

## Short Communication

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### Selenium needed for Ebola treatment?

By



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I am a micronutrient researcher who has specialised in **selenium** (Se) since 2001. I believe Se should be a key component of treatment for Ebola patients. **The correct use of Se in treatment for Ebola as recommended below is likely to reduce significantly the mortality rate and should be implemented as a matter of urgency. The current, supportive-based care is not good enough, as evidenced by the case fatality of over 60%. Selenium must be included in order to give patients their best chance of recovery.**

As an RNA virus, Ebola will be more active, and indeed will mutate to more virulent forms, in a Se-deficient host, e.g. a person with a plasma Se concentration less than around 75 micrograms/litre, a level common in Sub-Saharan Africa. As the disease progresses, in the absence of supplemented Se, the patient will become progressively more Se deficient, increasing oxidative stress/lipid peroxidation and compromising immunity (Beck et al, 1995; Beck et al, 2001; Taylor et al, 1994; Taylor et al, 1997). In

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addition, Se plays a role in the regulation of blood clotting via its effects on the thromboxane/prostacyclin ratio, and effects on the complement system. Selenium has an anti-clotting effect, whereas Se deficiency has a pro-clotting or thrombotic effect. Proliferation of Ebola virus is likely to impose an unprecedented Se demand on the host, potentially leading to severe lipid peroxidation and cell membrane destruction, and contributing to haemorrhagic symptoms (Ramanathan & Taylor, 1997). People who are infected with the virus are more likely to recover if they can maintain an adequate Se status.

A role for Se in Ebola treatment is also supported by the results of Chinese researchers, who treated patients in an outbreak of viral haemorrhagic fever with oral sodium selenite, obtaining dramatic reductions in mortality: after 9 days of Se dosage, the death rate fell from 100% (untreated) to 37% (treated) in the very severe cases, and from 22% to zero in the less severe cases (Hou, 1997)

Suggested Se forms: sodium selenite or sodium selenate.

Suggested dose (based on Hou et al 1997): 2 milligrams (i.e. 2000 micrograms) of selenate/selenite per day (which equates to 800 micrograms of actual Se). Preferably, administer the Se as a split dose, eg 400 micrograms in the morning and 400 mcg in the evening, otherwise one dose of 800 mcg/day. Take orally with a cup of water (it has no taste or smell). Intravenous administration is likely to be even more effective (use same dose). Starting with selenite/selenate powder and using successive dilutions it is easy to provide the required dose in 10-50 ml of water.

Suggested duration: 10 days (followed by a maintenance dose of 0.25-0.5 of the above dose for a further 20 days).

Safety: No adverse effects would be expected at this dose over this period, or indeed up to 30 days. Doctors in Melbourne dosed prostate cancer patients with over 15 milligrams selenate per day for 2 months with minimal side-effects (Corcoran et al, 2010)

Cost: using a cost of A\$200 for one kilogram of selenate or selenite (and I believe it can be bought cheaper than this if 50kg+ amounts are purchased, eg from the Lewer Corporation, Sydney), an amount which would provide enough Se for 500,000 daily doses at the above recommended rate, the cost of treating one person for 10 days is around half a cent, i.e. negligible.

The main other treatment component which is likely to be effective against Ebola (especially when used in combination with Se) (Hou, 1997) is **glycyrrhizin**, a triterpenoid from licorice with liver protective and antiviral, anti-inflammatory and antidiabetic effects (Pu et al, 2013). Glycyrrhizin had a stronger benefit than the antiviral drug ribavirin in an animal study and was 30 times less toxic and 30 times less expensive (Utsunomiya et al, 1997). Its anti-inflammatory effect is related to its ability to inhibit the enzyme 11 beta-hydroxysteroid dehydrogenase (Asl & Hosseinzadeh,

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2008). The recommended antiviral dose: 600 mg/day, preferably IV as its bioavailability will be lower via oral. There appears to be synergism between glycyrrhizin and selenium: In a mouse model, combined selenite and glycyrrhizin inhibited immune complex-mediated tissue injury more effectively than either treatment alone (Hou, 1997).

**Selenium treatment (ideally together with glycyrrhizin) is urgently needed in the current Ebola epidemic. At the recommended dose it is safe, effective, inexpensive and likely to reduce mortality by at least 50%.**

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