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DETECTION OF ANTIBIOTIC RESIDUES AND MYCOTOXINS IN MILK USING COMPETITIVE IMMUNOCHROMATOGRAPHIC TESTS

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ABSTRACT

As milk should be free from harmful substances before leaving the farm, this study provides the results of the analysis of the presence of β-lactam and tetracycline residues and Aflatoxin M1 (AFM1) in milk samples obtained within one year from Ireland and Slovakia. To evaluate the presence of β-lactam and tetracycline residues, Duplex BT Scan assay, produced by Zeulab S.L. was used. For the detection of AFM1, AflaM1 Scan (Zeulab S.L.) tests were used. Of a total of 69 raw cow's milk samples analysed, 40 samples were obtained from the farms in Slovakia and 29 samples from the farms in Ireland. Among the 69 analysed samples, 17 (24.6 %) samples were tested positive for the presence of β-lactam residues, 12 (17.4 %) samples for tetracycline residues and 59 (88.4 %) samples for AFM1. Milk samples positive for antibiotic residues and mycotoxins were not acceptable and it is important that the reputation of milk as a healthy and safe food is protected worldwide. Dairy farmers and consumers want to be confident that milk and milk products are of high quality and free of all pharmacologically active substances and toxins.

Key words: aflatoxin M1; betalactams; detection; milk; tetracyclines

INTRODUCTION

Milk is considered one of the most valuable foods in the world and therefore has a vital role in the life of animals and especially in humans. The milk production industry has steadily grown in recent years. In the last year, 544 tonnes of cow's milk were produced worldwide. The European Union has produced 145 tonnes of milk in the last year, making it the largest producer of dairy products worldwide [17].

Raw milk must come from animals that: do not show any symptoms of infectious diseases communicable to humans through milk; that are in a good general state of health, without any symptoms of disease that might result in the contamination of milk, and, in particular, are not suffering from any infection of the genital tract with discharge, enteritis with diarrhoea and fever, or a recognisable inflammation of the udder; that do not have any udder wounds likely to affect the milk; to which no unauthorised substances or products have been administered and that have not undergone illegal treatment within the meaning of the Directive 96/23/EC and in respect of which, where authorised products or substances have been administered, and the withdrawal periods prescribed for these products or substances have been observed. The official veterinarian shall verify: that the health status of the animals, the absence of the use of prohibited or un-authorised pharma-

cologically active substances, and the possible presence of residues of authorised pharmacologically active substances, such as the pesticides or contaminants does not exceed the levels laid down in Regulations (EU) No. 37/2010, (EC) No. 396/2005 or (EC) No. 1881/2006. Milk and colostrum production holdings shall undergo official controls by the competent authorities to verify that hygiene requirements laid down in Regulation (EC) No. 853/2004 are being complied with. These controls may involve inspections and the monitoring of controls carried out by professional organisations. If it is demonstrated that the hygiene is inadequate, the competent authorities shall verify that appropriate steps are taken to correct the situation [5, 6, 7, 20].

Antibiotic residues and mycotoxins are the most common contaminants of milk. Each year, around 63,151 tons of antibiotics are used in livestock worldwide, whereas antimicrobial usage in animals is double compared to human's worldwide [10]. Many antibiotics are released unaltered meaning there is release of potential antimicrobial activity into the environment. Once released, most antibiotics are persistent and biologically active [19]. On the other hand, mycotoxins occur naturally through the growth of moulds. They are primarily found on cereal grains and forage. Especially harmful are Aflatoxins. These are a type of mycotoxin which occurs naturally by the growth of *Aspergillus flavus* and *Aspergillus parasiticus*. They can grow on soil, decaying vegetation, forage and grains [2]. Specifically, Aflatoxin M1 (AFM1) that is a hydroxylated metabolite of Aflatoxin B1 found in milk and milk products from animals who have ingested contaminated feed [22]. Due to the high toxicity and carcinogenic properties of AFM1 and antibiotic residues, its presence in milk is a concern. AFM1 and some antibiotics are resistant to thermal inactivation, pasteurisation, autoclaving and other varieties of food processing procedures. Thus, to produce high quality milk, it is essential to keep feeds free from contamination [2, 19].

The residues of antimicrobials and mycotoxins must be monitored and controlled in accordance with applicable European legislation. Commission Implementing Regulation (EU) No. 2019/627 laid down on 15 March 2019 which outlines practical arrangements for carrying out official controls on products of animal origin intended for human consumption in accordance with Regulation (EU) No. 2017/625 of the European Parliament and of the Council on monitoring certain substances and residues thereof in live animals and animal products in accordance with Council Directive 96/23/EC of 29 April 1996 [4, 7].

As the presence of antibiotic residues as well as mycotoxins may pose a risk factor for public health, the aim of this study was to analyse the milk collected at the farm level for the presence of the most commonly used groups of antibiotics (β-lactam and tetracycline) and AFM1.

MATERIALS AND METHODS

Milk Samples

A total of 69 milk samples were collected from a variety of dairy farms in Ireland (29) and Slovakia (40), frozen and stored in a freezer at a temperature of –18 °C. The Irish samples were transported in freezer bags with ice packs to Slovakia to prevent thawing and protect samples. Immediately before testing, the samples were heated to a temperature of 40 °C for 20 minutes and homogenized.

Duplex BT Scan

Duplex BT Scan (Zeulab S.L., Zaragoza, Spain) is a qualitative automatic test in cassette format designed for the detection of β-lactams and tetracyclines in raw cows, sheep and goat's milk. It is a competitive immunochromatographic test with two components: a tube with freeze-dried reagents that has to be mixed with the milk sample, and a strip which is subsequently introduced into the tube. The tube contains receptors and antibodies bound to gold particles and the strips have specific antibodies. If the sample is free from β-lactams or tetracyclines, the receptors present in the tube will bind to its specific line of the strip when the liquid runs vertically, and intense red lines will appear (negative sample). If an antibiotic is present in the sample, it binds to its receptor of the tube, which is then not able to bind to the specific line in the strip, inhibiting the appearance of the red colour of the corresponding test line, or decreasing its intensity (positive sample). Limits of detection are showed in Table 1. The test was used according to the manufacturer's instructions. In short, the cassette was removed from the sterile package and inserted into the IRIS device. 100 µl of the milk samples were added into the cassette and the automatic assay was started using IRIS app. The procedure lasted 6 minutes. This assay was designed and validated in accordance with Commission Regulation (EU) No. 37/2010 of 22 December 2009

Table 1. Duplex BT Scan limits of detection [µg.l^{-1}, ppb] of β-lactams and tetracyclines in cow's milk

Antibiotic	MRL [µg.l^{-1}, ppb]	LOD [µg.l^{-1}, ppb]
Amoxicillin	4	3
Ampicillin	4	3
Cefalonium	20	4
Cefoperazon	50	5
Cefquinome	20	10
Ceftiofur	100	100
Cephalexin	100	> 600
Cephapirin	60	8
Chlortetracycline	100	40
Cloxacillin	30	5
Nafciline	30	15
Oxacillin	30	5
Oxytetracycline	100	60
Penicillin G	4	2
Tetracycline	100	40

MRL – maximum residues limit; LOD – limit of detection
Source: https://www.zeulab.com/en/landing-duplex-bt-scan-iris-eng/

on pharmacologically active substances and their classification regarding maximum residue limits (MRL) in foodstuffs of animal origin and according to internal validation ISO 13969:2003.

AflaM1 Scan

AflaM1 Scan (Zeulab S.L., Zaragoza, Spain) is a rapid test designed for quantification (30–200 ppt (ng.kg^{-1}) of AFM1 in cows, sheep and goat's raw milk. It is a competitive immunochromatographic test consisting of a tube with freeze-dried AFM1 detection compounds and a strip with specific reagents. The presence of AFM1 is inversely proportional to the intensity of the test line, and quantification requires an IRIS reader. The test was used according to the manufacturer's instructions. In short, 200 µL of milk samples were added into the tube with freeze-dried reagent, mixed well with the pipette and incubated for 3 minutes at 40 °C. Subsequently, the test strip was introduced into the tube and incubated for another 7 minutes at 40 °C. After incubation, the strip was placed in the tray and the results were read with the IRIS device using the IRIS app.

IRIS

IRIS (Zeulab S.L., Zaragoza, Spain) is an automatic device for the analysis (automatic assay) and reading (read strip) of the rapid tests from Zeulab. The device evaluates the presence of contaminants in the matrix by measuring of the absorbance, which is expressed in numerical values. The results are displayed on the device when the test is done with the keypad, in the app and in the cloud Test4all.es, when the test is done with the app.

RESULTS

Beta-lactam and tetracycline residues

Of a total of 69 cow's milk samples analysed, 17 (24.6 %) samples were tested positive for ß-lactam and tetracycline antibiotic residues. Out of the 17 samples tested positive, 12 (70.6 %) samples were tested positive for tetracycline residues and 17 (100 %) samples were tested for β-lactam residues. Out of the 40 Slovak (SK) milk samples tested, 11 (27.5 %) samples were positive for β-lactam residues and 8 (20 %) samples were positive for tetracycline residues. Out of the 29 Irish (IE) milk samples analysed, 6 (20.7 %) samples were tested positive for β-lactam residues and 4 (13.8 %) samples were positive for tetracycline residues. Numerical values of the results are shown in Table 2. A graphical comparison of the positivity rate of samples from Slovakia and Ireland is shown in Figure 1.

Aflatoxin M1

A total of 69 raw cow's milk samples were examined for the presence of AFM1. Out of all samples analysed,

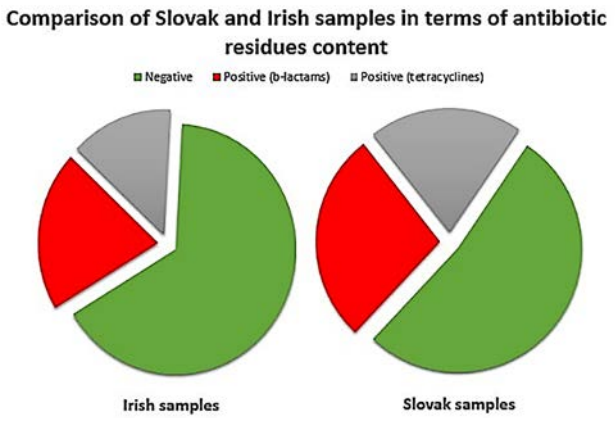


Fig. 1. Content of antibiotic residues in milk samples originated from Slovakia and Ireland

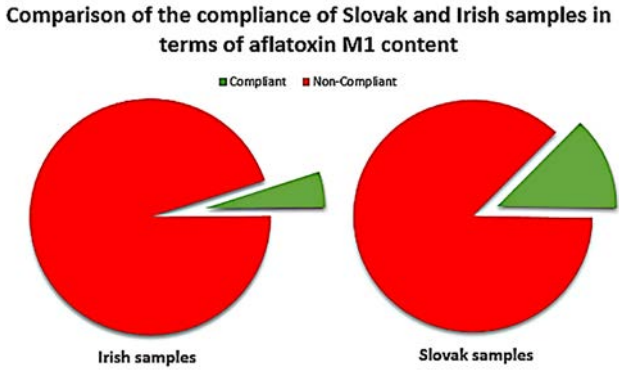


Fig. 2. Aflatoxin M1 content in milk originated from Slovakia and Ireland

59 (85.5 %) samples were tested positive (non-compliant, NON-COM) and only 10 (14.5 %) samples were tested negative (compliant, COM). Of a total of 40 Slovak samples analysed, 32 (80 %) samples were tested positive (NON-COM) and 8 (20 %) samples were tested negative (COM). Out of the 29 Irish samples analysed, 27 (93.1 %) samples were tested positive (NON-COM) and only 2 (6.9 %) samples were tested negative (COM). A comparison of the compliance of the Slovak and Irish samples is shown in Figure 2.

Of a total of 59 samples tested positive (NON-COM), up to 57 (96.6 %) samples contained AFM1 at the con-

Table 2. Content of β-lactam and tetracycline residues and Aflatoxin M1 in analysed raw cow's milk samples

Sample	Country of origin	ß-lactam residues	Value*	Tetracycline residues	Value*	AflaM1	Value**
1	SK	POS	0.6	NEG	1.3	COM	<30
2	SK	NEG	2.3	NEG	4.1	NON-COM	>200
3	SK	NEG	1.7	NEG	2.9	NON-COM	69
4	SK	NEG	5.9	NEG	2.1	NON-COM	>200
5	SK	POS	0.5	POS	0.9	NON-COM	>200
6	SK	NEG	2.1	NEG	4.4	NON-COM	>200
7	SK	NEG	2.4	NEG	4.9	COM	35
8	SK	POS	0.4	POS	0.9	COM	>200
9	SK	POS	0.9	POS	0.7	NON-COM	>200
10	SK	NEG	2.0	NEG	4.0	NON-COM	139
11	SK	NEG	1.6	NEG	6.7	NON-COM	>200
12	SK	NEG	2.8	NEG	4.9	NON-COM	69
13	SK	POS	0.3	POS	0.8	NON-COM	>200
14	SK	NEG	5.8	NEG	4.7	NON-COM	>200
15	SK	NEG	2.4	NEG	3.8	NON-COM	>200
16	SK	NEG	4.4	NEG	5.2	NON-COM	>200
17	SK	POS	0.7	NEG	3.7	COM	<30
18	SK	NEG	3.9	NEG	2.8	NON-COM	>200
18	SK	NEG	4.5	NEG	2.9	NON-COM	>200
19	SK	POS	0.3	POS	0.4	NON-COM	>200
20	SK	NEG	5.9	NEG	6.7	NON-COM	>200
21	SK	NEG	4.6	NEG	3.2	NON-COM	133
22	SK	NEG	5.8	NEG	4.1	COM	<30
23	SK	NEG	3.4	NEG	6.2	NON-COM	>200
24	SK	POS	0.2	NEG	4.5	NON-COM	>200
25	SK	NEG	4.1	NEG	4.7	NON-COM	>200
26	SK	NEG	3.8	NEG	3.6	NON-COM	>200
27	SK	NEG	5.7	NEG	5.1	NON-COM	>200

Table 2. continue

Sample	Country of origin	ß-lactam residues	Value*	Tetracycline residues	Value*	AflaM1	Value**
28	SK	POS	0.4	POS	0.9	NON-COM	>200
29	SK	NEG	4.9	NEG	2.9	COM	31
30	SK	NEG	4.8	NEG	3.4	NON-COM	>200
31	SK	NEG	2.6	NEG	3.8	NON-COM	>200
32	SK	NEG	2.9	NEG	6.5	NON-COM	>200
33	SK	POS	0.2	POS	0.9	NON-COM	>200
34	SK	NEG	2.6	NEG	4.5	NON-COM	>200
35	SK	NEG	2.9	NEG	2.3	NON-COM	>200
36	SK	NEG	4.7	NEG	5.7	NON-COM	>200
37	SK	NEG	2.5	NEG	4.9	COM	36
38	SK	NEG	3.8	NEG	3.1	NON-COM	>200
39	SK	NEG	3.2	NEG	5.5	NON-COM	>200
40	SK	POS	0.4	POS	0.8	COM	<30
41	IE	NEG	2.5	NEG	3.2	NON-COM	>200
42	IE	NEG	2.3	NEG	3.5	NON-COM	>200
43	IE	NEG	2.9	NEG	3.6	NON-COM	>200
44	IE	NEG	3.1	NEG	4.1	NON-COM	>200
45	IE	POS	0.5	POS	0.7	NON-COM	>200
46	IE	NEG	2.8	NEG	2.4	NON-COM	>200
47	IE	NEG	3.2	NEG	5.4	COM	32
48	IE	POS	0.3	NEG	6.1	NON-COM	>200
49	IE	NEG	2.8	NEG	3.7	NON-COM	>200
50	IE	NEG	2.7	NEG	3.9	NON-COM	>200
51	IE	NEG	3.4	NEG	2.2	NON-COM	>200
52	IE	NEG	3.9	NEG	3.4	NON-COM	>200
53	IE	NEG	5.5	NEG	4.0	NON-COM	>200
54	IE	POS	0.5	NEG	3.1	NON-COM	>200
55	IE	NEG	5.1	NEG	5.0	NON-COM	>200
56	IE	NEG	4.2	NEG	6.1	NON-COM	>200
57	IE	POS	0.9	POS	0.4	NON-COM	>200
58	IE	NEG	2.9	NEG	2.5	NON-COM	>200
59	IE	NEG	3.5	NEG	3.7	NON-COM	>200
60	IE	NEG	4.5	NEG	5.5	NON-COM	>200
61	IE	NEG	3.3	NEG	4.9	NON-COM	>200
62	IE	NEG	4.9	NEG	2.8	NON-COM	>200
63	IE	NEG	3.1	NEG	3.6	NON-COM	>200
64	IE	NEG	2.8	NEG	4.6	NON-COM	>200
65	IE	NEG	3.0	NEG	5.0	NON-COM	>200
66	IE	POS	0.8	POS	0.2	NON-COM	>200
67	IE	NEG	3.9	NEG	5.4	COM	<30
68	IE	POS	0.5	POS	0.6	NON-COM	>200
69	IE	NEG	5.5	NEG	6.0	NON-COM	>200

* – Absorbance directly proportional to the content of contaminants; ** – Values expressed in ppt [ng.kg^{-1}];
POS – positive sample; NEG – negative sample; COM – compliant sample; NON-COM – non-compliant sample

centration higher than the maximum detection limit of the used AflaM1 Scan assay (> 200 ppt (ng.kg^{-1}). Compliance or non-compliance with numerical expression of AFM1 content of all the samples is shown in Table 2.

DISCUSSION

The presence of mycotoxins and antibiotic residues in the feed or milk are of growing concern nowadays. These harmful residues can cause many detrimental effects to the health of both, humans and other animals.

It has been reported that antibiotic residues in milk can have a negative impact on human health, milk processing and quality, and can prevent the fermentation process in the production of yogurts and cheese [1]. It is evident that the spread of antibiotic resistance has become a global health threat in recent years. The Centres for Disease Control and Prevention in America described resistance as one of the most prominent health problems due to the number of antibiotic resistant bacteria discovered in recent studies [23].

In our study of β-lactam and tetracycline residues, they were analysed as they are widely used in therapy of bacterial infections, especially for the treatment of mastitis in cows. Any milk containing antibiotics is unfit for human consumption [5]. Out of all 69 samples analysed, 17 (24.6 %) of the samples were tested positive for ß-lactam and tetracycline residues. Positivity for the presence of ß-lactam and tetracycline residues for the Slovak samples was 27.5 % and for the Irish samples was 20.7 %. The results indicated that the excessive use of antibiotic treatment of dairy cows could be associated with the absence of isolation of milk produced by dairy cows treated with antibiotics. Therefore, contaminated milk is mixed with uncontaminated milk and milk from other farms during collection. This also indicated a lack of screening of antibiotic residues in milk. Out of all 69 milk samples analysed, 17 (24.6 %) samples were tested positive for β-lactam residues and 12 (17.4 %) samples were tested positive for tetracycline residues. The results indicated a higher prevalence of β-lactam residues compared to the tetracycline residues in cow's milk.

In other studies that were conducted in Palestine, similar results were obtained. They reported the presence of β-lactam and tetracycline residues in 22.2 % of the analysed milk samples. Surprisingly in Romania, they reported that more samples where positive for tetracycline residue (25.7 %) compared to β-lactam residues (5.7 %) [18]. In Iran, milk samples were tested using the β-star test which showed that 5.33 % of sample where tested positive for antibiotic residues [16]. In India, the Charm β-lactam Tetracycline Combo test was used and it was found that 4.2 % of the samples were tested positive for β-lactam and tetracycline residues [24]. In Benin, milk was tested using the Twin Sensor kit 020 and the result showed 83.9 % positivity for β-lactam and tetracycline residues. They believe the most common cause of the presence of antibiotic residues in milk is non-compliance with the period for antibiotic excretion from the animal body, followed by overuse of banned antibiotics [24]. Other causes may include the therapeutic or prophylactic misuse of antibiotics and violation of the withdrawal period, illegal use of antibiotics or use of antibiotics as growth promoters [11].

Overall, antibiotic residues are often present in milk and therefore of great concern to dairy farmers, milk processors, regulatory agencies and consumers [21]. Antibiotic residues in milk have strong public health significance as they can cause adverse health effects in humans such as allergic reactions, carcinogenicity, mutagenicity, teratogenicity and drug resistance from long term exposure to antibiotics, which can cause failure of antibiotic therapy in clinical situations and result as a global problem. Antibiotic residues can be responsible for hepatotoxicity, bone marrow toxicity and reproductive disorders [13].

It is important for adequate consumer protection and quality assurance of dairy products that the presence of chemical residues in milk is not detected. Residues in milk must be controlled and the level must not exceed the acceptable maximum residue level [15]. To help reduce antibiotic residues in milk, simple, rapid, sensitive tests should be used and discarded if it exceeds the MRL. The concentration of MRL should be regularly monitored nationwide. It is vital that farmers are educated and follow withdrawal periods, store drugs in the correct location and maintain good hygiene management during antibiotic administration. Milk must be withdrawn and discarded from all quarters following intra-mammary infusion of antibiotics. All cows should be easily identified and antibiotic treated cows should be separated from the others to minimize the risk. Most important farmers should be made competent about maintaining proper quality of milk as well as its assurance [3].

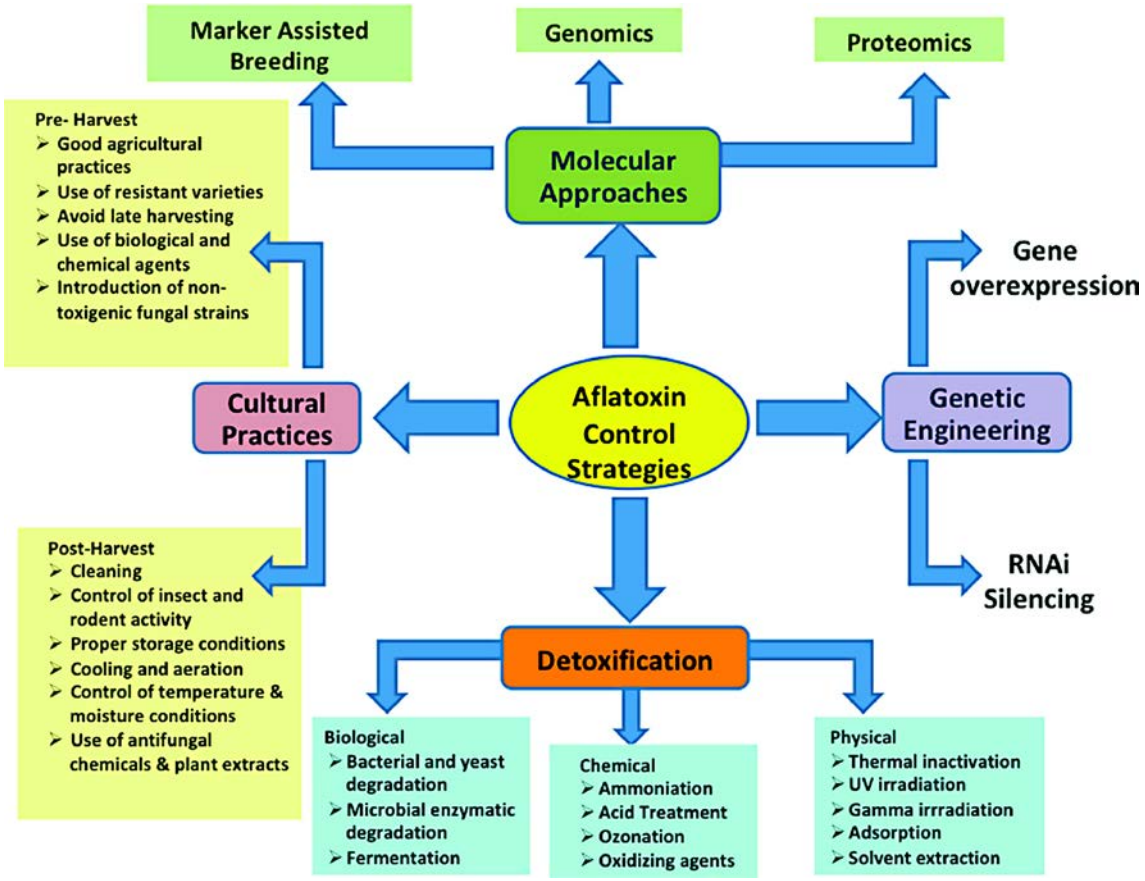


Fig. 3. Aflatoxin control strategies
Source: https://link.springer.com/chapter/10.1007/978-3-319-95354-0_11

In case of the milk samples tested for the presence of AFM1 in this study, it is important to note the high level of contamination. Out of all of the samples analysed, only 14.5 % were tested negative (compliant) for the presence of AFM1. The compliance of the Irish samples tested was 6.9 % and compliance of the Slovak samples tested was 20 %. The results indicated a huge prevalence of the problem at farm level both, in Ireland and Slovakia. The content of AFM1 in non-compliant samples varied from 69 ppt to >200 ppt.

If we compare these results to previous studies carried out worldwide, the prevalence is exceptionally high. A study [14] of raw milk in Sarab city of Iran in 2005 showed 40 % compliance. This is a sixfold increase if compared to Irish results and twice as high as Slovak results found in this study. A further study [12] by H u s a i n and A n w a r (2008) in Pakistan carried out a monthly analysis of AFM1 levels in milk. This study provides us with a more unbiased comparison than the aforementioned study. If each milk sample taken is compared to its corresponding month sample, the October levels in their study ranged from 0.27 $\mu g.l^{-1}$ to 0.45 $\mu g.l^{-1}$ with a mean value of 0.345 $\mu g.l^{-1}$. The next month for comparison was February, the mean value was 0.466 $\mu g.l^{-1}$. Out of all of the samples tested, 99.4 % of the samples exceeded the European community/Codex Alimentarius recommended limit 0.05 $\mu g.l^{-1}$ or 0.05 $\mu g.kg^{-1}$. This limit has been established following the ALARA (as low as reasonably achievable) principle. The “as low as reasonably achievable” principle was the reason that the European levels of acceptable aflatoxin contamination is so low. This is why the majority of samples exceeds these levels when tested. Further education and research into this problem are required to reduce these levels [8].

The risk of aflatoxin exposure is considered higher in regions with a tropical or subtropical climates. Extreme temperatures and droughts may be factors in the growth of *Aspergillus* spp. in crops [2]. The season of the year may also impact on the occurrence of AFM1. Levels observed are higher in the winter months. This is due to the nutrition

of housed animals. Commonly cattle are fed forage and concentrates whilst in winter accommodation. In the summer months in comparison, the cattle will be grazing fresh pastures and the risk of aflatoxin exposure is diminished [22].

There are a variety of control strategies for aflatoxins available both pre and post-harvest (Figure 3) including detoxification, cultural practices, molecular approaches, and genetic engineering.

Moulds will grow in humid or damp conditions. It is important to adequately dry and store feeds. Higher consumption of concentrates in the diet is also a factor which may lead to high levels of aflatoxins carried over into the milk. By inspecting grains regularly whether growing or stored, and checking for any signs of contamination or exposure to aflatoxins, we can reduce the risk of them occurring. Discard any that look mouldy, discoloured or shrivelled. Damage to grains should be avoided whilst drying, in storage. Damaged grains are more prone to the invasion of moulds especially aflatoxins. Farmers and food business operators should buy fresh grains where possible. Storage areas for grains and forage should be kept free of insects and not too warm. The purchase of animal feeds a long period of time before they are required should be avoided, extended storage times adds risk. To lessen the risk of mycotoxin risk on a farm, it is also recommended to provide a varied diet. By feeding a variety of grains and forages the risk of over exposure to one mould will be reduced [2, 14, 22].

The European Food Safety Authority report [9] summarises the monitoring data generated in 2020 in the frame of official control activities on the presence of residues of veterinary medicinal products and certain substances in live animals and animal products in the European Union, Iceland and Norway. A total of 620,758 samples for nearly 13 million single analytical results were reported to the European Commission by the 27 EU Member States, Iceland and Norway; of those samples, 331,789 were targeted samples and 4,259 suspect samples reported under Council Directive No. 96/23/EC, while 2,551 samples were collected at import and 282,159 samples tested in the framework of programmes developed under the national legislation. The majority of countries fulfilled the minimum requirements for sampling frequency laid down in Council Directive 96/23/EC and in Commission Decision 97/747/EC. Overall, the percentage of non-compliant samples in 2020 (0.19 %) was lower compared to 2019 (0.30 %), but also compared to the previous 11 years (0.25–0.37 %). The same overall pattern was observed for targeted samples in 2020 (0.27 %) compared to the previous 3 years (0.30–0.35 %). For the group of antibacterials (B1) including antibiotics (e.g. beta-lactams, tetracyclines, macrolides, aminoglycosides), but also sulphonamides and quinolones; the total number of analyses carried out in 2020 in targeted samples was 93,920 of which 127 (0.14 %) were non-compliant. For the group of antibacterials, there were 9,489 milk samples analysed of which 6 countries reported a total of 7 (0.074 %) non-compliant results. For mycotoxins (subgroup B3d), there were 1,568 milk samples analysed of which 4 (0.26 %) samples were reported non-compliant relating to AFM1, reported by 3 countries.

CONCLUSIONS

Currently, the existence of antibiotic residues and aflatoxins in milk is a major issue worldwide. There are many factors that can lead to the presence of antibiotic residues in milk including therapeutical use, prophylactic use, lack of maintenance of proper withdrawal time, lack of awareness of farmers about residual effects and improper cleaning of antibiotic contaminated equipment. The detection of antibiotic residues can be challenging and should be completed in a simple, fast and cost effective way for the farmer. Aflatoxicosis may cause acute clinical signs or in many cases prolonged exposure at low concentrations may cause chronic health problems. Acute toxicity will cause severe symptoms soon after exposure, whereas chronic exposure can cause illness such as cancer, immune deficiencies, digestive and reproductive signs. Due to the carcinogenic qualities of mycotoxins and in particular aflatoxins, their maximum limits must be as low as reasonably achievable (ALARA). These measures ensure that farmers are compliant and thus prevent and reduce contamination as far as possible to protect public health. The veterinarian has an important role in education and prevention. If farmers understand the health consequences for animals and humans and the potential economic losses, they may be encouraged to test their feeds and milk products for the presence of antibiotic residues and aflatoxins. Both, Duplex BT Scan and AflaM1 Scan produced by Zeulab S.L. used for the detection of antibiotic residues and AFM1 in

milk, are one of the fastest ways to analyse milk and are also very cost effective for the farmers worldwide. In addition, in conjunction with the IRIS device, it is an efficient and accurate method of detection. Analysis results show the necessity of monitoring milk samples in order to protect public health, reduce antibiotic resistance and avoid economic losses.

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