Abstract of proposed student project (1 page limit. This should mirror the aims page of a grant and CLEARLY indicate the student's role.)

Sepsis is one of the most common causes of death in small animal emergency and critical care patients. It is defined as a life-threatening organ dysfunction due to dysregulated host response to infection, being considered a medical emergency due to patient fast decompensation and elevated mortality rates. Despite several basic and clinical studies being performed in recent decades to elucidate this syndrome, the mortality rate in dogs with sepsis persists elevated. This results not only from the severity of the disease, but also from owners' propensity to opt for humane euthanasia considering the poor prognosis of this condition and elevated costs of its treatment.

An early diagnosis and appropriate treatment in the initial hours after the development of sepsis is imperative to improve outcomes as well-described in the human medical literature. Of paramount importance in treating the septic patient is an early administration of appropriate antimicrobials. The initial prescription of antimicrobials is empiric since the microorganism (s) responsible for the clinical syndrome of sepsis is (are) unknown at the time of diagnosis. Thus, a four-quadrant therapy (i.e., with antimicrobial coverage against aerobes, anaerobes, Gram-positive and negative bacteria) is prescribed, and then later de-escalated based on the results of the culture and sensitivity tests (C/S). Despite its significant importance, the C/S tests take days to indicate the microorganism (s) responsible for the septic event and the best antimicrobial approach for the patient. Therefore, patients are at risk of inadequate coverage with the antimicrobial prescription in addition to an increased selection pressure of a multi-drug resistant (MDR) bacteria until the C/S results are available. Not surprisingly, the incidence of MDR microorganisms is alarmingly growing over the last few years, which brings increased risks of infection to pets and their owners. Thus, new approaches and techniques to an early diagnosis of sepsis are of paramount importance in the emergency and critical care field, allowing faster and more appropriate administration of antimicrobials. This could culminate in significant changes in patient's cost, time of hospitalization, risks of antimicrobial detrimental effects, and survival rate.

Based on this, the main goals of this study are: 1) diagnose sepsis in dogs by using a new benchtop molecular method of microbial identification and the presence of genes of antimicrobial resistance in addition to the C/S testing; 2) compare both diagnostic tests through different patient's biological samples (i.e., whole blood and abdominal free fluid); 3) investigate if the method of diagnosis chosen to diagnose and treat sepsis culminates in different patient's cost, time of hospitalization, and outcome.

To accomplish this, new automated system of molecular real-time polymerase chain reaction (qPCR) testing designed for veterinarian molecular screening for bacterial infection will be used. The automated qPCR diagnostic tool allows early identification (i.e., approximately 3 hours) of the correct pathogen (s) responsible for the septic event and the presence or not of antimicrobial resistance profile as opposed to days or weeks when compared to the C/S tests. Thus, it provides a more patient target-centered care, judicious and responsible use of antimicrobial therapy. To this end, a number of dogs with suspected or diagnosed septic peritonitis will be enrolled for the qPCR testing in addition to the C/S tests and treated accordingly. Patients' illness score (SOFA), time of hospitalization, treatment cost, and survival will be evaluated between these two groups. Also, the results performed by the qPCR technique will be compared by paired samples with the traditional C/S laboratory diagnostic testing.

Student specific roles

- Project planning: collect references, plan, and write the project.
- Project development: receive training and perform collection of samples (i.e., abdominal free fluid by the ultrasound-guided paracentesis technique and peripheral blood by venipuncture) from dogs with suspicious or diagnosed septic peritonitis; receive training and perform qPCR analyses from the samples collected for microbial and AMR diagnosis in dogs with suspected septic peritonitis; organize, interpret, and report the qPCR results obtained; organize and interpret the results obtained from the C/S tests; compare C/S versus qPCR microbial and AMR data results. Collect additional patients' data including treatment costs, time of hospitalization, and outcome.
- Project conclusion: statistical analysis of the results, report results in local and national conferences, and submit article (s) for publication.