SHORT REPORT

Flies and *Helicobacter pylori* infection

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Houseflies have been proposed to be a reservoir and vector for *Helicobacter pylori*. We assessed the effect of insecticide spraying in villages in The Gambia on *H. pylori* infection in young children. Effective control of flies did not prevent infection with *H. pylori*.

Infection with *Helicobacter pylori* is a major cause of gastrointestinal disease but the precise mode(s) of transmission are unknown. There is no confirmed environmental reservoir other than man, suggesting that transmission is from person to person and faecal-oral, oral-oral, and gastro-oral routes have been implicated.[1] *H. pylori* infection is common in young children living in poor socioeconomic circumstances. Domestic flies are ubiquitous in these settings and have a close affinity with human faeces and food. Whether flies are a reservoir and/or vector of *H. pylori* remains controversial. Viable *H. pylori* has been isolated from the bodies, alimentary tracts, and excreta of houseflies fed on freshly grown cultures of *H. pylori* on agar plates[2] and *H. pylori* DNA was identified in wild houseflies using a specific PCR assay.[3] However, *H. pylori* was not isolated from houseflies fed on infected human faeces.[4]

The "Flies and Eyes" project investigated the effect of domestic fly control on trachoma transmission.[5] Clusters of Gambian villages were selected according to known trachoma endemicity and pair-matched according to population size. In each pair, villages were allocated randomly to insecticide spraying and control arms. Insecticide spraying reduced trachoma prevalence by 56% (95% confidence interval (CI) 19 to 93%; $p = 0.01$). This study provided a unique opportunity to undertake a pilot study in the field to observe whether fly control affected infection with *H. pylori*. We used the ^{13}C-urea breath test (UBT) to determine *H. pylori* status which has been shown previously to be accurate in this setting.[6]

METHODS

A cohort of all consenting children aged 6–18 months in 12 village clusters was recruited (table 1). Expired air was collected before and 30 min after an oral solution of 50 mg ^{13}C-urea in clean water was administered. Children had not fasted before the procedure and no test meal was given. Isotope enrichment was detected by mass spectroscopy and a cut off of 5.5 Craig corrected delta relative to the Pee Dee belemnite limestone international standard was employed.

Flies were controlled by twice weekly ultra-low-volume space spraying with aqueous permethrin (3.75–5.0 g/ha) for 6 months. Fly populations were monitored fortnightly with 16 sticky traps (245×200 mm) set for 24 h per cluster. Traps were set on the day before spraying to reflect the minimum level of fly control achieved.[5]

The UBT was repeated in cohort children at a survey at the end of the intervention. Information on antibiotic prescriptions from local health centres (mainly penicillin and co-trimoxazole) was collected from the children's Road to Health cards, and carers were asked about feeding practices and the use of traditional medicines. UBTs were also performed in infants aged 6–11 months at the follow up survey. Based on previous research, about 80% of these infants are likely to have been uninfected at the beginning of the intervention.[6] The study was approved by the Joint Gambia Government/Medical Research Council Ethics Committee.

RESULTS AND DISCUSSION

In both groups of villages, nearly all children were breast fed (overall 98.5%) and were also receiving other fluids or food (91.8%). Overall, 133/206 (64.6%) cohort children were seen at the 6 month survey and follow up was similar in each arm ($p = 0.86$; table 1). Loss to follow up was due mainly to migration and death. Fly catch data were not normally distributed with many "zero" catches, particularly in the insecticide group. The maximum population of houseflies (*Musca domestica*) in the insecticide group was reduced to 25% of that in the control group (table 1).

The prevalence of *H. pylori* infection was similar in the control and insecticide groups at baseline (59.7% , 95% CI 51.0 to 68.3 and 63.4%, 95% CI 53.0 to 73.8, respectively) and follow up (79.8%, 95% CI 70.9 to 88.6 and 75.9%, 95% CI 64.5 to 87.3, respectively; table 1). The proportions of cohort children who acquired and spontaneously lost infection during the study were similar between control and insecticide groups (fig 1). Analysis by paired *t* test, to account for the cluster randomised design, showed that the difference in the proportion of cohort children who acquired infection in the insecticide group compared with the controls was −1.7% (95% CI: −22 to 19%). Overall, 67.2% children had received an antibiotic and 35.9% a traditional medicine during the intervention. Use of antibiotics and traditional medicines was similar in the two arms ($p > 0.5$) and was not related to *H. pylori* status at follow up. The prevalence of infection in infants recruited at the follow up survey was similar between groups (table 1).

Our findings do not discount that *M. domestica* may be a vector of *H. pylori*. The number of children in the cohort means that the true benefit of fly control in preventing *H. pylori* infection may be as much as 22%, but is unlikely to be greater (with 95% confidence). However, the absence of any trend of reduced acquisition of infection in the cohort children or the infants, or of increased spontaneous loss of infection in the cohort children, implies that flies are neither an important reservoir of infection nor a major route of transmission in Gambian villages. Large intervention trials investigating the role of flies in *H. pylori* transmission are not warranted in this environment.

Abbreviations: 95% CI, 95% confidence interval; IQR, interquartile range; UBT, urea breath test

Table 1 Characteristics of children and effects of intervention

	Insecticide villages	Control villages	p Value*
Baseline survey			
Number (%) positive UBTs†	52/82 (63.4)	74/124 (59.7)	0.69
Median (IQR) age, months	12.5 (8.9–15.4)	11.5 (8.2–15.0)	0.40
Follow up survey: cohort children			
Number (%) positive UBTs†	41/54 (75.9%)	63/79 (79.8)	0.76
Follow up survey: infants aged 6–11 months			
Number (%) positive UBTs†	31/42 (73.8)	19/29 (65.5)	0.63
Median (IQR) age, months	8.5 (7.0–10.7)	9.5 (7.1–10.7)	0.76
Catches of *M. domestica*			
Number of fly traps	1176	1162	–
Median (IQR) *M. domestica* per trap	1 (0–5)	4 (1–12)	<0.001
Range	0–151	0–619	–
Number of traps with no *M. domestica* after 24 h	499	266	<0.001

IQR, interquartile range; UBT, urea breath test.
*χ^2 test for categorical variables and Mann-Whitney U test for continuous variables.
†Children with inadequate breath samples have been excluded: a total of four from the insecticide and three from the control villages.

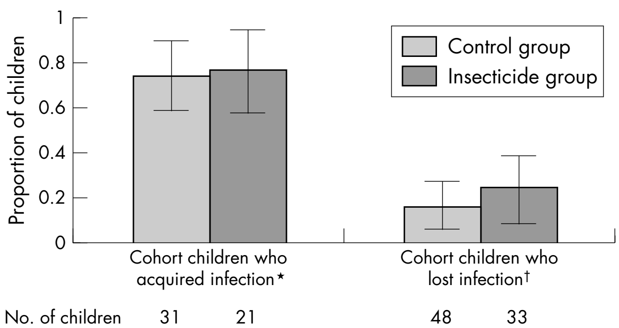

Figure 1 Change in *H. pylori* status according to village group. Error bars show 95% confidence interval for a proportion. *UBT negative at baseline and positive at follow up; †UBT positive at baseline and negative at follow up.

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