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Risk factors for *Campylobacter* spp. colonization in French free-range broiler-chicken flocks at the end of the indoor rearing period

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Abstract

The aim of this cross-sectional survey was to identify risk factors for *Campylobacter* spp. colonization in French free-range broiler flocks at the end of the indoor rearing period (between 35 and 42 days old). Seventy-three broiler farms were studied from March 2003 to March 2004 in France. A questionnaire was administered to the farmers and samples of fresh droppings were taken to assess the flocks' *Campylobacter* status by bacteriology. *Campylobacter* species were determined by PCR. A logistic regression analysis was used to assess the influence of various factors on flocks' *Campylobacter* status. 71.2% of the sampled flocks excreted *Campylobacter* spp. before going out on the range. The risk of a flock being colonized with *Campylobacter* was increased in the spring/summer period (RR = 1.8, $p = 0.02$) and autumn (RR = 2.2, $p = 0.02$) compared to winter, on total freedom rearing farms (RR = 3.3, $p = 0.04$) in comparison with farms with a fenced run, when the first disinfection of the poultry-house was performed by the farmer (RR = 2.4, $p = 0.04$) instead of a hygiene specialist, when rodent control was carried out by a contractor (RR = 1.8, $p < 0.01$) and not by the farmer and when the farmer came into the house twice a day as opposed to three time a day or more (RR = 1.5, $p = 0.02$). Use of a specific gate for chick placement decreased the risk of a flock being colonized with *Campylobacter* (RR = 0.5, $p = 0.01$) in comparison with using the gate for manual disposure or the door of the change room.

Keywords: *Campylobacter* spp.; Risk factors; Broiler chicken; Free-range; Logistic regression

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1. Introduction

Thermophilic *Campylobacter* species are recognized as a major cause of human gastroenteritis in developed countries (Blaser, 1997). Consumption of undercooked poultry has often been identified as a risk factor for human campylobacteriosis (Kapperud et al., 1992; Pearson et al., 2000). Reducing the *Campylobacter* contamination of poultry products should reduce the risk of human infection. However, efforts within the slaughterhouse to reduce *Campylobacter* contamination of poultry carcasses, like improvement of equipment disinfection measures, have a limited effect (Mead et al., 1995). Therefore, in accordance with the European legislation which focuses the control of zoonotic agents particularly on the level of primary production (UE Regulation 2160/2003), the aim must be to produce broilers free from *Campylobacter* at slaughter. The identification of risk factors for bird colonization during the rearing period is a necessary step in determining efficient farm interventions aiming at preventing colonization of broilers with *Campylobacter*.

The factors influencing the presence of *Campylobacter* in broiler flocks have been identified and quantified in several studies but on-standard production only. The main factors associated with an increased risk of colonization are the lack of hygiene barriers (Kapperud et al., 1993; Evans and Sayers, 2000; Hald et al., 2000); the presence of other domestic animals than poultry on the farm or in the vicinity (Kapperud et al., 1993; Van de Giessen et al., 1996; Bouwknegt et al., 2004), several poultry-houses on the farm (Bouwknegt et al., 2004; Refrégier-Petton et al., 2001) and a warm season (Kapperud et al., 1993; Refrégier-Petton et al., 2001). All these epidemiological surveys have been carried out only in conventional broiler farms in Europe. However, the French free-range broiler production complies with breeding specifications different from those of standard production: low breeding density, selection of slow growth breeds and access to an open-air range. To the best of our knowledge, no epidemiological study aiming at identifying risk factors for *Campylobacter* colonization in French free-range broiler farms has been published. On free-range farms, broilers are reared indoor from 1 to 42 days old and can go out on a range from 6 week old until depopulation (81 days old at least). In most of the studies of on-standard (Jacobs-Reitsma et al., 1995; Berndtson et al., 1996) and free-range broilers (Reichardt et al., 1997), chicken flocks become colonized by *Campylobacter* between the second and fourth week of rearing. This critical period corresponds to the indoor rearing period of free-range chickens.

Therefore, our aim was to assess the association between farm characteristics and managerial practices and the colonization of broiler flocks with *Campylobacter* at the end of the indoor rearing period.

2. Materials and methods

2.1. Farm sampling

Our cross-sectional survey was carried out in France from March 2003 to March 2004 and involved 73 free-range broiler farms, selected among those affiliated with the poultry