Knowing the prevalence of the problem

A good anticoccidial program reflects the infection pressure on the field and the specifics of the production system. A good coccidiosis infection pressure monitoring program collects data and information to assess prevalence and give feedback. This gives the producer the tools to make decisions on product, dose and duration of use, adjustments and investigations.

What is coccidiosis monitoring in broilers?

It is a regular and routine assessment of subclinical coccidiosis incidence and pressure in the operation.

It is based on macroscopic and microscopic scoring of intestinal lesions produced by the most economically important *Eimeria* species in broilers – *E. acervulina*, *E. maxima* and *E. tenella*.

The main objective is to gather information and be proactive, taking corrective actions and measures, and planning the coccidiosis management program in view of the analysis of the data collected.

The coccidiosis monitoring data should be interpreted with the overall intestinal health status, performance and overall health of the flocks.

An adequate sanitary monitoring program should basically cover the following points:

01. Training of the team that will perform the monitoring (lesion scoring, scrapings, etc.).

02. Definition of frequency, monitoring sampling and items to be monitored.

03. Management of health monitoring data.

Let's see each one.

01. Training of the Team

Consistency determines the success of a monitoring system. Training is necessary and decisive for the team to enhance the knowledge and skills in detecting macroscopic pathological changes, but another very important point, even before training, is the choice of people/coordinators responsible for carrying out and managing the health monitoring program.

Without the correct understanding of the purpose (of the monitoring management), of the commitment to collect data in a correct and systematic way, the data will often not reflect the field situation. Doing it correctly and with good management is fundamental.

It is very important to establish a frequent training routine for the teams in charge of monitoring. Verifying the performance of the team and the retention of the training offered is fundamental, but often overlooked. Are those responsible for monitoring (execution and management) able to carry out the monitoring tasks? Regular training and verification sessions with industry experts or vendors are useful to maintain consistency of the scoring teams.

02. Monitoring: scope, frequency, sampling

Coccidiosis monitoring is part of the integral health monitoring system of the operation. The most objective field evaluation system is based on macroscopic intestinal lesion scoring and microscopical identification of oocysts in the intestinal mucosa of scored birds.

The most economically important *Eimeria* species in broilers have a different predilection place and produce distinct characteristic lesions (e.g. *E. acervulina* produces white-striped kind of lesions on the mucosal side of the duodenum; *E. maxima* produces characteristic pin point hemorrhagic lesions visible from the serosal side of the jejunum and *E. tenella* produces characteristic hemorrhage in the ceca).

To assess the severity of subclinical coccidiosis a reliable, a 0 through 4 scoring system has been developed (Johnson and Reid, 1970). The downside of the system is that especially mild lesions (1-2) of *E. maxima*, might be under or over estimated. For this reason, it is good to confirm them with microscopical scoring – identification of *E. maxima* oocysts in scrapings from the intestinal mucosa of the scored birds.

To assess the coccidiosis incidence and infection pressure within a given operation (integration or all farms supplied by a given feed mill) regular necropsy sessions (often called posting or lesion scoring sessions) should be carried out. They should be planned on operation level including flocks from different farms representative for the integration. Each session should include at least ten different flocks representing different ages ranging from 18 to 38 days of age. Typically, 5 average-looking birds per flock, randomly-picked at different places of the house are selected. Only average, healthy birds should be selected (not clinically diseased or dead birds). Scoring should take place immediately after birds are euthanized. The postmortem process might destroy some lesions, therefore scoring should happen right after euthanizing the birds.

Tips:

- **Monthly or weekly**
- **Same protocol, Every time**
- **Different farms at different ages (18 to 38 days of age)**
- **At least ten different flocks per session (e.g. 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38 days of age)**
- **Five healthy birds/flock (No mortality or clinically-ill birds)**
- **Systematic approach combining macroscopic lesion scoring and scrapings**
- **Take your time, don't rush the job**
- **Need good light and a microscope**

E. acervulina

(affects mostly the duodenum)

Lesion score +1

Scattered white plaque-like lesions containing developing oocysts confined to the duodenum.

These lesions are elongated with the longer axis transversely oriented on the intestinal walls like the rungs of a ladder.

They may be seen from either the serosal or mucosal intestinal surfaces.

They may range up to a maximum of 5 lesions per square centimeter.

There can be some loss of pigmentation and some loss of performance.

Lesion score +1

Lesion score +2

Lesions are much closer together, but not coalescent.

They may extend as far posterior as 20 cm below the duodenum in 3-week-old birds.

The intestinal walls show no thickening.

Digestive tract contents are normal.

There can be some loss of pigmentation and some loss of performance.

Lesion score +2

E. acervulina
(affects mostly the duodenum)
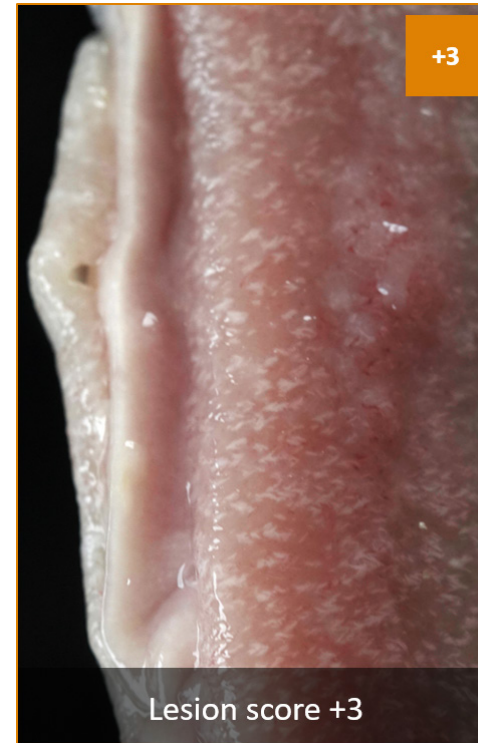
Lesion score +3

Lesions are numerous enough to cause coalescence in the lesion size, giving the intestine a coated appearance.

The intestinal wall is thickened, and the contents are watery.

Lesions may extend as far posterior as the yolk sac diverticulum.

There can be some loss of pigmentation and loss of performance is well known.

Diarrhea

+3

Lesion score +3

Lesion score +4

The mucosal wall is greyish with individual lesions completely coalescent.

Congestion – may be confined to small petechiae or in extremely heavy infestation, the entire mucosa might be bright red in color.

Individual lesions may be indistinguishable in the upper intestine, typical ladder-like lesions appear in the jejunum.

The intestinal wall is very much thickened, and intestine is filled with a creamy exudate, bearing a large number of oocysts.

Watery diarrhea.

+4

Lesion score +4

E. maxima

(affects mostly the Jejuno-illeum)

Lesion score +1

The serosal surface may be speckled with numerous red petechiae, and the intestine may be filled with orange mucus.

There is little or no ballooning of the intestine.

The intestinal wall is not thickened.

There could be some weight and pigmentation loss.

Lesion score +1

Lesion score +2

Serosal surface may be speckled with numerous red petechiae.

Intestine might be filled with orange mucous.

Little or no ballooning of the intestine.

Thickening of the intestinal wall.

Performance and pigmentation loss.

Lesion score +2

E. maxima
(affects mostly the Jejuno-illeum)

Lesion Score +3

Serosal surface may be speckled with numerous red petechiae.

Intestine might be filled with orange mucous.

Little or no ballooning of the intestine.

Thickening of the intestinal wall.

Performance and pigmentation loss.

Lesion score +3

Lesion Score +4

Intestinal wall may be ballooned for most of its length.

Contains numerous blood clots and digested red blood cells giving a characteristic color and putrid odor.

The wall is greatly thickened.

Significant adverse effect on performance and pigmentation.

Diarrhea (sometimes bloody with digested blood), dehydration and mortality.

Lesion score +4

E. tenella

(affects mostly the ceca)

Lesion Score +1

Very few scattered petechiae on the caecal wall

No thickening of the caecal wall.

Normal caecal contents are present.
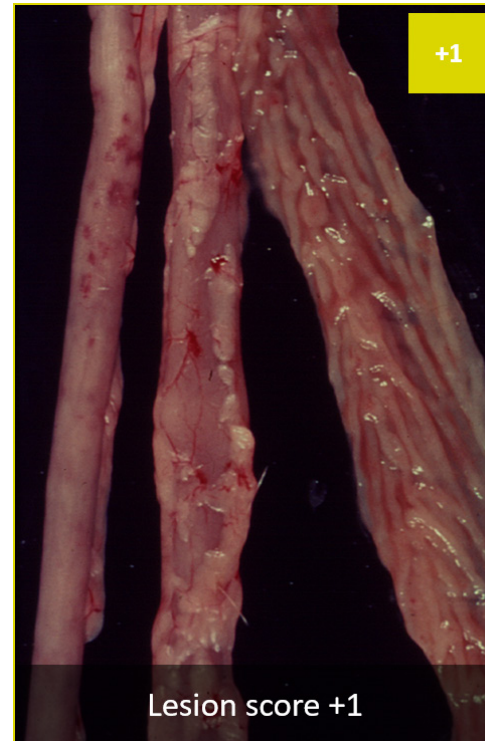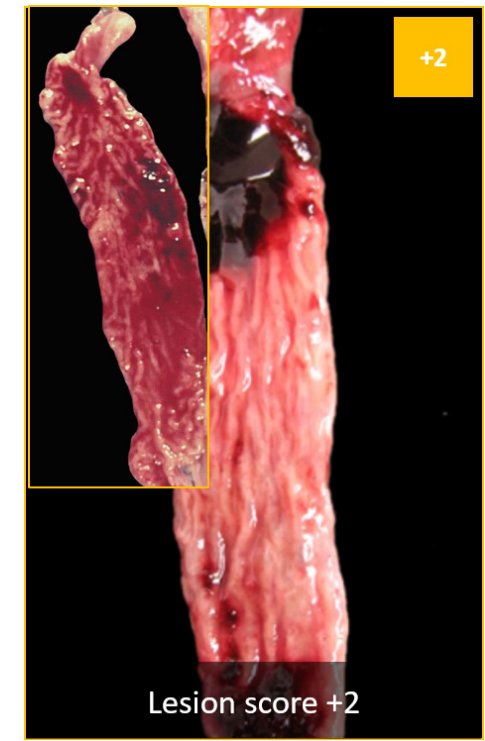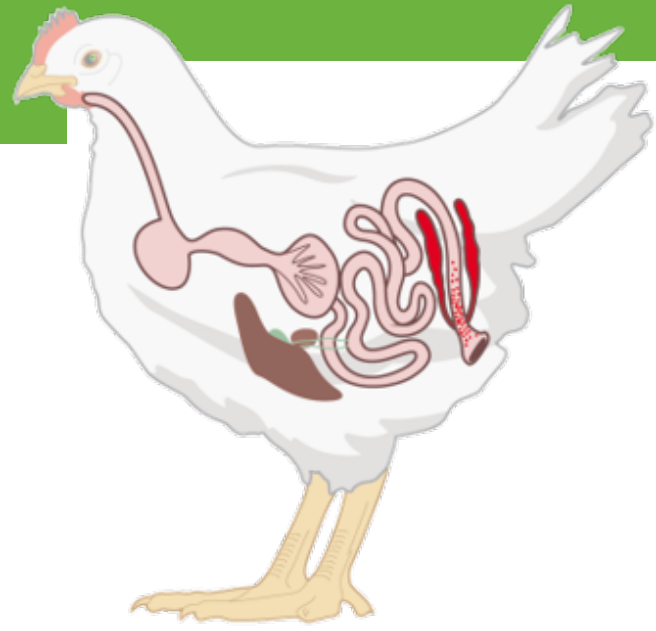

Lesion score +1

Lesion Score +2

Lesions more numerous, with noticeable blood in the caecal contents.

The caecal wall is somewhat thickened.
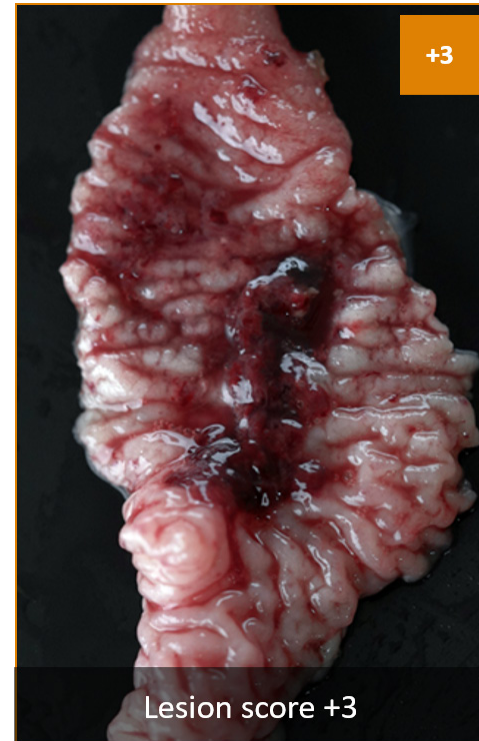
Normal caecal contents are present.

Lesion score +2

E. tenella

(affects mostly the ceca)

Lesion Score +3

Large amounts of blood or caecal cores are present.

Caecal walls are greatly thickened.

Little, if any, fecal contents are present in the caeca.
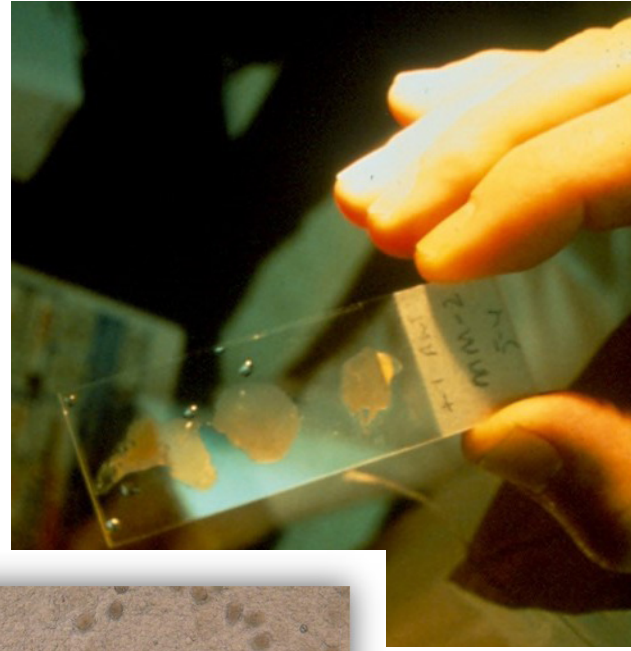

+3

Lesion score +3

Lesion Score +4

Cecal wall greatly distended with blood or large caseous cores.

Fecal debris lacking or included in the cores.

Bloody diarrhea (non digested blood) and mortality.

+4

Lesion score +4

# Microscopical examination of deep intestinal scrapings

Macroscopic lesion scoring is the most reliable tool for estimating the infection pressure and the efficacy of the cocci control program on the field, but to maximize its value, we need to address some limitations namely the *E.maxima* scoring. This species produces characteristic lesions, but they could be overlooked or misdiagnosed especially in mild case 1+ or 2+. To cope with these limitations in the modified system we apply microscopy of deep mucosal scrapings.

It could be a standard part of the scoring protocol; thus we take deep scrapings from 3 standard points (beginning, middle and end of the jejunum) and we introduce an additional score called *E. maxima* micro. We examine the slide under the microscope at 100x magnification and giving a 0 grade when there are no oocysts, +1 when there are less than 10 per visual field; +2 for 10 to 20; +3 for 20 to 40 and +4 for more than 40 per visual filed.

Alternatively we can use scrapings only for confirmation of the macroscopic score especially +1, so we take deep mucosal scraping when we see any sign indicative for *E.maxima* infection (even a single serosal pinpoint petechia, ballooning of the intestine, thickening of the mucosa or orange mucous). We examine the slide under the microscope, and we confirm and record the macroscopic score if we find any *E.maxima* oocyst.

How do we take deep intestinal scrapings? After careful examination of the serosal side, we incise the intestine, examine the intestinal content and the mucosa, then we clean carefully all the intestinal content and with the corner of the coverslip or the tip of the scissors we make a deep scratch of the mucosa. After that we place the material on the microscope slide, cover it with the cover slip and press so we have thin enough specimen for examination. If we have intestinal content or the specimen is too thick it makes examination more difficult and increases the risk of missing oocysts.
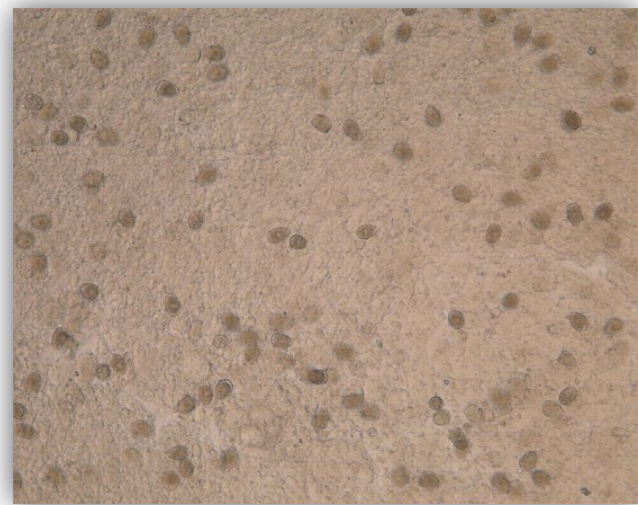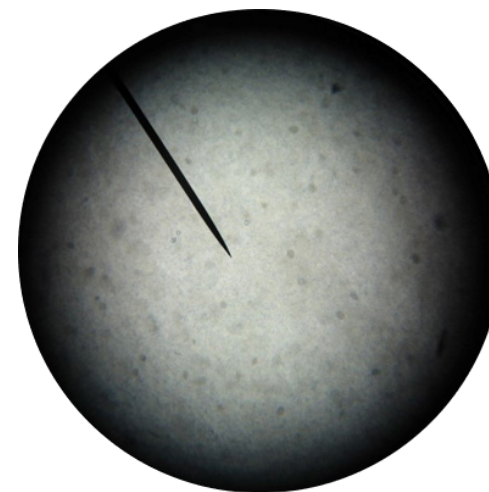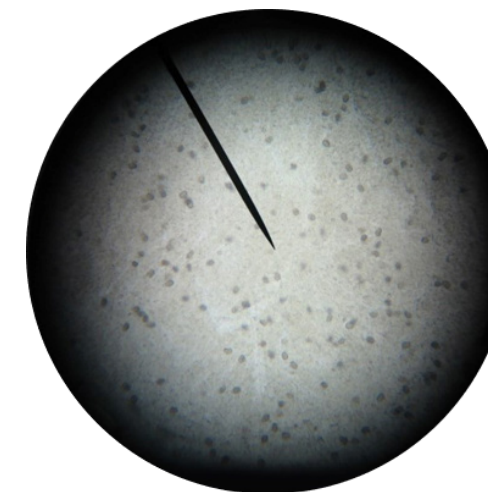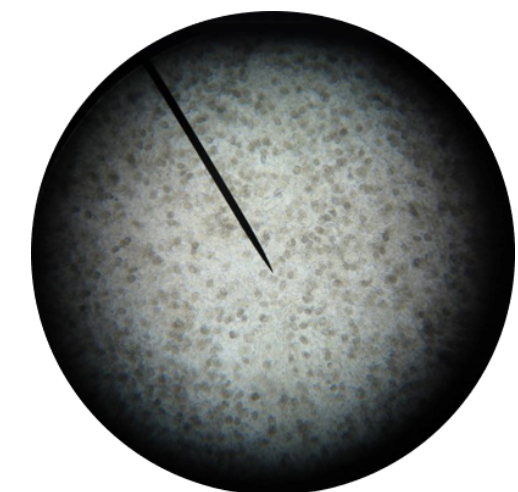
No Oocysts
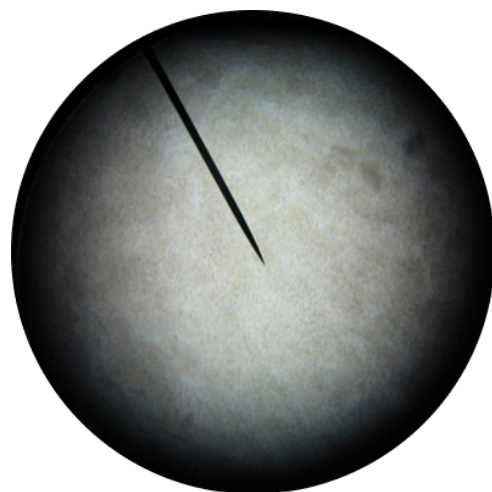
Mild Infection
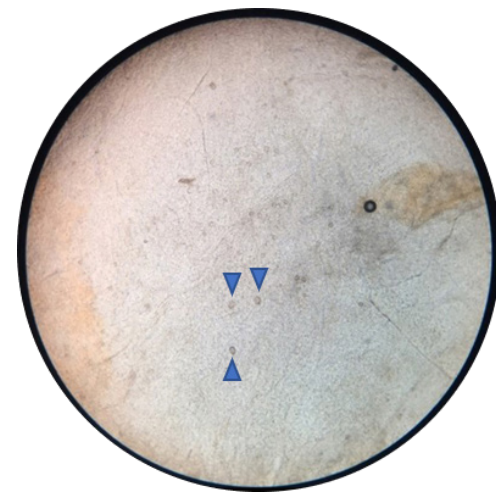
Heavier Infection

Much Heavier Infection

TNTC

03. Coccidiosis monitoring data management and interpretation

Lesion scoring should not be interpreted on a bird or a flock base, but rather on integration level. It gives data that should be compared with previous sessions to determine the infection pressure trend. It is also useful to benchmark with other integrations producing under similar conditions.

Different *Eimeria* species have different impact on performance with *E. maxima* being most detrimental for BWG (body weight gain), FCR (feed conversion rate) and absorption of nutrients and *E. tenella* having the lowest impact (Conway 1997).

aDG											
aFCR	1.55	1.62	1.54	1.55	1.51	1.61	1.58	1.52	1.55	1.53	1.52	1.51

Lesion Scoring Results Over Time

Body Weight Gain (% of control)

Feed Conversion Ratio (% of control)

Plasma Carotenoid (% of control)