

Summary Report on the Aflatoxin M1 Situation in V4 Countries

Introduction and Background

Aflatoxins are secondary metabolites produced by fungi, of which **aflatoxin B1 (AFB1)** is the most hazardous, classified by the IARC as a Group 1 human carcinogen. **Aflatoxin M1 (AFM1)** is the 4-hydroxylated metabolite of AFB1, which appears in the milk of dairy animals after they consume contaminated feed. Although AFM1 is less toxic than AFB1, it is still classified as a carcinogen and poses a significant food safety risk because milk is a staple in the human diet, particularly for infants and children.

1. National Legislation and Regulatory Framework

In the V4 countries (Hungary, Czechia, Slovakia, and Poland), regulation of aflatoxins is fully harmonized with **European Union** legislation.

- **Core EU Regulation:** The primary legislation is **Regulation (EU) 2023/915**, which sets maximum levels for certain contaminants in food. This was supplemented by **Regulation (EU) 2024/1756**, which clarified product classifications.
 - **Limits in Milk:** For raw milk, heat-treated milk, and milk for the manufacture of dairy products, the limit is **0.050 µg/kg (50 ng/L)**. For infant formula and follow-on formula, a stricter limit of **0.025 µg/kg** applies.
 - **Feed Regulation:** **Directive 2002/32/EC** regulates undesirable substances in feed. The maximum level of AFB1 for most feeds is 0.02 mg/kg, but for lactating animals, it is stricter: **0.005 mg/kg**.
 - **Specific National Acts:**
 - **Slovakia:** Act No. 152/1995 on foodstuffs, Act No. 39/2007 on veterinary care, and Act No. 355/2007 on public health protection.
 - **Poland:** Act on Food and Nutrition Safety (2006) and the Act on Products of Animal Origin (2005).
 - **Hungary:** Implemented through ministerial decrees and national monitoring programs aligned with EU standards.
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2. Authorities Involved in Legislation and Investigation

Hungary

- **Ministry of Agriculture:** Responsible for legislation, strategic policy, and defining the structure of monitoring programs.
- **National Food Chain Safety Office (NÉBIH):** The central enforcement body responsible for sampling, lab analysis, and official actions like product recalls.

- **National Tax and Customs Administration (NAV):** Involved in border controls for imports from third countries.
- **National Centre for Public Health and Pharmacy (NNGYK):** Performs scientific health risk assessments.

Czech Republic

- **State Veterinary Administration (SVA):** Organizes and performs official controls throughout the food chain.
- **State Veterinary Institutes (SVI):** Accredited laboratories (e.g., SVI Jihlava) perform AFM1 testing using HPLC.

Slovakia

- **State Veterinary and Food Administration (SVPS SR):** The central authority coordinating monitoring programs.
- **Public Health Authority (UVZ SR):** Assesses consumer health risks and provides expert opinions.
- **State Veterinary and Food Institutes (SVPI):** Laboratories in Bratislava, Košice, and Dolný Kubín perform sample analysis.

Poland

- **Veterinary Inspection:** The key authority for raw milk, dairy plants, and feed safety.
- **State Sanitary Inspection:** Focuses on retail, catering, and public health.
- **Agricultural and Food Quality Inspection (IJHARS):** Monitors commercial quality and labeling.

3. Country Statistics and Trends

Hungary

Contamination is strongly climate-dependent. The most severe event occurred in **2012–2013**, when drought led to **7%** of raw milk samples exceeding the limit. A 2021–2022 survey showed **11.9%** of raw milk samples exceeded 50 ng/L, but only **0.5%** of consumer milk did so. Average concentrations typically range between 10 and 30 ng/L.

Czech Republic

The long-term situation is favorable. Between 2006 and 2025, only **1.3% (8/606)** of cow milk samples were positive (above the detection limit), and **none exceeded the EU maximum level**. A targeted 2022 research study found a 13.4% detection rate, but only two samples exceeded the limit.

Slovakia

Monitoring data from 2015–2025 show a fluctuating but generally low incidence. Only a few positive cases were recorded (e.g., 2 samples in 2017, 1 in 2022), while in most years (e.g., 2015, 2016, 2024, 2025), no samples were above the detection limit.

Poland

Official monitoring shows very low contamination. In 2016 and 2017, zero out of 40 samples were non-compliant. A 2025 research study on intensive farms detected AFM1 in only **1.7%** of samples (4/228), all well below the EU limit.

4. Former Research and Research Results

Hungary

- **Seasonal Studies (Buzás et al., 2023):** Found that AFM1 levels are significantly higher in **autumn** due to summer droughts affecting maize and the use of stored feed.
- **Exposure Assessment:** Estimated exposure for the Hungarian population is below the European average reported by JECFA.

Slovakia (Highlighted Research Area)

Slovakia has shown significant results in analytics and mitigation:

- **Analytical Methods:** Developed **HPLC-FLD** methods, rapid test strips, and innovative **electrochemical aptasensors** with detection limits as low as 0.5–5 ng/L.
- **Mitigation Strategies:**
 - **Adsorption:** Tested bentonite, activated carbon, and chitin as effective sorbents.
 - **Beta-cyclodextrin:** Research showed that removing cholesterol from milk with beta-cyclodextrin also reduces AFM1 by an average of **39.1%**. Using an insoluble beta-cyclodextrin polymer (BCP) achieved a **58%** elimination rate in raw milk.

Czech Republic

Research confirmed that AFM1 levels have no significant effect on most milk quality parameters (protein, lactose), with the exception of total solids.

5. Recommendations at Country and V4 Level

Legislative and Control Recommendations

- **Prevention via Feed:** Since feed is the source of AFB1, prevention must focus on harvest and storage conditions (moisture control, mold inhibition).

- **Seasonal Monitoring:** Intensive sampling is required during drought years, particularly in the autumn and winter months.
- **Rapid Methods:** Implementation of rapid screening (e.g., lateral flow tests) at dairy processing plants for real-time decision-making.

V4 Level Cooperation

- **Common Forecasting System:** Develop a shared, weather-based warning system for the V4 to predict aflatoxin risk using meteorological data.
- **Data Sharing:** Harmonize monitoring strategies and reporting formats across the region to improve risk assessment.
- **Joint R&D:** Conduct inter-laboratory ring trials to improve measurement accuracy and comparability.

Research Areas

- **Biocontrol:** Testing non-toxigenic fungal strains that can suppress aflatoxin-producing species in soil and plants.
- **Innovative Mitigation:** Developing active packaging systems and practical, industry-scale adsorption technologies.
- **Climate Impact:** Continuous monitoring of how climate change shifts the prevalence of mycotoxins in Central Europe.