



Report: Aflatoxin M1 occurrence in raw milk in the Czech Republic

FOR MILKCHECK PROJECT (22430015, MILKCHECK – V4 dairy research network for raw milk qualification practices and challenges) 2026

INTRODUCTION

Aflatoxin M1 (AFM1) is a toxic metabolite formed from aflatoxin B1 (AFB1) in the liver of lactating animals and subsequently excreted into milk. AFM1 may appear in milk within a few hours after the intake of contaminated feed, and its excretion may continue for several days.

AFM1 represents an important food safety risk. It is classified by the IARC (International Agency for Research on Cancer) as a Group 2B carcinogen (possible human carcinogen). Contamination of milk is indirect and is mainly associated with the consumption of feed contaminated with AFB1.

Due to the importance of milk in human nutrition, especially for sensitive population groups, regular monitoring of AFM1 levels is essential to ensure the safety of the food chain.

LEGISLATION

The occurrence of aflatoxin M1 in milk in the Czech Republic is regulated by European Union legislation. Commission Regulation (EU) 2023/915 sets a maximum level (ML) of 0.050 µg/kg for raw milk, heat-treated milk and milk for the manufacture of milk-based products, and 0.025 µg/kg for infant formulae, follow-on formulae and young children formulae. These limits are very strict compared with the limits applied in the USA or in some Asian countries.

ORGANIZATION OF MONITORING

Monitoring of AFM1 in raw milk in the Czech Republic is part of the official control system for contaminants in the food chain and is based on European Union legislation, particularly regulations governing official food controls. This monitoring is organized by the State Veterinary Administration and is carried out on a regular basis according to official control plans.

In addition, research institutions also conduct studies on AFM1 occurrence to address specific research needs.

RESULTS

Results of official monitoring in the Czech Republic (2006–2025): raw cow, goat and sheep milk

The State Veterinary Administration (SVA) annually publishes the results of the official monitoring of residues and contaminants in the food chain in the form of information bulletins, including the results of AFM1 testing in milk. Results are therefore available from 2006 onwards (SVA, 2007–2026).

In the period 2006–2025, a total of 606 samples of raw cow milk, 81 samples of raw goat milk and 34 samples of raw sheep milk were collected and analysed. Composite samples of raw cow milk were collected on farms, from milk vending machines, or in dairies before emptying the milk tanker. Samples of raw sheep and goat milk were collected mainly in areas with higher numbers of sheep or goats. The samples were analysed in accredited laboratories of the State Veterinary Institutes. According to the accreditation certificate of the State Veterinary Institute Jihlava, the determination of AFM1 is performed by HPLC in accordance with ČSN EN ISO 14501 (CAI, 2025).

Based on data on the number of collected and positive samples, i.e. samples with results above the detection limit of the method used, the total number of positive samples and their proportion were calculated for the periods 2006–2025 and 2011–2025.

For the period 2011–2025, a weighted mean AFM1 concentration was also calculated using the reported annual mean AFM1 values, with the number of tested samples in each year used as the weighting factor. These calculations were performed only for data from 2011 onwards, due to a change in the way AFM1 values below the detection limit were reported. Until 2010, a substitute value of 0.003 µg/kg was used for these samples, whereas from 2011 onwards a value of 0.0025 µg/kg was used. These values correspond to one half of the detection limit of the method and do not represent true positive AFM1 findings. The standard deviation of the annual mean AFM1 values was also calculated, and the highest of the maximum values reported in the individual annual summary tables was used as the maximum. All calculations were performed in MS Excel 2013.

Monitoring of AFM1 occurrence in 2006–2025 showed a very low level of milk contamination in the Czech Republic. Only 1.3% (8/606) of cow milk samples were positive for AFM1 (Table 1), and none of them exceeded the maximum EU level (0.050 µg/kg). Positive findings were

detected in 2006 (4.8%; 1/21), 2012 (2.5%; 1/40), 2017 (2.9%; 1/35), 2020 (2.9%; 1/35), 2024 (9.7%; 3/31) and 2025 (3.2%; 1/31). In each of these years, one positive sample was recorded, except for 2024, when three positive samples were reported. No measurable occurrence of AFM1 was detected in goat or sheep milk.

For the period 2011–2025, the mean AFM1 concentration in cow milk, expressed as a weighted mean of the annual mean values, was 0.0026 ± 0.0002 µg/kg (weighted mean $\pm$ SD of annual mean values; Table 2). The distribution of annual mean values in 2011–2025 is shown in Figure 1. The highest reported annual maximum value was recorded in 2024 and reached 0.015 µg/kg. As AFM1 was not detected above the detection limit in goat or sheep milk during the monitored period, the mean AFM1 concentration was not calculated as a measurable value.

These results confirm the long-term favourable situation and the high level of milk safety in the Czech Republic with regard to AFM1 occurrence in milk from the tested animal species.

Table 1. Occurrence of AFM1 in raw milk in the Czech Republic, 2006–2025

Milk type	Total samples	Mean samples/year	Positive samples > DL	Positive samples (%)	Samples above EU maximum level
Cow milk	606	30.3	8	1.3	0
Goat milk	81	4.1	0	0	0
Sheep milk	34	1.7	0	0	0

AFM1 = aflatoxin M1.

Table 2. AFM1 occurrence and concentrations in raw milk in the Czech Republic, 2011–2025

Milk type	Total samples	Mean samples/year	Positive samples > DL	Positive samples (%)	Samples above EU maximum level	Mean AFM1	SD	Max	Interpretation
Cow milk	501	33.4	7	1.4	0	0.0026	0.0002	0.0150	Low, below EU maximum level
Goat milk	46	3.1	0	0	0	< DL	not calculated	< DL	All sample values below DL
Sheep milk	26	1.7	0	0	0	< DL	not calculated	< DL	All sample values below DL

AFM1 = aflatoxin M1; DL = detection limit; Mean AFM1 = weighted mean AFM1 concentration calculated from reported annual mean values; SD = standard deviation of reported annual mean values; Max = highest reported annual maximum value. Values below the DL are reported as < DL; where numerical values below DL were used for calculation, they were included as one half of the DL (0.0025 µg/kg).

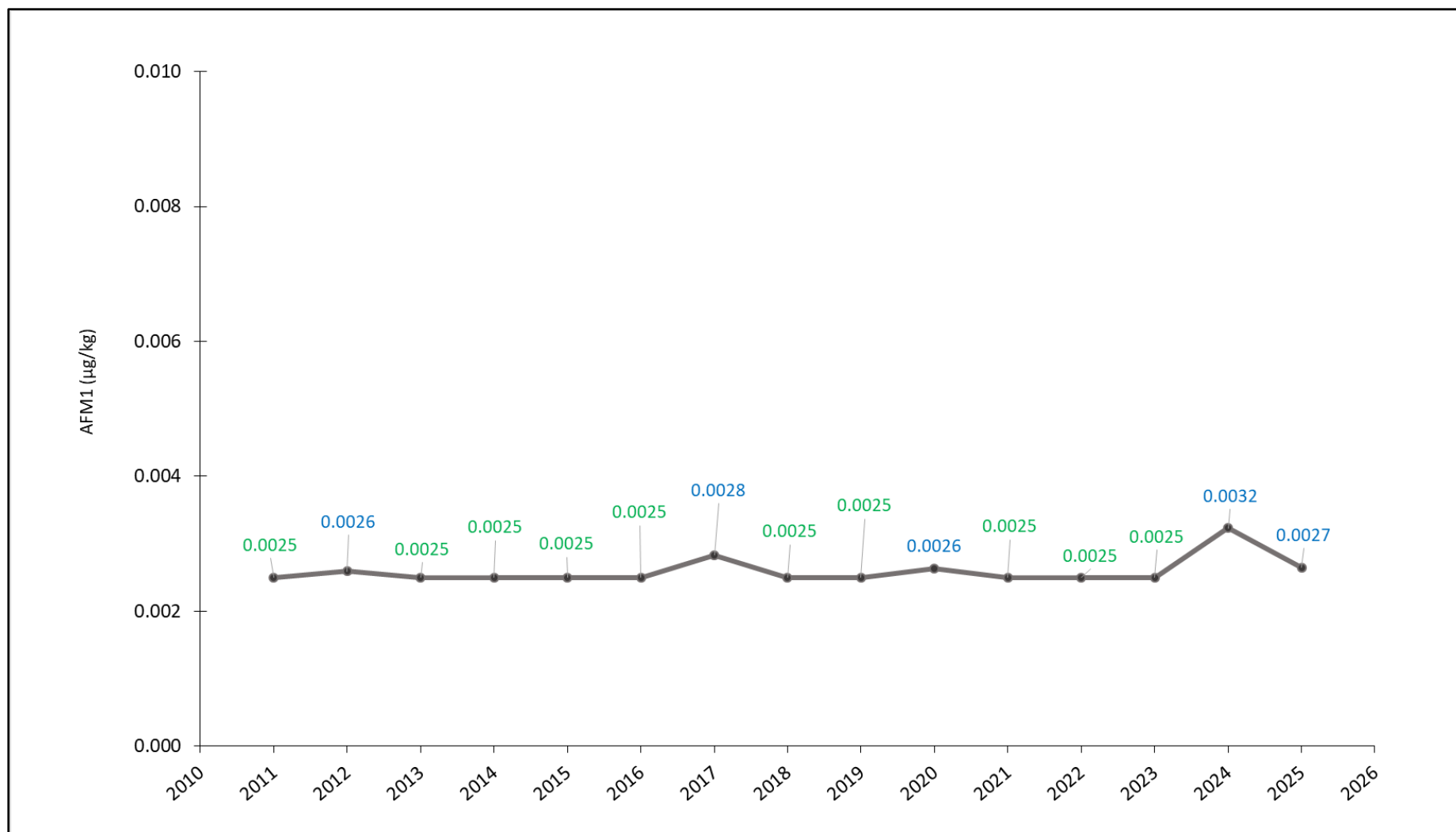


Figure 1. Mean annual AFM1 content in raw cow milk in the Czech Republic, 2011–2025

Green font = annual values based on results below the detection limit (DL); one half of the DL value was used for calculation (0.0025 µg/kg). Blue font = annual values with results above the DL. All values were below the EU maximum level.

Results of research in the Czech Republic in 2022: raw cow milk

Hasoňová L. *et al.* Occurrence and seasonal variation of aflatoxin M1 in raw cow milk in the Czech Republic. Food Control. 2025;170:111028.

In a study conducted in 2022 on 47 dairy cattle farms, 172 bulk tank milk samples were collected and analysed for the presence of AFM1. An immunochromatographic method was used for the analysis, specifically the Charm MRL AFM1 Quantitative Test. AFM1 was detected in 23 milk samples (13.4%), with concentrations ranging from 0.015 to 0.064 µg/L. The mean AFM1 concentration was 0.0037 µg/L. Only two samples exceeded the maximum level permitted by the European Union.

Of the 17 farms where AFM1 was detected, a single positive finding was recorded on 11 farms (23%), while repeated positive findings were observed on 6 farms (13%).

AFM1 occurrence showed some seasonal variation, with the highest frequency in autumn, especially September, and the lowest in summer, although these differences were not statistically significant. At the observed concentrations, AFM1 had no significant effect on most milk quality parameters, except for total solids.

These results suggest that although AFM1 may occur in milk more frequently than indicated by long-term monitoring data, its concentrations remain low. Further regular monitoring with a larger number of samples, as in this study, would be desirable to determine whether the observed increase in positive findings is significant over time.

CONCLUSION

The occurrence of aflatoxin M1 in milk in the Czech Republic has long been very low and well controlled. Exceedance of maximum levels are exceptional, and the overall situation reflects the high level of safety of milk production.

Nevertheless, regular monitoring should continue in the future, with attention paid to feed quality and storage conditions, as well as to the potential effects of climate change on the occurrence of mycotoxins in the food chain.

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Additional source of information

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AI use statement:

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