GRANT PROGRESS REPORT REVIEW

Grant: 01188-A: *Capacity for Respiratory-Based Thermoregulation in Brachycephalic Breeds*

Principal Investigator: Dr. Michael Scott Davis, DVM
Research Institution: Oklahoma State University

Original Project Description:
Background: Dogs can not sweat effectively to cool themselves, and thus have to rely on their breathing to rid themselves of excess body heat. When a dog needs to shed more body heat, it increases its breathing, often by panting. This is a relatively inefficient way of controlling body temperature, and may be even more inefficient in dogs with short, compressed faces such as Boxers, Pugs, and Bulldogs which have narrow airways and require increased effort to breathe. Recently airlines have begun restricting these types of dog breeds as cargo due to the suspicion that the breeds are too susceptible to high environmental temperatures that may be encountered during shipping, and are more likely to suffer from heat stroke or death during routine transport.

Grant Objective: Determine the ability of adult brachycephalic dogs to attain ventilatory and thermal homeostasis during periods of mild heat stress.
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Report to Grant Sponsor from Investigator:
Dogs, in contrast to most mammals, rely on their respiratory tract for thermoregulation by evaporating excess body heat from the respiratory surfaces during breathing. Heat stress (a combination of increased temperature and humidity) results in increased breathing, often observed as panting, as the dogs increase the amount of air moving across the evaporative surfaces of the upper airways without affecting the function of the lower portions of the respiratory tract. Unfortunately, this system is not as efficient as the methods used by other mammals (i.e., sweating), and as a result dogs are prone to overheating in hot, humid environments. It is widely believed that brachycephalic (short-nosed) breeds are particularly at risk due to the design of their airways. The combination of short noses or mouths and narrowed airways makes panting more energy-demanding and less efficient in shedding excess heat. As a result, many airlines have begun restricting the air transport of these breeds in order to reduce the injuries and deaths associated with confinement in cargo holds that can expose the dogs to hot, humid conditions.

This study demonstrates that brachycephalic breeds of dogs adopt an exaggerated, and possibly energy intensive and inefficient, breathing strategy in response to heat stress. In short, they must work harder, and may be expending more energy, to eliminate excess body heat, than other breeds. Additionally, they are less successful than other breeds in maintaining normal body temperature under conditions of heat stress.

An additional important finding of this study is that body condition score (i.e., the relative obesity of the dog) is a greater determinant of body temperature and respiratory

pattern than breed type, in that obesity resulted in smaller breaths and higher body temperature than dogs with normal body condition, regardless of environmental conditions. In other words, obese dogs will tend to have less efficient breathing patterns and higher body temperatures, even in cool conditions, bringing them somewhat closer to a point of inability to thermoregulate than other dogs. This information suggests that the risks of heat stress can be at least partially mitigated by careful attention to appropriate body condition, and avoiding exposure of obese or overweight dogs to heat stress.