



RESEARCH PROGRESS REPORT SUMMARY

Grant 01827: Defining the Specific Species of Bacteria That Contribute To Canine Periodontal Disease

Principal Investigator: Dr. Marcello Pasquale Riggio, PhD

Research Institution: University of Glasgow

Grant Amount: \$31,000.00

Start Date: 1/1/2013 **End Date:** 12/31/2014

Progress Report: End-Year 2 (FINAL)

Report Due: 12/31/2014 **Report Received:** 1/19/2015

Recommended for Approval: Approved

(Content of this report is not confidential. A grant sponsor's CHF Health Liaison may request the confidential scientific report submitted by the investigator by contacting the CHF office. The below Report to Grant Sponsors from Investigator can be used in communications with your club members.)

Original Project Description:

Our knowledge of the causes of gum disease in dogs is poor, even though this is one of the most common diseases of dogs and causes severe pain and tooth loss. However, it is widely thought that certain bacteria may cause the disease, as is the case in the human form. Most of the research carried out so far into the causes of gum disease in dogs has focussed on growing specific bacteria from clinical samples. However, since many types of bacteria in the mouth cannot be grown in the laboratory, we have an incomplete understanding of the bacteria linked to health and disease of the mouth. To overcome this problem, we shall use the most modern, cutting edge laboratory technology available (known as 'high-throughput sequencing') to provide an in-depth understanding of the types of bacteria that cause gum disease in some dogs but not others. This method detects the DNA of bacteria rather than live bacteria and allows bacteria to be identified and quantitated without the need to grow them from clinical samples. The biggest advantage of this method is that, as well as detecting known types of bacteria, we can also identify bacteria that cannot be grown in the laboratory as well as new types which have not been discovered previously and which may help to cause the disease. This study will give us the most up to date knowledge on gum disease in dogs and will help in the development of vaccines and improved treatment methods for this disease.



Grant Objectives:

1. Identify the bacteria associated with a healthy oral cavity and periodontitis in dogs.
2. Determine which uncultivable and novel species, in addition to known cultivable species, are present in oral health and periodontitis.
3. Assess the differences in bacterial populations between the healthy and periodontitis groups.

Publications:

Manuscript in preparation.

Report to Grant Sponsor from Investigator:

This is the first part of a study to identify the bacteria that cause periodontal disease (gum disease/periodontitis) in dogs of all ages and breeds. Our knowledge of the causes of gum disease in dogs is poor, even though this is one of the most common diseases of dogs and causes severe pain and tooth loss. Although the disease causes much suffering, it remains difficult and expensive to treat. However, it is known that certain bacteria may cause the disease, as is the case in the human form of the disease. Most of the research carried out so far into the causes of gum disease in dogs has focused on growing specific bacteria from clinical samples. However, since many types of bacteria in the mouth cannot be grown in the laboratory, we have an incomplete understanding of the bacteria linked to health and disease in the mouth. To overcome this problem, in this study we used the most modern, cutting-edge laboratory technology available (known as 'high-throughput sequencing') to provide an in-depth understanding of the types of bacteria that cause gum disease in some dogs but not others. This method detects the DNA of bacteria rather than live bacteria and allows bacteria to be identified and quantitated without the need to grow them from clinical samples. The biggest advantage of this method is that, as well as detecting known types of bacteria, we can also identify bacteria that cannot be grown in the laboratory as well as new types which have not been discovered previously and which may help to cause the disease.

In this study we examined the types of bacteria associated with the gums of dogs that are orally healthy (20 samples) and those with periodontitis (20 samples). Our results showed major differences in the populations of bacteria between the two groups of samples. Although the relevance of these changes to disease (in particular which types of bacteria may actually be involved in the disease process) is still unclear, this is a significant step in understanding better which bacteria may be of importance in helping to produce disease. Future studies will expand upon this preliminary study to identify more precisely the bacteria of potential



importance in disease, particularly by investigating how their presence in disease alters the dog's immune response to infection.

This study could have a significant impact on the health of dogs, with potentially wide-ranging benefits. It has given us the most up-to-date knowledge on the bacteria that cause gum disease in dogs, but will also identify bacteria that are essential for maintaining a healthy mouth. Rapid diagnostic methods can then be developed to identify bacteria that cause disease in affected animals and appropriate treatment carried out. Knowledge of the bacteria that cause the disease could ultimately lead to the development of improved ways to removing the infecting bacteria, including the use of anti-bacterial compounds and localized therapies in the mouth. If specific bacteria are shown to be involved in disease, then vaccine development is a possibility. This will aid in improving the oral health of the dog population with obvious welfare improvements, and this will of course be of significant benefit to dog owners and veterinarians. Knowledge of the bacteria associated with both a healthy mouth and gum disease will also increase our understanding of how bacteria found in the mouth can cause serious diseases at other body sites in the dog, as frequently occurs in humans.