Role of range use in infections with parasites in laying hens
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In organic layer farms a free-range area is provided for animal welfare reasons. Both higher and lower worm burden (Ascaridia (Asc), Heterakis (Het) and Capillaria (Cap)) are described in hens housed in free range systems compared to other systems. Parasite infections can reduce health, welfare and productivity. We investigated the role of the range area in helminth infections: (1) Is infection of manure different for samples being collected in the free-range or inside the house, assuming to distinguish 'outdoor hens' from 'indoor hens'? (2) Is there an association between the proportion of hens using the range area and parasite eggs in soil and manure? (3) Is there an association between parasite eggs in manure, health and production parameters? Forty one flocks are being visited once when hens >45 weeks old and >3 weeks after a deworming. Together with farmers the proportion of hens using the free-range was estimated assuming optimal conditions (%HensOut), as well as health status (score on scale 1 (=bad) to 10 (=perfect)). Lay % at 60 weeks and mortality % till 60 weeks were collected too. Six soil samples per farm were taken at 5, 20 and 50 m from the pop-holes. Seventy individual manure droppings, pooled into 7 samples were collected inside and 70, pooled into 7, outside. On the free-range, manure samples were collected >50 m from the pop-holes, assumed to originate from 'outdoor hens'. Manure samples inside were taken from the inner part of the barn, away from the pop-holes, assumed to originate from 'indoor hens'. All soil and manure samples, 20 per farm, were analysed for parasite eggs per gram (EPG; McMaster method). This abstract contains preliminary results from 14 farms. From the soil samples (n=84) 7% was infected with Asc, 5% with Het and 0% with Cap. From the manure samples collected outside (n=98), 76% was infected with Asc and 26% with Het. From the manure samples collected inside (n=98), this was respectively 68 and 14%. There was no difference in number of positive manure samples between outside and inside, neither for Asc, nor for Het. A negative correlation between %HensOut and soil samples infected with Asc was found (-0.57; P=0.034). A tentative explanation may be that the hens' behaviour changes the soil surface into an environment detrimental to parasite egg survival. No correlation was found between %HensOut and soil samples infected with Het. Furthermore, no correlation was found between %HensOut and manure samples infected with Asc, nor with Het. No correlation was found between manure samples positive for Asc and health status, lay% 60 weeks or mortality till 60 weeks. Furthermore, no correlation was found between manure samples positive for Het and health status, lay% 60 weeks or mortality % till 60 weeks. These preliminary results indicate that range use may not be a risk factor for parasite infections in laying hens.
Role of range use in infections with parasites in laying hens

Introduction
In organic egg production a free-range area is provided for animal welfare. Both higher and lower worm burden (Ascaridia (Asc), Heterakis (Het) and Capillaria (Cap)) are reported for hens in free-range systems compared to other systems. Parasite infections can reduce health, welfare and productivity.

Questions
1. Is infection of manure different for samples from 'outdoor hens', compared to 'indoor hens?
2. Is proportion of hens using the free-range correlated with parasite eggs in soil and manure?
3. Are parasite infections correlated with health and production parameters?

Methods
- 20 Dutch Flocks - 45 weeks old and - 3 weeks after a drenching.
- Farmers’ estimate of range-use (%HensOut) & health status
- Lay % at 60 weeks & mortality % till 60 weeks
- 6 soil samples/farm at 5, 20 and 50 m from pop-holes
- 70 individual droppings, pooled into 7 samples from outside - 50 m from the pop-holes (outdoor hens)
- 70 droppings, pooled into 7 samples from inside (indoor hens)
- All soil and manure samples analysed for parasite eggs/gram (EPG; McMaster method).
- Ascaridia and Heterakis counted as one category (Asc+Het) since they could not always be distinguished.

Results

<table>
<thead>
<tr>
<th></th>
<th>Asc+Het</th>
<th>Cap</th>
</tr>
</thead>
<tbody>
<tr>
<td>% of samples positive</td>
<td>Mean EPG (E2)</td>
<td>% of samples positive</td>
</tr>
<tr>
<td>Soil (n=15)</td>
<td>12</td>
<td>7 (1)</td>
</tr>
<tr>
<td>Manure outside (n=48)</td>
<td>0.4%</td>
<td>406 (950)</td>
</tr>
<tr>
<td>Manure inside (n=45)</td>
<td>0.7%</td>
<td>247 (353)</td>
</tr>
</tbody>
</table>

* Drenching is commonly advised when Asc+Het > 100 EPG or when Cap > 1

Conclusions
- Manure from outside hens was more frequent infected with Ascaridia and Heterakis and had higher EPG, compared to manure from inside hens.
- Flock mortality was higher in case of a higher number of manure samples from 'indoor hens' being positive for roundworms. No other correlations were found between parasite infections and health or production parameters.
- No association was found between %HensOut and parasite infections in soil or manure.