STUDY OF THE PATHOGENICITY IN CHICKENS OF *EIMERIA PRAECOX* ALONE OR ASSOCIATED WITH *EIMERIA ACERVULINA*

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INTRODUCTION

Among the seven species of coccidia that are able to infect chickens, *Eimeria praecox* is described as the less pathogenic. Its effect on growth and health is even controversial and its interest for vaccination has been questioned (Williams 2000 and 2002). When a side effect due to the infection with *E .praecox* is described, it is only noticed with high levels of infection (Long 1968; Jorgensen et al. 1997; Williams 1998). There seems to be no description of mortality or morbidity induced with this species, at least in experimental infection (Gore and Long 1982). In field conditions, its impact is controversial, and has no typical lesion associated with this species (Johnson and Reid, 1970), thus, no differential diagnosis can be done. A recent paper (Jenkins et al., 2008) even suggested a beneficial effect in case of co-infection with *Eimeria maxima*, when compared to birds receiving only *E. maxima*. However, the authors do not explain this phenomenon.

Our aim was to investigate the pathogenicity of a strain of *E. praecox* we maintain in our laboratory, in experimental infection with several amounts of oocysts inoculated and to study the effects of co-infection with *E. praecox* and *Eimeria acervulina*. The two species are localized in the duodenum, even if *E. acervulina* can also colonize the jejunum in heavier infections (Pellérdy, 1965). They also occupy a superficial position on the mucosa, developing in the epithelial cells (Pellérdy, 1965). Possible interactions in this part of the gut between the two species were investigated with growth and symptomatic criteria.

MATERIAL AND METHODS

Ten groups of eighteen birds of the Ross strain were formed, with six cages of three birds for each group. In order to evaluate the pathogenicity of *E. praecox* alone, four groups were made:

Group NI: birds not infected
Group IP1: birds infected with 5,000 sporulated oocysts of *E. praecox*
Group IP2: birds infected with 30,000 sporulated oocysts of *E. praecox*
Group IP3: birds infected with 200,000 sporulated oocysts of *E. praecox*

In order to study the interaction with *E. acervulina*, six groups were made:

Group IA1: birds infected with 5,000 sporulated oocysts of *E. acervulina*
Group IA2: birds infected with 200,000 sporulated oocysts of *E. acervulina*
Group IA1P1: birds infected with 5,000 sporulated oocysts of *E. acervulina* and 5,000 sporulated oocysts of *E. praecox*
Group IA1P3: birds infected with 5,000 sporulated oocysts of *E. acervulina* and 200,000 sporulated oocysts of *E. praecox*
Group IA2P1: birds infected with 200,000 sporulated oocysts of *E. acervulina* and 5,000 sporulated oocysts of *E. praecox*
Group IA2P3: birds infected with 200,000 sporulated oocysts of *E. acervulina* and 200,000 sporulated oocysts of *E. praecox*

The birds in all the groups, except group NI, were infected individually at the age of 16 days with coccidia oocysts, by oral gavage with an intra-esophagus canula with a volume of 1 ml per bird.

Zootechnical criteria investigated have been:

- Weight on D+5 post-infection of all the birds
- Weight gain from D-3 to D+5, and feed conversion ratio from D-2 to D+5
- Weight at D+11 for half of the birds
- Weight gain from D-3 to D+11 and feed conversion ratio from D-2 to D+11 for half of the birds

While the pathological criteria have been:

- Individual lesions on D+5 for one half of the birds in each group infected with *E. acervulina*, according to the lesion scoring described by Johnson and Reid (1970) for this species.
- Aspect of the guts examined on D+5 of half of the birds infected with *E. praecox alone.*

RESULTS AND DISCUSSION

E. praecox caused growth depression related with the infective dose during the period from D-3 to D+5. The depression was no longer observed during the period from D-3 to D+11 (table 1). The negative effect on growth seems to take place during the parasitic development in the intestine, as it is the case with coccidia species which pathogenicity is definitively established.

Lesions observed on D+5 were not constant from a bird to the other, sometimes with a white creamy exudate on a pale mucosal surface in the duodenum or other times mucosal inflammation and few to numerous petechiae on the serosal surface of the duodenum and jejunum. And finally, for some birds, the small intestine appeared normal. These observations were not dependant on the infective doses. In association with *E. acervulina*, *E. praecox* increased its negative effect on growth (table 2). Thus, where *E. acervulina* administered alone with a low infective amount had no significant effect on weight gain, the association with *E. praecox* induced a significant decrease of weight gain on the period from D-3 to D+5, which can be explained by a negative effect of *E. praecox* highlighted in single infection (table 1). On D+11, differences were no longer significant.

With *E. acervulina* used at high infective dose, even if differences that were observed were not significant between birds infected with this single species or with the two species on D+5, values indicate a tendency to increased damaging of growth. Furthermore, on D+11, no compensatory growth was observed, and weight and weight gain were significantly higher for the birds receiving only 200,000 oocysts of *E. acervulina* than those receiving 200,000 oocysts of *E. acervulina* and 200,000 oocysts of *E. praecox*.

Table 1. Pathogenicity of *Eimeria praecox* alone depending on the infective dose.

Group	Weight D+5	WG - 3/+5	Weight D+11	WG -3/+11
NI	949[a]	525[a]	1385[a]	965[a]
IP1	898[b]	474[b]	1344[a]	925[a]
IP2	867[bc]	442[bc]	1366[a]	945[a]
IP3	849[c]	424[c]	1336[a]	915[a]

For group names, refer to text
WG: mean weight gain on the period of observation (in days)
Weight and WG: mean values expressed in grams

Table 2. Pathogenicity of *Eimeria praecox* associated to *E. acervulina* depending on the infective dose.

Group	Weight D+5	WG - 3/+5	Weight D+11	WG - 3/+11	Lesions
NI	949[a]	525[a]	1385[a]	965[a]	0
IA1	940[ab]	516[ab]	1430[a]	1013[a]	2.8
IA2	824[d]	399[cd]	1304[b]	883[ab]	3.9
IA1P1	891[bc]	465[cd]	1381[a]	960[a]	2.0
IA1P3	826[d]	401[d]	1320[a]	899[a]	2.2
IA2P1	797[d]	373[d]	1251[bc]	830[bc]	3.8
IA2P3	784[d]	360[d]	1224[c]	804[c]	4.0

For group names, refer to text;
WG: mean weight gain on the period of observation (in days)
Weight and WG: mean values expressed in grams
Lesions: lesion scoring per bird for E. acervulina according to the lesion scoring developed by Johnson and Reid (1970)

CONCLUSION

Pathogenicity of *Eimeria praecox* was clearly demonstrated in this study, and the negative effect on weight gain was observed from the lowest infective dose. When it was inoculated with *E. acervulina* with lowest infective dose, its side effect on growth was additive to the later and it was significantly raised compared to an infection with *E. acervulina* alone. Although it was not possible to measure the impact of an infection with *E. praecox* in field conditions, because of the absence of typical lesions reflecting the intensity of infection, this species should be taken into account in a prophylactic approach to perform an optimal protection of poultry.

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