Hyperbaric Oxygen Therapy in Animals
A White Paper on The Delivery of Hyperbaric Oxygen Therapy to Animals

Hyperbaric therapy is produced by placing a patient in an environment where the surrounding pressure is higher than the atmospheric pressure at sea level. Hyperbaric *oxygen* therapy is providing 100% oxygen to a patient while they are in an environment where the surrounding pressure is greater than the atmospheric pressure at sea level. The use of a hyperbaric environment began in the middle 1650s. Animals were treated with hyperbaric oxygen beginning as early as 1878. Clinical hyperbaric oxygen therapy for animals was used on a very limited basis in the early 1980s. It wasn't until the mid to late 1900s that an initial surge occurred in clinical application in animals, mainly in the equine industry. After 2000, a second surge occurred in small medicine as companies began producing hyperbaric chambers for small animals. In 2005 a small group of veterinarians and industry partners met to discuss the future direction of the clinical application of hyperbaric oxygen therapy in animals. The results of this meeting were the roots of a more organized approach to the delivery of hyperbaric oxygen therapy to animal patients. The Veterinary Hyperbaric Medicine Society (VHMS) was established. In association with International ATMO a basic course on hyperbaric oxygen therapy in animals was integrated into their educational programs. At the same time the VHMS partnered with the National Board of Diving and Hyperbaric Medical Technology and created a board certification in animal hyperbaric oxygen therapy, Certified Veterinary Hyperbaric Technologist (CHT-V). In 2019-2020 a review of the VHMS resulted in a reorganization, a new commitment to animal hyperbaric therapy, expansion and a name change to the Veterinary Hyperbaric Association (VHA). This new association now manages the basic animal training course and the CHT-V board certification process.

The delivery of hyperbaric oxygen therapy to animals traditionally utilizes a chamber that facilitates the development of a higher than normal surrounding pressure. The pressure may be increased by filling the sealed chamber with either air or 100% oxygen. In animal therapy that pressure is *usually* produced by the use of 100% oxygen. The FDA considers hyperbaric chambers to be medical devices and 100% medical grade oxygen to be a drug. Animal hyperbaric oxygen chambers are constructed and installed according to the same standards developed for human chambers (ASME, PVHO, NFPA). The treatment of animals in chambers not constructed to these standards or chambers that have been structurally altered creates a serious safety concern. The treatment of animals and humans in a human multiplace chamber presents some unique issues surrounding protocol lengths, inspiration of hyperbaric air with the potential for decompression sickness in the animal patient, and hygiene concerns. The use of low pressure, soft chambers may not provide adequate inspired oxygen concentrations to

produce tissue oxygen levels for the effective treatment of most animal diseases or problems. Soft pressure vessels are also susceptible to damage from animal claws and nails.

Hyperbaric oxygen therapy for animals is being delivered in two main settings, veterinary clinics and hospitals and in association with animal rehabilitation facilities. Veterinary based facilities include individual private practices, multi-veterinarian private referral centers and academic veterinary medical centers. Both small and large animal rehabilitation centers are also providing hyperbaric oxygen therapy. There is also a very few private farms and homes that deliver hyperbaric therapy to their personal animals.

When compared to human hyperbaric oxygen therapy, hyperbaric therapy in animals comes with a few unique challenges. The *lack of verbal communication* between the patient and the care provider commands a sound knowledge of normal and abnormal animal behaviors. Both high oxygen levels and pressure can produce complications that must be recognized and managed before and/or during treatment. The *multiplicity of species* and their unique anatomic and physiologic characteristics
is often challenging when hyperbaric oxygen is being administered. There is often a lack of published information on hyperbaric therapy in many of these species. The ability to correlate known effects of hyperbaric oxygen with the *unique anatomy and physiology* of different species is important in delivering hyperbaric treatments in a safe and efficacious manner. In some animal species *restraint* outside of the chamber can be a challenge not to mention while inside the chamber with limited accessibility. The *scarcity of controlled research* and trials directed at the clinical use of hyperbaric oxygen in animals has and continues to produce hesitation in using this treatment modality. Clinical use and individual case experiences indicates that it should be a primary or complementary treatment in many diseases and problems in animals. Lastly, there is a lack of controlled studies on the *appropriate treatment protocols* that should be used for various diseases. Current protocols are based on clinical experience and individual patient response.

The efficacious and safe delivery of hyperbaric oxygen therapy to animals is dependent on several factors:

1) a thorough knowledge of normal and abnormal animal behavior and experience in animal handling and management, 2) a knowledge of the physiology of animal species and pathophysiology of animal diseases, 3) a knowledge of the basic physiology and physics of pressure and oxygen, 4) ability to correlate the beneficial effects of hyperbaric oxygen with the pathophysiology of a particular disease or problem (patient selection), 5) a knowledge of the potential side effects and complications associated with hyperbaric oxygen therapy, their clinical signs and their management in animals, 6) a thorough knowledge of chamber operation and operational safety as it pertains to personnel and patients. These factors require very specialized training and experiences.

The hyperbaric oxygen treatment process requires proper knowledge in two broad areas, animal medical knowledge and chamber operations knowledge. Medical knowledge is provided by a veterinarian in association with trained certified veterinary nurses. Ideally, each hyperbaric therapy center or practice should have a medical director, a veterinarian with adequate knowledge of hyperbaric oxygen therapy. The medical team within the hospital or practice may also include other specialists, veterinarians, and nurses. Chamber operations may be the responsibility of qualified veterinary nurses or veterinary assistants under the supervision of a veterinarian. Ideally, each hyperbaric center should have a safety director who has a proper knowledge of chamber operation and safety. Together, the medical director and safety director

make decisions about each case and about the day to day operational processes of the hyperbaric center or practice. In many cases, the medical director and safety director may be the same person. A veterinarian trained in hyperbaric medicine is also important in patient management when side effects and complications occur during treatment.

In veterinary medicine each state has its own veterinary practice act. These acts govern what is considered the practice of veterinary medicine and what credentials a person must have to treat animals brought to them by the public. In most cases these regulations do not apply to the treatment of a person's own animals. Hyperbaric oxygen therapy is a conventional medical procedure backed by a plethora of reviewed, scientific literature and studies and is used as a therapy directed at specific diseases and problems. Although some veterinary practice acts do not specifically mention hyperbaric oxygen therapy as a veterinary procedure, the Veterinary Hyperbaric Association considers its use in animals as a veterinary medical procedure which delivers a drug by utilizing a special medical device and requiring specialized provider training for efficacy and safety.

Summary: Hyperbaric oxygen therapy in animals:

Hyperbaric oxygen treatment facilities should have a veterinarian knowledgeable about hyperbaric oxygen on site to make medical decisions about patients being considered for therapy.

Animal hyperbaric chambers should be constructed according to ASME, PVHO, and NFPA, codes and guidelines. Animals should not be treated in low pressure, soft sided chambers. The treatment of animals and humans in the same chamber is not recommended.

Hyperbaric oxygen facilities should have a veterinarian on staff to make decisions about and triage patients that may exhibit side effects, complications or emergencies while being treated with hyperbaric oxygen.

A member of the hyperbaric oxygen facility's patient care team should have training and a sound knowledge in chamber operations and operational safety for delivery of hyperbaric oxygen.

Patients coming to a hyperbaric facility for treatment should have been examined and referred by a veterinarian.

The ideal hyperbaric treatment team should include a medical director, safety director, and trained chamber operators that work in cooperation with the primary care givers for each patient.

It is highly recommended that at least one member of the hyperbaric treatment team should be a board certified veterinary hyperbaric technologist (CHT-V).

Training is the key to a successful hyperbaric oxygen treatment service. Training should be on-going and documented annually.

The application of hyperbaric oxygen therapy in animals is considered the practice of veterinary medicine.