

BEYOND THE CLINIC

A Practical Approach to Sustainability in the Veterinary Clinic

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The healthcare industry accounts for approximately 8.5% of the United States' annual global greenhouse gas (GHG) emissions.¹ This staggering statistic has driven many human medical facilities to embrace wide-ranging changes to reduce their carbon footprint.² Moreover, the provision of medical care has extensive ecological impacts that include pollution, waste disposal, fresh water use, eutrophication, extraction of primary resources, and land use change which further negatively impacts our health.³ Veterinarians have a responsibility, alongside human medical providers, to adopt a leadership role in reducing the environmental impact of healthcare provision.^{4,5}

Veterinarians can rapidly reduce the ecological impact of their hospitals by implementing various sustainability initiatives in everyday clinical practice. To more completely account for the social, health, and environmental cost of doing business, sustainable businesses embrace the triple bottom line, incorporating "people" and "planet" with "profit."⁶ This is imperative in a world with increasingly costly but limited resources that are more challenging and expensive to acquire, notwithstanding the associated costs of pollution, limited fresh water, environmental degradation, and escalating waste accumulation.

There are co-benefits when transitioning to sustainable practice methods beyond the traditionally thought of benefits of lowering GHG emissions, cost savings, and improved efficiency. These co-benefits include decreased waste; improved employee satisfaction and mental wellbeing (which may result in improved employee recruitment and retention); a safer working environment (e.g., reduction in the use of toxic chemicals); increased client loyalty, purchase, and return rates⁷; and community presence and engagement in local environmental stewardship.⁸

A set of practical actions are presented below on how to approach a veterinary practice's transition to more sustainable methods. This list is by no means exhaustive; however, it provides an initial foundation on which to build. The ease of implementation of each action and realization by staff of the importance of this transition are the critical aspects to ensure success. These ideas can be equally applied at home, increasing the impact of this guide by 1 to 2 orders of magnitude. Additional resources are available in **BOX 1**.

ACTION 1: Form a Green Team

The first step in the process of transitioning a hospital to more sustainable methods is to form a green or sustainability team. The role of the team is to improve

the sustainability of the practice by facilitating the transition with practical, measurable, and implementable actions. The core team should be multidisciplinary, and all sectors of the practice afforded an opportunity to be represented and involved, including veterinarians, veterinary nurses/technicians, custodians, client service representatives, and management. This enhances collaboration of resources and ideas. Furthermore, robust support from management (by making a strong business case for sustainability) is crucial and will empower the team to succeed.⁸

Challenge: Incorporate sustainability into the core values of your business and its operations.

ACTION 2: Prioritize Sustainability Goals and Actions

Start with brainstorming meetings to identify the main areas of concern, interest, and opportunities for improvement. Then prioritize the initiatives proposed considering cost versus savings, ease of implementation, and effectiveness of action in reducing the environmental impacts. Early on, embrace and attain the “low-hanging fruit” goals to help drive momentum with easy rewards; build from there. To ensure the programs have their intended effect, it is vital to conduct a baseline estimation followed by ongoing audits to reevaluate the program. Quantify using measurable units where possible to enhance the accuracy of subsequent comparisons.⁸

Challenge: Calculate your practice’s carbon footprint to determine where your greatest environmental effects are, and strive for the eventual adoption of the most impactful actions. The Veterinary Sustainability Alliance is currently working on a veterinary carbon calculator specifically for the United States.

ACTION 3: Embrace the Power of 100% Renewable Electricity

Approximately 11% of the United States healthcare GHG emissions come from electricity generation.⁹ As states decarbonize and become less reliant on coal and gas for electricity production, this impact is falling rapidly. Solar, wind, geothermal, and hydrokinetic electricity generators are swiftly replacing fossil fuel plants. Switching to a renewable zero-carbon or low-carbon electricity source is one of the easiest ways for a practice to immediately reduce its carbon footprint. Many electrical energy utility suppliers

BOX 1 Veterinary-Specific Sustainability Resources

- **The Veterinary Sustainability Alliance:** A nonprofit organization representing the North American veterinary industry that is dedicated to preserving and protecting animal and human health by promoting sustainability (veterinariansustainabilityalliance.org)
- **Vet Sustain:** Home of the U.K. veterinary carbon calculator and courses, Carbon Literacy for Veterinary Professionals and A Sustainable Approach to Clinical Veterinary Practice (vetsustain.org)
- **VetSalus:** Leads 2 comprehensive courses on veterinary approaches to food and farming (vetsalus.com)
- **Vets for Climate Action:** Hosts an extensive practice-based course, the Climate Care Program (vfca.org.au)

provide a simple link to opt in, with a low (and declining) cost differential. Contact your utility provider for options as every region varies. To further drive a shift to renewable energy, consider divesting from fossil fuels by banking and investing with institutions that do not invest in oil, gas, or coal.¹⁰

Challenge: Consider installing on-site photovoltaic solar panels or join a community-based micro-site renewable project.

ACTION 4: Electrify Everything

Approximately 7% to 14% of emissions from healthcare facilities come from stationary combustion (e.g., oil/gas furnaces, gas water heaters, gas clothes dryers) and mobile combustion (e.g., business-owned fleet vehicles).¹¹ Replacing these with electrically powered machines can eliminate these emissions. Today, there are extremely efficient and quiet heat/cool pump HVAC (heating, ventilation, and air conditioning) units, water heaters, and clothes dryers. Electric vehicles with a range of 300 to 400 miles or more are also available. There are also many Inflation Reduction Act (IRA) incentives for electrification. Use this calculator to determine yours: go.navc.com/3VociFt.

Challenge: Install electric vehicle chargers at your hospital for staff and client use. These can be obtained via purchase or a long-term lease agreement.

Adequan® Canine polysulfated glycosaminoglycan (PSGAG) solution 100 mg/mL in a 5 mL preserved Multiple dose vial for intramuscular use in dogs.

Brief Summary: Prior to use please consult the product insert. **Caution:** Federal law restricts this drug to use by or on the order of a licensed veterinarian. **Indications and Usage:** Adequan Canine is recommended for intramuscular injection for the control of signs associated with non-infectious degenerative and/or traumatic arthritis of canine synovial joints. **Efficacy:** Efficacy of Adequan Canine was demonstrated in two studies, a laboratory study and a clinical field trial. **Contraindications:** PSGAG is a synthetic heparinoid; do not use in dogs with known or suspected bleeding disorders or in dogs showing hypersensitivity to PSGAG. **Precautions:** The safe use of Adequan Canine used in breeding, pregnant, or lactating dogs has not been evaluated. Use with caution in dogs with renal or hepatic impairment.

Adverse Reactions: In the clinical efficacy trial, 24 dogs were treated with Adequan Canine twice weekly for 4 weeks. Possible adverse reactions were reported after 2.1% of the injections. These included transient pain at the injection site (1 incident), transient diarrhea (1 incident each in 2 dogs), and abnormal bleeding (1 incident). These effects were mild and self-limiting and did not require interruption of therapy.

Post Approval Experience (2014): The following adverse events are based on voluntary, post-approval reporting. The signs reported are listed in decreasing order of reporting frequency: vomiting, anorexia, depression/lethargy, and diarrhea. In some cases, death has been reported. **Warnings:** Not for use in humans. Keep this and all medications out of reach of children. **Dosage and Administration:** Adequately clean and disinfect the stopper prior to entry with a sterile needle and syringe to decrease the possibility of post-injection bacterial infections. **Use only sterile needles, and use each needle only once.** **Use in 28 days of first puncture and puncture a maximum of 10 times.** This risk information is not comprehensive, visit adequancanine.com to obtain the FDA-approved product labeling. To report suspected adverse drug events, contact American Regent, Inc. at 1-888-354-4857.



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Approximately 11% of the United States healthcare GHG emissions come from electricity generation.⁹

ACTION 5: Increase Energy Efficiency

Jevons paradox accounts for the rebound effect of increased use or consumption of a material despite major improvements in efficiency.¹² To this day, this holds true for energy. The cheapest and most effective way to be energy efficient is to reduce use: switch off appliances and lights when not in use, use motion or automated switch-off or power-down/sleep modes, use smart plugs to remotely time use periods, install LED lights, use natural light, purchase the highest Energy Star-rated reliable and readily serviceable appliances, cogitate appliance placement, turn off laser printers when not in use (as these consume much energy) or use inkjet printers, set HVAC thermostats in winter to 18 °C to 20 °C (64 °F to 68 °F) and in summer to 23 °C to 26 °C (73 °F to 78 °F), dress for the season, use ceiling fans, combine washing loads, wash laundry on a cool setting with appropriate detergents, and use a clothes line instead of a dryer.¹³

Challenge: Consider building upgrades, including insulating hot water pipes, replacing door seals to reduce drafts, sealing gaps and cracks, improving wall and roof insulation, installing a solar-powered roof cavity ventilator, and increasing building shade (with eaves, retractable awnings, and plants).

ACTION 6: Reduce Waste

For many practitioners, waste reduction can appear to be among the most challenging aspects to a sustainable transformation because so much of what is used is single use and made of plastic.¹⁴ Since 1950, approximately 9 billion tons of plastic have been produced worldwide with less than 15% recycled in the United States.¹⁵ The U.S. healthcare system produces 5.9 million tons of waste annually.¹⁶

Despite these shocking numbers, with some effort, substantial waste reduction is possible. The first steps are to *rethink* all purchases and switch to *reusable* materials, including water bottles; surgical textile gowns, drapes, and cloth caps; and sterilizable instrument tins and equipment. *Refuse* and *reduce* the use of disposable plastics where possible. *Repair* materials and equipment. *Recycle* paper, metal, and most plastic materials and equipment when otherwise unrepairable, ensuring to deposit in a waste stream that can utilize the components. Lastly, *rot* all compostable material in appropriate aerobic sites that avoid the anaerobic conditions of landfills that create methane. Note that many materials are not truly compostable, so look for appropriate American Society for Testing and Materials labelling. See **BOX 2** for specific ways to reduce landfill waste at your clinic.

It is also important to be mindful of drug wastage and to use good stocking principles while ensuring appropriate medication disposal; consider the



consequences of chemical environmental contamination, including the consequences of parasiticide and antimicrobial use and disposal.²⁰

Challenge: Perform a waste audit. This provides a measurable baseline for comparison over time to determine quantifiably whether implemented actions are having the intended effect.

ACTION 7: Consider the Life Cycle Assessment of Products and Services

Every product and most services impact the environment in multiple ways across the value and supply chain throughout their lifespan. A detailed analysis of this process is known as the life cycle assessment (LCA) of a product.²¹ For an individual, gathering LCA information on products is challenging. Procurement guides are an essential tool. A veterinary-specific resource in the United States is the SAVE Veterinary Procurement Guide (go.navc.com/3yFVWyV).

Historically we have used a linear economy production model based on resource extraction, manufacturing, packaging and delivery, use, and discard. To become sustainable, it is vital to evolve a circular economy that strives to maintain materials within a reuse, repurpose, repair, recycle circuit, thereby limiting resource depletion, energy input, and waste accumulation. It is crucial to understand that there is a need for the veterinary and healthcare industries to rethink the design of products and services to minimize the environmental footprint over their lifetime.

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BOX 2 Suggestions for Reducing Veterinary Clinic Landfill Waste

- Contact your waste management facility for region-specific waste segregation/type of material accepted for recycling.
- Switch to reusable sharps containers. These are cheaper, safer, and much more environmentally friendly and can be reused more than 600 times.
- Downcycle standard nitrile gloves out of landfills and into building, road, or other materials.¹⁷ Fully biodegradable nitrile gloves that meet ASTM standards for resistance to permeation by chemotherapy are available.^{18,19}
- ASTM-rated compostable poop bag options are available. Although dog and cat feces are generally not compostable, these bags do not produce microplastics.
- Collect small aluminum pieces (e.g., scalpels, suture material packets) into baseball-sized clumps to allow segregation at recycling facility sort mechanisms; place into the municipal recycling bin.
- Consider TerraCycle pet food bags; downcycling/recycling options are available (terracycle.com).

ASTM = American Society for Testing and Materials



To become sustainable, it is vital to evolve a circular economy that strives to maintain materials within a reuse, repurpose, repair, recycle circuit ...

Challenge: Contact your supplier for environmentally friendly products and services from companies with clear sustainability initiatives or those that hold B Corp certification. Discuss the consolidation of deliveries, reduction in packaging, and use of reusable and recyclable materials.

ACTION 8: Transition to Green Anesthesia

Waste anesthetic gases (WAGs) become potent GHGs when exhausted into the atmosphere.²² Desflurane (rarely used in veterinary medicine) and nitrous oxide (N₂O) are the greatest WAG contributors to global warming and should be avoided. Isoflurane is still about 3 times more impactful than sevoflurane and together with N₂O also degrades atmospheric ozone. A substantial drop in emissions can be achieved by transition to sevoflurane, safe use of lower-flow gas anesthesia (requires advanced technical skill), and, for the utmost reduction, use of intravenous or regional anesthesia. Practically, when WAG exhaust is considered for isoflurane and sevoflurane, they account for less than 0.01% of all U.S. GHG emissions.²³ Despite this, efforts to limit WAGs should be made as the quantity used increases globally each year.

Challenge: Consider WAG capture and recycling, although its availability is limited at this time.²⁴

ACTION 9: Limit Meat, Fish, and Dairy Consumption by Staff and Patients

This could be considered among the easiest, and yet likely the most contentious, ways to reduce GHG emissions. Dairy products and all meats (including fish) account for approximately 15% to 19% of global annual emissions when all parts of production,

including land use change, distribution, and waste, are accounted for.²⁵ Approximately 23% of all available fresh water and 77% of arable land are used to produce meat and dairy products; this land usage accounts for more than 40% of all recent deforestation.²⁵ Much of the biodiversity loss (Living Planet Index reduction of 69% since 1970) is due to habitat loss from land use conversion to agriculture.

Dogs within the United States consume 18% (1.7 billion animals annually) and cats consume 2% of the country's entire annual livestock meat production; the remainder is consumed by humans.²⁶ There are a multitude of health considerations of intensive animal farming, including bacterial foodborne illness, emerging diseases, and antimicrobial resistance. Transitioning to a more plant-based, nutritionally balanced diet will massively reduce humans' and companion animals' ecological impact. Another way to reduce the impact of pet food is to promote dry food, as on average it has 7-fold less carbon footprint than canned.²⁷

Challenge: Offer vegan and vegetarian options at staff gatherings. Consider providing and promoting nutritionist-approved, reduced-meat, balanced, insect- or plant-based pet food diets to patients.

ACTION 10: Travel Sustainably

The transport sector accounts for 29% of U.S. GHG emissions, with light-duty vehicles responsible for 58%, which encompasses staff commute and client's travel.²⁸ There are many ways to reduce this impact, including carpooling, ditching diesel, combining errands and short trips, regular vehicle maintenance, keeping tires appropriately inflated, switching to an electric vehicle, walking, cycling, or taking public transport. For clients, providing patient service through the least number of visits or utilizing some level of telemedicine when appropriate can be considered. Telehealth is used extensively in human health care, providing substantial reduction in GHG emissions, and there are opportunities for expansion in veterinary medicine, pending state regulations.²⁹

Air travel is particularly egregious and accounts for 8% of the U.S. transport sector's GHG emissions annually, almost doubling to 15% when the effect of radiative forcing is included, due to the emissions being deposited high in the atmosphere.^{30,31} Consider not flying or fly short distances less than 1 to 3 hours.

Where and when possible, take the train and attend conferences virtually. Also try to avoid deliveries by air, particularly heavy items.

Challenge: Calculate the travel carbon footprint of the clinic staff annually. Find incentives to provide the necessary motivation to reduce travel emissions. **TVP**

References

1. Dzau VJ, Levine R, Barrett G, Witty A. Decarbonizing the U.S. health sector - a call to action. *N Engl J Med*. 2021;385(23):2117-2119. doi:10.1056/NEJMp2115675
2. Healthcare Without Harm. Race to zero. Accessed May 30, 2024. <https://healthcareclimateaction.org/racetozero>
3. Lenzen M, Malik A, Li M, et al. The environmental footprint of health care: a global assessment. *Lancet Planet Health*. 2020;4(7):e271-e279. doi:10.1016/S2542-5196(20)30121-2
4. Stephen C, Carron M, Stemshorn B. Climate change and veterinary medicine: Action is needed to retain social relevance. *Can Vet J*. 2019;60(12):1356-1358.
5. Kiran D, Sander WE, Duncan C. Empowering veterinarians to be planetary health stewards through policy and practice. *Front Vet Sci*. 2022;9:775411. doi:10.3389/fvets.2022.775411
6. Elkington J. *Green Swans: The Coming Boom in Regenerative Capitalism*. Fast Company Press; 2021.
7. Deluty SB, Scott DM, Waugh SC, et al. Client choice may provide an economic incentive for veterinary practices to invest in sustainable infrastructure and climate change education. *Front Vet Sci*. 2021;7:622199. doi:10.3389/fvets.2020.622199
8. Practice Green Health. A guide for creating effective green teams in health care. September 8, 2008. Accessed May 30, 2024. <https://practicegreenhealth.org/sites/default/files/pubs/epp/GuideGreenTeams.pdf>
9. The Commonwealth Fund. How the U.S. health care system contributes to climate change. April 19, 2022. Accessed May 30, 2024. <https://www.commonwealthfund.org/publications/explainer/2022/apr/how-us-health-care-system-contributes-climate-change>
10. Rudolph L, Beyeler N, McKibben B. It's time for the health sector to stop bankrolling the fossil fuel industry. *NEJM Catalyst*. 2023;4(2). doi:10.1056/CAT.23.0038
11. Health Care Without Harm. Health care's climate footprint: how the health sector contributes to the global climate crisis and opportunities for action. September 2019. Accessed May 31, 2024. https://noharm-global.org/sites/default/files/documents-files/5961/HealthCaresClimateFootprint_092319.pdf
12. Berners-Lee M. Energy. In: *There is No Planet B*. Cambridge University Press; 2021:92-94.
13. Gale J. Sustainable(ish) work. In: *The Sustainable(ish) Living Guide*. Green Tree; 2020:189-200.
14. Kern-Allely CM, McGimsey MR, McAdam TS, et al. Waste not want not: piloting a clinical waste audit at a United States university veterinary teaching hospital. *JAVMA*. 2023;261(4):584-591. doi:10.2460/javma.22.11.0495
15. Geyer R, Jambeck JR, Law KL. Production, use, and fate of all plastics ever made. *Sci Adv*. 2017;3(7):e1700782. doi:10.1126/sciadv.1700782
16. Voudrias EA. Healthcare waste management from the point of view of circular economy. *Waste Manag*. 2018;75:1-2. doi:10.1016/j.wasman.2018.04.020
17. PolyCarbin. Recycle any brand of nitrile glove. Accessed May 30, 2024. <https://polycarbin.com/pages/gamma-carbin>
18. VetFlex. About nitrile. Accessed May 30, 2024. <https://vetflex.com>
19. KVP. BetterGloves. Accessed May 30, 2024. <https://kvpvet.com/products/bettergloves>
20. Vet Sustain. Greener veterinary practice checklist. March 19, 2021. Accessed May 30, 2024. <https://vetsustain.org/resources/vet-practice-checklist>
21. McGinnis S, Johnson-Privitera C, Nunziato JD, Wohlford S. Environmental life cycle assessment in medical practice: a user's guide. *Obstet Gynecol Surv*. 2021;76(7):417-428. doi:10.1097/OGX.0000000000000906
22. Jones RS, West E. Environmental sustainability in veterinary anaesthesia. *Vet Anaesth Analg*. 2019;46(4):409-420. doi:10.1016/j.vaa.2018.12.008
23. Varughese S, Ahmed R. Environmental and occupational considerations of anesthesia: a narrative review and update. *Anesth Analg*. 2021;133(4):826-835. doi:10.1213/ANE.0000000000005504
24. Blue-Zone Technologies. Blue-Zone Technologies sustainable anesthesia recovery. Accessed May 30, 2024. <https://www.blue-zone.com>
25. Ritchie H, Rosado P, Roser M. Environmental impacts of food production. *Our World in Data*. 2022. <https://ourworldindata.org/environmental-impacts-of-food>
26. Okin GS. Environmental impacts of food consumption by dogs and cats. *PLoS One*. 2017;12(8):e0181301. doi:10.1371/journal.pone.0181301
27. Lesté-Lasserre C. Wet pet food has seven times the carbon emissions of dry food. *New Scientist*. November 17, 2022. <https://www.newscientist.com/article/2347569-wet-pet-food-has-seven-times-the-carbon-emissions-of-dry-food/>
28. Center for Climate and Energy Solutions. Federal vehicle standards. Accessed May 31, 2024. <https://www.c2es.org/content/regulating-transportation-sector-carbon-emissions>
29. Donald N, Irukulla S. Greenhouse gas emission savings in relation to telemedicine and associated patient benefits: A systematic review. *Telemed J E Health*. 2022;28(11):1555-1563. <https://doi.org/10.1089/tmj.2022.0047>
30. Lee DA, Fahey DW, Skowron A, et al. The contribution of global aviation to anthropogenic climate forcing for 2000 to 2018. *Atmos Environ*. 2021;244(1):117834. <https://doi.org/10.1016/j.atmosenv.2020.117834>
31. Center for Climate and Energy Solutions. Federal vehicle standards. Accessed June 10, 2024. <https://www.c2es.org/content/regulating-transportation-sector-carbon-emissions/>



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