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Short communication

Isospora sp. (Apicomplexa: Eimeriidae) in Icterine Warbler (*Hippolais icterina*, Passeriformes: Sylviidae): the Possibility of Parents to Nestlings Transmission

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Summary. The prevalence of *Isospora* sp. in a population of icterine warbler was studied to ascertain the possibility of transmission of oocysts from parents to nestlings. Seventy-two adults and nestlings in 51 nests were examined; *Isospora* sp. oocysts were found in 91.2% of samples from females, 78.9% from males and 35.3% from nestlings. There was no significant difference between the prevalence of infection in females and males; the difference between adults and nestlings was statistically highly significant. The prevalence in nestlings depended on their age (24% in 7-9 days and 50% in 10-12 days old nestlings). From 39 nests with 1 or both parents harboring oocysts, 12 nests contained infected youngs and 27 were infection free; the difference between the average age of nestlings in the infected and uninfected group (9.7 and 9.2 days, respectively) was not significant. As no nests with infection-free parents were found, we could not conclude if nestlings were infected by food contaminated accidentally or directly from their positive parents.

Key words. *Isospora, Hippolais icterina*, icterine warbler, coccidia, transmission, prevalence.

Coccidia of the genus *Isospora* are common parasites of passerine birds; their prevalence in some populations can reach 40% (Scholtyseck and Przygodda 1956, Svobodová 1994). These prevalences are interesting because *Isospora* spp. of passerine birds are monoxenous, oocysts are excreted in feces and the possibility of infection acquired with food seems to be low due to the dispersion of oocysts in the environment. A possible manner of infection is the direct transmission between individuals, e. g., during the nesting period when oocysts could be transmitted to nestlings with food contaminated by feces of infected parents. Przygodda and Scholtyseck (1961) found that the prevalence of infection with *Isospora* spp. is higher in older nestlings of passerine birds; however, they did not examine parent birds.

In 1989-1991, the breeding biology of a population of icterine warbler (*Hippolais icterina*, Passeriformes: Sylviidae) in Central Bohemia, Czech Republic, was studied. Warblers are mainly insectivorous and both females and males feed the young (Hudec 1983, Payevsky 1987). Our attention was directed to

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monoxenous coccidia to ascertain if there is some relation between the oocyst shedding in parents and nestlings.

Warblers were caught in nets using 2 methods: males were attracted by tape replayed song, both sexes were caught near nests with nestlings (Cibulková 1993). Birds were kept in tissue bags (max. 1 h), released, and the feces were collected. Samples from nestlings were collected during controls of nests, feces from siblings being mixed together and representing one sample. Accurate hatching date was detected during previous nest controls. Samples of feces were kept in 2% aqueous potassium bichromate ($K_2Cr_2O_7$) solution for three days at room temperature to allow oocysts sporulation and then stored at 4°C. First microscopical examination of samples was direct; when no oocysts were found further examination involved flotation of the material in 33% aqueous zinc sulfate ($ZnSO_4.7H_2O$) solution.

A total of 72 adult birds and nestlings in 51 nests were examined; 91.2% of samples from females (n=34), 78.9% from males (n=38) and 35.3% from nestlings (n=51) being positive to oocysts of the genus *Isospora* (see Table 1.) Oocysts were subsphaerical, measuring 26.8 x 24.8 µm (19.5-33.8 x 18.0-31.5, n=279; for detailed description see Svobodová 1994). There was no significant difference between the prevalence of infection in adult females and males (G-test, G = 2.15, p>0.05). The prevalence in adults (84.7%) was 2.4 times higher than in nestlings; the difference is highly significant (G-test, G = 32.63, p<0.01). Age dependence of oocyst shedding was proved by division of nestling in 2 age groups, older nestlings being positive more frequently (see Table 2); the difference is significant for one-tailed hypothesis (G-test, G = 3.67, p<0.1). In 39 nests, one or both parents were also examined. All nestlings from these nests had at least one parent positive to *Isospora* oocysts; 12 of the nests contained infected youngs, 27 did not. No family was found with all members being negative, nor a positive nest with negative parents. Average age of infected and uninfected nestlings was 9.7 and 9.2 days, respectively; however, the difference was not significant (Mann-Whitney U-test, Z = -1.25, p=0.21).

Table 1

Prevalence of *Isospora* sp. oocysts in icterine warbler

Year	Females			Males			Nestlings		
	n	+	%	n	+	%	n	+	%
1989	11	9	81.8	8	7	87.5	16	6	37.5
1990	16	16	100	20	13	65.0	23	7	30.4
1991	7	6	85.7	10	10	100	12	5	41.7
Total	34	31	91.2	38	30	78.9	51	18	35.3

n - number of examined, + - number of infected, % - prevalence

Table 2

Prevalence of *Isospora* sp. oocysts in two age groups of nestlings

Age (days)	Number of examined	Number of infected	Prevalence (%)
7-9	29	7	24.1
10-12	22	11	50.0

Coccidia of the genus *Isospora* are very common in this population of icterine warbler, including nestlings. There are probably more mechanisms for the maintenance of *Isospora* in the population of the host. Generally, *Isospora* spp. of birds are transmitted *via* oocyst-contaminated food or water; however, the direct transmission should be considered. The fact that oocysts are not infective before sporulation could decrease the possibility of such transmission; but the process depends on temperature and lasts only 24 h for some passerine species of *Isospora* (Stabler and Kitzmiller 1972, Barré and Troncy 1974). Oocysts adhered to the plumage and other parts of the body of parents could be a source of infection for their youngs. The existence of families with infected parents and negative nestlings may be explained in two ways: (1) the youngs are not (yet) infected; (2) the youngs are infected but not yet shedding oocysts due to the prepatent period, which lasts at least 4-5 days (Stabler and Kitzmiller 1972, Box 1977, Cawthorn and Wobeser 1985, Amoudi 1990).

As no nests with *Isospora*-free parents were found, we cannot determine whether nestlings were infected *via* food contaminated by their parents or accidentally (by oocysts dispersed in the environment).

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