

# **EXERCISE INDUCED BRONCHOCONSTRICTION**

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Exercise induced bronchoconstriction (EIB) is defined as a transitory increase in airway resistance that follows vigorous exercise in a non-asthmatic non-atopic population. It is estimated that 12% of the general Australian population have EIB. However a number of studies have shown a higher prevalence in elite athletes with numbers ranging from 11 to 50% depending on the sport.(1) The prevalence is higher in endurance sports which involve high ventilation rates such as distance running and cycling and in sports performed in cold, dry environments such as cross country skiing.

## **CLINICAL PRESENTATION**

Symptoms of EIB are diverse and include cough, wheeze, chest tightness and shortness breath during or after exercise. Presentation can also be subtle such as a reduction in performance or fatigue. Typically symptoms occur after 6 to 8 minutes of intense exercise (>80% HR Max) at high ventilation rates. The peak of the symptoms occurs at 8 to 15 minutes after exercise has stopped.

However Rundell et al have shown that self reported symptoms aren't that useful in making the diagnosis. Approximately 50% of those that had positive laboratory tests for EIB reported no symptoms.(2)

## **PATHOPHYSIOLOGY**

There are 2 theories to explain the onset of symptoms after a few minutes of intense exercise

1. Drying of airways. Mouth breathing and high ventilation rates cause loss of water vapour from the surface liquid lining the airways. This causes a change in the osmolality, pH and temperature of the fluid which causes chemical mediator release e.g. leukotrienes which in turn induce bronchoconstriction.
2. Cooling of the airways. After exercise ceases the bronchial blood vessels dilate in attempt to rewarm the airways. This results in a narrowing of the airways, vascular leakage and mediator release.(2,3)

The triggers that seem to be involved include

- Mechanical stress- High ventilation rates in training
- Allergens
- Cold air
- Pollutants (Chlorine exposure has been implicated in swimmers) (3)

## DIAGNOSIS

**Recently the IOC Medical Commission has implemented a requirement that notification for the use of inhaled Beta Agonists (eg Ventolin) be accompanied by laboratory documentation of reversible airway obstruction.**

These tests involve the use of spirometry (lung function tests) which document a fall in FEV1 from baseline post exercise. FEV1 is the volume expired in the first second of maximal expiration after a maximal inspiration. It is a useful measure of how quickly full lungs can be emptied. A fall of >10% is 90% specific but a fall by >15% is 100% specific.

The gold standard test is the eucapnic hyperventilation test. This involves breathing a dry gas containing 5% CO<sub>2</sub> via a mask at high ventilation rates. However this test is not widely available.(4)

Other tests include a hyperosmolar saline challenge and the use of spirometry before and after intense exercise in the field or laboratory.

**The IOC will accept EVH challenges, bronchodilator challenges and field based exercise challenges as objective evidence of EIB.**

## MANAGEMENT

There are various nonpharmological measures which may reduce the symptoms of EIB such as prolonged warm up or nose breathing but these are no substitute for pharmacological treatment.

### Beta agonists

The most effective medication in EIB is beta agonists which include salbutamol (Ventolin) or terbutaline (Bricanyl). They bronchodilate, increase airflow and moderately inhibit the inflammatory response. Studies have shown no ergogenic effect in non asthmatics but the IOC still requires notification of their use. They are used to prevent EIB by inhaling 15 minutes prior to exercise. However recent reports suggest prolonged use can lead to tolerance so their regular use should be limited in elite athletes.(5)

### Sodium Cromoglycate (Intal)/Nedocromil (Tilade)

Are prophylactic medications which can be administered 5 to 10 minutes prior to exercise. They have few side effects and do not need to be declared to the IOC. However they are ineffective in treating acute symptoms.

### Inhaled corticosteroids

These medications are used regularly to reduce inflammation in the airways. They are not used prior to exercise to relieve acute symptoms. It is recommended if an athlete has more than 2 attacks a week they use corticosteroids. Regular use seems to reduce episodes of EIB.

### **SUMMARY**

EIB is a very common disorder which has a very high prevalence in endurance sports. Triathletes are likely to be vulnerable due to high ventilation rates in training and exposure to chlorine while swimming. A high level of suspicion is needed as symptoms are a poor guide to its detection. The diagnosis can be established by laboratory testing. If using beta agonists proof of diagnosis by laboratory testing is now required by the IOC.

### References

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