

Stability of selenium sources reviewed

Sodium selenate is stable in premixes during storage, stable in feeds during manufacture and more biologically available to most species than sodium selenite.

By DAVID EISENBERG, NIKOLAY BARASHKOV, ZACHARY EISENBERG and THOMAS MAY*

SODIUM selenate is a chemically stable compound, whereas sodium selenite is chemically unstable. This superior stability of sodium selenate over selenite has been previously demonstrated in animal feed premixes (Eisenberg, 2007).

Although both compounds are permitted as animal feed additives in the U.S. and internationally, the current article provides additional research supporting sodium selenate over sodium selenite as a lower cost option than selenium yeast as a feed additive.

Background

Selenium is an essential element for most animal species, including humans, and its functions include serving as a cofactor in protein synthesis and metabolism, stimulating the production of antibodies and aiding in male fertility.

However, selenium is toxic in excess concentrations, with an LD50 (lethal dose for 50% of test animals if fed continuously) of between 5 and 7 parts per million for most species.

Because many formula feeds are deficient in selenium, the Food & Drug Administration allowed selenium additions to feed beginning in 1974, in recognition of these and other dietary benefits. This regulation permitted the addition of a maximum of 0.1 ppm selenium as sodium selenite or as sodium selenate to chicken and pig feeds and at 0.2 ppm to turkey feeds under strict manufacturing controls that precluded any toxicity while incorpo-

rating the nutritional benefits.

Over the years, these limits were carefully expanded to 0.3 ppm for all species. In addition, the allowable concentration of premixes was increased, the requirement that premixes be analyzed was eliminated and additions via salt/mineral mixes and organo-selenium (e.g., selenomethionine) in the form of yeasts were permitted.

While sodium selenite, sodium selenate and selenium yeast are all legally permitted feed additives in the U.S., virtually all inorganic selenium is added as the selenite form, as it is about 30% less expensive than selenate. Elemental selenium and volatile selenium compounds are not considered bioavailable and are, therefore, not used.

Metabolisms of selenite, selenate and selenium yeast are different, but all are accepted by FDA as being bioavailable. However, numerous published research studies indicate that sodium selenate is 20-30% more bioavailable than sodium selenite (Whanger, 2002; Ammerman et al., 1995; Borshel et al., 1993), which could indicate that higher costs of selenate are worthwhile considering the nutritional losses that may occur due to the greater instability of sodium selenite.

Selenate may be more efficiently me-

tabolized than selenite or significant amounts of selenite may be lost due to its greater chemical instability in premixes and from chemical oxidation during feed manufacturing. While this difference may not seem economically significant, because the sodium selenate is more expensive than the sodium selenite, it may be very significant when one considers the total added selenium is limited to 0.3 ppm and the positive benefit of adding the maximum permitted amount may be substantial.

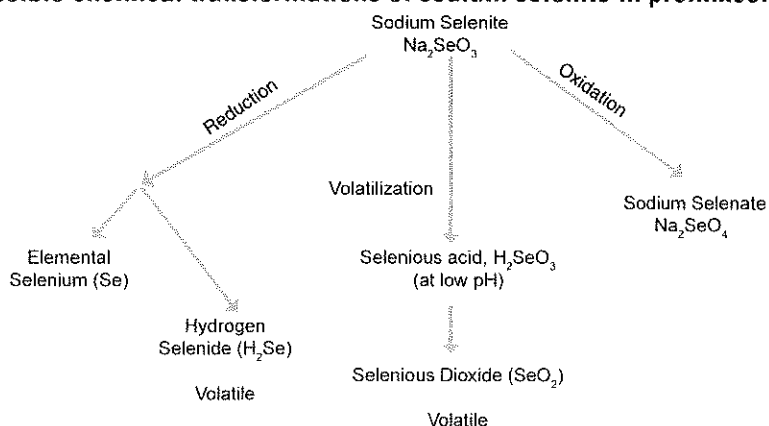
Currently, various companies are supplying selenium yeast containing 50% or more selenomethionine for feeds at a far higher cost than the cost of the sodium selenite or sodium selenate. Formulated at 0.3 ppm, the cost for sodium selenite or sodium selenate is about 5.0 or 6.5 cents per ton of feed, respectively (assuming a current price of \$80/kg for sodium selenite). The cost for selenium yeast is \$1/ton or more.

The organic selenium compounds are being added to feeds because they apparently provide more biological benefit than the selenite or the selenate. If a significant part of the advantage of organo-selenium compounds is due to chemical instability of selenite, then selenate may be a useful alternative to selenite and provide a significant economic benefit to the feed industry.

Storage stability

It is impossible today to speciate selenium compounds in complex feed premixes. It is, however, possible to speciate

Possible chemical transformations of sodium selenite in premixes.



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selenium in water extracts of such premixes.

Micro-Tracers Inc. obtained samples of 10 feed premixes (Attachment A) as well as a sample of food-grade molasses. Selenium was added at a rate of 1,000 ppm as sodium selenate, as "unprotected" sodium selenite (ACS grade) and as "protected" selenite (proprietary mixture of sand, sodium selenite and soybean oil) to three sets of each of the 10 feed premixes, to molasses and to molasses with 1% added phosphoric acid (typical in molasses-based liquid feeds).

A total of 108 samples were prepared — 12 samples x 3 selenium sources x 3 sets.

One set of 36 samples was immediately frozen. The second set was incubated at 45°C for one week and frozen. The third set was incubated for three weeks at 45°C and frozen.

Water extracts of the 108 samples were made and preserved by adding nitric acid (pH 2.0); refrigerated samples were then shipped to the U.S. Geological Survey Laboratory at Columbia, Mo., for speci-

ated selenium analysis (May et al. 2009). Results are listed in Table 1.

Anresco Laboratory (associated with Micro-Tracers) analyzed four samples of the premixes to which "unprotected" sodium selenite had been added after water extraction (Table 2). For these samples, the residual selenium in the wet premix, when added to the water-soluble selenium, approximated 100% of the formulated level. The non-water soluble sodium selenite in these premixes was probably reduced to mostly elemental selenium and not transformed into volatile compounds.

Interpretation

In evaluating our analytical findings, it was assumed that the sum of sodium selenite plus sodium selenate equated to recovery of selenium.

The results are best interpreted in three groups as follows:

- Three premixes containing ferrous sulfate where selenite degraded nearly

totally and immediately in water extracts of two samples and where it degraded gradually over time in the third;

- The two molasses mixes, and
- The remaining seven dry premixes where the sodium selenite and "protected" selenite both degraded 20%-plus initially but were then stable over time.

The sodium selenate appeared reasonably stable in all 12 premixes, including molasses and molasses plus phosphoric acid, at all times tested (at preparation of the samples and after incubation of one and three weeks) with an average recovery of 88.9%, with no result lower than 74.1%.

Sodium selenite and "protected" selenite degraded almost totally and immediately in water extracts of two premixes (4011 and 1202), both containing ferrous sulfate. The unprotected sodium selenite degraded more slowly in one premix (1598) that contained ferric ammonium citrate (an oxidizing compound) in addition to ferrous sulfate, whereas the "protected" selenite in this premix appeared

1. Effects of time on percent selenium source in feed premix extracts

Premix	Incubation time (weeks)	-Sodium selenite-		-4.5% sodium selenite on sand-			-Sodium selenate-			
		Selenite, %	Selenate, %	Total, %	Selenite, %	Selenate, %	Total, %	Selenite, %	Selenate, %	Total, %
4011	0	0.6	0.8	1.4	0.7	1.1	1.8	0.0	89.1	89.1
	1	1.2	0.6	1.8	0.5	1.1	1.6	0.0	74.1	74.1
	3	0.2	0.7	0.9	—	—	—	0.0	82.8	82.8
1202	0	1.4	0.8	2.2	1.0	1.1	2.1	0.2	90.2	90.4
	1	1.6	1.1	2.7	0.9	1.1	2.0	0.0	94.9	94.9
	3	0.5	0.7	1.2	1.4	3.1	4.4	—	—	—
Molasses	0	59.0	19.4	78.4	66.1	30.8	96.9	0.0	93.3	93.3
	1	17.4	42.0	59.4	34.0	16.9	50.9	0.0	91.2	91.2
	3	1.2	52.8	54.0	4.2	78.7	82.9	0.0	91.5	91.5
Molasses + phosphoric acid	0	54.2	32.9	87.1	53.2	34.3	87.5	0.0	90.3	90.3
	1	1.1	51.2	52.3	19.1	46.0	65.1	0.0	86.5	86.5
	3	22.8	27.0	49.8	1.8	82.3	84.1	0.0	82.3	82.3
1598	0	78.2	9.0	87.2	64.1	4.4	68.5	0.0	100	100
	1	57.6	10.8	68.4	76.0	12.2	88.2	0.0	90.1	90.1
	3	38.3	5.9	44.2	72.1	13.2	85.3	0.0	94.3	94.3
170	0	94.1	0.0	94.1	96.0	4.5	100.5	0.0	93.2	93.2
	1	87.8	3.9	91.7	77.7	4.8	82.5	0.0	86.1	86.1
	3	84.1	6.2	90.3	83.6	11.7	95.3	0.0	88.7	88.7
1819	0	56.1	5.9	62.0	37.8	13.6	51.3	0.0	98.8	98.8
	1	78.5	0.0	78.5	63.5	19.2	82.7	0.0	89.7	89.7
	3	—	—	—	—	—	—	0.0	90.5	90.5
1910	0	65.1	2.5	67.6	62.4	8.5	70.9	0.0	85.0	85.0
	1	66.8	0.0	66.8	78.6	17.8	96.5	0.0	86.7	86.7
	3	70.1	5.9	76.0	—	—	—	0.0	88.5	88.5
99	0	79.6	0.0	79.6	74.6	1.3	75.9	—	—	—
	1	63.9	0.0	63.9	67.1	0.6	67.7	—	—	—
	3	66.3	0.0	66.3	76.8	2.9	79.7	0.0	89.0	89.0
1548	0	85.1	0.0	85.1	68.1	0.0	68.1	0.0	94.0	94.0
	1	83.4	3.0	86.4	50.8	0.0	50.8	0.0	84.5	84.5
	3	78.3	1.2	79.5	—	—	—	0.0	91.3	91.3
1703	0	72.0	2.0	74.0	69.3	0.0	69.3	0.0	94.9	94.9
	1	79.8	1.3	81.1	73.0	0.6	73.6	0.0	82.2	82.2
	3	67.6	0.0	67.6	90.6	0.0	90.6	0.0	90.5	90.5
1815	0	76.9	2.0	78.9	65.3	0.0	65.3	0.0	85.4	85.4
	1	77	1.5	78.5	59.0	0.0	59.0	0.0	84.2	84.2
	3	60.9	1.6	62.5	—	—	—	0.0	81.0	81.0
Averages										
All	52.2	8.4	60.6	51.3	13.3	64.6	0.0	88.9	89.0	
Time = 0 weeks	60.2	6.3	66.5	54.9	8.3	63.2	0.0	92.2	92.3	
Time = 1 week	51.3	9.6	61.0	50.0	10.0	60.0	0.0	86.4	86.4	
Time = 3 weeks	44.6	9.3	53.8	47.2	27.4	74.6	0.0	88.0	88.0	

stable over time (Table 1).

Recovery from premix 1598 for unprotected sodium selenite was 87.2% at preparation of the samples, 68.4% after one week incubation and 44.2% after three weeks of incubation. Recovery of "protected" sodium selenite was 68.5% at preparation of the samples, 88.2% after one week and 85.3% after three weeks, indicating analytical error in the testing procedure.

The average recoveries of sodium selenite, "protected" selenite and selenate from the remaining seven dry premixes are shown in Table 3.

In these premixes, the selenate appeared stable, while both the selenite and the "protected" selenite lost more than 20% during sample preparation and then seemingly achieved stability.

In the molasses and molasses-plus-phosphoric-acid premixes, significant percentages of selenite and "protected" selenite degraded to the selenate form. The incubated samples apparently lost a substantial portion of the selenite to gaseous compounds. The applicable chemical reactions are explained in the Figure.

The average total recovery of the bioavailable selenium (selenite plus selenate) from the two molasses premixes after three weeks of incubation was 51.9% for sodium selenite, 83.5% for "protected" selenite and 86.9% for sodium selenate.

Besides oxidation into selenate and reduction to elemental selenium, selenites can be converted into two volatile products: selenium dioxide (through intermediate formation of selenous acid following by its thermo-degradation) and hydrogen selenide. Reduction of selenites to hydrogen selenide requires the presence of very strong reducing agents and, therefore, loss of selenium to hydrogen selenide in premixes is less likely than loss to selenium dioxide.

During manufacturing

In a trial with a simulated corn/soybean meal-based poultry feed manufactured at the Oceanic Institute in Hawaii, 1,000 ppm selenium was added to two batches of feed, one batch as sodium selenite and a second batch as sodium selenate. Four samples were taken from each batch at

each of three locations, mash, after conditioning and after pelleting.

The recovery of selenite from water extracts of the mash feed was 90.5%, of the conditioned feed was 74.5% and of the pelleted feed was 69.0% based on analyses of all samples by Micro-Tracers using the Norris-Fay titration method. Results from the samples with added selenate were meaningless due to false high results from the method.

In a trial with a corn/soybean meal-based poultry mash feed, Micro-Tracers added 1,000 ppm selenium as either sodium selenite or as sodium selenate, incubated them for two weeks at 40°C, made water extracts from them and sent the extracts and the residual wet premixes to the University of California-Davis for speciated selenium analysis by LC-ICPMS.

The recovery of selenite from the water extract was 76.3% and from the selenate was 99.6%. The additional recovery of total selenium from analysis of the wet premix formulated with sodium selenite was 20.3% and from the wet premix formulated with sodium selenate 4.3%. The selenium from the wet premix analyses was probably elemental selenium.

Sodium selenate appeared stable in the corn/soybean meal poultry mash feed whereas sodium selenite degraded by 25.5% in the first trial and by 23.7% in the second trial. It appears likely the sodium selenite degrades when feed is conditioned and pelleted or merely incubated.

During digestion

Dr. P.D. Whanger of Oregon State University (2002) reported that cattle rumen microbes reduce sodium selenite to insoluble forms. Whanger further reported that the uptake and retention by suckling rat pups was most rapid for selenomethionine (70%), followed by selenate (51%) and least for selenite (29%). He also reported that the transfer of selenium as selenomethionine and selenate to vascular effluents was respectively 2.4-fold and 1.5-fold greater than the transfer of selenite-based selenium.

These data suggest that selenomethionine (and therefore, selenium yeast) is preferable to sodium selenate and that sodium selenate is preferable to sodium selenite as a feed additive.

Bioavailability

The summary data reported in "Bioavailability of Nutrients for Animals," by Ammerman et al. (1995; no newer summary data was found) indicates that sodium selenate, selenium yeast and selenomethionine are more bioavailable than sodium selenite (Table 4).

In that book, the term bioavailability is defined as "the degree to which an ingested nutrient in a particular source is absorbed in a form that can be utilized

2. Results of analysis of four samples of the wet premixes for residual selenium, after water extraction

Premix (%)	Selenium from extractions (%)	Selenium in wet premix (%)	Total selenium (%)
99	66.3	30.1	96.5
1548	79.5	19.6	99.1
1703	67.6	26.1	93.7
1815	82.5	20.3	82.8
Average	69.0	24.0	93.0

3. Average recoveries (%) of sodium selenite, "protected" selenite and selenite from the dry premixes (170, 1819, 1910, 99, 1548, 1703 and 1815)

	Incubation time, weeks		
	0	1	3
Selenite	77.3	78.1	73.7
Protected selenite	71.6	73.3	79.2*
Selenate	93.1	87.6	88.1

*For this data point where four sample results were lost, the one-week incubation results were substituted for what otherwise would have been no data.

4. Relative bioavailability (%) of supplemental selenium sources (Ammerman et al., 1995)

Source	Poultry	Swine	Cattle	Sheep	Rat
Sodium selenite	100 ^a	100	100	100	100
Selenium selenate	130 (6) ^b	—	—	120 (1)	110 (3)
Selenium yeast	—	—	290 (1)	100 (1)	135 (3)
Selenomethionine ^c	80 (12)	120 (2)	—	—	105
(12)					
Selenomethionine ^d	115 (17)	150 (1)	245 (1)	—	202 (2)

^aBioavailability as a percentage of what was found for sodium selenite.

^bNumber of studies used to generate the average percentage of bioavailability.

^cStudies in which glutathione peroxidase activity or incidence of exudative diathesis was the response variable.

^dStudies in which whole body or tissue selenium retention or incidence of pancreatic fibrosis was the response variable.

in metabolism by the animal. ... For some nutrients, measurement is extremely difficult."

One can reasonably conclude that sodium selenate is stable in premixes during storage, stable in feeds during manufacture and more biologically available to most species than sodium selenite. It is probably less bioavailable for some species than selenium yeast containing selenomethionine, but it costs far less and should be seriously considered as a feed additive.

One may also reasonably conclude

that sodium selenite may be particularly unstable in premixes containing ferrous sulfate, vitamin C or other compounds, and it may also degrade during the pelleting of formula feeds and during digestion in the rumen of cattle.

References

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May, T.W., M.J. Walther, M.K. Saiki and W.G. Brumbaugh. 2009. Total selenium and selenium species in irrigation drain inflows to the Salton Sea, California, October 2008 and January 2009: U.S. Geological Survey Open-File Report 2009-1123.

Whanger, P.D. 2002. Selenocompounds in plants and animals and their biological significance. J. American College of Nutrition. 21(3). ■

Attachment A

List of Premixes Used

Code 4011 — Dairy — Ingredients: vitamin A supplement, D-activated animal sterol (source of vitamin D3), DL-alpha tocopherol acetate, iron sulfate, iron carbonate, zinc methionine, zinc sulfate, zinc oxide, manganese methionine, manganese sulfate, manganous oxide, copper lysine, copper sulfate, cobalt glucoheptonate, cobalt carbonate, EDDI, sodium selenite, calcium carbonate, mineral oil, ethoxyquin.

Code 1202 — Swine — Ingredients: ferrous sulfate, zinc sulfate, manganese sulfate, copper sulfate, cobalt sulfate, EDDI, sodium selenite, calcium carbonate, mineral oil.

Code 1598 — Swine — Ingredients: ferrous sulfate, ferrous fumarate, ferrous gluconate, iron ammonium citrate, iron amino acid complex, zinc oxide, manganous oxide, copper sulfate, cobalt carbonate, EDDI, calcium carbonate, mineral oil.

Code 170 — All species — Ingredients: D-biotin, roughage products, calcium carbonate, mineral oil.

Code 1819 — Swine — Ingredients: vitamin A acetate, vitamin D3, vitamin E, vitamin B12, riboflavin, D-calcium pantothenate, niacin, choline chloride, vitamin K-MSBC,

calcium carbonate, corn dried distillers grains plus solubles (DDGS), mineral oil.

Code 1910 — Beef — Ingredients: vitamin B12, riboflavin, D-calcium pantothenate, niacin, choline chloride, vitamin K-MSBC, pyridoxine hydrochloride, thiamine monohydrate, folic acid, D-biotin, calcium carbonate, corn DDGs, roughage products, natural mixed tocopherols, citric acid, rosemary extract.

Code 99 — All species — Ingredients: EDDI, salt, calcium carbonate, iron oxide and mineral oil.

Code 1548 — Swine — Ingredients: vitamin A acetate, vitamin D3, vitamin E, vitamin B12, vitamin K-MSBC, riboflavin, D-calcium pantothenate, niacin, choline chloride, pyridoxine hydrochloride, folic acid, thiamine monohydrate, D-biotin, ethoxyquin, roughage products.

Code 1703 — Swine — Ingredients: vitamin A acetate, vitamin D3, vitamin E, vitamin B12, riboflavin, D-calcium pantothenate, niacin, vitamin K-MSBC, *Aspergillus oryzae*, calcium carbonate, roughage products, mineral oil.

Code 1815 — Swine — Ingredients: vitamin A acetate, vitamin D3, vitamin E, calcium carbonate, DDGs, mineral oil.

23 July 2012

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MEMORANDUM

TO: Feedstuffs

FROM: David Eisenberg

RE: Response to Feedstuffs letter to the Editor of Mr. Jon D. Nelson, Executive Vice President, Southeastern Minerals, published in Feedstuffs 9 July 2012.

I read with great interest Mr. Nelson's Letter to the Editor as referenced. I am pleased to respond with comments as follows.

Mr. Nelson states that since the water solubility of sodium selenite is not much greater than for sodium selenate (85 grams/100 ml as compared with 82 grams/100 ml) there should not be much difference in their stability in feeds.

He did not consider that "water activity" not solubility in water is what determines if a feed material will pickup or lose moisture. The water activity for feed grade sodium selenite averaged 0.68 and for sodium selenate 0.73 (S. Eisenberg, JAOAC March 2007) again seemingly a small difference. But the difference had major consequences. After 23 days incubated storage petri dishes containing sodium selenite picked up 78.1% and 80.0% moisture becoming wet slurries while sodium selenate picked up 0.85% moisture and was visually unchanged. Most chemical reactions require water so this difference is huge.

Further, sodium selenite is an inherently reactive compound whereas sodium selenate is inherently stable as outlined in the June 18th Feedstuffs article..

Mr. Nelson also states sodium selenate for feed use has 5% or more contamination by selenite. This is untrue. Micro-Tracers analyzed a sample of feed grade sodium selenate supplied by Pacific Rare Metals, The Philippines and it was 99.46% pure with 0.54% selenite.

Sodium selenate is more expensive by 20-30% per unit selenium than selenite but it is also more stable and more bioavailable and certainly should be considered as a superior alternative to sodium selenite.

With best wishes.
David A. Eisenberg, President, Micro-Tracers, Inc.



Our food safety system isn't failing

ANYONE paying attention to the thousands of food safety-related headlines generated each year would think that Americans have little reason to trust our food system.

Increased media coverage has led the public to believe that foodborne illnesses are becoming more prevalent, provoking increasing public distrust in the food industry. However, the facts challenge this conventional wisdom: The numbers of foodborne illnesses have actually dropped by more than 20% in the last decade.

Technological advancements such as pulsed field gel electrophoresis (PFGE) and new U.S. Department of Agriculture regulations represent further steps to increase consumer food safety protection, but they will also increase the number of food recalls. Unfortunately, the media — and, consequently, the public — more often focus on the reports of the number of people affected by a foodborne illness, rather than the actual decreases in overall illnesses.

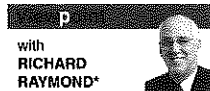
This public misperception is caused in large part by the substantial increase in coverage of foodborne-illness outbreaks and food recalls in the last decade — a symptom of the changes in global media, the rise of the internet and shorter news cycles.

Media coverage of food recalls related to illness has dramatically increased by 114% in the past five years and by more than 250% in the past 10 years, while actual laboratory confirmed illnesses have dropped 23% (Figures). Online discussion of food recalls has spiked in social media sites in recent years. In the last six months alone, food safety and food recall-related terms produced more than 81,000 mentions on Twitter and personal blog sites.

Also, traditional media coverage drives their commentary around issues and topics. For example, foodborne outbreaks related to *Escherichia coli* O157:H7 alone generated more than 3,500 media stories in 2011, a 149% increase since 2001. Over the same time period, the Centers for Disease Control & Prevention announced a 43% decline in *E. coli* O157:H7 illnesses and that the number of persons affected by the deadly *E. coli* O157:H7 bacteria in 2010 was the lowest since mandatory reporting for this pathogen began.

What the media isn't reporting on, and what

Dr. Richard Raymond is a medical doctor by training and a former undersecretary of agriculture for food safety at the U.S. Department of Agriculture.



with RICHARD RAYMOND*

consumers don't always know, is that technological advancements such as PFGE, which provides the bacterial DNA "fingerprint," have provided unprecedented opportunities to detect, identify and track foodborne pathogens and to link what used to be considered isolated illnesses into clusters, which aids in identifying the source, and often leads to a recall.

Improved identification and tracking of foodborne pathogens is an important step toward improved public health, but it also causes an increase in the number of recalls. This leads to increases in the number of foodborne illness victims being reported by the media. Whereas an individual infection would not have been noted by the media in the past, current coverage trends often exploit outbreaks with their identifiable victims and pursuit of the source product.

Technology continues to shed light on the food safety system, encouraging policymakers and regulatory agencies to take necessary actions to further prevent and track foodborne illnesses, including the passage of the Food Safety Modernization Act in 2010, which will be implemented over the coming years. These initiatives are created by regulators to enhance the protection of food safety, but they will result in an increase in food recalls.

The catch 22 for the food industry is that better food safety systems — a good thing for both industry and consumers — may lead to negative public perception of the industry.

There are fewer foodborne illnesses overall because we are better at preventing pathogen contamination of products and we are better at detecting pathogens before food leaves the farm or factory and makes it to stores and ultimately consumers' plates. If there is an outbreak, we are better at identifying it and removing unsafe food from grocery store and pantry shelves.

However, this may not be fully communicated to the public, which only hears the negative information.

Given the recent changes in testing by USDA for non-O157:H7 shiga-toxin *E. coli* strains, and the media coverage surrounding the increased testing, this is a time for the industry to reflect on current practices and assess the

need for course correction in their communication strategies.

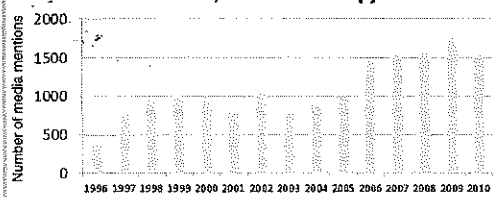
Saying that the new policy will cause industry to "destroy perfectly safe meat" just won't cut it. Nor will accusing proponents of this policy change of "wrestling in the mud."

The current level of traditional and social media attention around food safety necessitates that companies adapt to a new environment where there will be increased public scrutiny of food safety practices. Companies need to become more transparent and proactive in the way they engage diverse stakeholders on their food safety efforts, and in the event of a recall, how they handle the situation will determine whether they engender trust and restore confidence in the company and food brand that is being challenged.

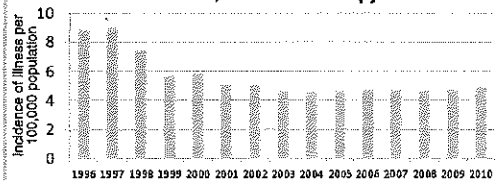
Confronting the myths about the supposedly failing system with the facts about the actual decrease in foodborne illnesses represents a real challenge for the food industry. However, it is also an opportunity for the industry to restore consumer confidence.

Food companies can

Average media coverage of foodborne illnesses linked to Listeria, E.coli and campylobacter



Average incidence of foodborne illnesses linked to Listeria, E.coli and campylobacter



do this by adopting a 360-degree approach to food safety communications that proactively builds confidence, responds to crises and restores trust following a crisis event. These discussions with consumers and key stakeholders will help them to see how the food they feed their families is the safest it has ever been.

This is also an important reminder to the food industry to maintain and increase its vigilance and proactive efforts regarding the management and communications around

food recalls. Food recalls are important elements in an effective food safety system. The better food companies are prepared for such events, the better they can be managed, and the faster the company can recover and return to business as usual.

My next article will reflect upon what I see as some failings by industry and its professional associations in the management of positive communications as opposed to feeding the frenzy to attack the beef industry with quotes that can only harm them in the long run. ■

Letter to the Editor

Selenium review questioned

Dear Editor:

I read with interest the recent article in the June 18 issue of *Feedstuffs* entitled, "Stability of selenium sources reviewed" by David Eisenberg of Micro-tracers Inc. along with two of his staff and Dr. Thomas May of the U.S. Geological Survey.

I wanted to bring to the attention of your readers the fact that, although the article makes a case for the use of sodium selenate over selenite, the realities of a cost/benefit ratio and real world analysis of what is involved do not lend support to the use of sodium selenate.

Firstly, it is interesting to note that, in the laboratory, ergo, in all probability in physical feed and premix production, the solubility of sodium selenite and selenate are almost identical, with selenite getting a slight nod.

- Sodium selenate solubility = 82 g per 100 g/mL water.
- Sodium selenite solubility = 85 g per 100 g/mL water.

It is extremely doubtful that this 3.65% solubility differential would create a difference in the stability of the two compounds in physical feed or premixes on a consistent basis.

Secondly, from an economic standpoint, sodium selenate has been in limited use primarily because of cost. The chemistry requires that sodium selenite is an intermediate in the production of sodium selenate. The conversion to selenate requires an additional oxidative step, which adds significant cost to the selenate end-product. Additionally, it is also very difficult and costly to create a selenate product that is 100% selenate. Usually, the product created and thus designated is, at best, a blend of 95% selenate and 5% selenite. A 100% selenate product can be created, but only with considerable expense. Essentially, this opens up a nightmare for the Association of American Feed Control Officials and would

require a redefinition of sodium selenate based on its selenate:selenite content. If this were not done, any sodium selenate manufacturer or a premixer who fudges on the chemistry would have a distinct economic and marketing advantage over a more honest company.

In summary, I strongly urge the reader to check into the facts involved in making a change in selenium source as suggested in this article. If they are willing to bear the additional cost and demand that the selenate:selenite ratio be guaranteed in writing for a modest "theoretical" gain in storage stability, it is their decision and the industry will react accordingly.

Respectfully submitted by:
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