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The isolation of *Campylobacter jejuni* from flies

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SUMMARY

Living flies collected from three locations were cultured on selective medium for *Campylobacter* spp. *Campylobacter jejuni* was isolated from five (2·4 %) of 210 flies examined.

These results suggest that the potential hazard to health from the transmission of campylobacters from animals to human food by flies is small.

INTRODUCTION

Campylobacter jejuni is now well recognized as a leading cause of acute bacterial gastroenteritis in humans. Skirrow (1982) recorded that in Britain the rate of isolation of *C. jejuni* from stools is similar to that of salmonella. Although a few reports have described person-to-person transmission (Blaser *et al.* 1981) the chief mode of spread is from animals to man. *C. jejuni* has been isolated from a wide variety of wild and domestic animals but it is probable that birds constitute the main reservoir of infection (Skirrow, 1982). With the exception of a few reports of infection due to milk (Robinson & Jones, 1981), water (Palmer *et al.* 1983) and poultry (Brouwer *et al.* 1979), most human infections are sporadic with no definite mode of transmission. It is well known that enteropathogenic bacteria are carried by flies (Christie, 1980) and although flies are rarely the main transmitting agent in any epidemic disease, they represent a potential hazard to health wherever they have access to both faeces and food. Rosef & Kapperud (1983) reported an overall isolation rate of 28·4 % of *C. jejuni* from flies in Norway. The aim of the present investigation was to determine the incidence of *C. jejuni* in flies collected in Britain in order to further estimate the ability of flies to act as a vector of this organism.

MATERIALS AND METHODS

During the period from May to September 1982 a total of 259 flies were examined for the presence of *C. jejuni*. The identification of individual flies was not recorded but Houseflies (*Musca*), Lesser house flies (*Fannia*), Bluebottles (*Calliphora*), Greenbottles (*Lucilia*) and Fleshflies (*Sarcophaga*) were all represented. All flies were collected at three locations in Bedfordshire in south-eastern Britain. In May 1982, 49 flies were captured alive using empty sterile containers. These flies were divided into pooled samples with between two and ten flies in each sample. The presence of *C. jejuni* in one of these samples prompted a more detailed study; hence a total of 210 flies were captured, as described before, and examined individually.

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A suspension was made with quarter-strength Ringer's solution by cutting the flies into small pieces with sterile scissors; this suspension was inoculated directly onto campylobacter selective medium (Bolton & Robertson, 1982) and into an equal volume of double-strength enrichment broth consisting of the Preston medium without agar. After overnight incubation the enrichment broth was subcultured onto Preston medium. Throughout the investigation all plates and broths were incubated at 43 °C in an atmosphere containing about 5 % oxygen, 7 % carbon dioxide and 88 % hydrogen; plates were examined after two days. Smears from suspect colonies checked for oxidase positive and catalase reactions were identified as *C. jejuni* by their characteristic morphology on Gram staining. All campylobacter isolates were biotyped (Skirrow & Benjamin, 1980) and serotyped (Abbott *et al.* 1980).

RESULTS

Of ten pooled samples containing 49 flies examined, *C. jejuni* was isolated from one (10 %); this sample contained nine flies. A total of 210 flies were examined individually, five (2·4 %) yielded *C. jejuni* (Table 1). The identification of the flies giving the positive cultures was not recorded.

The enrichment procedure enhanced the isolation rate of campylobacters: four (66 %) of the six samples would not have been detected without enrichment. Two samples were direct plate positive/enrichment positive, no samples were positive by direct plating only.

A total of seven strains of *C. jejuni* were isolated; one fly yielded two distinct strains (*C. jejuni* biotype 1 and *C. jejuni* biotype 2). The distribution of the biotypes is shown in Table 1. The serotypes isolated were 5/31 and untypable (*C. jejuni* biotype 1); 27, 55 and untypable (*C. jejuni* biotype 2); 23 and untypable (*C. coli*).

DISCUSSION

The results show that *C. jejuni* may be present in living flies although in this study the incidence of 2·4 % was below the 28·4 % reported by Rosef & Kapperud (1983). One explanation for this difference could be that in the present study flies were collected in houses and gardens away from farms and abattoirs whereas in the Norwegian study the culture-positive flies were collected from a chicken farm and a piggery and therefore could have had more access to infected animal faeces. *C. jejuni* has been recovered previously from poultry and pigs in several countries (Blaser, 1982). In addition, the survival time of *C. jejuni* either as a surface contaminant or in the alimentary tract of the fly has yet to be determined so that the flies in the present study may have been carrying *C. jejuni* which were no longer viable.

The distribution of biotypes is difficult to evaluate due to the small numbers; however the relative prevalences of *C. jejuni*, *C. coli* and nalidixic acid-resistant thermophilic campylobacters (NARTC) were 71, 29 and 0 % in this study whereas Rosef & Kapperud (1983) report prevalences of 6·2, 90·1 and 3·7 % respectively. The high incidence of *C. jejuni* in the present study may be a chance finding among only a few isolates. Similarly an evaluation of the serotypes is difficult due to the

Table 1. *Frequency of isolation of* C. jejuni *from flies*

Site	Type of sample	No. of samples	No. of flies	No. of samples positive for campylobacter: *C. jejuni* biotype 1	*C. jejuni* biotype 2	*C. coli*	NARTC*	Total
A	Pooled	3	15	0	1	0	0	1†
	Single	175	175	2	2	2	0	5‡
B	Pooled	6	23	0	0	0	0	0
	Single	31	31	0	0	0	0	0
C	Pooled	1	11	0	0	0	0	0
	Single	4	4	0	0	0	0	0
Total	Pooled	10	49	0	1	0	0	1
	Single	210	210	2	2	2	0	5‡

* Nalidixic acid-resistant thermophilic campylobacters.
† Positive sample contained nine flies.
‡ One fly yielded *C. jejuni* biotype 1 and *C. jejuni* biotype 2.

small numbers involved. Further studies of campylobacter serotypes may show whether the bacteria from these flies are similar to those causing human illness. Flies may have superficial contamination of the hairs and body surfaces or infection of the alimentary tract by enteropathogenic bacteria. No attempt was made in this study to distinguish between these two possibilities, further work is needed to determine where flies carry *C. jejuni*. Although it is possible that food may be contaminated by flies carrying *C. jejuni*, where there are conditions of good hygiene and sanitation flies are unlikely to play a significant role in the transmission of this organism. The present study does however confirm that *C. jejuni* should be added to the list of enteropathogenic bacteria that can be carried by flies.

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