

Veterinarians Will Save More Than Their Patients by Acting on Climate Change and Embracing Sustainability

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Abstract

Climate change is a worldwide health problem. Veterinarians and other health professionals have been called upon to participate in mitigation and adaptation efforts to protect animals and people. The objectives of this article are to review the ways in which climate change impacts animal health and highlight ways in which veterinarians and other animal health professionals can engage on the topic. Disease in terrestrial and aquatic species as well as domesticated and wild animals occurs through a series of shared exposure pathways (temperature, air, water, food, vector-borne disease, extreme events, and welfare). To meaningfully address this problem, the veterinary profession must recognize climate change as part of a complex and interwoven collection of sustainability challenges. Proposed actions include leading by example, building new partnerships, and promoting education, policy, and research. Veterinary professionals are key contributors to global health initiatives and trusted messengers of

health information. Lending our voices and actions to address the climate crisis and related sustainability issues will go a long way to protect the health of all species.

Introduction

The fact is that no species has ever had such wholesale control over everything on earth, living or dead, as we now have. That lays upon us, whether we like it or not, an awesome responsibility. In our hands now lies not only our own future, but that of all other living creatures with whom we share the Earth.

— David Attenborough

Images of lone polar bears on small pieces of sea ice have long been used to symbolize the effects of climate change. Indeed, the Arctic is warming 4 times faster than the rest of the planet, threatening the survival of this iconic species, but the polar bear is not alone in its plight (1, 2).

Anthropogenic change impacts everyone, and all animals, around the world. Public health authorities agree that climate change is the greatest public health threat of the 21st century, and health professionals, including veterinarians, have been called upon to address this complex problem (3–5). It is important to recognize that animal populations, typically those managed for human needs (eg, livestock production) also contribute to climate change, an issue beyond the scope of this article but relevant as our profession seeks to upscale mitigation efforts (6–8). The objectives of this article are to provide an overview of the animal health impacts associated with climate change and highlight ways in which veterinary professionals can begin to engage in climate change action that will protect the health of all species.

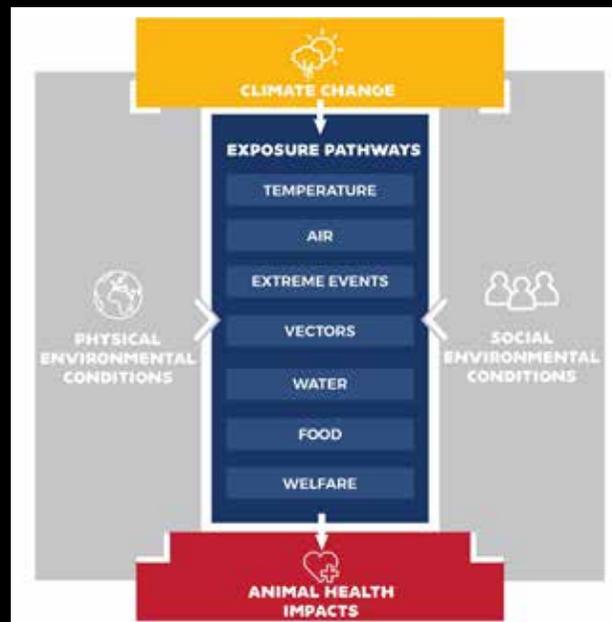
Animal Health Impacts of Climate Change

The health impacts of climate change are context-dependent. Species vary in their anatomy, physiology, and response to harm, while the type and severity of climate-associated threats vary with geography and time. Animals are also managed in different ways by different people, which further modifies, by protecting or exaggerating, the health impacts on any individual or group. This makes it challenging to summarize or predict the overall effect of climate change on the wide range of species that may concern veterinarians.

Despite this variability, it is helpful to categorize climate-associated diseases in a way that contributes to developing mitigation efforts. Consistent with other risk assessment frameworks, groups like The Intergovernmental Panel on Climate Change and The US Global Change Research Program have categorized human illness related to climate change according to a series of exposure pathways (9, 10). This 7-category exposure framework (**Figure 1**) has been adapted to animals and proposed for adoption in veterinary medicine as a common language to facilitate collaboration between human and animal health professionals (11). The variable context for different animals is represented by the superimposition of these exposures on the physical and social environmental conditions. The likelihood of an animal experiencing a particular climate-associated health threat is largely dictated by the physical environment in which the animal lives (eg, rising sea levels and storm surge that uniquely impact coastal habitats, geographic variability in the presence of disease-causing vectors, or areas where inversion layers trap air pollution). Social environmental conditions, how animals are managed, and the ability of their human caregivers to protect them from harm (eg, underlying health and nutritional status, access to

veterinary care, or warning systems) are critical to build resilience in animals and aid in climate adaptation.

Figure 1



Schematic representation of how climate change can impact animal health through 7 different exposure pathways. Pathways exist within the context of physical and social factors that are themselves influenced by climate change while simultaneously able to alter the exposure and/or the health of the animal(s) (9–11).

Temperature

Warming temperature leading to heat-associated illness is well documented in humans and animals. Excess, protracted, or unexpected heat exposure can disrupt thermoregulation resulting in vascular damage and systemic inflammation (12). Heatstroke in companion animals (eg, dogs, cats, guinea pigs, ferrets) has historically been associated with risk factors like exertion or vehicular confinement but is increasingly attributed to higher ambient temperatures and heat events (13, 14). Veterinarians have long understood the impact of heat on production animals, where thermal stress decreases productivity through mechanisms such as changes in growth rate, altered reproductive physiology, and increased energy demands despite reduced appetite (15, 16). Finally, heat stress leaves animals more vulnerable to other diseases and further increases management costs as additional facilities and labor are needed to keep animals healthy and cool (17–26).

In contrast to human health professionals who are logically focused on the effects of rising air temperatures, veterinarians must also be aware of the impacts of warming waters on aquatic animals. Recent heat events

like the 2021 “heat dome” in the Pacific Northwest caused heat-associated deaths in people and also catastrophic loss of intertidal shellfish that will have far-reaching impacts on the region (27, 28). Such events are not new; they take place worldwide and affect a range of aquatic species. However, they are increasing in intensity, frequency, and duration (29–31). But it is not only the extreme events that impact aquatic animals. As on land, the temperature of oceans around the world has been increasing, causing shifts in the distribution of marine animal populations (32). For sedentary species such as corals with their pigmented dinoflagellates, impacts can be devastating, as evidenced by extensive coral bleaching and death seen around the world (33, 34). Rising environmental temperatures can have profound immunosuppressive effects on poikilothermic animals, leading to greater occurrence of infectious diseases (35). Finally, warming waters skew sex ratios of some species of fish and reptiles that exhibit temperature-dependent sex determination, signaling the potential for reproductive collapse in populations like green sea turtles in the northern Great Barrier Reef, where complete feminization is projected in the near future (36, 37).

Air

Rising temperatures underlie various other changes that collectively impact air quality, with profound implications. Pollution is the leading environmental cause of global human morbidity and mortality, accounting for 9 million premature deaths in 2015 alone (38). While corollary epidemiological studies in veterinary medicine are lacking, associations between air pollution and various conditions are increasingly recognized. Air pollution comes from many climate-related sources: particulate matter from dust caused by evaporation and aridification of land, smoke from larger and more frequent wildfires, protracted pollen seasons, and the creation of ground-level ozone. These pollutants can cause direct injury to the respiratory tract or reduce defense mechanisms, leaving animals vulnerable to infection.

Air pollution has been associated with pulmonary disease, corneal ulceration, and decreased athletic performance in companion animals (39–41). There are significant associations between ambient air pollution and health conditions in production animals, including inflammation, mortality, and productivity (42–44). Similar respiratory impacts have been described in captive and free-ranging wildlife populations (45–47). In humans, some of the most significant effects of air pollution are the result of very small particulate matter that can cross the alveolar-capillary barrier, inciting systemic

inflammation that typically manifests as cardiovascular disease such as stroke and myocardial infarctions (48, 49). While similar associations have not yet been made in veterinary medicine, animal models suggest that air pollution can cause primary lung and heart disease and worsen underlying problems (50–52).

Extreme events

The extreme weather events are arguably the most dramatic and observable effect of climate change. Climate change is a known driver of heat waves, wildfires, storms, droughts, and floods, all of which are increasing in intensity, frequency, and duration (32). The health impacts of these events are dictated by the location in which they occur, the type of disaster, the species involved, and the resilience of those exposed. Short-term impacts, including injuries, fatalities, and loss, are commonly reported; for example, thousands of cattle died in Kansas during a heatwave that took place while this article was being prepared (53). More difficult to quantify but often substantial are the long-term impacts that arise due to animal infrastructure damage, food and water contamination, protracted displacement, or infectious disease outbreaks resulting from novel animal mixing, pathogen exposure, or underlying stress (54). Terrestrial and aquatic wildlife are also impacted by these extreme events; biodiversity loss, population declines, and localized extinction are well-documented, with ecosystem impacts that can persist for many years after the event (55–59).

Management of animals during disasters also complicates emergency response and public health efforts. Lessons learned during Hurricane Katrina, where many people refused to evacuate without their animals, led to the passage of the Pets Evacuation and Transportation Standards Act of 2006, which provided resources and authorization for the care of pets in federally-declared emergencies (60). Advances in preparedness have led to more infrastructure and planning for animals in disasters. However, given the projected increases in these events, more work is needed to minimize their consequences on animals and the people who care for them.

Vector-borne diseases

The epidemiology of vector-borne diseases in animals and people is rapidly changing along with the climate (61). While the specific vectors and the diseases they carry vary by location, general ways these occur are common to many pathogens. Overall warming, particularly at northern latitudes, has facilitated the range expansion of arthropod vectors and, thus, the infectious organisms they carry. In North America, canine Lyme disease and Rocky Mountain Spotted Fever are diagnosed more commonly and in new geographic areas due to the northward range expansion

of their tick hosts (62, 63). Range expansions can have significant financial consequences when a novel pathogen is introduced to a naive population, as seen with the climate-driven introduction of bluetongue virus serotype 8 that resulted in hundreds of millions of dollars lost to livestock producers in Europe (64–67).

The higher temperatures and longer warm seasons can extend vector seasons and increase the proliferation of some pathogens within vectors. Replication of *Dirofilaria immitis* within mosquitos is dependent on ambient temperatures, and climate change is now believed to be a key factor driving changes in the prevalence, geographic distribution, and season of canine heartworm disease (68–70). Similarly, increasing ambient temperature impacts the replication rate of West Nile virus within mosquitos, contributing to the growing transmission risk (71). These mechanisms collectively contribute to a higher risk of vector-borne disease in animals as the climate changes.

Water

There are several ways that animal health is impacted by climate-related changes in water availability and quality. Seasonal and unexpected droughts already affect domestic and wild species, and these events are only predicted to increase with climate change (72, 73). Beyond restricting access to life-sustaining water, drought can additionally concentrate pathogens and toxins within remaining water sources and, for wildlife, increase inter- and intraspecies competition and conflict at these sites. Water warming generally facilitates growth, survival, and even toxicity of many bacterial, fungal, and microparasite infectious agents (74, 75). Warmer waters, in conjunction with changes in precipitation, extreme weather events, and run-off, contribute to the eutrophication of water sources that can bring harmful algal blooms which have been associated with both domestic and wildlife mortality events (76–78).

Not surprisingly, marine animals are uniquely vulnerable to climate-induced changes in water chemistry (11). Warmer waters and nutrient loading contribute to the development of regions where dissolved oxygen is too low for aquatic animals to survive, referred to as “dead-zones” (79). Changes in the salinity of water, as may occur in estuaries following severe precipitation events, influence the prevalence, pathogenicity, and consequences of infectious organisms that favor low salinity (80). Also of concern are pathogens that favor high salinity, a common consequence of drought and rising sea levels (81, 82). Finally, ocean acidification resulting from

greater carbon dioxide levels in seawater, in response to a growing concentration of atmospheric carbon dioxide, reduces the availability of calcium carbonate, leading to growth restriction, erosion, and dissolution of rigid coral skeletons and mollusk shells (83, 84).

Food

Climate change threatens production, quality, and access to appropriate foodstuffs in ways that are significant, heterogenous, and inequitable (85, 86). The degree to which domestic animals are impacted is largely shaped by human resilience and resources to meet needs in times of scarcity. While warming conditions will improve production and growing seasons in some parts of the world, collectively the projected negative global impact of climate change on food safety and security is momentous (87, 88).

There are many interconnected pathways through which climate change impacts food. Heat and drought typically increase the burden of agricultural pests such as insects, pathogens, and weeds. Drought-stressed crops are more vulnerable to mycotoxin-producing fungi that can cause significant disease in many species (89). The growth of pathogenic organisms, both on food and in storage, is facilitated by extreme weather events, temperature, and moisture changes (87, 90). Increased temperatures and changes in precipitation can alter the nutritional composition and quality of plants, which will need to be accounted for in animal diets (15, 16, 91–93). For grazing animals, prolonged heat decreases the overall quality of rangeland through this mechanism and the invasion of pastures by toxic or unpalatable plants (94). In animal agriculture systems where feed efficiency is a critical part of production economics, diet management is further complicated by reduced food intake in heat-stressed animals (95, 96).

Food availability and quality can impact wild animals, as described above but also in unique ways. Disruption of phenology (cyclic and seasonal natural phenomena, especially in relation to climate and plant and animal life) may also occur due to changes in food abundance. Well-recognized examples of mismatch are seen in European songbirds where the climate has altered vegetation and insect abundance. Some species of birds have not changed their behavior, leaving insufficient food available for chick-rearing and thus impacting their populations (97–100). Food scarcity or lack of access can drive free-ranging animals into new areas, increasing the potential for novel pathogen or toxin exposure and creating conflict with humans or other species.

Welfare

For people, this final exposure pathway is typically referred to as “mental health and wellbeing.” The relationship between climate change and human mental health is significant and complex. Effects can be direct or indirect, short- or long-term, and are borne disproportionately by those people who are most marginalized (101–103). This field is evolving rapidly, shaping new terminology like ecoanxiety, ecoguilt, ecopsychology, and ecological grief or *solastalgia* (103). Veterinarians are not immune to this stress, either through their own experience or concern for animals and the environments on which they depend (104).

The animal corollary of mental health and wellbeing is animal welfare. Animal welfare is assessed through multiple established frameworks that include characteristics of their physical environment (heat stress), nutrition (hunger, malnutrition, or thirst), health (pain, injury, and disease), behavior (normal or abnormal), and mental state (fear and stress) (105, 106). The many conditions and exposure pathways described above highlight the diverse range of climate-associated morbidity and mortality, making it an obvious and increasing animal welfare issue (20). Animals are also indirectly impacted when those who care for and protect them are unwell. This highlights the need to focus not only on improving the welfare and coping capacity of the animals, but also of the people responsible for their care.

Embedding Climate Action in Broader Sustainability Efforts

The good physician treats the disease; the great physician treats the patient who has the disease.

— William Osler

Climate change is only one of several concurrent and related threats to the health of people and animals worldwide. It is well recognized that the effects of climate change, including health, are disproportionately borne by those who already suffer from other inequalities; climate change is ultimately a social justice issue (107). As animal health professionals, it is incumbent upon us to recognize and address the many complex factors that predispose our clients, and therefore our patients, to these climate-associated harms (**Figure 1**). We will be helped in this effort by embedding our climate change efforts within the broader context of sustainability and working in concert with others who share this space. Sustainability encompasses not only ecological but also the social and economic health of current and future generations. Through this lens, we will better know our patients who have the disease.

The United Nations has proposed a series of 17 Sustainable Development Goals which serve as a blueprint to achieve a better and more sustainable future (108). These goals have been reimagined as the Veterinary Sustainability Goals by the non-profit group Vet Sustain (a) (109). They have embedded each of the goals within categories: diverse and abundant wildlife, a good life for animals, net-zero warming, health and happiness, a no-waste society, and enough clean water for all (**Figure 2**). They propose several actions veterinary professionals can take to address these challenges. This framework is also helpful in building awareness of the interrelatedness of the sustainability goals and the multiple ways in which our profession can work to address them. Similarly, a more holistic approach to climate change will ensure that climate adaptation and mitigation actions do not unduly compromise other goals like reducing poverty and increasing water and energy access (1).

Multi-Faceted Opportunities for Veterinarians to Drive Sustainability

Action is the antidote to despair.

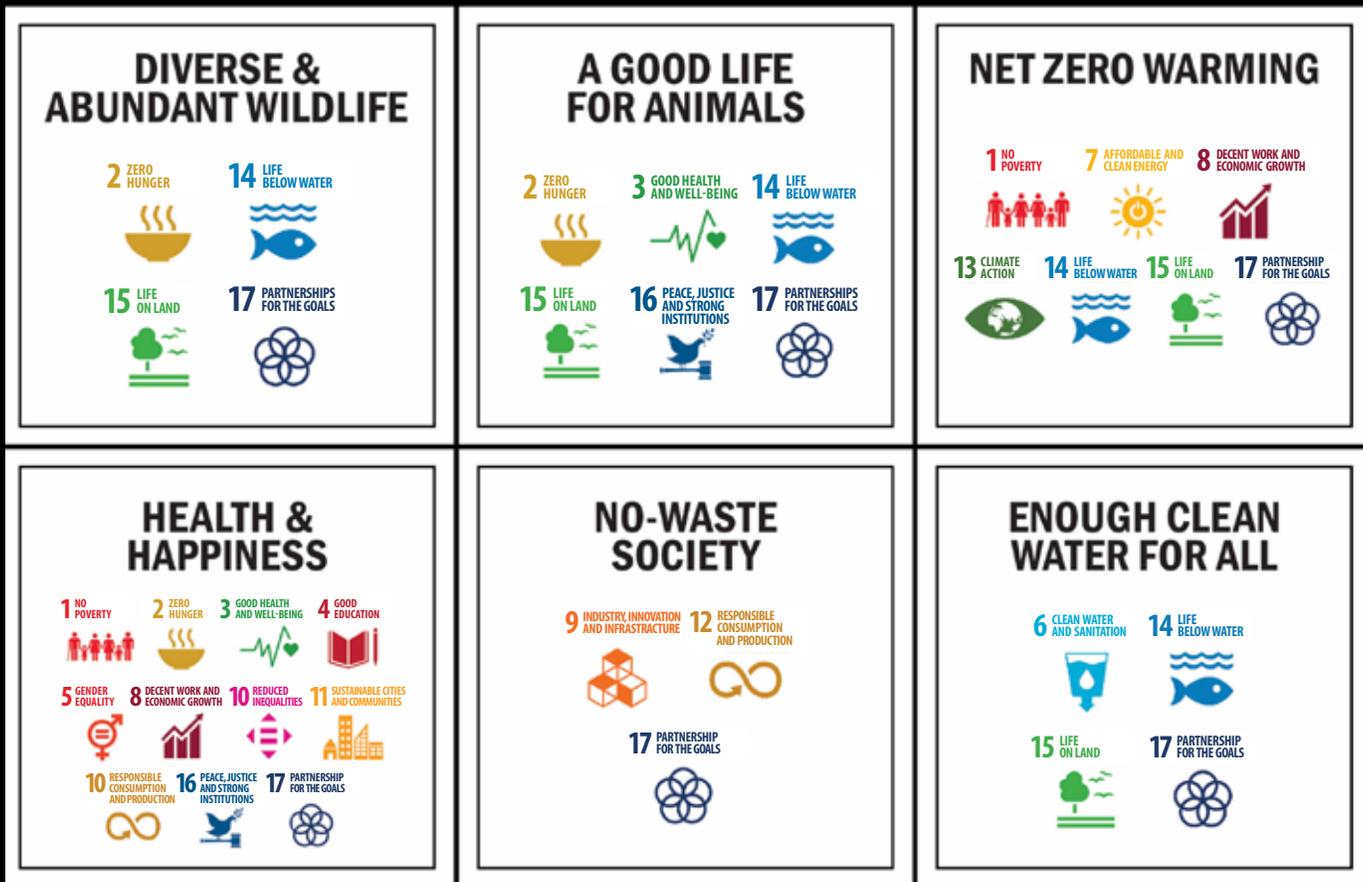
— Joan Baez

There are countless ways for animal health professionals to act on climate change and broader sustainability initiatives. Opportunities for mitigation and adaptation extend across local to global scales, individual to collective actions, and personal to professional life. The breadth and depth of these are well beyond the scope of this article, so the focus here will be on a series of recommendations broadly applicable to veterinary professionals.

Lead by example

One of the most powerful ways to be an agent of change is to lead by doing. These actions signal a commitment to the environment that animals and people need to be healthy. For veterinarians who make this change in their professional lives, this has the co-benefit of reducing the environmental footprint of the profession. The overwhelming majority of veterinarians in North America are employed in clinical practice, and medical care is resource intensive (110). A priority for current and future veterinarians is to reduce the impact of patient care they deliver as they recognize the health risks arising from the climate crisis and seek to mitigate those where possible (104, 111). While few peer-reviewed articles guide such efforts in veterinary clinics, helpful resources broadly applicable to veterinary clinics are available from other sectors (112). For example, there is a critical and immediate need to transition buildings, including veterinary facilities, to renewable energy to slow climate change and decrease air pollution. As this is not an

Figure 2



The veterinary sustainability goals proposed by Vet Sustain incorporate all 17 of the United Nations Sustainable Development Goals. Redrawn (109).

action specific to the veterinary profession, working with local or state agencies knowledgeable about laws, incentives, and available options is critical. Recycling, and to some degree water conservation, are similarly informed by community resources.

There are an increasing number of veterinary sustainability groups arising in other countries, such as Vet Sustain in the United Kingdom and Vets for Climate Action (b) in Australia, that have developed a series of excellent resources addressing a broad suite of sustainability issues, many of which apply to veterinarians around the world. Veterinary sustainability goals can be helpful for groups to form objectives, prioritize efforts, and recognize the interconnection of the environmental, social, and economic sustainability pillars. Such an approach can complement efforts addressing other challenges faced by veterinarians such as workplace wellbeing, gender inequities, financial crises, and burnout (109, 113, 114).

Communication

Veterinarians are excellent messengers for sustainability issues as they are trusted community members, generally viewed as honest and ethical (115). There is a need for health professionals to speak about climate change as a health issue; many studies show that health framing elicits more positive responses to climate change discussions (116–119). These conversations can include information about how animals are impacted by their changing environment but should remain focused on helpful actions such as reducing greenhouse gas emissions, conserving water, and protecting natural ecosystems. Sharing stories that are personal to us, including actions we have taken, can help to find common areas of interest and facilitate what might otherwise be difficult conversations. Audiences for these crucial conversations include clients, staff, colleagues, media outlets, local boards of health, and other community organizations that touch on climate change and animal or public health (Rotary Club, Future Farmers of America,

4-H, schools). From 2018-2019, worldwide media coverage of climate change and health has increased by 96%, outpacing news of climate change by itself (120). Given the breadth of veterinary medicine, this is just an example of how the veterinary profession can more readily engage in media while there is significant public interest.

Team building and collaboration

Bold and immediate climate action is needed to ensure a livable future (121). Working on issues of local relevance is an excellent way to build a community of action (122). Addressing regional disease threats, protecting the resident at-risk animal populations, and ensuring animals are accounted for in disaster preparedness planning are all excellent ways for veterinarians to build a community around climate change and health. Such activities undoubtedly involve working with relevant subject matter experts, public health professionals, and engaged members of the public. This type of local engagement can develop organically or be associated with a local organization already committed to a related issue.

Veterinarians would also be well served by building synergistic alliances both within and beyond the profession that can share resources on sustainability. In other countries,

non-profit groups like Vet Sustain and Vets for Climate Action form a network for like-minded professionals to work together on issues relevant to their specific location and the broader profession. These groups are engaged in a variety of activities such as educating veterinary professionals (via webinars, social media, conferences, and infusion of content into curricula), developing and promoting policies for a range of audiences (veterinary clinics and veterinary medical associations), sharing tools for working in a way that is more sustainable (“greening” veterinary hospitals), and commending those who are engaging on sustainability initiatives (by sharing stories and promoting third party certifications). Nascent efforts in North America such as the Veterinary Sustainability Alliance(c) can learn from these as well as other professions’ regional successes to enhance their abilities. An example is the Medical Society Consortium on Climate and Health, focusing on 3 simple messages: climate change is harming Americans today, and these harms will increase without action; the way to slow or stop these harms is to decrease the use of fossil fuels and increase energy efficiency and use of clean energy sources; changes in energy choices will improve air quality and water quality, providing immediate health benefits (123).

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The advertisement features a black and white dog jumping joyfully against a blue sky with snowflakes. In the foreground, three bottles of Mayway joint support formulas are displayed: 'Joint Construction Capsule', 'Three Objections Capsule', and 'Soothing Hoarse Capsule'. The background shows a snowy mountain range.

Education

The topic of climate change has not been consistently covered in veterinary curricula nor showcased in veterinary teaching hospitals, despite its obvious role as an extension of public health and clinical care (104, 111, 124). In 2020, the US National Academies of Sciences, Engineering, and Medicine released a strong framework entitled *Strengthening Sustainability Programs and Curricula at the Undergraduate and Graduate Levels* (125). This publication brings together important recommendations on better instilling sustainability into training programs across post-secondary education. The 5 realms identified include systems thinking, anticipatory, normative, strategic, and interpersonal, and generally align with the 9 domains of competence outlined by the American Association of Veterinary Medical Colleges. Public health, one of the domains, is a critical component of veterinary medical education, part of the veterinary professional oath worldwide (126). The public health domain describes the graduate responding to issues at the interface of animals, humans, and the environment, utilizing a global perspective and sensitivity to local cultures (127). This is a logical area for climate change education to be embedded. Climate change will impact virtually all aspects of veterinary public health, including infectious disease, natural disasters, and food security, and should therefore be considered core curricular content.

The topic of climate change could additionally be infused throughout other areas of the curriculum by using it as a framework to address further veterinary education or skills. Courses such as microbiology (eg, range expansion of pathogens), emergency care (eg, heat stroke in dogs), internal medicine (eg, air pollution and pulmonary disease), zoo/wildlife medicine (eg, habitat and biodiversity loss, wildlife conflict), and animal production (eg, mycotoxin exposure in feed) are all appropriate places to introduce key sustainability issues. Finally, veterinary teaching hospitals should serve as a “living lab,” showcasing best practices in sustainability such that trainees learn ways to provide appropriate clinical care while minimizing the unintended and often overlooked negative consequences associated with medical services (124).

After veterinary school, there are ample opportunities to include climate change in continuing education (eg, conferences, courses, journals, and magazine articles) and other ongoing training such as graduate work, particularly with respect to clinical practice and business management education. There are growing economic arguments for integrating sustainability into

business. Preliminary work in the companion animal sector suggests that veterinary clients may preferentially select and pay more for veterinary services from a clinic that is knowledgeable about climate-associated health impacts and has taken steps to reduce their environmental footprint (128).

Policy

A strong case has been made for the engagement of veterinarians to work alongside other health professionals on policy issues involving environmental health (129). Climate change is a public health problem, and veterinarians are public health professionals; thus, climate change and sustainability are veterinary issues. However, these kinds of activities cannot be conducted within a vacuum, and support from cross-sector collaborations, stakeholders, and policy is critical for veterinarians to be effective stewards in this area (4, 130). Gaps must be bridged between veterinary practice and policy decision-making to ensure veterinarians are supported in public health capacities.

The human medical profession, including specialist doctors and nurses, has established calls to action and incorporated climate change as an essential issue into their professional society policies. These groups have created coalitions and subsequent policy action agendas, excluding any representation from animal health sectors. Guides to support practitioners in climate change and its impact on human and environmental health have been published in the human medical field. Additionally, the human medical profession views climate change and sustainability as a public health issue (5, 131). This is true across physicians, nurses, and dentists (132–136).

The need for these professionals to use their voices for change, be powerful advocates, and be agents of action in this space has been emphasized (137, 138). The same cannot be said for American veterinary societies; the only policy from the AVMA mentioning climate change is devoid of operational guidance for seeking action on the issue (129, 139). Association members are provided opportunities to comment on policies and are encouraged to share their perspectives and ideas for improvement.

Communication and relationships are central to sustained interactions between policy-makers and practitioners (140). Veterinarians are trained in these skills, as highlighted in the communication section above. With their unique perspectives on climate change vulnerabilities,

veterinarians can serve as cross-disciplinary experts to facilitate communication and establish strong relationships and trust with policy-makers (141). Veterinarians have the opportunity to use their roles as practitioners to share their knowledge about public health issues with policy-makers, educate the public on the impacts of climate change on planetary health, and bolster the capacity for climate-change resilience, adaptation, and mitigation (142).

Climate-change policy is relevant to all veterinary practitioners, whether in clinical practice settings or elsewhere, because climate change is a public health issue. Advocacy skills are key, and veterinarians can be involved with the policy-making process and build these skills at all levels, from the local level via county public health boards to the state and national levels through professional societies and relationships with policymakers. Veterinarians can also serve as critical community leaders to advocate for concerns relating to climate change and the health of their patients and clients (143).

Research

There is already scientific consensus that climate change is real and has significant health impacts projected to increase, and immediate and significant action is needed to avoid a climate catastrophe (32, 121). Indeed, there are substantial gaps in veterinary knowledge regarding the timing and magnitude of impacts across all species and regions. However, this uncertainty should not be a barrier to immediate climate action through well-established mitigation actions that transcend sectors, such as transitioning from fossil fuels to renewable energy. That said, there are several ways that research can help the veterinary profession most effectively protect animal health from current and emerging threats.

There is a need to develop and provide long-term support for a system that can better link animal health information to regional environmental conditions (11). Such a system could support epidemiological studies that would aid veterinarians by providing timely information on regional climate risks and serve as a site of case aggregation for targeted studies into risk and protective factors for climate-associated conditions. Research in science communication could support efforts to mobilize veterinarians and facilitate climate action. For example, veterinarians in the United States were significantly more likely to be concerned about different political views of their clients, so research that helps to support those who seek to act on climate

change, like how to effectively message clients on the topic of climate change, could help (104). Finally, the co-creation of community-engaged research projects can connect teams to develop questions and projects that are relevant and wanted.

Conclusion

Never doubt that a small group of thoughtful, committed citizens can change the world; indeed, it is the only thing that ever has.

— Margaret Mead

Veterinarians worldwide take a professional oath to protect the health and welfare of animals. Climate change and other emerging sustainability topics may not have been taught in veterinary school, but that does not mean veterinarians are without the knowledge and skills to adhere to that oath in the face of urgent and pressing crises. Building, supporting, and promoting healthy domestic and wild animal populations and animal health systems will build resilience to threats from climate change and numerous other challenges. This ultimately comes down to being a good veterinarian, not just for your clients but also for your community, by educating people about the value of preventive care, expanding access to veterinary care to people and animals in need, and safeguarding the factors determining the health of all species and all generations.

Endnotes

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- c. Veterinary Sustainability Alliance. <https://veterinariansustainabilityalliance.org>

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