

Viewpoint

One Welfare – a platform for improving human and animal welfare

R. García Pinillos, M. Appleby, X. Manteca, F. Scott-Park, C. Smith, A. Velarde

The concept of One Welfare recognises the interconnections between animal welfare, human wellbeing and the environment. Integrating this concept in existing projects could provide a low-cost platform for fostering interdisciplinary collaboration to improve human and animal welfare internationally. This concept could ultimately help improve global standards of both human wellbeing and animal welfare. It could also help promote key global objectives such as supporting food security, reducing human suffering (eg, abuse of vulnerable people) and improving productivity within the farming sector through a better understanding of the value of high welfare standards. It extends the approach of (and partially overlaps) the One Health theme used for human and animal health. A One Welfare approach promotes the direct and indirect links of animal welfare to human welfare and environmentally friendly animal-keeping systems. It could provide a means to improve animal welfare and human wellbeing worldwide, both as a basis for expanding opportunities for farming and science industries, and increasing resilience and security for communities in developing countries. The introduction of this concept within the research community would have the added benefit of helping to identify research outputs with added value and mutual benefit between animal welfare, human wellbeing and/or the environment, by introducing the key search term 'One Welfare'.

Introduction and background

In 2007, the American Medical Association (AMA) and the American Veterinary Medical Association (AVMA) adopted a resolution that resulted in the One Health Initiative (AVMA 2016). The One Health concept provides a worldwide strategy for expanding and fostering interdisciplinary collaborations and communications in all aspects of health care for humans, animals and the environment. The concept has understandably focused on animal/human health and infectious diseases and aims to advance the future of health care for humans and animals worldwide (Monath and others 2010, AVMA 2016, One Health Initiative 2016). While some elements of animal welfare are included, the concept is mainly focused on the medical/disease aspects and it does not specifically target

the direct/indirect links between animal welfare/human wellbeing aspects and the environment within different disciplines for a fully comprehensive and integrated approach (Box 1).

Following the resolution, a number of US agencies formed the One Health Commission in 2009 (Monath and others 2010). It has since grown rapidly with the buy-in of global organisations such as the OIE (OIE 2016a), the United Nations agencies and the World Bank (which has used it as the basis for collaborative efforts to control avian and zoonotic influenza with pandemic potential as well as other diseases of animal origin, on both a local and global scale). In 2010, the UN and the World Bank recommended adoption of One Health approaches and the EU reaffirmed its commitment to operate under a One Health umbrella. In addition, the Hanoi declaration (Unicef 2010) was adopted unanimously by a total of 71 countries and regional bodies recommending broad implementation of One Health. The first One Health congress and conference took place in Australia (One Health Initiative 2011) and Africa (Sacids 2011) respectively in 2011, followed in 2012 by the first global risk One Health summit in Switzerland.

In practical terms, One Health has

moved beyond a concept to becoming a global movement (OIE 2014).

The One Health concept is now making its way on to university curricula and encompasses topics such as zoonotic disease transmission, antimicrobial resistance, food safety and, more recently, animal assisted therapies and natural disaster management (Fig 1).

The One Welfare concept

In a similar way to the relationship between animal and human health, there is a strong link between animal welfare and human wellbeing. Animal welfare is a characteristic inherent to the animal. The initiatives to improve animal welfare are multifaceted, international and domestic, public-policy issues that must take account of not only scientific, ethical and economic issues but also religious, cultural, and international trade policy considerations (Bayvel and Cross 2010). There is a range of multidisciplinary areas where different professions and disciplines can work together to achieve common goals and improve both human and animal wellbeing.

Historically, animal welfare has always followed on from animal health concepts and approaches. Regarding global standards, for example, the OIE Terrestrial Code

R. García Pinillos, OneWelfare, London, UK
M. C. Appleby, World Animal Protection, London, UK
X. Manteca, Autonomous University of Barcelona, Barcelona, Spain
F. Scott-Park, The Links Group, UK
C. Smith, Farming Community Network, UK
A. Velarde, IRTA, Monells, Spain
 Corresponding author: R. García Pinillos, email: onewelfare@outlook.com

Box 1: Animal welfare

Animal welfare is defined by the OIE as the state of how an animal is coping with the conditions in which it lives. An animal is in a good state of welfare if (as indicated by scientific evidence) it is healthy, comfortable, well nourished, safe, able to express innate behaviour, and if it is not suffering from unpleasant states such as pain, fear and distress.

Good animal welfare requires disease prevention and veterinary treatment, appropriate shelter, management, nutrition, humane handling and humane slaughter/killing. Animal welfare refers to the state of the animal; the treatment that an animal receives is covered by other terms such as animal care, animal husbandry, and humane treatment.

In this article, 'human wellbeing' is used as an equivalent term for humans.

includes Animal Health chapters; the first edition of the Terrestrial Code was published in 1968, with regular updates and reviews. Since 2004 the OIE has been developing animal welfare standards for inclusion in the OIE Terrestrial Code and Aquatic Code (OIE 2016b).

Some of the initial scientific papers on One Health focused mainly on clinical aspects, without integrating animal welfare and wellbeing considerations. One example is a paper where mainstreaming of animal-assisted therapies is discussed. It covers the need for improving clinical studies to demonstrate the impact on human physical wellbeing as well as taking into account the animal health and welfare components (Palley and others 2010).

Many still perceive animal health as separate to welfare and animal welfare as a cost rather than a benefit. However, as Colonius and Early (2013) have

argued, 'The separation between human, social, and animal welfare is an artificial compartmentalisation. These disciplines rely on the same set of scientific measures and heavily depend on each other in an ecological.'

This paper introduces One Welfare as a starting point for a wide debate about this new concept, with an aim to improve animal welfare and human wellbeing worldwide. A One Welfare approach (Fig 2) will help to empower the animal welfare field to address the connections between science and policy more effectively in various areas of human society, including environmental science and sustainability.

A One Welfare approach is necessary to appreciate and utilise fully the direct and indirect benefits of animal welfare improvements to human wellbeing and also the links to the environment. This will help to increase the opportunities

to improve ways of working for a more integrated approach, resulting in better animal welfare, as well as human wellbeing, globally. Considering health and welfare together — because of the interconnections between human, animal and environmental factors — helps to describe context, deepens our understanding of the factors involved, and creates a holistic and solutions-oriented approach to health and welfare issues (Jordan and Lem 2014). Integrating One Welfare with One Health will open the doors to more holistic approaches that cover all aspects of the issues considered, rather than only part of the equation (Fig 3).

The links between animal welfare, human wellbeing and the environment affect a large number of areas and it is best to subdivide the One Welfare concept into a number of topic-specific areas. Fig 4 shows a number of areas that benefit from the One Welfare approach.

One Welfare outcomes

There are a number of areas which could benefit or are already benefiting from a One Welfare approach, as discussed below. We would encourage experts in each of the specific areas and other related areas to investigate the links further and take forward the concept within their own area.

Reduction in animal and human abuse

Animals often act as indicators of human health and welfare, as can be seen in the link between animal abuse, family and social violence (Jordan and Lem 2014, Ascione and Shapiro 2009, Ascione and others 2007). There is significant evidence to demonstrate that those who mistreat and abuse animals are more likely to mistreat and abuse vulnerable people around them, such as children or the elderly. It is also often the case that those convicted of murder have a history of animal abuse. Similarly, individuals who treat animals humanely also tend to treat children and elderly people in the same way (Europeanlinkcoalition 2016).

The abuse of vulnerable individuals can be reduced and prevented by improving animal welfare among abusers. Improving animal welfare therefore has wider societal benefits through a human welfare/public health gain. Case studies have already concluded that the work of animal welfare organisations can help protect women and children from abuse (RSPCA 2007). A One Welfare approach could help reduce the incidence of crime and violence internationally, in particular domestic violence and abuse of elderly people and children.

Based on studies showing equine-assisted interventions to treat psychological

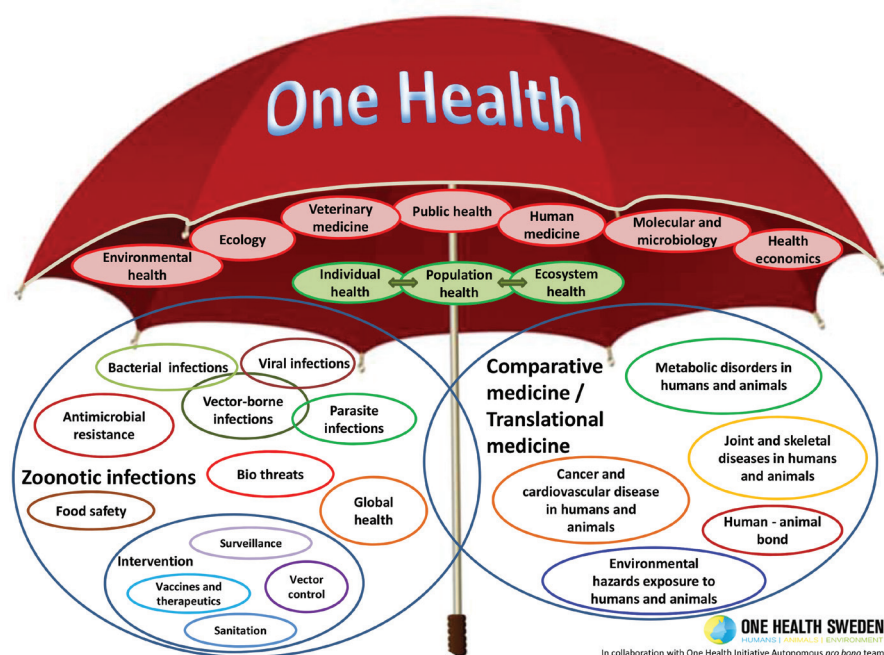


FIG 1: One Health infographic. (Source: www.onehealthinitiative.com, One Health Sweden in collaboration with the One Health Initiative Autonomous pro bono team)



FIG 2: A One Welfare logo. Design by R. Held

and physical problems as well as to promote human development and wellbeing (eg, Selby and Smith-Osborne 2013), Gibbons and others (2015) carried out a project in Guatemala where a non-violent horse-handling programme showed a reduction of violent attitudes and aggressive behaviour in an area where community and family violence were endemic. This study concluded that an equine-facilitated programme shows promise for transforming communities in which violence is prevalent.

Box 2 discusses the work of the Links Group, a multiagency group in the UK that promotes the welfare and safety of vulnerable children, animals and adults so that they are free from violence and abuse.

Improved animal welfare – addressing social problems

In inner cities areas, it is not unusual for cases of animal cruelty and abuse to be related to poverty and social problems.



FIG 3: One Welfare – One Health. Design by R. Held

There are also specific inner city issues related in particular to dog fighting. This activity is related to other illegal activities, such as drugs or gangs, which are a marker for a general social malaise associated with poverty and all its consequences (D. Grant 2016, personal communication). This is a complex area involving a number of not just animal welfare but also socioeconomic indicators and offences at other levels. Improvements of animal welfare at this level would support interventions tackling other social issues in inner cities.

There are already documented cases. For example, among street-involved youths, pet ownership has been described as a motivator to decrease use of alcohol and drugs, avoid arrest and develop responsibility (Jordan and Lem 2014, Lem and others 2013).

Historically, companion animals have also played a role in improving the wellbeing of lonely people. A recent study reported that dogs belonging to homeless people contribute to the wellbeing of their

owners by providing emotional support and, in many cases, a reason for living. There is also a wider societal benefit (Williams and Hogg 2016) since dog ownership appears to reduce the likelihood of a homeless person committing a crime (Taylor and others 2004), potentially because imprisonment necessitates loss of the animal (Williams and Hogg 2016).

Williams and Hogg (2016) also report a positive effect on pets and state that dogs owned by homeless people were significantly healthier animals, less likely to be obese and had fewer behaviour issues such as aggression to strangers and separation anxiety when compared to dogs owned by people living in a conventional home.

Links between improved animal welfare and food safety

There is ample documented evidence to show the impact that stress and poor animal welfare have on the release and virulence of a number of zoonotic diseases.

There is also evidence that better animal welfare for farm animals results in improved food safety. Stressed animals during transport or at the point of slaughter tend to release more pathogens, such as *Escherichia coli*, *Salmonella* or *Campylobacter*, in their faeces, resulting in increased cross-contamination, productivity losses due to illness and/or contamination of meat (Barham and others 2002, Callaway and others 2006). Stress and concomitant infection could be contributory factors to the variable presentation of campylobacteriosis (Cogan and others 2007).

Stress may have pronounced effects on some diseases, including respiratory infectious diseases and *Salmonella* infection, the latter being a disease that can be transmitted from animals to people. In one study in pigs, increased feed withdrawal times involved changes in the gut microbial ecosystem (the caecal pH increased) that could be associated with the trend of increased caecal Enterobacteriaceae and *Salmonella* in faeces, and may represent a higher risk of carcass contamination in cases of laceration of viscera (Martín-Peláez and others 2009).

Another example of these links is a study of broilers in Great Britain showing that *Campylobacter*-positive batches of caeca were associated with higher levels of rejection due to infection and digital dermatitis (Bull and others 2008). Interventions to reduce *Campylobacter* levels have also had a positive effect in reducing the prevalence of pododermatitis on target farms.

Conditions that harm animal welfare negatively affect animal health and productivity and damage specific quality aspects, thereby jeopardising profitability and ultimate product quality (Velarde and Dalmau 2012).



FIG 4: One Welfare Outcomes. Design by R. Held

Box 2: The Links Group

The Links Group is a multiagency group that promotes the welfare and safety of vulnerable children, animals and adults so that they are free from violence and abuse. The main role of the Group is to establish liaisons with other agencies working in the same field.

The Group has prepared guidance for the veterinary profession in collaboration with the Royal College of Veterinary Surgeons, the British Veterinary Association, the Animal Welfare Foundation and Medics Against Violence (Links Group 2016). There is also training available for members of the veterinary team (Links Veterinary Initiative Training). In addition, an online training course for human healthcare professionals is being prepared to help them recognise the signs of animal welfare when there is an animal present in a violent household.

Further work in this area could be to, for example:

- Undertake a literature review of the available evidence for consideration, wider dissemination and as a policy reference document
- Develop a specific farm animal document, similar to that already issued for companion animals
- Provide information/training in this area to rural workers, which could particularly benefit remote, rural farming areas
- Incorporate the materials and guidance into the veterinary/medical curriculum

Improved animal welfare – improved human wellbeing

Good animal welfare is correlated to good human wellbeing both within companion and farm/working animals. For example, for farm/working animals there is evidence indicating that a farmer's intention to treat animals humanely is significantly positively correlated with psychological and social factors (EAWC 2016, unpublished). The farmer's motivation could be either reward-seeking or empathy; however, the motivation type makes no difference to the improvements on animal

welfare or production.

Animal hoarding is another area where animal welfare and human wellbeing are interlinked. In most cases, this affects companion animals but it could equally affect livestock/working animals. Identifying and tackling hoarding will help to improve not only animal welfare, as hoarded animals end up suffering from neglect, but also the hoarders, as evidence suggests that animal hoarding is connected to psychiatric issues generally linked to historical and current socioeconomic and dysfunctional mental health concerns (Frost

and others 2015, Patroneck 2006).

There are also a number of companion animal-related issues which can be included in the improved animal welfare-improved human wellbeing category, such as livestock worrying by pet dogs or separation anxiety of pets. Recently, in the UK, a case of sheep worrying resulted in the death of 116 sheep (Anon 2016). Livestock worrying is a welfare issue not only for livestock but also for the farmer, as a result of direct financial losses and emotional harm; for the dog owner, who has to deal with the distress and damage caused by the dog; and for the dog, for example, if conviction results in it being killed. Responsible dog walking can positively impact on animal and human welfare.

Separation anxiety behaviour is a significant welfare concern (Mendl and others 2010). This was identified as one of the top eight welfare priorities in UK dogs during 2012 (Crispin and others 2012). Keeping animal species that are not used to isolation can result in undesired behaviours such as vocalisation, attempts to escape and destructive behaviour. This has an impact both on the animal's welfare and the wellbeing of owners. Measures recommended to address this include social habituation as part of treatment by a behaviourist (Crispin and others 2012, Blackwell and others 2016).

More efficient multidisciplinary approaches

A more joined up and multidisciplinary approach could be more efficient and effective. For example, animal welfare indicators can be used as a sign of a farmer being successful or failing to cope, and could be used to detect poor farmer health/wellbeing. Equally, poor farmer wellbeing detected by a medical practitioner could indicate a risk of poor animal welfare on the farm. Different professionals such as food business operators, enforcement officials, retailers, veterinary surgeons, doctors and the public could all play a part in improving both farm animal welfare and farmer wellbeing (Devitt and others 2013). Box 3 gives an example of multiagency working.

Multiagency approaches have also been raised in the past in the UK Parliament, where it was acknowledged that all agencies, professions and individuals who have contact with children have a duty to safeguard them. This includes agencies that work with animals and those that work with families. It was suggested that cross-reporting of cases between animal and social care agencies is appropriate (UK Parliament 2010).

Improved life chances - human rehabilitation and animal rehoming

Programmes in place in prisons and offenders' institutions have demonstrated

Box 3: Animal welfare multiagency investigations

In Great Britain, there are three bodies, the Food Standards Agency (FSA), Animal and Plant Health Agency (APHA) and local authorities (LA), responsible for animal welfare investigations from farm to slaughter at different levels. Following a European Audit in 2015, the three agencies got together and have now created improved reporting mechanisms to improve their approach to animal welfare problems during transport so that they are more effectively followed up.

Further work in this area that could take place:

- More efficient multiagency communication approaches could be used for other animal welfare concerns. A comprehensive structure for relationship-building, planning and cross-reporting between all the relevant agencies would help deliver a One Welfare approach
- Monitoring of fallen stock records as an indicator of animal welfare – this would require liaison between APHA and the National Fallen Stock Company (NFSCo)
- Strengthening mechanisms for early warning, on a national basis, of poor or deteriorating farmer wellbeing and the associated possible impacts on farm animal welfare
- Scope for provision of tailored information and guidelines targeting government and private veterinarians and support services

Box 4: Farming community support networks

The Farming Community Network is a national charity providing pastoral and practical support for farmers and farming families suffering periods of stress and anxiety, which are caused by issues in the farm business or within the family. Such issues may be financial, bureaucratic, related to physical or mental health, animal health and welfare difficulties, relationship breakdowns or disagreements about succession. Frequently, a combination of issues occurs simultaneously to create a seemingly insurmountable barrier to progress (FCN 2016).

Over the years, strong anecdotal evidence backed up by FCN casework data has confirmed that there is a strong link between animal welfare and farmer wellbeing. This has led many groups to create informal but strong working relationships with other stakeholders such as the Animal and Plant Health Agency (APHA), Trading Standards, the Royal Society for the Protection of Animals (RSPCA) and medical practitioners. These relationships have proved mutually beneficial and have led to outcomes that benefited farmers and animals alike, while helping to avoid costly and often destructive legal interventions.

This experience has convinced FCN and others that:

- Government and its agencies could and should work even more closely with existing farm support networks and commercial and professional organisations, to facilitate early intervention in relation to problems of poor wellbeing of farm personnel that are having an impact on animal welfare
- Support networks should be empowered to work more closely together, sharing information and best practice and making joint decisions on which agency will take responsibility for each case
- There should be wider publicity of support networks at different levels, including GP surgeries and veterinary practices

that rehabilitation of dogs for rehoming can be beneficial both for the people and animals involved. Animal-assisted interventions can help to build self-esteem and reduce reoffending (Jacob 2011)

Elsewhere, projects in developing countries have also shown the links between women's daily lives and their use of working equids (mainly donkeys). Studies show how improved animal welfare and support provided by working equids can improve women's daily lives, for example by transporting feedstuffs and water for other livestock (Upjohn and Valette 2014). Working equids have also been shown to lighten women's burdens, to support their capacity to care for their children, and to generate income (Brooke 2014).

Improved animal and farmer welfare - improved farming productivity

Farmer wellbeing is directly correlated with animal welfare. Productive farms with well-kept animals are generally associated with positive farmer wellbeing. There is evidence that farmers consider taking care of their own wellbeing as the most important way of improving animal welfare; one study found that even intending to do so was weakly but positively linked with animal welfare indicators (Kauppinen and others 2013). Human wellbeing and animal welfare can be considered a part of responsible and

sustainable food production (Box 4).

Economists argue that most agricultural business are aiming for profit rather than productivity. Production economics suggest that producers will not maximise animal welfare, even if animal welfare is highly correlated with output (Lusk and Norwood 2011). While it is understandable that most individual businesses aim to maximise profit rather than productivity, food security and sustainable production is fundamental, and policymakers need to ensure that maximum productivity is achieved to support global goals (Waran 2012).

Economists have much to contribute to the animal welfare debate, particularly as to how the wellbeing of humans and animals could be improved. Economists could produce more economic analysis of the effects of private and government actions related to animal welfare, which obviously impacts on human welfare (Lusk and Norwood 2011).

Practical evidence demonstrates that improved farm animal welfare results in superior meat yields (eg, avoidance of preslaughter trauma will minimise carcass weight loss due to trimming of bruising, better hoof care improves the health of cows and healthy cows have a better milk yield).

Producers, retailers and other food chain stakeholders increasingly acknowledge that consumer concerns for good animal

welfare represent a business opportunity that can be profitably incorporated in their commercial strategies. The International Finance Corporation (IFC, World Bank Group) recognised that animal welfare is gaining increased recognition as an important element of commercial livestock operations around the world. According to the IFC, high standards of animal welfare are important to enhance business efficiency and profitability, to meet consumer expectations and to satisfy domestic and international markets (IFC 2014). The demand for 'welfare friendly' products increases as public conscience and perception on livestock production systems grow. Animal welfare is not only a matter of ethics, but is also an essential tool to gain and maintain markets, and any husbandry that benefits sustainability should maximise animal welfare (Velarde and others 2015).

Improved animal welfare - addressing poverty and local community support

It is well established that where there are poor states of human welfare there commonly exist poor states of animal welfare, for example in countries or regions with emerging economies (Jordan and Lem 2014).

In Canada, among an estimated 12 to 19 per cent of homeless and vulnerable housed-people owning pets, research has shown a high level of attachment to pets as well as a tendency for homeless pet owners to put the needs of their pets before their own. The result is that pets act as a motivator for positive behaviour change in the caregiver (Jordan and Lem 2014).

In developing countries, there have been studies showing the reliance of whole families on the income generated by a single working equid and the consequences for human welfare of the loss or serious injury/illness of the animal (Brooke 2008).

Cross-organisation publications have recommended that animal welfare, including animal health, should be an essential part of all community development programmes, particularly in developing world rural areas where people depend on livestock farming or keeping. Promoting the integration of animal welfare as part of general livelihoods improvement programmes is seen as a key for success (RSPCA 2008, Waran 2012).

The Food and Agriculture Organization of the United Nations (FAO) also recognises that the welfare of humans and animals is closely linked. In many regions, a secure supply of food for people depends on the welfare of animals, and these, in turn, depend on the care and nutrition that animals receive. The massive increase in animal production over recent decades has raised a wide range of ethical issues,



FIG 5: A One Welfare approach helps to identify and recognise the links that exist between different sectors. Design by R. Held

including concerns for animal welfare, which have to be considered alongside environmental sustainability and secure access to food (FAO 2008).

Improved animal welfare – improved food security and sustainability

Developing communities that care for their animals help to ensure continuity of farming and enhanced availability of animal-derived products, but there are wider areas of societal concern, such as climate change, farming sustainability and disaster management. Communities that place emphasis on sustainability would therefore take an inclusive approach protecting the soil, safeguarding water, widening biodiversity, introducing local food sourcing, establishing local carbon-neutral energy schemes and housing, and creating community initiatives around sustainability partnerships (O’Riordan 2004).

Animal welfare is largely perceived as a ‘public good’ by European citizens (Miele and Evans 2010) and is also considered a necessary element of sustainable animal production (Broom 2010).

Increased biodiversity – improved human wellbeing

Environmental and conservation issues also contribute to the One Welfare concept. There are studies to show, for

example, that an increased number of wild birds in a given area has a positive impact on human wellbeing in the area (Sekercioglu and others 2016). Conversely, biodiversity loss can have highly detrimental consequences for human wellbeing (Dennis and James 2016, MEA 2005). Reductions in biodiversity may contribute to the emergence or re-emergence of infectious disease prevalence and changes in ecosystems with an impact in human health and wellbeing, climate change and population migration from rural to urban areas (Corvalan and others 2005). Specific diseases mentioned are rabies and Lyme disease, illustrating the overlap with One Health.

Conclusions and implications for animal welfare

Professionals working in the area of animal welfare generally consider human wellbeing alongside animal welfare. For example, companion animal veterinarians promote the human-animal bond, regulatory veterinarians guard public health and ensure a safe food supply for humans and animals alike, and veterinary researchers work at the interface of human and animal health and welfare. A One Welfare approach embodies this mission (Colonius and Earley 2013). Providing a name helps those not so familiar with these links to identify and recognise that such links exist (Fig 5).

The concept of One Welfare was recently presented in the UK to a number of key stakeholders (García-Pinillos and others 2015). Overall, there is broad support for the use of this concept alongside that of One Health. Others have already suggested embracing the concept of One Welfare (Waran 2012, Jordan and Lem 2014, Colonius and Earley 2013) indicating that there is global interest for the One Welfare concept to develop. The announcement of the forthcoming 1st International One Welfare Conference at the 3rd One Health, One Planet, One Future summit in 2015 (GRF Davos 2015) and the 4th OIE Global Conference on animal welfare programme, which comprises two plenary sessions on the topic of ‘One Welfare’ (OIE 2016c) are proof of this.

The current body of animal welfare knowledge is substantial enough for the One Welfare concept to stand by itself; however, an integrated approach is preferable to maximise efficiency and improvements. A collaborative approach to much wider dissemination of the benefits that animal welfare brings to wider society and the use of the One Welfare concept, alongside One Health, will promote this synergy.

For example, outreach community projects could take account of both One Health and One Welfare. They have already shown how veterinary professionals can experience the significant and reciprocal power of human-animal bonds among clients and their pets. Through a One Health, One Welfare lens, the increased empathy, compassion and stewardship of early career veterinary professionals could lead to improved animal and human welfare, and thus improved community health. These projects include the integration and community-level collaboration of veterinary teams with social service workers and human healthcare providers. This team approach serves to improve the health and welfare of humans and animals cooperatively, demonstrating that veterinary care can act as a direct avenue to improve health and social service delivery for underserved populations (Jordan and Lem 2014).

Overall, introducing an internationally recognised One Welfare concept will contribute to raise awareness of all the positive benefits of improving animal welfare, strengthen ongoing projects and facilitate identification of projects where animal welfare improvements will add more value to society. The One Welfare approach will help enhance people’s understanding of animal welfare benefits, which can be complex and, in certain situations, quite subtle, especially in the enhancement of human welfare.

An interdisciplinary approach to human, animal and social welfare is critical

to further progress in welfare science (Colonius and Earley 2013). The adoption of One Welfare within the research community will allow research outputs with beneficial impacts into human wellbeing, linked to animal welfare, to be identified. A One Welfare approach (where animal welfare adds value to wider societal areas) probably already exists in a number of studies; however, gathering evidence for this article has shown that it is very difficult to carry out a search to identify papers where animal welfare adds value to other areas. Establishing a One Welfare component would enable better understanding of the direct and indirect impacts that animal welfare studies have in society. It would also allow studies in this area to be easily identified, and thus strategic planning in further research and/or interventions which will benefit both humans and animals.

This could be facilitated by researchers using the keyword #onewelfare, enabling others to readily identify papers which study the added value of a particular study in a multidisciplinary way within the area of welfare and wellbeing. This is already happening in the One Health arena and the impact continues to grow; complementing this with One Welfare will unlock further potential for cross collaboration and improved efficiency in relevant areas.

Developing a strategic roadmap and exploring options for suitable knowledge exchange platforms should be one of the next steps. The creation of an electronic One Welfare platform has been suggested (García Pinillos and others 2016). A generic site, with links to more specialist areas, for example, The Links Group website (Links Group 2016), could make a working and helpful model. It might also be possible to create a themed Wikipedia site where authors could upload their own practical examples or research papers (R. Held 2016, personal communication).

Acknowledgments

Thanks are due to: Michelle Beer, Local Authorities National Animal Health and Welfare Panel; John Blackwell, British Veterinary Association; Paula Boyden, Dogs Trust; David Bowles, RSPCA; Javier Dominguez and John Lawrence, Food Standards Agency; Nigel Gibbens, UK Chief Veterinary Officer (CVO); Christianne Glossop, Wales CVO; David Grant; David Harris, Animal and Plant Health Agency; Robert Huey, NI CVO; Peter Jinman, Farm Animal Welfare Committee; Catherine O'Connor, Public Health England; Mohan Raj, University of Bristol; Michael Seals, AHAWB; Kate Sharpe, Home Office; Jessica Stark, World Horse Welfare; Peter Stevenson, Compassion in World Farming; Melisa Upjohn, The Brooke; Andrew Voas,

Scottish Government; Sheila Voas, Scotland CVO; Simon Waterfield and Sue Ellis, Defra Animal Welfare Team.

References

- ANON (2016) 116 sheep die in 'worst sheep-worrying case in living memory'. www.theguardian.com/world/2016/mar/08/116-sheep-die-worst-sheep-worrying-living-memory. Accessed October 14, 2016
- ASCIONE, F. R. & SHAPIRO, K. (2009) People and animals, kindness and cruelty: research directions and policy implications. *Journal of Social Issues* **65**, 569-587
- ASCIONE, F. R., WEBER, C. V., THOMPSON, T. M., HEATH, J., MARUYAMA, M. & HAYASHI, K. (2007) Battered pets and domestic violence. Animal abuse reported by women experiencing intimate violence and by non abused women. *Violence against Women* **13**, 354-373
- AVMA (2016a) One Health: what is One health? www.avma.org/KB/Resources/Reference/Pages/One-Health94.aspx. Accessed October 14, 2016
- BARHAM, A. R., BARHAM, B. L., CLOUD, C. E., HAYS, A. F., JOHNSON, A. K., ALLEN, D. M. & OTHERS (2002) Effect of transportation stress in beef cattle on prevalence levels of *Escherichia coli* O157 and *Salmonella* spp. from the feedyard to the packing plant. *Journal of Food Protection* **65**, 280-283
- BAYVEL, A. C. D. & CROSS, N. (2010) Animal welfare: a complex domestic and international public-policy issue—who are the key players? *Journal of Veterinary Medical Education* **37**, 3-12
- BLACKWELL, E. J., CASEY, R. A. & BRADSHAW, J. W. S. (2016) Efficacy of written behavioral advice for separation-related behavior problems in dogs newly adopted from a rehoming center. *Journal of Veterinary Behavior: Clinical Applications and Research* **12**, 13-19
- BROOKE (2008) Bearing a heavy burden. www.thebrooke.org/_data/assets/pdf_file/0010/50968/BROOKE_heavy_burden.pdf. Accessed October 14, 2016
- BROOKE (2014) Invisible Helpers. www.thebrooke.org/sites/default/files/Advocacy-and-policy/Invisible-Helpers.pdf. Accessed October 14, 2016
- BROOM, D. M. (2010) Animal welfare: an aspect of care, sustainability, and food quality required by the public. *Journal of Veterinary Medical Education* **37**, 83-88
- BULL, S. A., THOMAS, A., HUMPHREY, T., ELLIS-IVERSEN, J., COOK, A. J., LOVELL, R. & JORGENSEN, F. (2008) Flock health indicators and *Campylobacter* spp. in commercial housed broilers reared in Great Britain. *Applied and Environmental Microbiology* **74**, 5408-5413
- CALLAWAY, T. R., MORROW, J. L., EDRINGTON, T. S., GENOVESE, K. J., DOWD, S., CARROLL, J. & OTHERS (2006) Social stress increases fecal shedding of *Salmonella* Typhimurium by early weaned piglets. *Current Issues in Intestinal Microbiology Journal* **7**, 65-71
- COGAN T A, THOMAS A O, REES I E, TAYLOR A H, JEPSON M A, WILLIAMS P H & OTHERS 2007 Norepinephrine increases the pathogenic potential of *Campylobacter jejuni*. *Gut* **56**, 1060-1065
- COLONIUS, T. J. & EARLEY, R. W. (2013) One welfare: a call to develop a broader framework of thought and action. *Journal of the American Veterinary Medical Association* **242**, 309-310
- CORVALAN, C., HALES, S. & MCMICHAEL, A. (2005) Ecosystems and Human wellbeing health systems. Publication by WHO <http://apps.who.int/iris/bitstream/10665/43354/1/9241563095.pdf>. Accessed October 17, 2016
- CRISPIN, S. (2012) The Advisory Council on the Welfare Issues of Dog Breeding: A report on the first 8 welfare problems. www.dogadvisorycouncil.com/resources/8-may-master-priority-problems-revised-080512.doc. Accessed October 14, 2016
- DENNIS, M. & JAMES, P. (2016) User participation in urban green commons: Exploring the links between access, voluntarism, biodiversity and wellbeing. *Urban Forestry and Urban Greening* **15**, 22-31
- DEVITT, C., KELLY, P., BLAKE, M., HANLON, A. & MORE, S. J. (2013) Veterinarian challenges to providing a multi-agency response to farm animal welfare problems in Ireland: responding to the human factor. *International Office of Epizootics* **32**, 657-668
- EUROPEANLINKCOALITION (2016) Facts and figures. www.europeanlinkcoalition.eu/#/blank/s2khn. Accessed October 14, 2016
- FAO (2008) Capacity building to implement good animal welfare practices. Report of the FAO Expert Meeting FAO Headquarters (Rome) 30 September – 3 October. www.fao.org/docrep/012/i0483e/i0483e00.htm. Accessed October 14, 2016
- FCN (2016) Farming Community Network <http://fcn.org.uk/about-fcn/news-detail/39>. Accessed October 14, 2016
- FROST, R. O., PATRONEK, G., ARLUKE, A. & STEKETEE, G. (2015) The hoarding of animals: an update. www.psychiatristtimes.com/addiction/hoarding-animals-update/page/0/1. Accessed October 14, 2016
- GARCÍA-PINILLOS, R., APPELEY, M. C., SCOTT-PARK, F. & SMITH, C. W. (2015) One Welfare. *Veterinary Record* **177**, 629-630
- GIBBONS, J. L., CUNNINGHAM, C. A., PAIZ, L., POELKER, K. E. & MONTUFAR CARDENAS, M. A. (2015) 'Before, he fought every day with the horse and with me': reducing violence in a Guatemalan community through a horse-handling program. *Human-Animal Interaction Bulletin* **3**, 37-55
- GRF DAVOS (2015) One Health, One Planet One Future: fostering interdisciplinary collaboration for global public and animal health. Programme and Short Abstracts. http://onehealth.grforum.org/fileadmin/user_upload/one_health/programme/2015_Programme_Booklet.pdf. Accessed October 14, 2016
- IFC (2014) Good practice note: Animal welfare in Livestock operations. www.ifc.org/wps/wcm/connect/67013c8046c48b889c6cbd9916182e35/IFC+Good+Practice+Note+Animal+Welfare+2014.pdf?MOD=AJPERES. Accessed October 14, 2016
- JORDAN, T. & LEM, M. (2014) One Health, One Welfare: education in practice veterinary students' experiences with community veterinary outreach. *Canadian Veterinary Journal* **55**, 1203-1206
- JACOB, C. (2011) Benefits of animal-assisted interventions to young offenders. *Veterinary Record* **169**, 115-117
- KAUPPINEN, T., VALROS, A. & VESALA, K. M. (2013) Attitudes of dairy farmers toward cow welfare in relation to housing, management and productivity. *Anthrozoos* **26**, 405-420
- LEM, M., COE, J. B. & HALEY, D. B. (2013) Effects of companion animal ownership among Canadian street-involved youth: a qualitative analysis. *Journal of Sociology and Social Welfare* **XL**, 285-304
- LINKS GROUP (2016) The Links Group. www.thelinks-group.org.uk. Accessed October 14, 2016
- LUSK, J. L. & NORWOOD, F. B. (2011) Animal welfare economics. *Journal of Applied Economic Perspectives and Policy* **22**, 1-21
- MARTÍN-PÉLAEZ, S., PERALTA, B., CREUS, E., DALMAU, A., VELARDE, A., PÉREZ, J. F. & OTHERS (2009) Different feed withdrawal times before slaughter influence caecal fermentation and faecal *Salmonella* shedding in pigs. *The Veterinary Journal* **182**, 469-473
- MEA (2005) Ecosystems and Human Well-being: Health Synthesis. Island Press.
- MENDL, M., BROOKS, J., BASSE, C., BURMAN, O., PAUL, E., BLACKWELL, E. & CASEY, R. (2010) Dogs showing separation-related behaviour exhibit a pessimistic cognitive bias. *Current Biology* **20**, 839-840
- MIELE, M. & EVANS, A. (2010) When foods become animals, rumination on ethics and responsibility in care-full spaces of consumption. *Ethics, Policy and Environment* **13**, 171-190
- MONATH, T. P., KHAN, L. & KAPLAN, B. (2010) Introduction: One Health perspective. *ILAR Journal* **51**, 193-198
- OIE (2014) One Health: Scientific and Technical Review, volume 33 (2). Ed W. B. Karesh. http://web.oie.int/boutique/index.php?page=ficprod&id_produit=1308&fich_rech=1&lang=en. Accessed October 17, 2016
- OIE (2016a) One Health. www.oie.int/for-the-media/one-health/. Accessed October 14, 2016
- OIE (2016b) Animal Welfare OIE standards. www.oie.int/animal-welfare/oie-standards-and-international-trade. Accessed October 14, 2016
- OIE (2016c) Programme of the fourth OIE animal welfare conference on animal welfare: animal welfare for a better world. www.oie.int/eng/animal-welfare-conf2016/programme.html. Accessed October 17, 2016
- ONE HEALTH INITIATIVE (2011) 1st International One Health Congress Human Health, Animal Health, the Environment and Global Survival. www.one-health.org

- healthinitiative.com/publications/One%20Health%20Society%20Proposal%20Amended%20version.pdf. Accessed October 14, 2016
- ONE HEALTH INITIATIVE (2016) One Health Initiative website. <http://www.onehealthinitiative.com/about.php>. Accessed October 14, 2016
- O'RIORDAN, T. (2004) Environmental science, sustainability, and politics. *Transactions of the Institute of British Geographers* **29**, 234–247
- PALLEY, L. S., O'ROURKE, P. P. & NIEMI, S. M. (2010) Mainstreaming animal-assisted therapy. *ILAR Journal* **51**, 199–207
- PATRONEK, G. J. (2006) Animal hoarding: its roots and recognition. *DVM* **360**, August 6
- RSPCA (2008) With welfare in mind: animal welfare in international development programmes. RSPCA
- SACIDS (2011) 1st One Health Conference in Africa <http://www.sacids.org/kms/frontend/?m=101>. Accessed October 14, 2016
- SEKERCIOUGLU, C., WENNY, D. & WHELAN, C. (2016) Why Birds Matter: Avian Ecological Functions and Ecosystem Services. University of Chicago Press
- SELBY, A. & SMITH-OSBORNE, A. (2013) A systematic review of effectiveness of complementary and adjunct therapies and interventions involving equines. *Health Psychology* **32**, 418–432
- TAYLOR, H., WILLIAMS, P. & GRAY, D. (2004) Homelessness and dog ownership: an investigation into animal empathy, attachment, crime, drug use, health and public opinion. *Anthrozoos* **17**, 353–368
- UK PARLIAMENT (2010) Parliamentary office of science and technology – Postnote. Pets, families and interagency working. Number 350.
- UPJOHN, M. & VALETTE, D. (2014) The relationship between working equids and women in developing countries. Clinical Research Abstracts of the British Equine Veterinary Association Congress 2014. *Equine Veterinary Journal* **46**, 20
- UNICEF (2010) Hanoi Declaration. www.unicef.org/influenzaresources/files/Hanoi_Declaration_21April_IMCAPI_Hanoi_2010.pdf. Accessed October 14, 2016
- VELARDE, A., FÀBREGA, E., BLANCO-PENEDO, I. & DALMAU, A. (2015) Animal welfare towards sustainability in pork meat production. *Meat Science* **109**, 13–17
- VELARDE, A. & DALMAU, A. (2012) Animal welfare assessment at slaughter in Europe: Moving from inputs to outputs. *Meat Science* **92**, 244–251
- WARAN, N. (2012) One Health - One Welfare: Can we sustain welfare standards in a food hungry world? *Advances in Animal Biosciences* **3**, 187
- WILLIAMS, D. L. & HOGG, S. (2016) The health and welfare of dogs belonging to homeless people. *Pet Behaviour Science Open Journal* **1**, 23–30