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Zinc Diagnostic Tests.

There are a number of options with testing for zinc deficiency.

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1. Zinc Taste Test (Oral Zinc Test)

Because we know that taste and smell are dependant on there being enough zinc in the body we are able to get an idea of the zinc status by giving the patient a standard test solution of zinc sulphate for tasting and comparing the response to defined standards.

This is a very quick, 10 second test that can be done at home or in the doctors rooms.

Obviously assessment of altered taste perception by zinc 'taste tests' is very subjective and cannot be considered scientifically accurate.

A test solution of zinc sulphate in purified water, at a concentration of 1gm/liter is prepared. The solution can be kept for up to 6 months in a refrigerator, after which it should be discarded. The solution should be removed from the fridge and left at room temperature for about two hours prior to the test.

You must not eat, drink, or smoke for at least one hour before the test.

How the test is done.

About 1-2 teaspoons of the solution is sipped and held in the mouth for exactly ten seconds after which you can spit it out.

The defined standards are:

- 1.** No specific taste sensation: tastes like plain water. This indicates a major deficiency of zinc
- 2.** No immediate taste is noticed but, within the ten seconds of the test, a 'dry' or 'metallic' taste is experienced. Some people describe it as 'like baking soda'. This indicates a moderate deficiency.
- 3.** An immediate slight but not necessarily unpleasant taste is noted, which builds up over the ten second period. This indicates a deficiency of minor degree.
- 4.** An immediate, strong and unpleasant taste is experienced. The patient generally wants to rinse his mouth out. This indicates that no zinc deficiency exists.

If the latter response (4) occurs prior to any form of supplementation then it is obvious that one is getting sufficient zinc from ones diet.

If the patient had a prior test response that showed a deficiency and has taken supplemental zinc and is now showing no deficiency then one must conclude that their previous diet was lacking in zinc. If there is no hope of a change to a more zinc intense diet then it will be necessary to take a regular maintenance dose of zinc daily.

Note - It is possible that if the patient has a quantity of amalgam fillings in the mouth (which contain a fair amount of mercury) the zinc test may be less precise. The zinc liquid plus mercury could cause a nasty, metallic taste in the mouth in spite of the zinc deficiency in the body.

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2. Serum Zinc

This is the simplest way of assessing zinc status but the factors that can cause inaccuracies are high. They include diurnal variations, fluctuations after meals, increased levels after fasting, stress, pregnancy, certain malignancies, renal failure, low albumin concentrations etc.

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Analysis of the 250µL (minimum) blood sample is done by atomic absorption spectroscopy,

The reference range is 10.7 - 22.9µmol/L (70-150 µg/dl).

A concentration below 7 µmol/L (46µg/dl) is indicative of a decided deficiency.

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3. Plasma Zinc

This is the main lab test done to establish zinc deficiency. Although it is very good at picking up major deficiencies it is **quite insensitive** to marginal deficiency because a change in plasma zinc does not occur until zinc intake is extremely low. So a **patient with `normal' results may still be deficient.**

Plasma levels of zinc can be influenced by hypo or hyperproteinemia, acute infections, stress, time of sampling (how long after a meal), pregnancy, liver disease, malignancies and pernicious anaemia.

Zinc supplements will affect the results of plasma tests so one needs to avoid taking these for at least 24 hours prior to the test.

The optimal range of plasma zinc is 13.8 - 22.9µmol/L (90-150µg/dl).

Clinical signs of zinc deficiency may occur when plasma zinc concentrations drop below 9.9µmol/L (65 µg/dl).

Values less than 5µmol/L (33 µg/dl) are particularly associated with loss of the senses of taste and smell, abdominal pain, diarrhoea, skin rash, and loss of appetite.

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4. Zinc Tolerance Test

This test measures the changes in plasma zinc after zinc is orally administered. A normal response is a doubling of plasma zinc peaking at three hours, but this varies from person to person.

Fasting from 10pm the previous evening is necessary before this test is done.

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5. Hair Zinc

This is a test often used in research studies where it's results are of more use than in general practise because of the ability of the researchers to keep a tight control over external factors.

These factors include the presence of zinc in some hair products like shampoos and perming lotions.

A sample of hair, about 0.5g (1 heaped tablespoon full) cut close to the scalp from the back of head or nape of neck is required.

A normal range is around 150 - 240µg/gram. Levels of less than 70µg/gram would be indicative of zinc deficiency.

One cannot use this test if the subject is severely malnourished as malnutrition causes a decrease in the rate of hair growth.

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6. Urinary Zinc Excretion

Again this is an unreliable test because though low amounts may indicate zinc deficiency the results are influenced by other factors.

Zinc chelates to other substances, like proteins, and if an excess of those are being excreted zinc will be as well. In catabolic states large amounts of zinc which are released from tissues may be excreted in the urine.

Normal range is 3.3 to 21.4 µmol/24 h

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7. New Tests

Serum alkaline phosphatase enzyme reactivation.

As this enzyme contains zinc a low activity is indicative of a zinc deficiency.

Leukocyte zinc content correlates well with muscle zinc content and so may offer an improved indication of zinc status.

However this test requires a large sample of blood, which needs particularly careful handling soon after collection.

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