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*Case Report*

**A Case of Severe Methemoglobinemia in a Baby Fed  
Homemade Decoction of Silverbeet**

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## **Abstract**

This report describes a case of severe methemoglobinemia in a baby fed with a homemade decoction of silverbeet (*Beta vulgaris* L. var. *cicla*).

Lay people and health professionals must be aware of possible risks associated with the use of folk herbal remedies in infants that, despite being natural, may be not as safe as claimed.

**Keywords:** Methemoglobinemia; nitrates; silverbeet; complementary therapies; food poisoning.

## **Introduction**

The increasing use of natural remedies may be related to the common opinion, frequently spread through the media, that they are suitable for people of all ages and health conditions because they are always beneficial and harmless (Menniti-Ippolito, F. et al 2002, Menniti-Ippolito, F. et al 2008). Home made decoctions prepared from wild or cultivated vegetables are traditionally used to treat mild diseases (Moro, P.A. et al 2009). Our report shows the risks of using recklessly such remedies without taking into account possible adverse effects.

## Case Report

A 1 month old baby (weight 5.45 kg) was admitted to the hospital for the progressive blue coloration of the skin which started two hours after the ingestion of an infant formula reconstituted with 150 ml of a decoction of silverbeet.

His mother made it by boiling four white stems into two liters of bottled mineral water and used the strained fluid to prepare all the twelve meals administered during the last two days.

This herbal recipe had been suggested by an obstetric nurse to resolve constipation and abdominal cramps he was suffering for from birth.

Since the previous day, the mother had observed a mild blue discoloration of the skin, but she thought it was due to the artificial lighting of the room.

She worried because the unusual color was intensifying from hour to hour and she decided to carry him to the hospital, although the baby was neither moaning nor crying and he showed no symptoms of sickness.

At the admission the baby presented a severe central cyanosis without any other pathological sign. Pulse oximetry oxygen saturation was 90% in room air. Laboratory tests indicated a methemoglobin (MetHb) level of 36.8%, Hemoglobin (Hb) was 10 mg/L, coagulation and biochemical blood tests were normal.



His arterial blood gas on room air showed: pH 7.38 (7.37-7.43), partial pressure of carbon dioxide 36 mmHg (normal: 35-45 mmHg), partial pressure of oxygen 192 mmHg (normal: 80-100 mmHg), bicarbonate 21 mmol/ L (normal: 22-26 mmol/ L), Base Excess -4 mmol/ L (infant: -7/-1mmol/L). A disparity between the oxygen saturation calculated from partial pressure of oxygen values (192 mmHg) and pulse oximetry oxygen saturation (90%) readings may provide an important clue to the presence of methemoglobinemia (Marks, L.F, Desgrand, D 1991).

Neither drug nor other herbal or homeopathic remedy had been administered in the previous days.

Glucose-6-phosphate dehydrogenase deficiency or other genetic hemoglobinopathies, cardiac and respiratory diseases were ruled out.

No antidotal therapy was administered, but the patient survived with supportive therapy, arterial blood gas monitoring, and treatment with normobaric oxygen (2L/min) by nasal cannula. MetHb level was reduced to 10% after 12 hours and the patient fully recovered within 24 hours.

Laboratory analysis of a decoction of silverbeet made with the same recipe of that ingested by the baby showed a nitrate level of 340 ppm (340 mg/L).

To prevent methemoglobinemia in bottle fed infants the current maximum nitrate level in drinking water sources is stated below 50 ppm (50mg/L), while the Acceptable Daily Intake for nitrate is 3.7 mg/kg body weight per day. (Alexander, J. et al 2008).

## **Discussion**

Methemoglobinemia related to high nitrates containing vegetables ingestion is a rare but well documented event in infants (Greer, F.R, Shannon, M. 2005, Johnson, C.J. et al 1987 and Murone, A.J. et al 2005).

Nitrates per se have a very low toxicity (Fan, A.M, Willhite, C.C, Book, S.A. 1987); bacterial flora present into the gastrointestinal tract converts nitrates to nitrites, that cause the greatest toxicity

by oxidizing hemoglobin (Fe<sup>+2</sup>) to methemoglobin (Fe<sup>+3</sup>), the ferric form incapable of binding oxygen (Umbreit, J. 2007).

Normally MetHb is promptly reduced back to Hb, as it is formed, by a methemoglobin reductase system. If MetHb concentration rises above the physiologic value of 1%, progressive signs and symptoms of tissual hypoxia develop.

Methemoglobin levels correlate well with symptoms in most cases. Cyanosis is readily observable above MetHb levels of 15%; dyspnoea, headache, fatigue, dizziness, syncope and weakness show up above levels of 30%; tachypnea, metabolic acidosis, seizures, CNS depression and coma can be observed above levels of 50%; there severe hypoxic symptoms and death may be associated with above levels of 70% (Umbreit, J. 2007).

Apart from inherited abnormalities in hemoglobin structure or in hemoglobin reductase enzymes, several acquired causes of methemoglobinemia have been described.

Exposure to oxidant drugs, chemicals, or toxins may lead to an excessive production of methemoglobin, overwhelming the physiologic regulatory mechanisms (Ash-Bernal, R, Wise, R, Wright, S.M. 2004).

Newborns are more sensitive than adults to hemoglobin-oxidizing agents, due to lower amounts of methemoglobin reductases, higher gastric pH and proliferation of intestinal flora, and to the presence of fetal hemoglobin more readily oxidized to MetHb than adults (Greer, F.R, Shannon, M. 2005). For these reasons high nitrate-containing foods should be avoided in

infants; moreover there is no nutritional indication to add complementary foods to the diet of the infants before 4 to 6 months of age (Greer, F.R, Shannon, M. 2005).

Diagnosis may not be easy, since low levels of MetHb pass often unnoticed.

High levels of nitrates naturally occur in silverbeet (Gomez, L, Solaz, M., del Villar, R. 2008), fennels, carrots, rocket, spinach, courgette (Savino, F, et al 2006) and other vegetables (Chan, T.Y.K. 2011). The nitrate content can be higher in vegetables grown up in intensive fertilized soils (Katan, M.B. 2009).

In addition to the considerations about possible toxicity of some vegetal food, especially if improperly used as remedies, it seems important to highlight the context in which the described accident occurred: the poisoned infant belonged to a middle-class family living in a urban area and the silverbeet decoction was suggested by a hospital nurse.

It brings into focus the risks associated with the use of traditional herbal medicine, which is becoming more and more popular, without a proper knowledge of its possible adverse effects (Menniti-Ippolito, F. et al 2002, Menniti-Ippolito, F. et al 2008 and Moro, P.A. et al 2009).

Conventional health practitioners usually are not acquainted with the use of traditional practices and products.

All kinds of herbs, including vegetables, contain several constituents that may exert a pharmacological activity, therefore they should be used as remedies under the supervision of adequately trained practitioners and administered cautiously to children, especially those younger than six months of age (Greer, F.R, Shannon, M. 2005)..



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