Disease fact sheet: Methaemoglobinemia

Methaemoglobinaemia caused by the decreased ability of blood to carry vital oxygen around the body. One of the most common causes is nitrate in drinking water. It is most important in bottle fed infants and water from wells in rural areas is of special concern. Controlling nitrate levels in drinking water sources to below around 50mg/litre is an effective preventive measure.

The disease and how it affects people

Methaemoglobinemia is characterized by reduced ability of the blood to carry oxygen because of reduced levels of normal haemoglobin. It is uncommon. Infants are most often affected, and may seem healthy, but show signs of blueness around the mouth, hands, and feet, hence the common name "blue baby syndrome". These

children may also have trouble breathing as well as vomiting and diarrhoea. In extreme cases, there is marked lethargy, an increase in the production of saliva, loss of consciousness and seizures. Some cases may be fatal.

In the body nitrates are converted to nitrites. The nitrites react with haemoglobin in the red blood cells to form methaemoglobin, affecting the blood's ability to carry enough oxygen to the cells of the body. Bottle-fed infants less than three months of age are particularly at risk. The heamoglobin of infants is more susceptible and the condition is made worse by gastrointestinal infection. Older people may also be at risk because of decreased gastric acid secretion.

Malnutrition and infection seem to increase the risk of methaemoglobinaemia (McDonald and Kay, 1988). The general health of the infant as well as Vitamin C intake may determine whether or not the condition develops (Super et al, 1981).

Others at risk for developing methaemoglobinaemia include: adults with a hereditary predisposition, people with peptic ulcers or chronic gastritis, as well as dialysis patients.

The cause

The most common cause of methaemoglobinemia is high levels of nitrates in drinking-water. High nitrate levels may be present in drinking-water due to the use of manure and fertilizers on agricultural land. The natural level of nitrites and nitrates from the environment is normally a few milligrams per litre, although high levels may occur naturally in some areas. Intense farming practice may increase

this to more than 50 mg/litre (WHO 1998). Levels greater than 50mg/litre are known to have been associated with methaemoglobinaemia in bottle fed infants. Nitrate is also found in vegetables. Methaemoglobinaemia can also be a side effect of some drugs (phenacetin and sulphonamides), although this is very rare with modern drugs.

Scope of the problem

Methaemoglobinaemia is now rare in most of the industrialised countries due to control of nitrate contamination in water supplies, although occasional cases continue to be reported from rural areas. It is a risk in developing countries, for example where the drinking water is from shallow wells in farming areas.

There is no reliable estimate of the extent of the problem worldwide. WHO is presently collecting information in order to make such an estimate.

Intervention

Control of nitrate in drinking water is an effective preventive measure. WHO's Guideline Value for nitrate in drinking water is 50 mg/litre and for nitrite is 3mg/litre. This is relatively readily achieved in centralised, piped, supplies, but is difficult in rural and small supplies.

The group at greatest risk is bottle fed infants. Breastfeeding protects babies from methaemoglobinaemia. Boiling water does not remove nitrate.

For severely affected individuals, medical treatment is possible.

References

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