedoms

Following the Brambell Report, the UK Farm Animal Welfare Council (FAWC) proposed minimum requirements, known as the Five Freedoms, which should be followed to ensure the welfare of animals in livestock systems. These have subsequently been recognised internationally. The Five Freedoms describe the basic requirements for an animal to express its natural behaviour while avoiding stressful practices that can negatively influence welfare. Each freedom is accompanied by a 'provision' (how that freedom can be achieved):

1. Freedom from thirst, hunger and malnutrition (by ready access to fresh water and a diet to maintain full health and vigour)
2. Freedom from thermal and physical discomfort (by providing appropriate environment including shelter and a comfortable resting area)
3. Freedom from pain, injury and disease (by prevention or rapid diagnosis and treatment)
4. Freedom from fear and distress (by providing sufficient space, proper facilities and company of the animal's own kind)
5. Freedom to express normal behaviour (by ensuring conditions and treatment which avoid mental suffering)

The Five Freedoms have shaped the development of evidence-based animal welfare standards internationally. It is the animal welfare description most recognised by veterinarians, others working with animals and the public. Our knowledge on animal welfare has changed over the years and evolved from just avoiding the negative experiences of animals, as stated in the Five Freedoms, to recognising animals' emotional capabilities and the need for positive experiences. For animals to have a good welfare, or a "life worth living", we need to go beyond minimising the negatives and provide them with positive experiences.

Five Domains

The Five Domains Model is a welfare assessment framework, created in 1994, that helps the evaluation of animal welfare risks and opportunities for welfare improvement. This model is based on the premise that biological mechanisms inspire the generation of affective experiences, which could be positive or negative. The Five Domains allow us to extend our thinking beyond the Five Freedoms and put greater importance on offering opportunities for animals to be exposed to and engage in activities that will provide positive experiences, rather than only avoiding negative ones.

It consists of three 'survival-critical' physical/functional domains: nutrition, physical environment, health, one situational domain: behavioural interactions, and a fifth mental or affective state domain. This approach demonstrates how the internally and externally influenced domains interact with the animal's subjective experiences. The integrated outcome of all negative and positive mental experiences accumulated in domain 5 represents the animal's current welfare state.

Domain 1: Nutrition

Factors that enable animals' access to drink sufficient and good quality water and eat an appropriate quantity and good quality of foods.

Restrictions of feed and water are important factors affecting welfare of farm animals. Adequate quantity of food should be guaranteed throughout each development phase. High intake of food (energy and nutrients) is required in fast-growing meat-producing strains of farmed animals, and in lactating dairy animals, to allow high performance levels. However, ad libitum high-energy intakes of high-quality diets can have detrimental effects in farm animals where this leads to obesity and excessive deposition of fat. This may negatively impact fertility and predispose these animals to lameness, heart problems, diabetes and metabolic diseases. Thus, it is common to subject some farmed animals to quantitative food restriction to prevent these issues developing.

However, food-restricted farm animals have very high feeding motivation, and food may often be presented in small energy-dense meals, which do not require the animal to forage or search for food. These small meals are usually consumed immediately, and behaviours associated with unsatisfied feeding motivation, and hunger are often observed. Farmed grazing or browsing species are often raised on marginal lands with a variable feed supply, which are prone to drought and negative effects of climate change. Despite their good ability to survive through variation in feed supply using body lipid reserves, undernutrition can be common for extensively reared species, which can extend to starvation in drought periods.

Good nutrition is not only the availability of an appropriate quantity of feed, but also the quality of the food and how it is offered to the animals. When offered the opportunity to forage or explore to find food and to have a choice of different types of food animals engage in more prolonged and engaged feeding behaviour, associated with positive emotions. Malnutrition (deficit, imbalance, or excess of nutrients) will have negative effects on the normal functioning of the animal, including behaviour, physiology, reproduction, health, growth potential and production, and may lead to frustration and exhaustion.

Domain 2: Physical environment

Factors that enable comfort through appropriate temperature, substrate, space, air, odour, noise, and predictability.

The main environmental requirements of farm animals are comfort, security, hygiene and opportunities to perform normal behaviours. Animals raised in outdoor systems have more freedom to express normal behaviour, but they may be subject to extreme weather conditions if they do not have access to shelters, and they may be more prone to undiagnosed or untreated illnesses, predator attacks and thefts.

Indoor management systems have the benefit of eliminating the impact of outside weather conditions and allow humans to have more control of climate conditions. However, space is often limited in confined systems and animals may not be able to exercise or escape others who are being aggressive, resulting in high levels of aggression and other damaging behaviours. In very confined systems animals may not be able to turn around, groom themselves, stretch or engage in many normal comfort behaviours. In addition, in indoor systems, animals frequently have limited choice of environments, and there is a higher incidence of respiratory and digestive diseases than in outdoor systems, mainly because of higher stocking densities and poorer ventilation, giving higher concentrations of air pollutants (e.g. dust, ammonia). Heat stress may be more common in these systems, as animals cannot often use behavioural adaptations to avoid hot environments.

Provision of space and suitable resources, that allows normal species-typical behaviours to be expressed, such as nesting, rooting and perching, can offer opportunities to allow indoor environments to meet animal's behavioural needs, whilst preserving the positive benefits of shelter and protection.

Domain 3: Health

Factors that promote good health through a good fitness level and the absence of disease and injuries

Poor welfare usually leads to greater susceptibility to diseases because of the effects on the immune system of having to cope with difficult living conditions. At the same time, the presence of diseases will lead to poorer animal welfare, through pain, sickness or malaise arising from the disease state. Some diseases or injuries may arise from the housing conditions, such as lying on hard and un-bedded surfaces for long periods in confined systems where foot and leg lesions and sores can result.

Morbidity and mortality of farm animals can be considered as a crude indicator of health and welfare. High rates of mortality are almost always associated with poor quality of life for the animals. Assessing animal health using more sensitive indicators (such as body condition score, body temperature, presence of lesions or parasites, cleanliness, changes in behavior) which are available for use before animals are clinically ill or dying will reduce the risk of suffering because of disease.

Management procedures that can cause pain are commonly performed in farm animals including castration of male animals, removal of horns and extra teats of cattle, trimming beak tips and claws of poultry and tail docking in cattle, sheep and pigs. These procedures are typically carried out with little or no pain relief and are associated with acute pain and stress. They can be also associated with medium-term pain caused by inflammation or necrosis (depending on the procedure), and long-term chronic pain as result of nerve damage and neuroma formation.

Animals in good health can be seen to be thriving in the environment, are bright and alert and may engage in behaviours such as play, grooming and positive social interactions.

Domain 4: Behavioural interactions

Factors that provide interactions with the environment, with varied and novel environmental challenges, with availability of engaging choices, through sensory stimulation, exploration, and foraging; and interactions with other animals and humans, such as bonding or reaffirming bonds, playing, and ability to retreat, scape take refuge or mount defensive attack.

Domain 4 typically relates to an animal's opportunities to make choices and therefore exercise a sense of control over its circumstances, with the environment, and with other animals and humans. Situations that prevent or reduce the expression of coping behaviour, such as living in severely restrictive, oppressive, or challenging environments, may be associated with a range of negative affective states such as anger, frustration, boredom, loneliness, helplessness and isolation. On the other hand, environments that are rich in stimuli will encourage species-specific motivated behaviours such as exploration, hunting, various forms of bonding, or play. These behaviours will have positive affects in the mental domain, translated by feelings of engagement, pleasure, security, or excitement.

Farm animal social environments may bring additional challenges beyond those experienced by the animals' ancestors, such as housing animals in groups of the same sex, and age, or in such large groups that individual discrimination is impossible. Animals may be prevented from engaging in positive social behaviours, such as courtship, social grooming, maternal care and social bonding. Farmed animals may be separated from their mothers earlier than would occur naturally, and in some cases very early or before any contact with the mother is experienced. It may be possible to shift an animal from an overall negative to overall positive welfare state by making improvements in the physical and social environment that will provide them with opportunities to engage in voluntary, goal-directed behaviours that are inherently rewarding.

Affective experiences develop in response to interactions with humans, and the quality of the interactions between stockpeople and their animals can substantially influence the behaviour and welfare of farm animals.

Human-animal relationships (HARs)

In farm animals, human-animal relationships influence performance, health and welfare. In humans, HARs can influence working conditions, quality of life, and health and safety. Good interactions between humans and animals can reduce fearfulness and human-related stress.

Handling studies indicate that high levels of fear of the human caretakers may depress productivity and animal welfare. Stockperson's attitude (e.g. their beliefs about the animal or the job - like or dislike, good or bad, agree or disagree) and behaviour towards farm animals are closely linked to the fear of humans by farm animals. For instance, stockpersons who have a positive attitude to using gentle methods to handle animals and a negative attitude to the use of unpleasant tactile interactions, such as slaps, pushes and hits, were more likely to work with animals that were relaxed and calm and not fearful.

A simple model created by researchers in this area describes the influence of human-animal relationships on the productivity and welfare of farm animals.

HANDLER — Knowledge, attitude → Behaviour   ANIMAL — Fear → Productivity and welfare / Stress

Hemsworth, Paul H (2003)
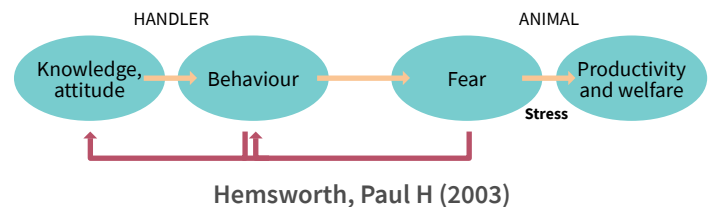
The relationships that exist between humans and farm animals are reciprocal. For instance, animals that are fearful of humans are generally more challenging to handle, which may induce more negative handling practices, increasing fear in the animals (as shown in the feedback loops in the figure). However, if a stockperson knows that fearful animals are more difficult to handle, they may use a gentler approach when handling them that will improve the HAR and may reduce fear.

The quality of human-animal interactions can be influenced by the attitude and skills or experience of stockpersons, as well as the type of interaction (e.g., level of force used, or whether it is focussed on punishment or reward). Improving both the attitudes and behaviour of stockpersons can have positive benefits for animal welfare.

Domain 5: Mental state

The conditions presented in domains 1-4 will affect positively or negatively the affective state of the animals. Although domain 5 is structurally separated from domains 1-4, it should not be evaluated separately.

For every physical/functional domain that is affected, there may be an accompanying emotion or subjective experience that may also affect the welfare. Emotional needs are equally important as physical needs for animals (see **Animal sentience**).

A summary of what makes up the five domains is in the table.

Physical Domain	Factors	Associated positive or negative mental states: 5th Domain
Nutrition	Access to drink sufficient and good quality water	Quenching thirst and pleasure of drinking
	Restricted food intake and a poor food quality	Hunger, and malnutrition
Physical Environment	Space for spontaneous movement	Physical comfort
	Exposure to thermal extremes	Thermal discomfort
Health	Minimal injury	Comfort, good functional capacity
	Poor physical fitness	Weakness and exhaustion
Behavioural interactions	Varied, novel environment	Interested, occupied
	Limits on threat avoidance, escape or defence activity	Anxiety, fear, anger, panic

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The Jeanne Marchig International Centre for Animal Welfare Education

E: JM.Welfare@ed.ac.uk
W: www.ed.ac.uk/vet/jeanne-marchig-centre

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