Probiotic for heat stress

Auburn University is seeking a development partner to formulate this probiotic for human or animal use.

Overview: Heat stress can affect the body’s defenses and barriers to bacteria, allowing microbes in the gut to slip past and enter the blood, organs, or other areas and induce inflammation and other immune responses. Clearing the bacteria and repairing resulting damage slows the body’s recovery from heat stress. A new probiotic has been shown to help maintain the integrity of the intestinal lining and block the movement of microbes from the gut into blood during heat stress. By taking this probiotic prior to heat stress, a person or animal can be better protected against the effects of heat stress and recover more quickly to full health. Such protection could be beneficial for athletes, workers, soldiers, animals, and others.

Advantages:
- **PROTECTIVE** — Prevents bacteria-induced inflammation caused by a leaky gut
- **SPEEDS RECOVERY** — Maintains normal intestinal lining for nutrient absorption
- **COST EFFECTIVE** — Inexpensive, scalable and can be stored at room temperature

Description: Rats were administered probiotic spores of Bacillus subtilis orally two days before exposure to 45°C (113°F). Body core temperatures reached 40°C (104°F), a temperature that is reached in humans and animals during fever and active exercise. Treatment with the probiotic helped to maintain normal intestinal villi height and mucosal thickness, reduced translocation of bacteria from the gut to circulating blood (measured by LPS and colony counts), reduced breakdown of red blood cells, and maintained normal or reduced levels of cytokines associated with heat stress (IL-1, IL-6, TNF-α, INF-γ, and IL-10). Similar results are seen when heat stress is metabolically-induced. The strain itself is a natural isolate and so not patentable. However, patent protection can be sought on formulations developed to effectively deliver the strain.

Status:
- Protection against thermal and metabolic heat stress demonstrated in rats
- No signs of adverse effects
- This technology is available for exclusive or non-exclusive licensing as a natural isolate
- Joint development opportunities include funded research or a joint venture

References:
- J Appl Microbiol. 2014 Nov;117(5):1463-71 (Link)
- J Vis Exp. 2016 Jul 11;(113) (Link)

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Reference: Heat Stress Probiotic

Protection of the Intestinal lining by a strain of Bacillus Subtilis. **(Left)** Comparison of intestinal villi height after heat stress, with and without bacillus probiotic treatment. Short villi is an indication of poor intestinal health. PBS does not contain probiotic. Controls were not heat stressed. **(Right)** Comparison of lipopolysaccharide (LPS) in blood following heat stress. LPS are found in bacterial cell walls and are used to detect the presence of bacteria. PBS and controls are as in the left panel.