



Why semicarbazide is not a suitable marker for nitrofurazone in dairy products

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Introduction

Nitrofurazone is a compound from the nitrofur class of antibiotics that were developed during the 1940s. By the 1960s, it was realised that nitrofur antibiotics have carcinogenic and genotoxic properties, and so their use in animal food production was banned by many countries.

Testing milk for nitrofurazone became possible in 1962, and with the ban on their use and the application of improved test methods during the years, this ensured that consumers were not exposed to residues in their milk supplies.

In meat, unlike milk, nitrofurazone rapidly breaks down which makes the detection of residues from illegal use on meat-producing animals very difficult. Therefore, in 2001 another test method was developed for meat that tested for semicarbazide, a breakdown product of nitrofurazone, as a 'marker metabolite'. Unfortunately, semicarbazide is not specific as a marker metabolite for nitrofurazone, as in various foods it can also form naturally at very low levels. Examples of the different types of foods that have been found to contain detectable traces of semicarbazide, yet never had exposure to nitrofurazone, include: meat; both fruit and vegetables packed in glass jars (where the source was azodicarbonamide, used as a blowing agent for sealing gaskets on lids); bread; bakery products; noodles; seafood; powdered egg; honey; and powdered dairy products.

Testing Laboratories — Meat vs. Dairy

Due to the limitations of detecting nitrofurazone in meat, many Food Control Laboratories have adopted the testing approach which looks for semicarbazide as a 'marker metabolite'. As indicated, testing for semicarbazide does not meet the requirements of being a specific and conclusive method for proof of nitrofurazone use on dairy farms. In contrast to meat, nitrofurazone is known to remain stable for extended periods of time in milk. At present, the only known confirmatory test, to determine whether nitrofurazone has been used on dairy farms, is to measure intact nitrofurazone.

Are There Health Risks from Trace Levels of Semicarbazide in Foods?

No. The toxicology of semicarbazide has been extensively studied in recent years. Whilst high levels can cause adverse health effects, the trace levels (low parts-per-billion), which are occasionally detected in food, are too low to cause any health effects for humans.

Semicarbazide is not a health risk at the trace levels at which it is found in dairy products when formed naturally via other mechanisms (not linked to nitrofurazone).



What Types of Dairy Products can be Affected?

In dried dairy powders, that do not initially contain detectable levels of semicarbazide at the time of manufacture, it is known that semicarbazide may develop during storage. Time and temperature are both factors that influence the amount of semicarbazide that develops. Products that are high in protein, such as Milk Protein Concentrate (MPC) and whey powder, are more susceptible to form semicarbazide than other lower protein products such as skim milk powder.

Summary

Trace levels of semicarbazide may form naturally in a wide variety of foods including dried dairy powders. These low part-per-billion levels are insufficient to have any adverse health effects. Testing dairy products for semicarbazide is not sufficiently specific to be used as a confirmatory test. Unambiguous evidence for the use of nitrofurazone on dairy farms presently requires testing for intact nitrofurazone.

References

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