



Medical conditions affecting sports participation

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Medical conditions in sport

- Muscle cramps
- Infections
- Allergies
- Dietary supplements
- Overtraining and staleness
- Fluid and hydration
- Epilepsy
- Travel and “jet lag”
- Other conditions



Classification: Skeletal Muscle Cramps

1. Pathological
 - a) Neurological disease - motor neuron disease
- peripheral neuropathies
- radiculopathy
 - b) Systemic disorders - Fluid and electrolytes
- Drugs
- Others eg. Malignancy, uraemia
2. Benign
 - a) Common benign cramps - Nocturnal
 - b) Pregnancy related
 - c) Familial benign
 - d) Exercise associated muscle cramps (EAMC)

Exercise Associated Skeletal Muscle Cramp (EAMC)

Painful, spasmodic, involuntary contractions of skeletal muscle that occur during, immediately after, or within 24 hours after muscular exercise

Schwellnus M P, et al, 1997, J Sports Science

Epidemiology of EAMC

1. Lifetime prevalence:

Runners:	67% (Kantarowski, 1990)
	39% (Manjra S, Schwellnus M, 1991)
Tri-athletes:	78% (Sulzer N, Schwellnus M, 2001)
Cyclists:	60% (Grundling C, Schwellnus M, 1994)
Club Rugby:	52% (Tindall R, Schwellnus M, 2003)

2. Incidence

Marathon:	18%
Professional rugby (seasonal):	2% (Holtzhausen L, Schwellnus M, 2001)
Club rugby (seasonal):	23% (Tindall R, Schwellnus M, 2003)

3. Frequency after an event:

Marathon:	10-22% of admissions
Ultra-marathon:	29% of admissions
Ironman:	55% of admissions

What are the possible causes of EAMC in athletes?

(Common hypotheses for EAMC)

- Inherited congenital muscle and metabolic abnormalities
- Abnormal serum electrolytes
- Dehydration
- Creatine supplementation
- Heat
- Novel “isolated” causes



Do athletes with acute EAMC have altered serum electrolytes?

- Prospective study with case-control component
- Three clinical studies (runners and tri-athletes) fail to show a relationship between alterations in serum electrolyte concentrations and EAMC
- Evidence for the relationship between abnormal serum electrolytes and EAMC is anecdotal

SchwelInus M, Nicol J : Br J Sports Med, Aug 2004

Dehydration hypothesis

- Literature: Anecdotal observations at best
- Possible mechanism: Not known (? systemic)
 - EAMC are localized not generalized
 - Evidence is anecdotal
 - Clinical studies do not confirm relationship



Are athletes with acute EAMC dehydrated?

- Prospective study with case-control component
- Two clinical studies (runners and tri-athletes) fail to show a relationship between dehydration and EAMC
- Evidence for the relationship between dehydration and EAMC is anecdotal

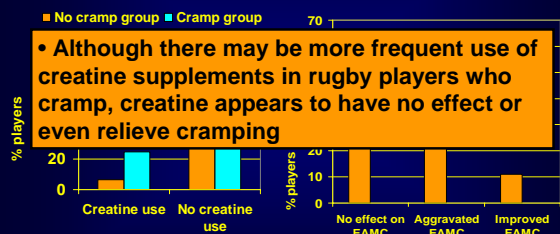
SchwelInus M, Nicol J: Br J Sports Med, Aug, 2004

Creatine supplementation hypothesis

- Recent suggestions linking creatine supplement use to cramps in athletes
- Evidence is anecdotal
- Clinical studies required
- Mechanism not clear: ?
 - Increased compartment pressure



Is EAMC in sport (rugby) related to the use of creatine supplements?

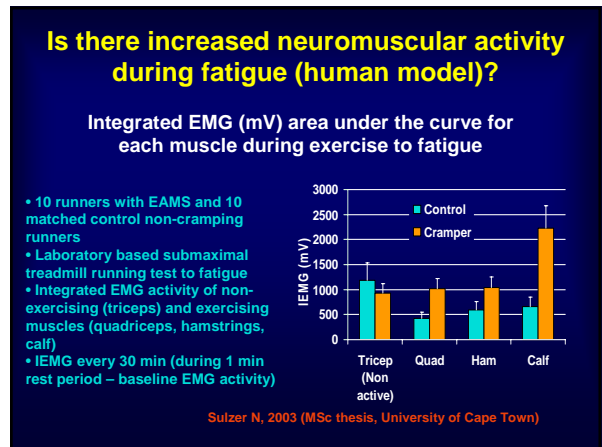
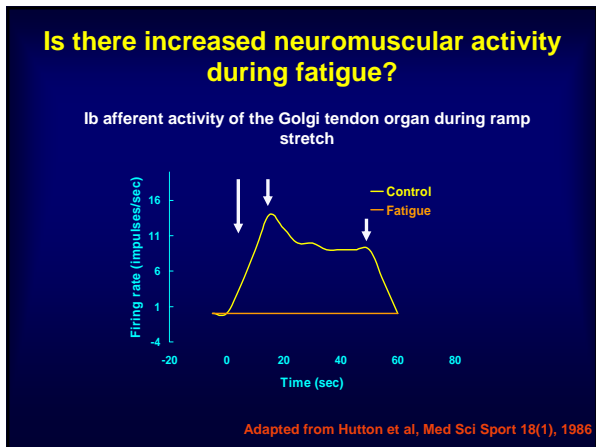
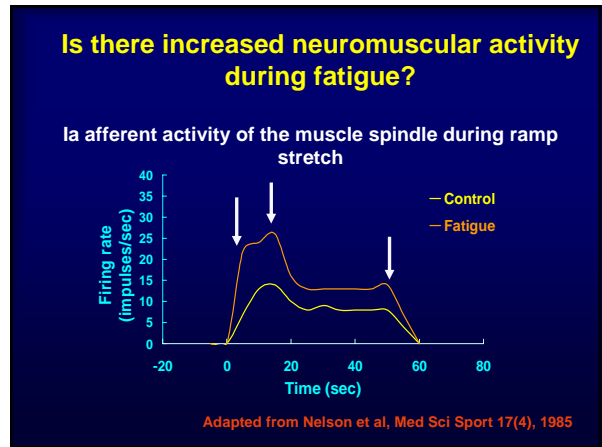
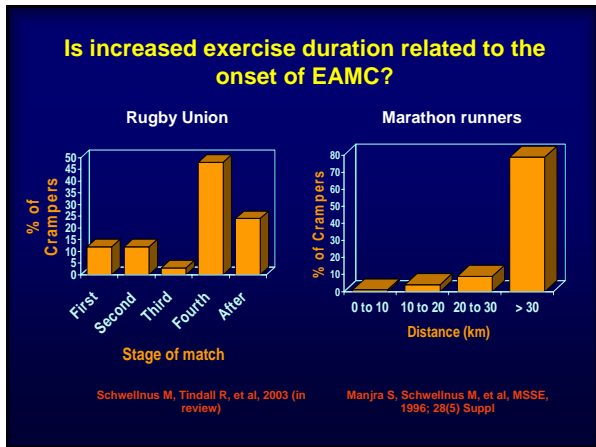
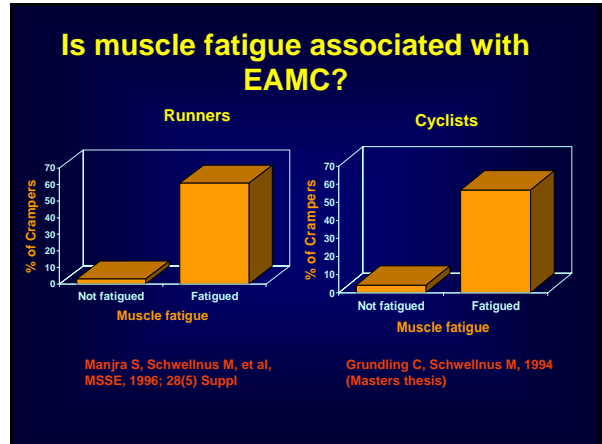
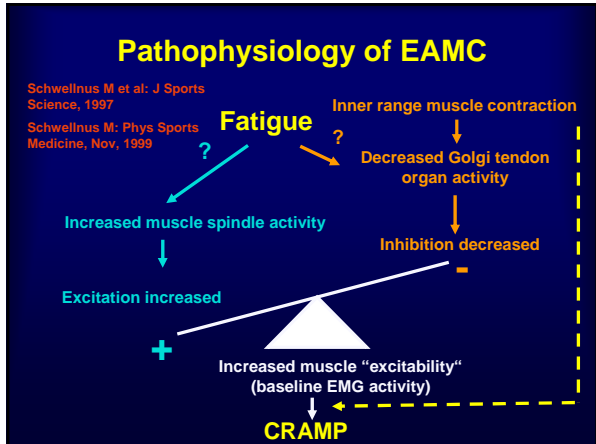


SchwelInus M P, Tindall R, et al. 2003 (in review)

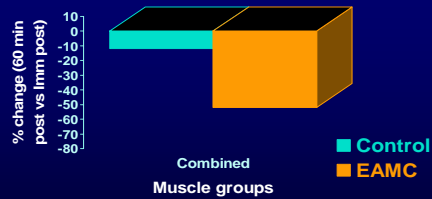
What causes EAMC? (Common hypotheses)

- Inherited congenital
- So then, what causes cramping (EAMC) in athletes?
- Heat
- Creatine supplementation
- Novel "isolated" causes





Do athletes with acute EAMC have increased neuromuscular activity?



Nicol J, Schwellnus M: Clin J Sports Med 2003 (in review)

Conclusion: Etiology of EAMC

- Exercise associated muscle cramping occurs as a result of an imbalance between the excitatory and inhibitory input to the alpha motor neuron
- Muscle fatigue is associated with changes in neural control of skeletal muscle activation, resulting in an inability to relax the muscle

Schwellnus M: Phys Sports Medicine, Nov, 1999

Schwellnus M et al: J Sports Science, 1997

Prevention of EAMC in athletes

Prevent fatigue

1. Adequate training
2. Adequate nutrition
3. Avoid exercise in hot and humid conditions to avoid premature fatigue

? Stretching

- ? Sensitize the Golgi tendon organ



Infections in sports

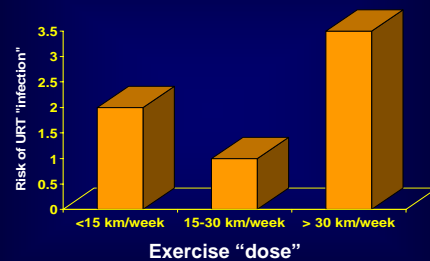
Spectrum of clinical problems in players

- **Exercise and upper respiratory tract infections (URTI)**
 - Acute infection and risk of sudden death (myocarditis)
 - Regular training and a protective effect
 - Post exercise URTI
 - Exercise performance post infection
 - **Exercise and HIV disease**
 - Risk of transmission in contact sports
 - Regular exercise training and disease progression
- **Transmission of pathogens during sports**
 - Skin infections (fungal, herpes)
 - Water borne infections (gastrointestinal)
- **Anti-microbial therapy and exercise performance**
 - Antibiotics (Mefloquine)
- **Anti-microbial therapy and risk of tendon injury**
 - Antibiotics (Quinolones – ciprofloxacin, ofloxacin, levofloxacin, gatifloxacin, norfloxacin)

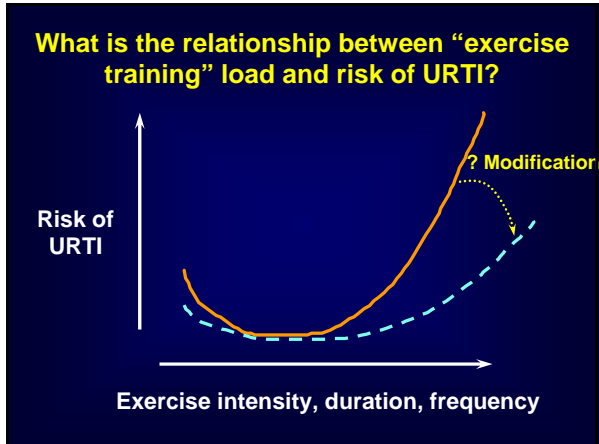
Exercise and upper respiratory tract infections

- Does regular exercise training protect against URT infection?
- Does an URT infection impair rugby performance during recovery?
- Are post URT symptoms after an exercise bout (rugby game) due to infection?
- Are there nutritional or other strategies to reduce the risk of post exercise URT “infections”?
- When can rugby players with URT symptoms continue with exercise training? – clinical guidelines

Does increased exercise training increase the risk of URT “infections”



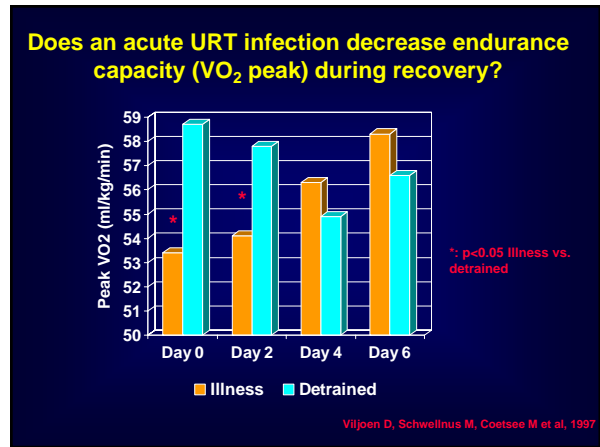
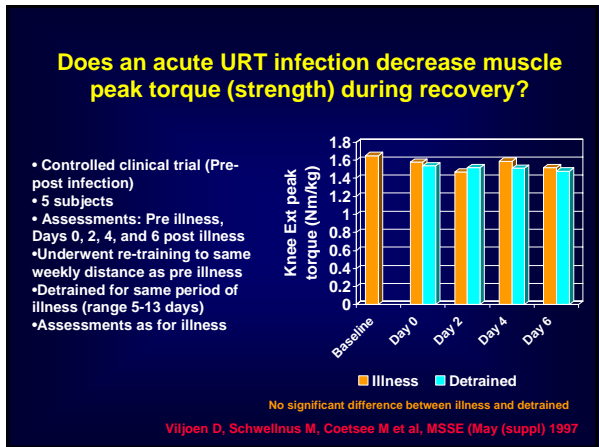
Heath et al, Med Sci Sports Exerc, 23, 1991



What is the risk of URTI after an acute bout of exercise?

1. Regular exercise performed at moderate intensity is associated with:
 - positive effects on the immune system
 - epidemiological evidence of decreased risk of symptoms of URTI
2. An acute high intensity or prolonged exercise bout may be related to a transient increased risk of infection

Time



Exercise testing completed at Day 0, 2, 5, and 8 post iatrogenic

Athletes with URTI that have become asymptomatic will have only a transient (0-4 days) decrease in exercise performance (endurance capacity) during recovery

control group

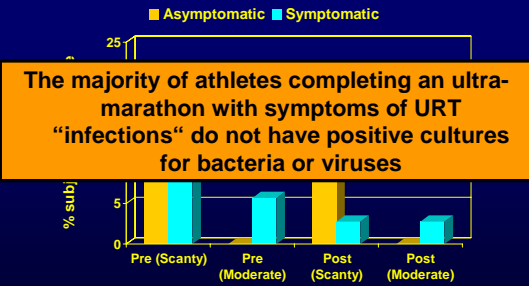
Wiedner et al, Med Sci Sports Exerc, 29(5), 1997)

Are viral cultures positive in runners presenting with URT 0-10 days after an ultra-marathon?

There were no positive viral cultures in either the asymptomatic (n=36) or the symptomatic groups (n=34) of runners pre and post race

Schwellnus M P, Tune M, et al Med Sci Sprts Exerc, May (suppl) 2002

Are bacterial cultures positive in runners presenting with URT 0-10 days after an ultra-marathon?



Schweltnus M P, Tune M, et al Med Sci Sports Exerc, May (suppl) 2002

What are the postulated nutritional factors that may reduce the risk of URTI in athletes during training?

- **Anti-oxidants** (Vitamins C, E and A)
- **Amino acids** (glutamine, arginine)
- **Lipids** (fat intake 30-50% daily intake, n-3 fatty acids)
- **Trace elements** (Zinc, iron, selenium, copper)
- **Carbohydrates**



When can an athlete with a respiratory tract infection train?

No training at all

- Muscle or joint pain
- Fever
- Chest pain
- Cough
- Increased resting heart rate
- Breathlessness

Trial of training

- (10 min of easy to moderate exercise and re-assess)
- Only mild symptoms above the neck (**Neck check**) – blocked nose, runny nose, mild sore throat

Skin infections in contact sports

- **Viral infections**
Herpes simplex
- **Bacterial infections**
S. aureus, Streptococcus pyogenes
Clostridium tetani
- **Fungal infections**
Tinea



Herpes simplex infections in rugby players

Epidemiology

At least 6 reports in rugby players (Scrum pox, Herpes rubiginosum)

Microbiology

Herpes simplex Type I (saliva) and Type II (genital secretions)

Spread

Spread by direct contacts from infected individuals (common) or symptomatic carriers (1-15% adults)

Incubation period

2-12 days



Stacey A, et al, Sports Med 2000, 29(3)

Blood borne infections in contact sports

- **HIV infection**
- **Hepatitis B**
- **Hepatitis C**



What is the risk of HIV disease in contact sports?

No case described (? In soccer)

Potential for blood and tissue products transfer on field

Risk of on field transmission is related to:

1. Prevalence in the populations
2. Risk of contact
3. Risk of open bleeding wound
4. Risk of transfer of virus when two wounds make contact (? Same as needle stick injury)

Risk of "off field" transfer higher (NB: traveling team)

Universal guidelines for management of bleeding wounds

Traveling to high risk area

Acute exposure treatment pack



Gastro-intestinal infections in contact sports

- Travel (food, water)
- "Locker room" infections
- ? Transmission on field



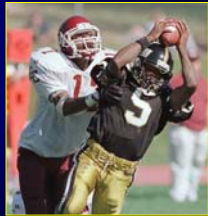
Can gastro-enteritis be transmitted through playing contact sport (rugby)?

Descriptive study: Football players who ate meals served before a match (Team A) and players on the opposing team (B) who became ill were interviewed

Primary cases: Players who had vomiting or diarrhoea 10-50 hours after eating

Secondary cases: onset of symptoms > 50 hours after meal or had symptoms without having eaten the contaminated meal

Stool samples: examined by electron microscopy and by a reverse-transcription-polymerase-chain-reaction (RT-PCR) assay



Becker KM et al, NEJM, 34(17), 2000

Can gastro-enteritis be transmitted through playing contact sport?

Relative risk of illness after eating the

1. Transmission of a virus causing acute gastro-enteritis occurred among players during a football game
2. Persons with acute gastroenteritis should be excluded from playing contact sports



How common are allergies in elite athletes?

- Exercise induced bronchospasm
- Skin (skin prick tests)
- Upper respiratory tract (Allergic rhinitis)
- Prevalence of atopy in most sport is unknown
- Survey of 74 Super 12 rugby players (3 teams)
 - 9.5% use medication for EIB
 - 5.6% use topical corticosteroids for allergic sinusitis

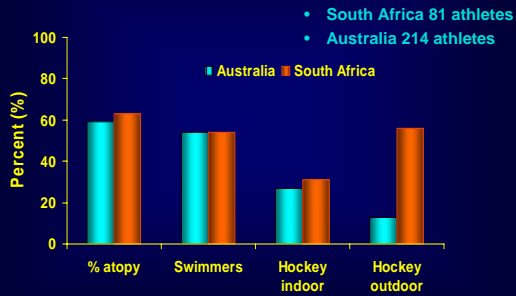
(Holzhausen L, Schwelinus M, 2001)



What is the prevalence of EIB in sports?

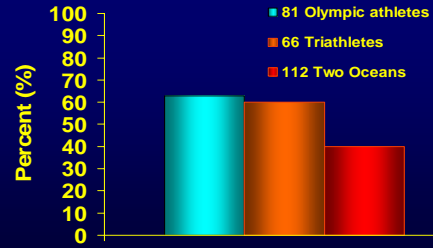
<u>Study</u>	<u>Athletes</u>	<u>Prevalence</u>	<u>Comments</u>
Sonna et al., Chest 2001	Army recruits	7%	
Wilber et al., MSSE, 2000	Olympic winter sport athletes	23%	X-country skiing 50%. Females>males Medal winners
Thorle et al., MSSE, 2001	Cross-country	14%	Symptoms poor predictor of EIB
Rundell et al., MSSE 2001	Elite winter athletes	26%	Self reported symptoms overdiagnose EIB
Derman et al., 2002	Elite Summer Olympic athletes	13%	Self reported

What is the prevalence of skin atopy (+ve skin prick tests) in other sports?



Katellaris et al., J Allergy Clinical Immunology 106(2), 2000

What is the incidence of atopy in Olympic Athletes, Iron Man Tri-athletes & Ultra-marathon runners?



Derman W et al., SAMJ 92(5) 2002
Tune M, Schwelinus M, et al., 2002

What is the clinical importance of allergy (atopy) in elite athletes?

1. High incidence of allergy in elite athletes (double normal population)
2. Cause as yet unidentified
3. Different allergy profiles in different sports
4. Allergies linked to poor performance
5. Essential part of medical work-up/pre-season evaluation of elite athletes



Thank you for your attention

