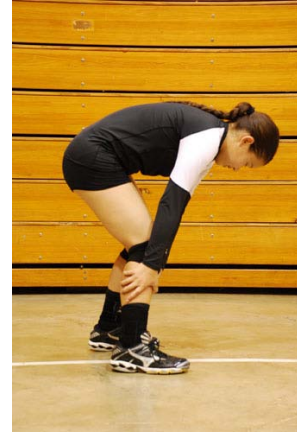


Exercise-Associated Muscle Cramps

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What are exercise-associated muscle cramps?

Exercise-associated muscle cramps (EAMC), more commonly referred to as just plain muscle cramps, is one of the most common conditions that require medical attention during or immediately after sport training and competition. It is characterized by involuntary, painful contractions of skeletal muscle. These spasms are most commonly experienced by endurance athletes (i.e. marathoners, triathletes, and soccer players); however, muscle cramping is well documented in many sports, including football, basketball, tennis, and volleyball. Muscle cramps are generally localized to specific muscle regions. The most common muscle groups involved include the calves, hamstrings, and quadriceps.



It is quite obvious that muscle cramps can be detrimental to playing performance. Because of this, much research has attempted to explain its cause.

What causes EAMC?

Despite a vast body of scientific literature, the exact causes of EAMC are unclear. Several hypotheses have been proposed: 1) Electrolyte depletion; 2) Dehydration; and 3) Muscular fatigue (see Figure 1). Early reports on physical activity related muscle cramping occurred in laborers working on steamships and mines. In these reports, muscle cramping not only occurred in hot and humid conditions, but was also accompanied by profuse sweating. The profuse sweating in these individuals resulted in substantial sodium (the primary electrolyte in lost in sweat) and fluid loss. Later, exercise physiologist determined that the concentration of sodium in sweat is always lower relative to the sodium concentration of blood. Thus considerable sweat sodium losses can only occur when sweat losses are also high. Together these early observations formed the birth of the “electrolyte depletion” and “dehydration” theories. Because of this, athletic trainers and sport coaches frequently recommend salty foods and high amounts of water for the prevention and treatment of muscle cramps. However, a great deal of evidence has been accumulating which suggest EAMC are not related to excessive sodium loss or dehydration but rather are due to altered neuromuscular control as a result of premature muscle fatigue. Table 4 provides a list of risk factors for EAMC.

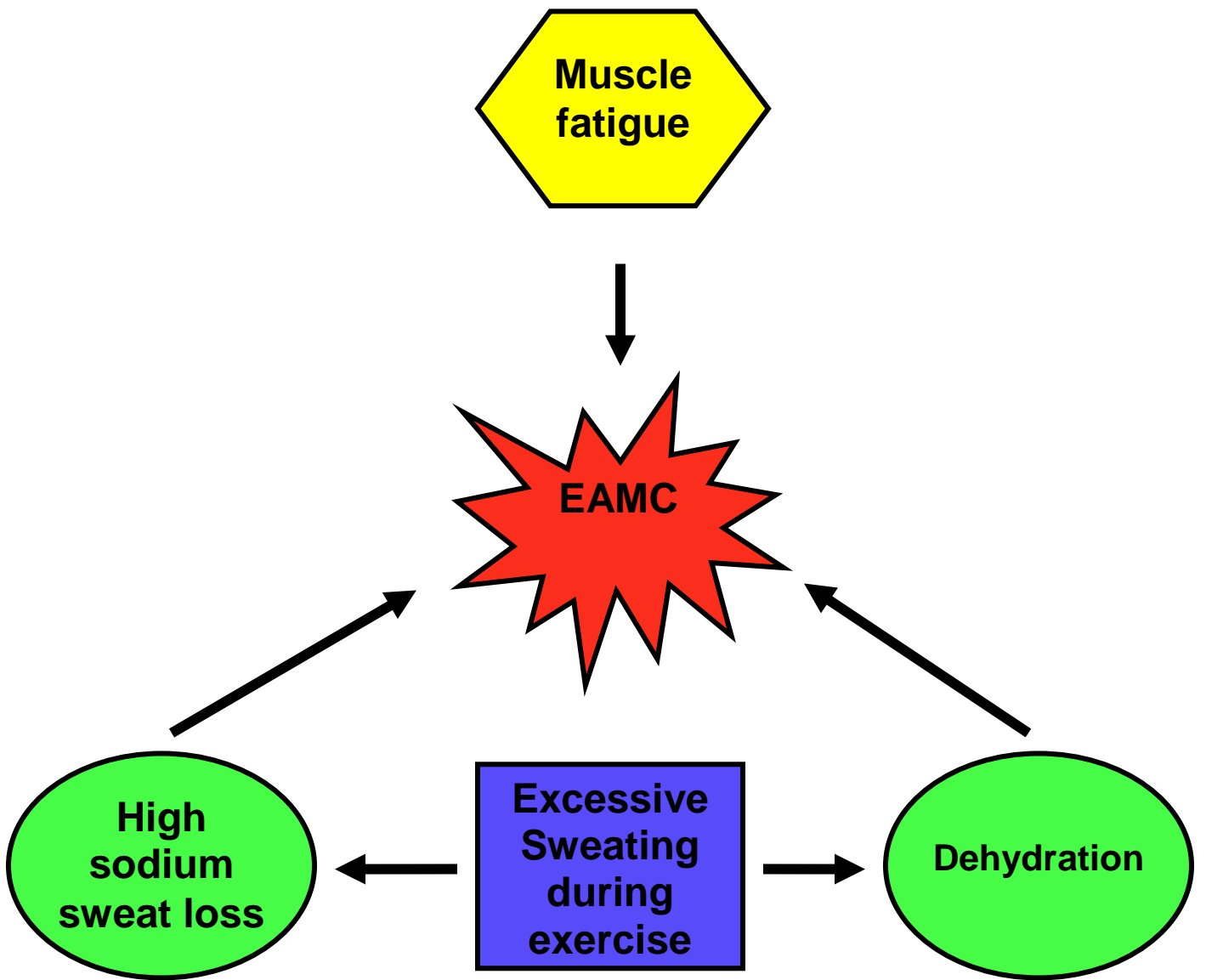


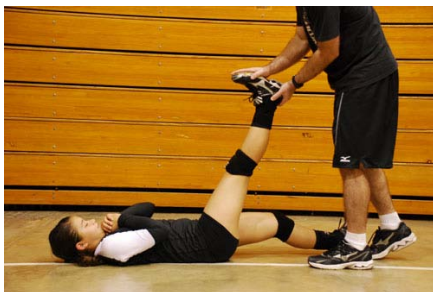
Figure 1. Possible causes of EAMC.

Table 1
Intrinsic and extrinsic risk factors for EAMC

Risk Factor	
Intrinsic risk factors	Prior history of cramping during competition or training
	Unaccustomed game intensity (e.g. higher intensity play during games compared to practice)
	Unaccustomed game or training durations (e.g. overtime, tournament game schedule)
	Muscle fatiguing exercise
	Dehydration
	Electrolyte depletion (sweat sodium loss)
	Salty sweater
Extrinsic risk factors	Higher body mass index (BMI)
	Hot and humid playing conditions

Treatment of EAMC

Immediate relief during an episode of EAMC requires passively stretching the contracted muscle. For example, cramping of the hamstrings due to repetitive jumping can be relieved by straightening out the legs. Once the cramp subsides, stretching should continue for an additional 30 – 60 seconds. For some, deep massage of the cramped muscle may provide further relief.



If EAMC is accompanied by heavy sweating, and you are observed as a “salty sweater”, it is wise to replace all fluid and electrolyte losses prior to subsequent games and practices. This is especially important during tournament play, when 2 or more games are played on the same day and less than 24 hours of recovery is provided between game days (i.e. 5 games in 3 days or “2-a-day” practices during the preseason).

To minimize fluid losses one should consume liquids before, during, and immediately after all games and practices. Bodymass changes provide an accurate and practical method for estimating sweat losses. Simply weigh yourself immediately before and after practice. The difference represents a fluid deficit. Fluid replacement guidelines recommend consuming 22 – 24 fluid oz. per pound loss. In terms of sodium replacement, typical western diets provide large amounts of salt, usually enough to replace all sodium lost in sweat. Still, when sodium losses are high, condiments (shoyu, ketchup, and mustard) provide a simple way to increase dietary salt intake.

Prevention of EAMC

The preceding diet regime is crucial for preventing EAMC during practice or games. The widely accepted, electrolyte depletion theory has convinced many to view bananas, pickles, pickle juice, and mustard as “miracle” foods. Although it would be extremely unwise to begin a game with low blood electrolyte levels, both clinical studies and practical experience suggest that EAMC are best prevented by delaying the onset of muscular fatigue. Nutritionally, this can be accomplished by eating large amounts of carbohydrates (breads, rices, pastas, fruits) and drinking plenty of fluids. Sports drinks (e.g. Gatorade, Powerade, Accelerade) serve as ideal choices since carbohydrates, electrolytes and fluids are provided simultaneously. In addition, improving one’s anaerobic (lactate threshold) and aerobic (VO₂ max) capacity can have an additive benefit. This can be accomplished through sport specific conditioning such as interval training, plyometrics, agility, and weight training.

Summary

Exercise-associated muscle cramping is one of the most common medical conditions experienced in sport. The exact cause of EAMC is uncertain. Early reports pointed toward electrolyte depletion (mainly sodium) and dehydration. However, recent evidence has been accumulating which points toward premature muscle fatigue and altered neuromuscular control as the prime culprit. Still, further research is needed. What is certain however is that EAMC can have debilitating effects on playing performance. Acute episodes of EAMC can be treated easily through passive stretching and massage. However, prevention is the key. This requires appropriate nutritional strategies as well as physical fitness preparation.