



Serum paraoxonase February 2009

There is now good evidence that the antioxidant enzyme paraoxonase-I (PON-I), which is associated with high density lipoprotein (HDL), exerts an anti-atherogenic effect by protecting low density lipoprotein (LDL) from oxidation.

HDL has a well-established inverse relationship with the risk of atherosclerosis [1,2]. HDL is required for the reverse transport of cholesterol from peripheral fibroblasts to the liver, but is also thought to protect LDL from oxidative modification, a key event in the initiation and acceleration of atherosclerosis [3,4]. The antioxidant role of HDL has been attributed to HDL-bound PON-I [5,6].

Paraoxonase (aryldialkylphosphatase EC 3.1.8.1, PON-I) is a calcium-dependant esterase that circulates in plasma associated bound to HDL [5,6]. It was originally identified by its activity in the metabolism of organophosphates [7,8] such as paraoxon, diazoxon, serin and soman, in addition to arylesters such as phenyl acetate [8]. It thus serves to neutralise anti-cholinesterase nerve gases and insecticides in the body [9]. PON-I is synthesised in the liver and hence serum levels decrease in chronic liver disease [8].

Recent studies have confirmed that PON-I is an oxidant-sensitive enzyme that inhibits the atherogenic oxidation of LDL [7]. Low PON-I activity has been associated with a number of risk factors for coronary heart disease, including diabetes, hypercholesterolaemia and smoking [7]. It is well known, for example, that chronic renal failure results in accelerated atherosclerosis and studies have shown that haemodialysis increases production of reactive oxygen species while decreasing PON-I activity [7,8]. There are also correlations between PON-I enzyme levels and plasma lipids; PON-I activity is lowered in familial hypercholesterolaemia, insulin dependent diabetes and amongst survivors of myocardial infarction [9].

PON-I is an enzyme with three activities: paraoxonase, arylesterase and dyazoxonase. The paraoxonase and arylesterase activities of PON-I both decrease in hypercholesterolaemia [10].

Pharmacologic therapy with simvastatin has been reported to increase serum PON-I activity [6]. Pomegranate juice consumption or the intake of vitamin C and E supplements are also reported to raise enzyme levels [6].

Indications

Serum paraoxonase (PON-I) is an antioxidant enzyme whose activity is associated with a decreased atherosclerosis risk; its measurement may therefore give useful information as to a subject's cardiovascular risk. Since PON-I is induced in oxidative stress, careful assessment of its serum activity is indicative of the subject's ability to metabolise organophosphates and other xenobiotics.

Patient preparation

No special patient preparation is required prior to venipuncture.

P.T.O.

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Specimen requirements

Serum or plasma is suitable for paraoxonase measurement. The specimen of choice is whole blood, collected with heparin as an anticoagulant. However, the enzyme is calcium-dependent, so blood collected into other anti-coagulants such as EDTA is unsuitable for assay.

The correct tube is available from Biolab on request. If posted, blood samples must reach us within 24 hours.

Turn around time

1 week (5 working days).

Interpretation

The reference interval for serum paraoxonase is 148 – 997 U/L; the median population value is 376 U/L.

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