Background

A number of toxic chemicals exert their effects by inhibition of the enzyme cholinesterase, which is important in controlling levels of the neurotransmitter acetylcholine in the brain and nervous system.

This enzyme is also present in red blood cells, and its activity in these cells can be measured as an indicator of occupational or accidental exposure to cholinesterase inhibitors. The enzyme in nerve tissue and red blood cells is a true acetylcholinesterase, which should be distinguished from the pseudocholinesterase present in plasma or serum (which may be measured for other reasons as well).

The classes of chemicals which inhibit cholinesterase include pesticides such as organophosphates or carbamates.

Test Principle

The activity of cholinesterase in red blood cells is measured by incubation with a synthetic substrate, acetylthiocholine. The rate of conversion of this substrate to the product thiocholine is monitored by a second reaction in which thiocholine is converted to 5-mercapto-2-nitrobenzoate, which absorbs at 415 nm. The result is expressed as an activity per litre of red blood cells (RBCs).

Sample requirements

Since the activity is measured in the red blood cells, clotted blood specimens or plasma/serum are not suitable. 5 ml of heparinised or EDTA blood should be provided; if it needs to be transported it should be kept at 4°C but it must not be frozen.

Reference Range

Samples from subjects not exposed to cholinesterase inhibitors show an activity greater than 8 units/ml of RBC. It should be noted that exposure produces a reduction in activity.

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