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Funded Study: High-Flow Nasal Oxygen Therapy for Blastomycosis in Dogs

Study Title: Feasibility of High-Flow Nasal Oxygen as a Life-Saving Therapy for Pulmonary Blastomycosis in Dogs

Purpose of Study:
Dogs with severe respiratory disease from blastomycosis have a poor prognosis (30-60%) despite aggressive therapies with antifungal drugs and traditional oxygen therapy (oxygen cages, nasal cannulas). Therefore, this study investigates a new oxygen technique, high-flow nasal oxygen therapy (HFNOT), for supporting these patients while hospitalized during the acute phase of the disease.

Inclusion Criteria:
- Dogs at least 6 months of age and weighing at least 5 kg
- Be hospitalized at the U of I VTH
- Have a definitive or presumptive diagnosis of pulmonary blastomycosis
    - Definitive: *Blastomyces* organisms identified on cytology, histology or culture OR a positive *Blastomyces* urine antigen test
    - Presumptive: Consistent clinical and radiographic findings with low likelihood of an alternative diagnosis
- Demonstrate a need for oxygen supplementation, which may include:
    - Respiratory rate > 60 rpm and/or
    - Increased respiratory effort and/or
    - P_aO_2 < 80 mmHg on arterial blood gas analysis

Eligibility Diagnostics:
- Physical exam
- Thoracic radiographs – at client's cost; if admitted, study will retroactively pay for first set of radiographs taken at the VTH
- Arterial blood gas analysis – paid for by study

Treatment/Protocol:

- All study diagnostics and interventions will take place during hospitalization at the VTH
- Patients will be screened for oxygen need via arterial blood gas analysis
    - Patients requiring oxygen therapy will be admitted to the study
    - Patients with severe respiratory compromise requiring advanced techniques (i.e., ventilation) will not be eligible
- Admitted patients will be randomized to receive oxygen therapy by HFNOT or traditional methods (cage or cannula)
    - Patients that subsequently fail traditional oxygen therapy will crossover to the HFNOT group
- Respiratory status (rate, effort, arterial blood gas analysis, pulse oxygenation) will be monitored and oxygen therapy adjusted based on standardized protocols
    - An arterial catheter will be placed to facilitate sampling
- Standardized antifungal (itraconazole) and anti-inflammatory (dexamethasone) therapy will be initiated
- All other treatments (e.g., fluids, sedation, supportive care) are at the discretion of the primary VTH clinician in consultation with the client

Owner Commitments:

- This study is for patients requiring hospitalization and oxygen therapy for blastomycosis. Patients will receive the standard of care for treatment of this disease.
- Clients must be committed to pursuing a reasonable course of treatment (generally several days) and continuing hospitalization until clinical stabilization, euthanasia, or death.
- Clients are responsible for the total cost of hospitalization less the compensations listed below. A general estimate for hospitalization for pulmonary blastomycosis is $4,000-6,000.

Compensation:

- Cost of all oxygen monitoring (arterial blood gas analysis, pulse oxygenation measurement) and associated procedures (arterial catheter placement and maintenance) during study participation
- Cost of oxygen therapy (HFNOT or traditional), including set-up for the first 48 hours of study enrollment (~$600).
    - Subsequent oxygen therapy (HFNOT or traditional) costs will be the financial responsibility of the client ($100-160 per day)
- Cost of one set of thoracic radiographs taken at the VTH (~$300)

Contact Information:

If you or have any questions regarding this study, please contact Dr. Jennifer Reinhart at jreinha2@illinois.edu.

Additional Information About High-Flow Nasal Oxygen Therapy (HFNOT):

High-flow nasal oxygen therapy (HFNOT) represents an intermediate step between traditional oxygen therapy and mechanical ventilation. HFNOT provides heated and humidified medical gas allowing higher and adjustable flow rates, consistent fraction of inspired oxygen [F_iO_2] delivery up to 100%, dead space washout, and reduction of mild hypercapnia (**Figure 1**). The support is delivered to the patient by nasal prongs, requiring mild to no sedation, which promotes patient tolerance of the apparatus. Importantly, HFNOT provides low-level positive end-expiratory pressure, which improves pulmonary mechanics and reduce fatigue.[2] Published veterinary reports suggest that HFNOT may be helpful in other respiratory diseases necessitating oxygen therapy.[1-5] HFNOT treated dogs showed improved oxygenation (arterial oxygen partial pressure [P_aO_2], blood oxygen saturation [S_pO_2]) as well as reduced work of breathing and respiratory rates following transition from traditional oxygen therapy.[2,3]

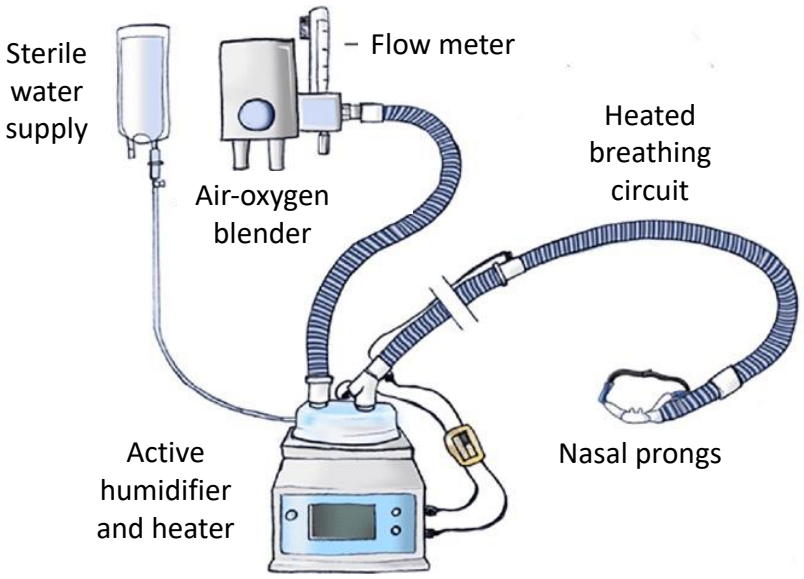


Figure 1 – Schematic of HFNOT. Pure oxygen and room air are admixed in the air-oxygen blender to the desired F_iO_2, which is then humidified and heated and delivered to the patients by a heated breathing circuit and nasal prongs. Adapted from Pouzot-Nevoret, *et al.* (2019).[6]

References:

1. Keir I, Daly J, Haggerty J, Guenther C. Retrospective evaluation of the effect of high flow oxygen therapy delivered by nasal cannula on PaO2 in dogs with moderate-to-severe hypoxemia. J Vet Emerg Crit Care. 2016;26(4):598-602.
2. Frischer R, Daly J, Haggerty J, Guenther C. High-flow nasal cannula improves hypoxemia in dogs failing conventional oxygen therapy. J Am Vet Med Assoc. 2023;261(2):210-216.
3. Jagodich TA, Bersenas AME, Bateman SW, Kerr CL. High-flow nasal cannula oxygen therapy in acute hypoxemic respiratory failure in 22 dogs requiring oxygen support escalation. J Vet Emerg Crit Care. 2020;30(4):364-375.
4. Eicher L, Young AA, Hoover L, Kuo KW, Her J. Retrospective evaluation of the respiratory rate-oxygenation index to predict the outcome of high-flow nasal cannula oxygen therapy in dogs (2018-2021): 81 cases. J Vet Emerg Crit Care. 2024;34(3):252-261.
5. Duble E, Her J, Preteseille I, Lee J, Allaouchiche B, Pouzot-Nevoret C. The utility of the respiratory rate-oxygenation index as a predictor of treatment response in dogs receiving high-flow nasal cannula oxygen therapy. Front Vet Sci. 2024;11:1404195
6. Pouzot-Nevoret C, Hocine L, Negre J, Goy-Thollot I, Barthelemy A, Boselli E, Bonnet JM, Allaouchiche B. Prospective pilot stody for evaluation of high-flow oxygen therapy in dyspnoeic dogs: the HOT-DOG study. J Sm Anim Pract 2019;60(11):656-662.