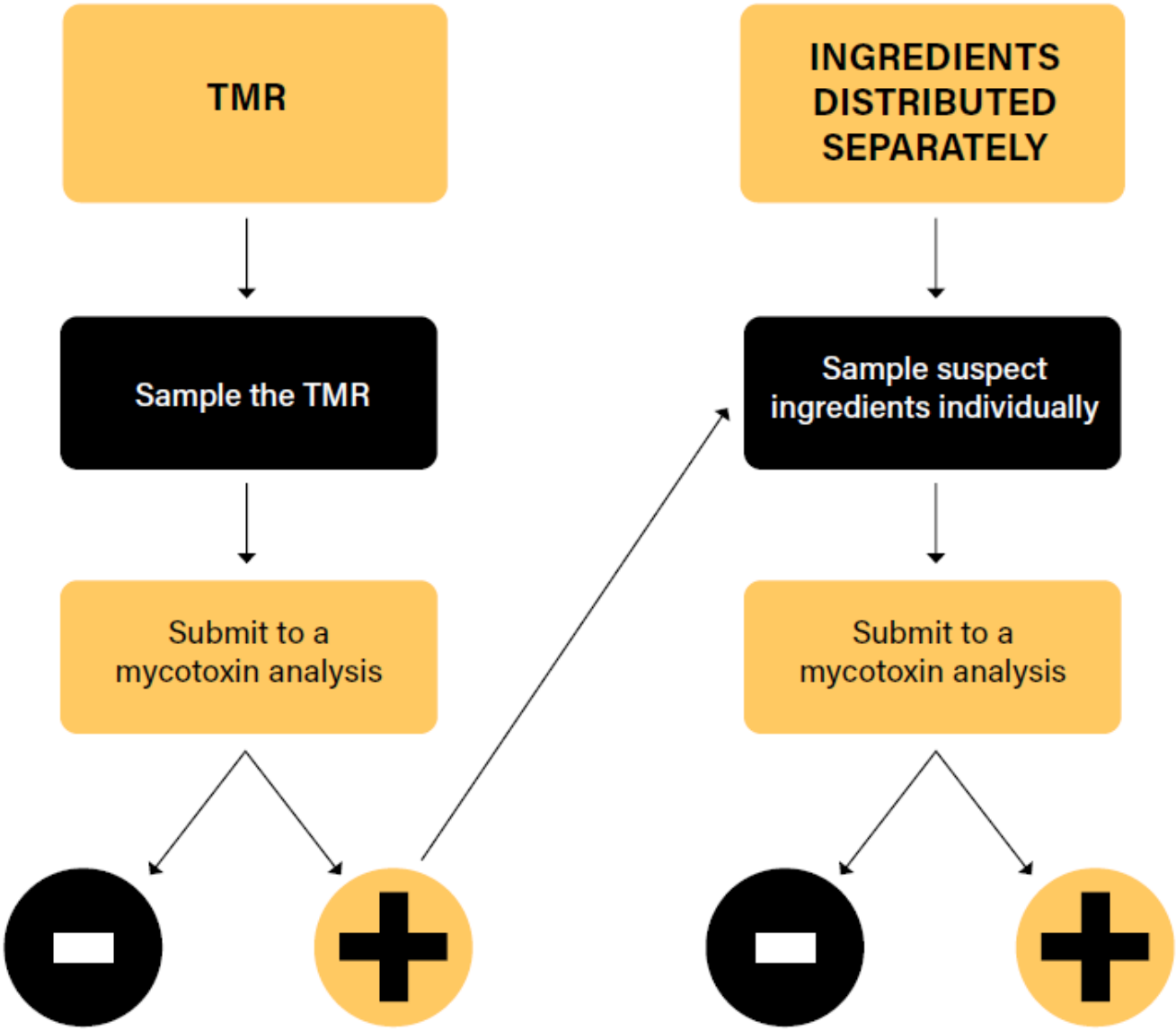
Analysis of mycotoxins in feed

PRACTICAL FACTS AND FIGURES : MYCOTOXINS

Is it necessary to test each ingredient in the ration individually?

Depending on the type of ration served, that is, a total mixed ration (TMR) or a ration of concentrates and forages distributed separately, a sampling and analysis strategy can be chosen to limit unnecessary efforts and costs. For example, for TMR, it may be advisable to proceed in stages (Figure 9). If the result is negative for the presence of mycotoxins, the analysis of each ingredient will not be necessary.

Figure 9. Sampling strategy based on the type of ration



How to ensure the sample taken is representative ?

After determining the relevance of an analysis and targeting the feeds to be submitted as a priority, the sampling stage must be carried out according to standard practice. The quality of the sampling impacts directly the accuracy and representativeness of the laboratory results. As shown in Figure 10, mycotoxin contamination is not necessarily uniform in the same batch of feed.

Figure 10.

Proteins $\bar{x}$ = 16% mycotoxins				
14	15	17	16	16
15	16	16	17	18
18	17	18	16	16
16	16	16	18	15

Mycotoxins $\bar{x}$ = 50 ppb				
0	0	0	0	0
0	0	0	0	0
0	0	0	1000	0
0	0	0	0	0

Dr. Diaz, Symposium, 2020 The One

To reflect reality as closely as possible, the sample must be composed of several subsamples taken from different meals or batches, as the case may be. In other words, taking a single “handful” of feed in a single step is not adequate.

Feed sampling procedures

Recommended sampling procedures differ depending on the moisture content of the feed. To ensure adequate preservation of samples from the time of collection to arrival at the laboratory, it is important to select the appropriate protocol for each food (Table 1).

Table 1. Choice of sampling protocol according to the moisture content of the feed to be tested

Protocol 1: feeds at <12% moisture

e.g. dry grains, protein supplements, dry hay and concentrates

1. When taking feedback from storage for meal preparation, take 8 to 12 subsamples of each suspect ingredient at random from the total mass.* Repeat for at least 3 to 5 meals on different days.
2. For each meal, thoroughly mix all subsamples collected to create a 500 g composite sample.
3. Store the composite sample in a clean, double-ply, stapled paper bag in the refrigerator.
4. Combine all composite samples from step 2 (at least 3 to 5) into a single 500 g composite sample to send to the laboratory.
5. Repeat step 4 to provide an additional sample for possible cross-validation needs. Store in the refrigerator.

Protocol 2: feeds at >12% moisture

e.g. TMR, silages, wet grains

1. At feed-out* or just before serving the ration, take 8 to 12 subsamples and repeat for at least 3 to 5 feedings.* Recommended sampling procedures for forages are described in the GUIDE SUR L'INTERPRÉTATION DES ANALYSES D'ENSILAGES (in French only) and are presented as a checklist and video for each type of storage.
2. For each meal, combine and thoroughly mix the collected subsamples to create a 750 g composite sample.
3. Store the composite sample in a clean, resealable plastic bag (Ziplock style), expel as much air as possible and seal the bag.
4. Thaw and mix the 3-5 samples from step 2 to create 3 final 1 kg composite samples in a sealed plastic bag for analysis of mycotoxins, of dry matter (needed to establish mycotoxin concentration on a DM basis), and a reserve sample for possible additional analysis.

5. To prevent the growth of new molds and yeasts, store wet food samples in the freezer and ship in an insulated bag with cold packs.

* Make sure you wear clean gloves for each sampling.

How to choose the right testing method?

Different methods are used in the laboratory for the analysis of mycotoxins in feeds (Table 2). No single method is perfect in all circumstances, and the most comprehensive are obviously the most expensive. The type of feed, the speed of the test, the cost, the accuracy of the results and the purpose of the analysis will influence the chosen method. In general, the more reliable and detailed results the method chosen provides, the more informed decisions can be made about what actions to take to control and prevent mycotoxin-related problems in the herd. And since the quality of sampling.

What are the contamination levels of concern in feeds?

The presence of mycotoxins in feed is common, but toxic effects are generally only apparent above a certain threshold concentration in the ration.

Table 3 shows the concentrations at which noticeable signs can be expected, depending on the type of mycotoxin and the stage of development of the animal.

Table 3. Concentration thresholds of concern (PPM) on a dry matter (DM) basis for major mycotoxins in dairy and beef cattle feed

Mycotoxins	Development stage	Maximum concentration (PPM) on a DM basis		Reference
		Dairy cattle	Beef cattle	
Deoxynivalenol (DON) and its derivatives	Lactation	1	5	FDA, EC, CFIA
	Calf < 3 months	2	2	FDA, EC, CFIA
	Calf > 3 months	5	5	FDA, EC, CFIA
Fumonisins (FUM)	Lactation	30	30	FDA
	Calf < 3 months	10	10	FDA
	Calf > 3 months	30	60	FDA
Zearalenone (ZEA)	Lactation	2-4	5-10	MO
	Calf < 3 months	0.5	0.5	EC
	Calf > 3 months	0.5	0.5	EC
T2/HT-2	Lactation	0.1	0.1	–
	Calf < 3 months	0.025	0.1	CFIA
	Calf > 3 months	0.025	0.1	CFIA

PPM : Part per million ; CFIA : Canadian Food Inspection Agency ; FDA: U.S. Food and Drug Administration ; EC : European Commission; MO : *University of Missouri Veterinary Medical Diagnostic Laboratory* ; ND :

North Dakota State University Veterinary Diagnostic Laboratory

These concentration thresholds of concern make it possible to determine the extent of the contamination of a feed, to assess the risk that it poses to the health and productivity of the animals and to decide on the actions to be taken, if necessary.

This is why it is relevant to choose a testing method that not only identifies the mycotoxins involved, but also assesses the extent of their presence in the feed.

Since several factors influence the onset and intensity of toxic effects, it is possible to detect signs at lower concentrations. Likewise, the absence of signs is possible even when the measured amount is above the threshold of concern.

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