DISCONTOOLS

# Campylobacteriosis
# Summary

## Introduction

1. This note provides a brief summary of an analysis undertaken by a DISCONTOOLS group of experts on campylobacteriosis. They reviewed the current knowledge on the disease, considered the existing disease control tools, identified current gaps in the availability and efficacy of the control tools and finally determined the research necessary to develop new or improved tools. Full details can be downloaded from the website at http://www.discontools.eu/

## Disease profile

2. Campylobacteriosis represents an important and worldwide public health problem with considerable socio-economic impact. The most important species in terms of food-borne disease are the so called 'thermotolerant' *Campylobacter* species, *C. jejuni* and *C. coli.* The organisms are ubiquitous in animals and the environment worldwide. *C. jejuni* and *C. coli* can colonise the intestinal tract of most, if not all, mammals and birds.
3. In humans *C. jejuni* and *C. coli* are associated with campylobacteriosis causing diarrhoea, abdominal pain, fever, headache, nausea and vomiting. Most cases of campylobacteriosis are self-limiting within a week, but some cases may require medical treatment including hospitalization. Post-infection complications include reactive arthritis, and *C. jejuni* has been implicated as a trigger of Guillain-Barré syndrome (GBS). Although outbreaks occur, the vast majority of human cases appear as sporadic cases.
4. *C. jejuni* and *C. coli* rarely cause disease in animals other than humans. The prevalence of *Campylobacter* positive chicken broiler flocks varies between countries. In countries in northern Europe (Scandinavia), prevalence is low - about 5% while in southern European countries it can be up to 100%. Cattle, sheep and pigs are frequently colonised with *Campylobacter* in the intestines, with prevalence at slaughter of up to 90%.
5. Control measures in conventional (reared indoors) broilers currently only involve enhanced biosecurity but it can be difficult to control *Campylobacter* colonization in animals and birds using biosecurity alone. Nevertheless, a decreasing prevalence is seen in some countries where biosecurity is implemented as part of a national action plan.

## Risk

6. *Campylobacter* remains the main bacterial cause of food-borne illness in high income countries and also has a major impact in low income countries. In Europe, there were over 120,000 reported cases of campylobacteriosis in 2020, which is a decrease of 33.4% compared with 2019, probably due to the COVID-19 pandemic. There is a significant underreporting of cases, hampering the possibility to calculate the total burden of the disease. The WHO estimates that 1% of the population contract campylobacteriosis each year.
7. Reports on risk factors for human infection indicate that the consumption of food (poultry meat, cross contaminated food products, raw milk and contaminated water) is the main source of infection, followed by direct contact with colonized animals. Fifty to 80% of campylobacteriosis cases may be attributable to campylobacters from the poultry reservoir, in particular chicken. During industrial slaughtering, faecal contamination from the bird intestine to the surface of the carcass is common, leading to substantial contamination of fresh poultry meat, in case the birds were colonized by *Campylobacter* spp. A substantial proportion of disease is caused by "poultry campylobacters" transmitted via direct consumption of insufficiently heated poultry meat and indirect routes, in particular by preparation of fresh poultry meat in contact with ready-to-eat food or by contact with fecally contaminated water or soil. Survival of *Campylobacter* is supported by cold temperatures (4-10 ºC), darkness and a moist atmosphere. The conditions that poultry meat is stored under at retail are therefore ideal for survival, although no multiplication of the organism occurs.
8. For conventionally-reared broilers major risk factors for introduction of *Campylobacter* to broiler flocks include poor biosecurity, age of birds (thereby probability of contact to *Campylobacter*

spp.), season, multiple species farming, other livestock nearby, multiple age of the flocks in a farm and free-ranging at any stage. In some studies, flies, 'thinning of flocks' and source of drinking water are risk factors.

**Diagnostics**

9. There are diagnostic methods described by International, European or National standards, such as International Standard Organisation, ISO 10272, Nordic Committee of Food analysis, NMKL No 119 2007, and WOAH Terrestrial Manual 2017. Chapter 2.9.3.
10. There are no serological assays in routine use for the detection of *C. jejuni* and *C. coli* in livestock. However, antigen-capture enzyme-linked immunosorbent assays (ELISAs) have been described in the literature for all host species. A standardised assay has recently been described in humans for use in sero-epidemiological studies.
11. A range of tests are available for testing food and primary production samples. Real time PCR tests are available as kits but need to be used within a laboratory. PCR- based assays have come into use to screen broilers. It should be noted that PCR-based assays detect both viable and non-viable organisms. Still, their interpretation can be improved by including a preceding step of staining with a DNA-intercalating dye, which quenches the signal from dead cells, and by including a dead cell standard. However, a validated kit is still missing for such a viable qPCR and research is needed to improve the application for various matrices.
12. There is the need for development of rapid tests for the detection of live *Campylobacter* including on-farm kits which could detect high levels of colonization in poultry flocks.

**Vaccines**

13. There are no effective vaccines available for the prevention of enteric *Campylobacter* colonization in birds or mammals. The development of a vaccine to prevent colonization of meat animals and birds would reduce numbers of infected animals going into abattoirs and reduce the spread into the environment. There are studies underway investigating approaches to develop effective vaccines.

**Pharmaceuticals**

14. Human cases are usually not treated with antibiotics unless the patient is bacteraemic or disease develops into life threatening condition. Use of antibiotics enhances development of resistance to antimicrobials.
15. Further research is needed to develop curative and preventive therapies not based on the use of antibiotics. Possible alternatives could include bacteriophages and bacteriocins.

**Knowledge**

16. The major hindrance to better understand the pathogenicity in humans is the problem with finding a suitable animal model of disease. In practice, no animal model has been available that mimics human disease. However, recently progress has been made by developing a murine model mimicking campylobacteriosis in humans.
17. Further information is required on the effect of biosecurity measures under different conditions. More research is needed on sources of infection and routes of transmission particularly in livestock other than poultry where information is lacking.

**Conclusions**

18. *Campylobacter* are a major cause of food-borne bacterial enteritis in humans worldwide. The occurrence and persistence of the pathogen in a wide range of animals and in the environment can make control difficult. There is a need for strict biosecurity in order to achieve control but this can be difficult to sustain. Nevertheless, a decreasing prevalence has been observed in some countries where biosecurity has been implemented as part of a national action plan.
19. There is a lack of effective vaccines to prevent or control intestinal colonization in poultry and other animals.