

Re: Arsenic and cattle

Source: <http://sci.tech-archive.net/Archive/sci.chem/2006-02/msg00232.html>

- *From:* "N:dlzc D:aol T:com \(\dlzc\)" <N: dlzc1 D:cox T:net@xxxxxxxxxx>
 - *Date:* Sun, 19 Feb 2006 16:29:50 -0700
-

Dear Bob:

"Bob" <bbx107@xxxxxxxxxxxxxxxxxx> wrote in message
news:jbnev1dirk6vajaiq5oakg1me8u324senk@xxxxxxxxxx

On Wed, 15 Feb 2006 06:13:44 -0700, "N:dlzc D:aol T:com
\(\dlzc\)" <N:
dlzc1 D:cox T:net@xxxxxxxxxx> wrote:

I had made an unsupported statement about a year and a half ago that cattle required a small amount of arsenic in their diets to survive. I was asked for any sort of literature support and found very little at the time.

<http://www.ead.anl.gov/pub/doc/arsenic.pdf>
"Depending on the amount ingested, arsenic can be beneficial (animal studies suggest that low levels of arsenic in the diet are essential) or adverse (high levels can be toxic)."

<http://horse.purinamills.com/bulletins/poison/lamenessinducing.html>

"The toxic effects of selenium in ruminants varies, depending on the amount and rate of its absorption, the individual animal's susceptibility, the type of selenium present in the plant, and the interaction of selenium with

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other elements, such as sulfur, arsenic, or copper, in the diet. These minerals, and possibly others, competitively interfere with selenium absorption by ruminants. If this also occurs in horses, adequate amounts of these minerals in their diet may help reduce selenium poisoning for them, although currently this hasn't been demonstrated."

I did a little more looking, and the situation does not become clearer. The common statements are that As is not essential for plants, seems to be essential for some animals, and it is not known for sure with humans. There is nothing particularly wrong with this ambiguity. Demonstrating that a micronutrient is truly essential, at levels commonly encountered, is not easy -- especially for humans. The possibility that it might act to counter something else is a possible confounder, that can make something non-essential appear essential under the tested conditions. It helps if a reason for essentiality is found, and apparently that bar has not been reached for As. Someone noted a relationship to methionine metabolism. Yes, but the essentiality of that is not at all clear.

Here are a few more links, for those who want to look:

American Chemical Society:

<http://pubs.acs.org/cen/80th/arsenic.html>

The status of arsenic changed in 1987 when inorganic arsenic present in drinking water was classified as carcinogenic. Arsenic is known to be nonessential for plants but an essential trace element in several animal species, while its presence in humans is an issue of debate.

EPA (US):

<http://www.epa.gov/ttn/atw/hlthef/arsenic.html>

Some studies have suggested that inorganic arsenic is an essential dietary nutrient in goats, chicks, and rats. However, no comparable data are available for humans. EPA has concluded that essentiality, although not rigorously established, is plausible. (1,6)

Journal article on determining trace element needs. This one does accept As as beneficial. Link here is to PubMed. I have included the abstract below.

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=88118

J Nutr. 1996 Sep;126(9 Suppl):2377S–2385S. Related Articles, Links

How should dietary guidance be given for mineral elements with beneficial actions or suspected of being essential?

Nielsen FH.

U.S. Department of Agriculture, Agricultural Research Service, Grand Forks Human Nutrition Research Center, North Dakota 58202, USA.

The term ultratrace elements, often used to indicate elements with an established, estimated or suspected requirement generally indicated by microgram/, could be applied to at least 20 elements. The quality of experimental evidence for nutritional essentiality varies widely for the ultratrace elements. Thus, although differing dietary guidance is appropriate for these elements, most need increased attention in future editions of the Recommended Dietary Allowances (RDAs) for the following reasons: (1) Increased interest in these elements by the public has been stimulated by the mass media; thus, responsible information about the usefulness of the ultratrace elements for health and well being is needed. (2) Risk assessments and toxicological standards are influenced by the RDAs. Authorative advice is required to prevent standards that obstruct the achievement of beneficial intakes of ultratrace elements. (3) An emerging new paradigm is that the determination of nutritional requirements should include consideration of the total health effects of nutrients, not just their roles in preventing deficiency pathology; some of the ultratrace elements have identified health benefits. Six ultratrace elements, iodine, selenium, manganese, molybdenum, chromium and boron (and cobalt as vitamin B12), merit specific RDAs. The term "estimated safe and adequate

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daily dietary intakes (ESADDI)" should not be used for any of the other ultratrace elements because of the misleading words "adequate" and "safe". "Apparent beneficial intake (ABI)" seems more appropriate for the elements with beneficial, if not essential, actions that can be extrapolated from animals to humans; these elements include arsenic, fluoride, lithium, nickel, silicon and vanadium. The evidence is too limited or controversial for the remaining ultratrace elements to even provide an ambiguous ABI. The amount found in a healthful diet probably should be a value provided for an appropriate intake for aluminum, bromide, cadmium, germanium, lead, rubidium, and tin.

More recent journal article. Seems to make no mention of possible benefit of As — though that may have been outside their purview.

PubMed link:

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=12730

1: J Nutr. 2003 May;133(5 Suppl 1):1536S–8S.

Related Articles, Links

Health effects and risk assessment of arsenic.

Abernathy CO, Thomas DJ, Calderon RL.

Fun. Maybe there will be an answer someday.

Thanks for a very full response. As always. I think all the bases are covered now.

David A. Smith