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## SUCKLING DAIRY CALVES/NURSE COWS SYSTEM AND RISK OF GASTROINTESTINAL NEMATODES INFECTION DURING THE FIRST GRAZING SEASON IN ORGANIC FARMS

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**Abstract:** In dairy farms, new rearing practices of calves with nurse cows have been developed by farmers but still remain poorly documented. The objective was to assess the impact of rearing suckling calves with nurse cows on the same pastures on the risk of gastrointestinal nematode (GIN) infection in calves. The grazing management has been recorded for each group. Serum pepsinogen level and GIN egg excretion per gram of faeces (epg) were determined in 438 calves belonging to 38 groups from 30 farms in the western part of France at housing (October 2018 to January 2019). The maximum number of infective larval generations met by the animals (LG) in each pasture plot was modelled by Parasit'Sim expert system.

The data were analyzed using logistic regression (univariate and multivariate). Mean parasiticological parameters per group were low. On average, the serum pepsinogen level was 1.1 units of tyrosine (U Tyr) and the GIN egg output was 130 epg. Pasture infectivity was above LG4 for 2/3 of the groups. These results suggest that rearing suckling dairy calves with nurse cows decreases the level of GIN infection in calves at the end of the 1st grazing season compared with putting out to pasture weaned heifers alone. This can be explained by i) the fact that cows were immune and have a cleansing effect on the pastures when eating a lot of larvae while excreting few eggs and ii) Because not weaned calves had a slow larval intake when drinking milk from nurse cows.

**Introduction:** The rearing of suckling calves with nurse cows has been implemented by farmers and is increasingly widespread in the West part of France, particularly in organic farms. This technique is perfectly suited to highly grassy systems on organic farms where calves with nurse have a very long first grazing season. Infections by gastrointestinal nematodes (GIN) are very common in grazing cattle in temperate regions. Among GIN species, *Ostertagia ostertagi* is the most pathogenic and is responsible for production losses, or even diarrhea in naïve first grazing season cattle (Ploeger et Kloosterman 1993). No study is available on the suckling dairy calves/nurse cows system on pasture, the objective of our study was to assess the impact of such a management on the GIN infection of calves.

**Material and methods:** Our study sample comprised 38 groups of calves reared with nurse cows from 30 organics dairy farms located in the northwest of France (464 calves and 204 nurse cows overall). These calves were mainly cross-bred (83% cross-bred, 7% Jersey, 7% Holstein, 3% Normande). The number of calf per group varied from 2 to 39 (average 12.2) and the number of adults per group varied from 1 to 18 (average 5.4), with a mean ratio of 2.6 calves per cows. Only 17 calves (3%) were treated with anthelmintics during the grazing season.

Each farm was visited twice: the first visit in august 2018 to collect all the information regarding the rearing and grazing management practices (period of birth, date of turnout, weaning and housing, number of paddocks used, time spent on each paddock…), and the second visit at housing (from the end of October 2018 to mid-January 2019) to collect blood and faeces sample on each calves (438 calves sampled out of 464). Faecal samples were collected from the rectum. Blood samples were centrifuged and sera were collected.

The number of GIN eggs per gram of faeces (epg) was determined in each faecal sample (Mini-FLOTAC technique with a sensitivity of 10 epg) (Cringoli et al. 2017). The mean egg output and the % of calves shedding more than 100 epg was calculated in each group. This % was categorized in two classes according the median value (36%).

Individual serum pepsinogen concentrations were determined according to Kerboeuf et al. (2002), and expressed as units of tyrosine (U Tyr). The serum pepsinogen level is a lesional marker of the abomasum mucosa and a predictor of the number worms at the end of the grazing season. The mean pepsinogen level was calculated in each group and was categorized in two classes according to the threshold 1.5 UTyr which is closed to the limit of 2.0 indicating type I ostertagiosis (Kerboeuf et al. 2002).

To assess in each group the pasture infectivity level, i.e. the level of GIN larvae on pasture, a model was used (Parasit'Sim) (Chauvin et al. 2009). The pasture infectivity was modeled by calculating the number of *Ostertagia* parasitic cycles realized since turnout on each pasture plot, taking into account local daily average temperatures (nearest station to the farm) and the grazing management practices described for each group. As each parasitic cycle produces a new *Ostertagia* larval generation (LG) on pastures, this model could simulate the maximal number of LG met by the animals since turnout. This simulation was done as if the calves grazed alone, without nurse cows.

For these two models, a univariate analysis ($p<0.20$), a check of the links between the selected variables and a multivariate analysis were performed ($p<0.05$).

**Results: Description of the grazing management indicators**

32 groups were composed of calves mainly born in spring and 6 groups of calves born in autumn. Thus, turnout took place from the end of February to the beginning of October, calves being on average 44 days old (0-195 days). The mean duration of the grazing season was 195 days (70-302 days). Calves were mainly weaned at housing, except in 5 groups where the weaning took place during the grazing season (from May to October) with a post-weaning grazing period without nurse cows lasting 130 days on average (30-197 days).

Grazing management practices did not differ according to the calving season. Continuous grazing was used for only 3 groups whereas 14 groups grazed on successive paddocks and 21 groups were conducted on rotational grazing.

Description of parasitic indicators

By modelling the grazing management using Parasit'sim, two-thirds of the groups (26 /38 groups) met at least the 4th larval generation during their first grazing season.

The average values per group of serum pepsinogen were low (1.12 U Tyr). This value was below the threshold of 1.5 U Tyr for 26 groups (70% of the groups) and the other values did not exceed 2.5 U Tyr.

The multivariate model, including parasitological and grazing management indicators, showed that only pasture infectivity >LG4 was a risk factor for serum pepsinogen levels (odds ratio (OR) = 13.4; 95% confidence interval (CI) = [2;1386]).
The average egg excreted per group was 130 epg (standard deviation 125) and the median was 102 epg. The percentage of animals that excreted more than 100 epg was on average 38% animals per group with a median of 36% animals. 9 calves excreted more than 500 epg.
The multivariate model including parasitological and grazing management indicators showed the presence of the following risk factors: a late sampling date (OR = 1.75; CI = [1.08 - 2.23]), a post-weaning grazing period (OR = 7.48; CI = [3.36 - 16.6]), a long delay between the date of re-entry into the housing and the date of sampling (OR = 2.64; CI = [1.64-4.26]), a successive grazing system compared to the rotational grazing (OR = 4.1; CI = [2.34 - 7.14]), a short grazing duration (OR = 3.46; CI = [3.46-10.34]).
**Discussion:** Dairy calves bred with nurse cows had a long first grazing season with an early turnout and a late housing. This could increase the risk of higher gastrointestinal nematodes infection on pasture. Since weaning was carried out in most cases during the winter season indoor, most calves were with nurse cows throughout their first grazing season.
Serum pepsinogen values were low (1.1 U Tyr) compared to other studies of dairy heifers in the first grazing season in organic farms: 2.4 U Tyr and even in conventional farms: 2.0 U Tyr (Merlin et al. 2018).
Calves excreted an average of 130 epg per groups. This value is close to those found in dairy heifer calves in the study by Shaw et al (1997) where these values were 95 epg and 362 epg of untreated animals. In another study (O'Shaughnessy, 2015) conducted on suckling beef calves in the first grazing season, the egg output was 172 epg on average at the end of the grazing season.
The two parasitic indicators in our study indicate a low GIN infection when calves are reared with nurse cows. In contrast, when the grazing management is modelled with Parasit'Sim, a relatively high number of larval generations on the paddocks is suggested.
The presence of the nurse cows with the calves during their first grazing season could have a diluting effect on the parasitic risk to the calves. Nurses cows that have acquired immunity against GIN would ingest large number of larvae from the pasture but would excrete only small amounts of eggs. Furthermore, the calves are not weaned and drink milk from the nurses; hey would therefore be less exposed to the larvae present in the grass. Calves would have a low risk of GIN infection due to the presence of nurses grazing together with the calves and the low grass and larval intake.
These results would be confirmed by other studies. The parasitic impact of this practice on cows could also be analysed.
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**Disclosure of Interest**: None Declared

**Keywords**: Dairy calves, Gastrointestinal nematodes, Nurses cows, Organic farms