



Cystic Fibrosis Research News

Title:

Heat acclimation improves sweat gland function and lowers sweat sodium concentration in an adult with cystic fibrosis

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What was your research question?

We investigated how a young-man with moderate cystic fibrosis and history of cramping during endurance exercise in hot weather, adapted to 10-sessions of exercise in a hot environment (i.e. heat acclimation), which has been shown to improve heat tolerance and sweat-gland function, and reduce sweat sodium concentration, in healthy males.

Why is this important?

People with cystic fibrosis are encouraged to maintain a physically active lifestyle, however, they are more susceptible to heat-related illnesses during prolonged exercise in both cool and hot weather conditions. This is important to understand, as people with cystic fibrosis produce sweat with higher concentrations of sodium and chloride, which can initially lead to electrolyte imbalances and dehydration, before more severe heat-related symptoms occur. However, there is limited data examining how people with cystic fibrosis adapt with repeated exposure to hot conditions (heat acclimation) and whether they demonstrate similar adaptations in sweat gland function, to those shown in healthy individuals.

What did you do?

We assessed the participant's health, fitness and heat tolerance before prescribing 10-sessions of heat acclimation training, consisting of 90-minutes of cycling exercise in an environmental chamber set to 40°C and 40% relative humidity. This training aims to raise the participant's deep-body temperature safely to ~38.5°C and induce adaptations that improve

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tolerance to the heat and reduce the likelihood of heat illnesses. We evaluated the participant's responses during a standard heat tolerance test after the 5th and 10th acclimation session, as well as 7-days after the final session to examine adaptations in deep-body temperature, heart rate and sweat gland function.

What did you find?

The participant safely and successfully completed all of the acclimation sessions without any adverse incidents, cramping or heat illnesses. It was demonstrated that ~75% of adaptations occurred after only 5-sessions of heat acclimation. However, larger changes were evident in the key markers of heat adaptation following 10-sessions of heat training, including; a lower resting core body temperature (-0.4°C) and heart rate (-6 beats per minute), a higher sweat rate (+ 370 mL) and, a lower sweat sodium concentration (-18 mmol per litre of sweat). These adaptations were maintained for at least 7-days after the end of heat training.

What does this mean and reasons for caution?

Our research demonstrates the effectiveness of heat acclimation training in an adult with moderate cystic fibrosis lung disease. These adaptations were consistent with typical responses seen in healthy adults of a similar age. Importantly, these findings may benefit people with cystic fibrosis and potentially lower the risk of heat-related illnesses, which is particularly important when exercising in hot weather conditions. However, we acknowledge our findings with caution as this research is based on 1 person with cystic fibrosis and therefore, more research is required in a larger cohort and also in those with more severe cystic fibrosis.

What's next?

In the future, we aim to examine groups of people with differing levels of severity of cystic fibrosis to determine the best method of heat training and/or heat therapy (i.e. hot bathing/sauna), in terms of enhancing adaptations and reducing susceptibility to heat illness during exercise in cool and hot conditions.

Original manuscript citation in PubMed

<https://pubmed.ncbi.nlm.nih.gov/32758394/>