

available to district hospitals and it is expensive. Its most important deficiency is that it does not yield *H pylori*. The microorganism is needed for further study (eg, detection of cytotoxins and DNA fingerprinting) and in routine clinical management so that antibiotic susceptibility can be assessed. A US National Institutes of Health consensus development conference statement on *H pylori* in peptic ulcer disease (Feb 8, 1994) lamented the lack of a "readily available, inexpensive, and accurate noninvasive method to monitor the eradication of *H pylori*. In the absence of such an assay, routine monitoring for relapse, reinfection, or treatment failure cannot be recommended". The string test should now be thoroughly evaluated to see whether it satisfies those requirements.

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Allergic response to Brunei frog *Staurois natator*

SIR—Many frogs possess highly toxic skin secretions, which are fatal when ingested by human beings and other mammals.¹⁻³ We are unaware of any previous report of frog skin secretions having an effect through unbroken skin.

The incident reported here occurred on Sept 1, 1993, when a 14-year-old boy was climbing up a waterfall at Labi in Brunei. He brushed the outside of his right hand against a frog. Moments later he complained of numbness on the outer aspect of his hand where the frog had been in contact. Very soon after, he felt faint and nauseated, and remarked that the peripheral vision of his right visual field was blurred. He developed a left-sided headache and fell asleep in the car. The trip home took about 90 min, and he retired to bed. 4 h after the incident he felt well enough to go out for a meal. Next morning the numbness had returned to his hand; the left-sided headache returned, and he spent the morning in bed. By midday, he felt worse, and started to vomit profusely for about an hour before he fell asleep. By about 1600 h he felt better and was able to get up. Although the headache and nausea left after about 36 h, he reported that the numbness in his hand recurred for 3 days. After this he made a full recovery. He had no relevant past medical history, other than a tendency to show prolonged skin reactions to scratches and stinging stimuli, especially microscopic jellyfish stings, manifested by prolonged itching and a rash lasting a month but no systemic symptoms.

The frogs on the face of the waterfall are the "black-spotted rock frog" *Staurois natator*, which are widely distributed in Brunei and Sabah and are known to produce a skin toxin considerably stronger than that of the average frog species. One suggestion was that the symptoms were caused by brushing against the toxic urticarial plant *Laportia* which grows along the edge of streams. Subsequently, the route taken by the boy was followed; no urticarial plants were encountered. Histological secretions of the skin of an adult *Staurois natator* collected at the site revealed hypertrophy of both mucous and granular glands. The physiologically active agents in frog skin secretions are diverse, including simple amines such as tryptamines and catecholamines, more complex amines such as tetrodotoxin and batrachotoxin, and cardioactive steroids such as bufogenines.⁴ There are also various peptides including the caerulein and bombesin families; others (magainins) are antimicrobial.⁵ Even if any of

these agents had achieved large enough systemic concentrations to produce effects, the initial local reaction of hypoaesthesia would exclude all except tetrodotoxin. Hypotension and possibly headache subsequent to vasodilation, plus the slight visual disturbance, might occur with tetrodotoxin; nevertheless this agent or one with similar cellular action seems excluded by the absence of muscular weakness.

Some of the symptoms (hypotension, headache, and vomiting) point to a possible involvement of histamine, locally manifested by histamine-like actions such as pain, erythema, and swelling, produced directly or via release of histamine at the point of contact. Because these symptoms were lacking, we are unable to explain the pattern of toxicity other than to suggest an allergic reaction of an unusual type. The suggestion is based on the nature of the exposure to the frog and the unlikelihood that any toxic secretion could have achieved substantial blood concentrations. Whether potent contact allergens are present in these secretions would be an interesting topic for further study.

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Listeriosis from consumption of raw-milk cheese

SIR—On April 28, 1995, the French National Reference Centre (NRC) for listeriosis (Institut Pasteur, Paris) notified health authorities of a cluster of six human cases of *Listeria monocytogenes* caused by an unusual phagovar (2389:3552:2425:1444:1317:3274:2671:47:52:108:340:31), subsequently called the epidemic strain. The six strains were isolated between April 2 and April 19 in hospitals located in different regions of France. In addition, the NRC reported four epidemic strains among the 2500 food isolates received since Jan 1. These strains were isolated from dairy products.

Preliminary investigations showed that the four dairy products that were contaminated with the epidemic strain were all samples of Brie de Meaux (a raw-milk soft cheese) and that all ten cases notified by May 10 had eaten brie cheese. However, the brand name of the cheese consumed by cases could not be obtained. The brie had been bought either in a supermarket or at a local market and had been cut on the counter. Further investigations were then conducted by the Ministry of Agriculture to identify the origin of the brie sold at the places at which the patient bought it. Concomitantly, a case-control study was conducted; controls (2-4 per case) were matched to cases for underlying condition, area of residence, and age. The results of investigations implicated one specific chain of Brie de Meaux production. Batches of brie incriminated by the investigation were then recalled. Disinfection and control measures were reinforced at the production level. Interview of 16 patients and 26 controls showed an increased risk for listeriosis among consumers of brie (odds ratio 7.0; 95% CI 1.1-56.2; $p < 0.05$). On May 18, a letter was sent to health