LIVESTOCK DEVELOPMENT NOTES: NO. 7

MYCOTOXICOSIS: III - SAMPLING, REPORTING AND SAFETY MEASURES

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ABSTRACT

Aspects in sampling, treatment of samples and informative reporting which are crucial to the process of detecting, assessing, preventing, advising and recording mycotoxin-related problems are discussed. Other aspects relating to handling of toxic materials, including personal safety are also highlighted.

Key words: *bulk sampling, subsampling, sample-handling, reporting, personal safety, mycotoxins*

INTRODUCTION

As in other forms of intoxication in the field, the quality of information and samples of suspected materials supplied from the field have an enormous bearing on the soundness of expert advice given and the accuracy of laboratory test results. In addition, paying careful attention to these tasks helps in minimizing costs, delays, in-actions, frustrations and disappointments. It is therefore important to adopt good techniques when taking and handling test samples and providing informative reports. Thus, having a sound background on these field tasks should go a long way in minimizing any set-backs. This communication intends to shed light on some hands-on techniques and considerations of tasks which are important in a field situation.

FIELD SAMPLING

As referred-to in Parts I and II of this Note-series (Livestock Development Notes. 5 & 6), one of the most important undertakings from a mycotoxicological viewpoint is to demonstrate the presence of mycotoxin(s) in the commodities. Adequacy of sampling procedures used or treatment of samples in the field are therefore very crucial in obtaining satisfactory results or outcomes. When sampling, it is important to be clear as to why one is taking samples. There are usually two purposes in sampling. They are:

- as a routine process (survey) in determining the incidence and levels of mycotoxins in the commodities, and
- as a specific undertaking (confirmatory test) in demonstrating the presence of mycotoxins in the commodities.

The type of method employed in sampling therefore should be geared to meet that particular aim or objective. For example, when sampling as a part of a survey, one would need to take unbaised samples by randomly taking samples without considering whether the sample is, or is not "free" of moulds. Whereas, if it is for the purpose of tests to confirm the presence of mycotoxins, biased samples are most preferred. This can be done by taking samples which are likely to contain mycotoxins (e.g. mouldy or defective materials).

Bulk sampling

The concentration of mycotoxins will vary greatly between different types of commodities (solids,

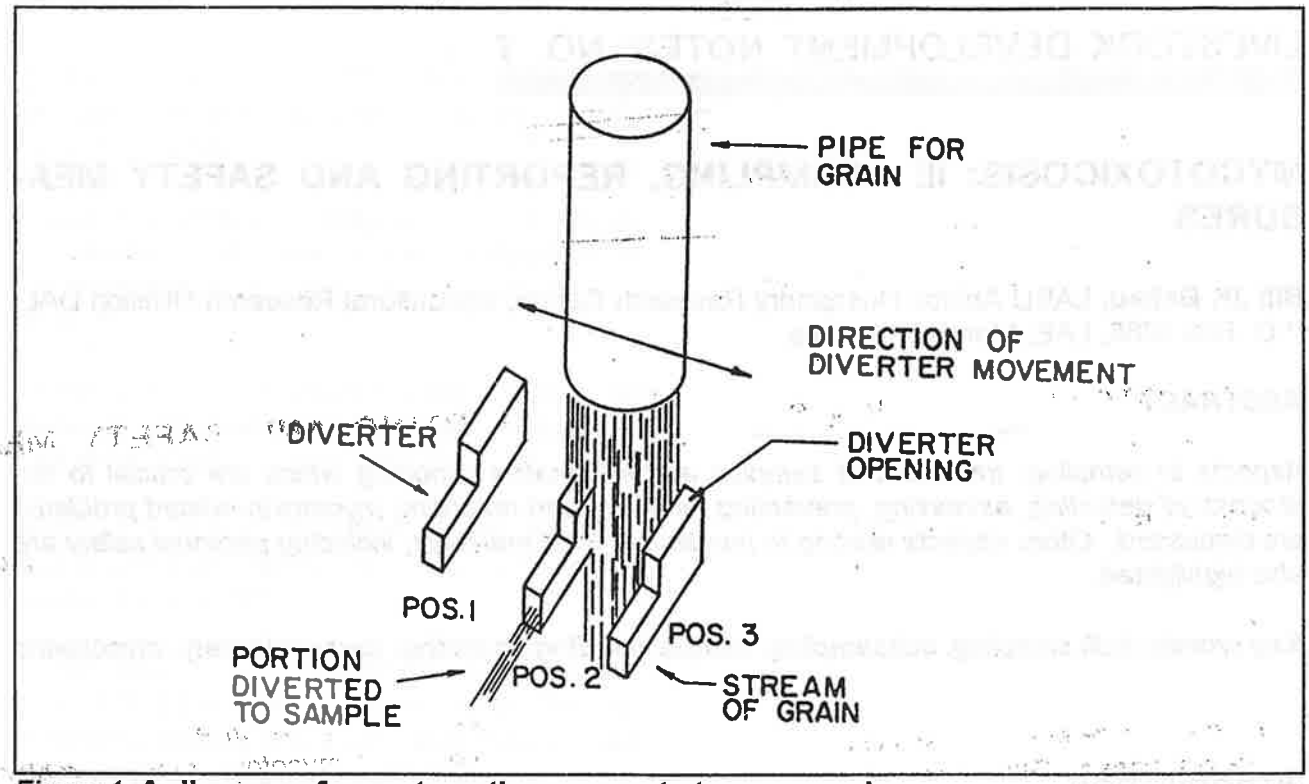

Figure 1: **A diagram of an automatic cross-cut stream sampler.**

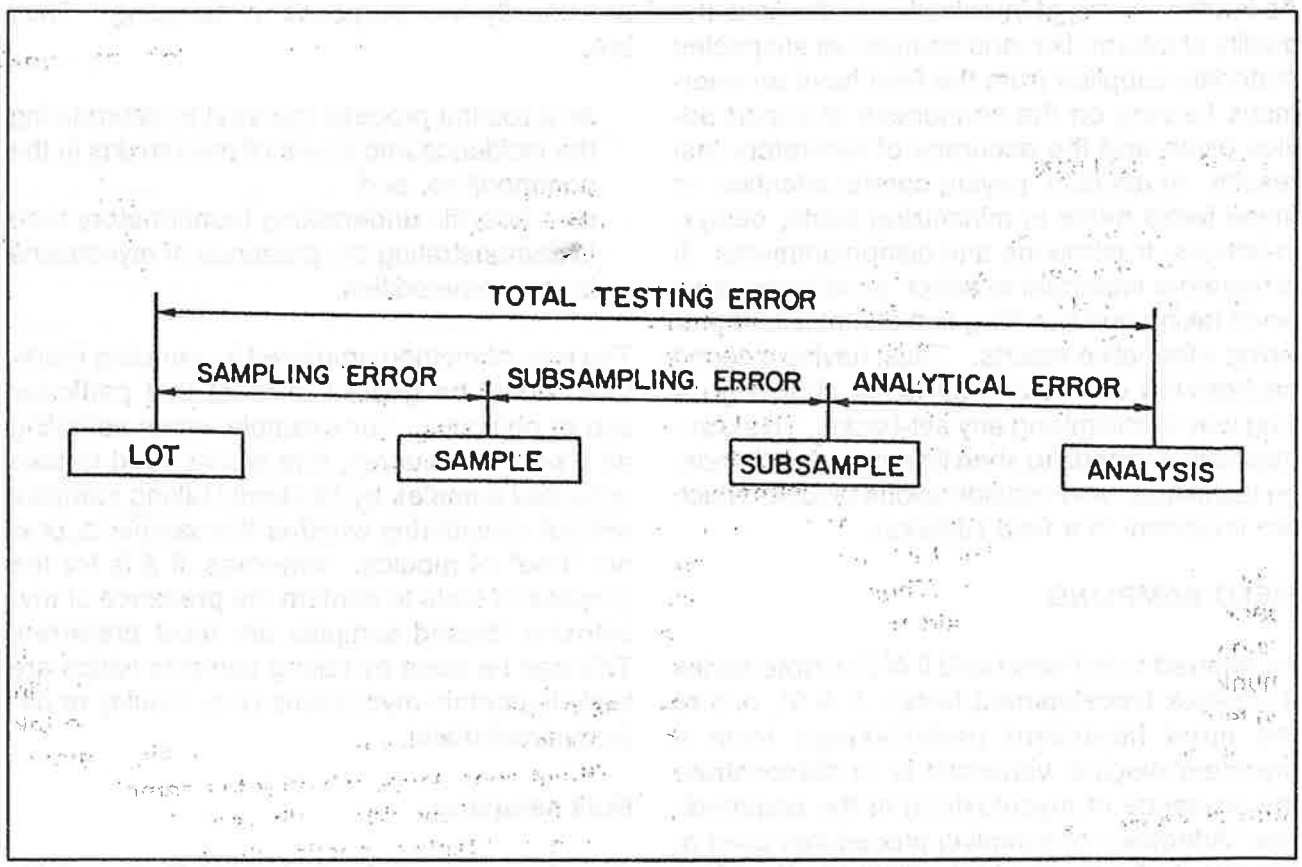

Figure 2: **Type of errors associated with sampling and detection of mycotoxins.**

liquids, pastes and powder), and in the case of solids, the size of the particles. Liquid, paste and powder products are more easy to sample than the solids. For liquids with suspended particles or mixtures of different liquids with different densities, they have to be thoroughly stirred before sampling. Animal products such as meat and eggs may also contain toxins if contaminated feed has been consumed. Deposits of toxins in these products are likely to be uniformly distributed in the tissues. Therefore any portion or quantity of a tissue (e.g. liver) sampled will show an even level of contamination.

This may not be the case for processed animal products (e.g. cheese, sausages and cured meats). This is because these products can also be contaminated during manufacturing, curing or during storage. Because of this, it is likely that the mycotoxins may only be concentrated in certain portions rather than being evenly distributed in the product. Similarly, for solids with large particle size (e.g. fruits and tubers), only a small portion may be invaded by the moulds and therefore only small portion may be contaminated. For these types of commodities, initally, a large sample size should be collected. These can be later minced, crushed or grounded into a manageable sample-size and if necessary, a subsample taken. For commodities such as maize, it would be more appropriate to sample shelled maize kernels than to sample the whole cobs with the kernels.

Commodities can be sampled when they are moving, e.g. during unloading and loading operation, or when they are stored in bags, bins or similar containers. An automated diverter-device (*Figure 1*) is ideal for taking moving samples. However, this may not be practical in the field. One practical technique to use in the field is to have someone positioned appropriately and pass the cup at intervals through the stream in collecting the samples. This type of sampling procedure is known as stream sampling, as the commodities being sampled are moving in a stream. For the commodities which are held in bins, sacks, trucks or other containers, the important point is to collect samples representative of the top, middle and bottom layers of the commodities. A device called probe sampler, hence the sampling procedure is known as probe sampling, is required for the purpose. If the materials are stored in large containers, a heavy duty probe is needed-a smaller version can be used in sampling commodities which are held in sacks or small containers. Ideally, a number of samples should be collected at evenly spaced intervals.

Subsampling

It may not always be possible to collect and/or dispatch bulky materials for tests due to factors such as the freight costs. The size of the final sample collected or despatched therefore has to be reduced (subsampled) to a managable but, still a representative sample of the original. That always ensures that each particle has an equal chance of being included in the sample. This is often difficult to do because errors will be introduced when the size of the sample is reduced (*Figure 2*). To keep these errors to a minimum ensure that:

- initial bulk sampling is adequate- large size particles are grounded or crushed to smaller particles size and increase the num ber of lot sampled prior to subsampling
- the bulk sample is thoroughly mixed prior to subsampling
- unnecessary parts of commodities such as the shells of peanuts and nuts or maize cobs are not included during sampling
- minimize the chance of dust to escape during grounding, as a disproportionate amount of mycotoxin might be in the sample component that is being converted to dust

There are a many types of appliances (eg. hammer mills, grinders, food choppers and twin-shell blenders) which are useful in reducing the particle size of samples before subsampling. But if they are not available the samples can be ground using a hallowed wood and a pounding stick.

The amount or quantity of the material to be sampled or subsampled depends on factors such as the volume of material available for sampling, the type of the commodity and what mycotoxin(s) to be analysed for. It is therefore difficult to establish the exact sample size re-

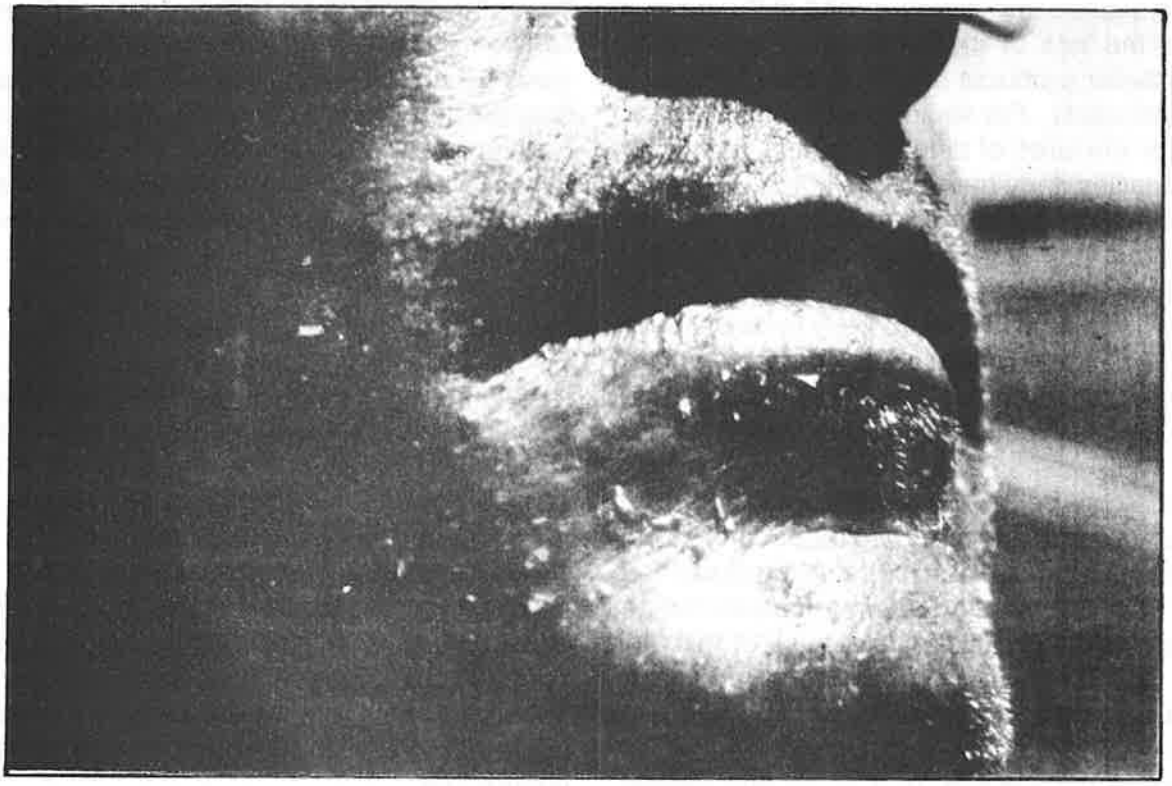

Figure 3: **Cutaneous injury following accidental exposure to a (T - 2 toxin) trichothecene mycotoxin.**

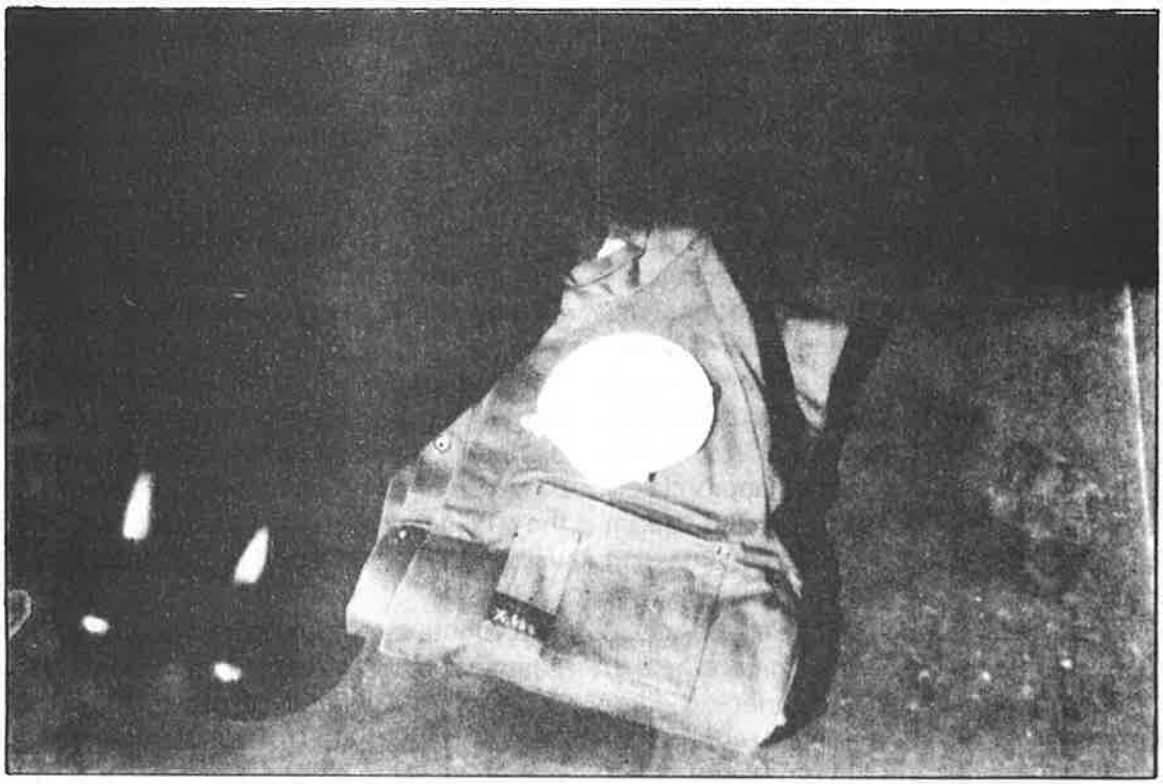

Figure 4: **Types of protective items to be worn when handling mouldy materials.**

quired for each commodity or mycotoxin. However, as a general rule, about 0.5-1.0 kg sample should be drawn from every 1000 kg of the sample. If the commodities are stored in sacks or small containers, sampling about a quarter of the sacks or containers should be sufficient.

Sample-handling

In the field, usually the samples have to be sent long distances, or may have to be withheld for some time before despatching. Minimizing further contamination of the samples is therefore just as equally important as it is in taking the samples. How the samples are packed and what they are packed-in are important factors to consider at the end of every sample-collection trip. Dry samples are easy to handle, and should be packed in water proof containers or bags. This is because rewetting of the samples will encourage further bacterial or mouldy growth and therefore may affect the results. Wet samples have to be dried properly before despatching. However, if they have to be sent as they are, they should not be packed in plastic bags or such nonporous containers. Again, such containers or bags encourage moisture condensation and microbial growth which will also affect the results. When storing samples for extended period, samples (dried) should be stored in air-tight water proof containers or plastic bags, and if possible, placed in cold storage. Furthermore, it is always a good practice not to discard the original samples immediately. This is because something may go wrong with the samples during shipment or during testing so that another sampled-lot may be required.

REPORTING

One of the important thing to do in the field is to document the details of the disease or intoxication and providing an informative abstract in accompanying the samples. A well narrated report helps not only in recording events as they occur, but also provide a useful record for future use. The type of information recorded should therefore be able to provide important information on, for example:

- date and the time the disease occurred;
- number,gender, age or age group of the affected animals;
- how the animals are being looked-after and the types of feed offered (feed composition) or type of pastures grazed;
- clinical signs (e.g. body temperature and respiration rate), including how they are expressed during the day and the type and colour of body secretions, urine and faeces;
- behaviour of the animals e.g. excitability, nervousness etc;
- climatic conditions of the location (e.g. temperature and rainfall);
- postmortem findings (if performed), especially, gross abnormal signs of the tissues (e.g. liver, heart, kidneys, gut linings etc);
- signs the animals show when the suspected feed is withdrawn.

A report containing similar information should also accompany any feed (ingredients) or animal tissue samples submitted for laboratory tests.

SAFETY MEASURES

It goes without saying the need to be protected when handling potentially hazardous materials such as mouldy feedstuffs. Besides the toxic compounds, moulds in general produce a lot of spores which may not necessarily contain toxins but can cause nasty health problems (mycoses) when inhaled. Other moulds such as *Fusarium* and *Stachybotrys* species produce toxins (e.g. T-2 toxin, roridin, verrucarin and satratoxin) which can cause severe allergic reactions or damage to skin when coming in contact with contaminated material. As shown in *Figure 3* severe injuries can occur if one is not careful in handling toxic materials.

It is therefore necessary to wear protective clothing and other exposed parts of the body properly covered up. A pair of gloves, boots, overalls and a face mask are basic items which should be worn when handling mouldy materials (*Figure 4*).

One final word, never dump contaminated materials into streams, lakes or rivers or thrown into open pits. This is because household pets,

fish and the crustaceans are also suceptible to mycotoxins, or can store the toxins in their tissues. Contaminated materials should be properly disposed-of by either, burying them in deep holes in the ground or incinerating them in a properly constructed incinerator.

CONCLUSION

Although the techniques and the tasks discused are intended for mycotxin -related problems, the priciples involved are applicable for use in other forms of intoxications in the field.

ACKNOWLEDGEMENT

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FURTHER READING

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