Black spots in cheese caused by intramammary teat sealant

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Origin of the black spots

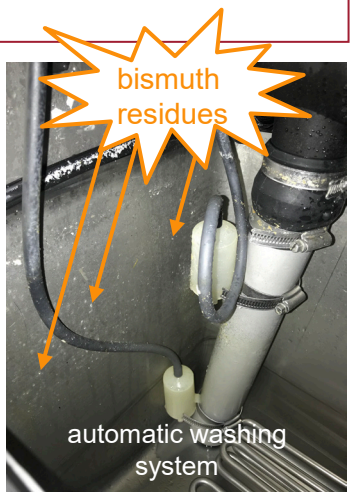
Black spots were detected on 6-month-old hard cheeses. Based on various analyses, it was possible to rule out the possibility that these were bacterial colonies or amino acids. ICP (Inductively Coupled Plasma) analysis revealed an extremely high concentration of bismuth in the area of the black spots. The bismuth contamination could be linked to the intramammary teat sealant (ITS), a paste injected into the teats with a syringe during drying off. The bismuth is present in the product as bismuth subnitrate.

Passage into milk

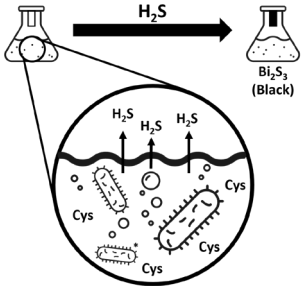
- The obturator is deposited in milking machines (liners, pipes, automatic washers).
- Bismuth (Ø = 1-3 µm) passes through the milk filter (Pore size = 100-250 µm)
- Residues cannot be effectively removed by heat or various cleaning agents
- Contaminated milk pipes lead to a continuous release of bismuth into the milk

From white to black

- Bacteria on the surface of washed-rind cheese produce hydrogen sulfide (H_2S)
- H_2S penetrates the cheese and reacts with the bismuth subnitrate and forms an insoluble black salt (= bismuth III sulfide)
- Although bismuth is present throughout the cheese, the formation of black sports is mainly visible directly below the rind.



The main bacteria isolated from the surface of rind-embedded cheeses were suspended in a phosphate buffer with or without the addition of L-cysteine. In the upper part of the vial, a paper has been coated with ITS.



Arthrobacter pascens		*Pseudarthrobacter oxydans*		*Corynebacterium variabile*	
-	*L-cys*	-	*L-cys*	-	*L-cys*

Summary

Following several complaints from pre-packaging companies, Agroscope was able to determine the cause of the black spots visible in the cheese paste. Analysis showed that the cause was bismuth. Bismuth subnitrate is the main component of various internal teat sealants used at dry-off. Bismuth residues are deposited in the milking installation and are difficult to remove with standard cleaning. The bacteria used to mature the cheese produce hydrogen sulfide, which reacts with the bismuth subnitrate to form bismuth III sulfide a black salt.

For further information see:
Ingenhoff J.-E., Haldemann J., Berger T. Stellungnahme zu Bismutrückständen in Milch und Milchprodukten verursacht durch intramammäre Zitzenversiegler. ***Agroscope, Merkblatt Nr. 193, 2023, 3 S.***

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