

(ab22285; Abcam Ltd., Cambridge, UK). Virus antigens were detected in feather epidermal cells from days 3 through 6 pi, and in a few stromal cells in the feather pulp on days 3 and 4 pi (online Appendix Figure, panel C).

Our results indicate that larger amounts of viruses can be isolated for a longer time from feathers than from swabs. Therefore, feathers can be considered useful samples for surveillance or diagnostic examination of AI virus (H5N1) in domestic ducks. The epidermis, the outer layer of the feather, is a tissue that has poor host immune response against viral replication (8). As has been observed in virus isolation, viruses may be able to survive longer in differentiated epidermal tissue such as contour feathers.

The sensitivity of the rapid test was not adequate for swabs, a finding similar to that of other studies (9,10). However, positive results for rapid tests of feather samples only may shed light on the on-site field detection of AI (H5N1) in asymptomatic domestic ducks. When virus shedding from domestic ducks is maintained at a low level of viral load during the infection, selecting the sample with higher viral load and antigens in tissues, such as feathers, can increase the detection rate obtained from on-site examination. Our results show the potential of feathers as candidates for early AI virus (H5N1) detection.

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## *Neisseria gonorrhoeae* Meningitis in Pregnant Adolescent

**To the Editor:** Dissemination is a rare complication of gonococcal infection and has been observed in 0.5%–3% of patients (1). We describe a new case in a pregnant adolescent infected with a strain resistant to ciprofloxacin and tetracycline.

A 14-year-old girl of Ecuadorian descent, 24 weeks pregnant, sought treatment after a 48-hour history of holocrania cephalica, fever, nausea, and vomiting. She had returned a few days before from a holiday trip to Quito, Ecuador, and had not taken any antimicrobial drugs. She was admitted to hospital with a temperature of 40°C and neck stiffness. Results of a neurologic examination were otherwise normal.

Laboratory blood tests at hospital admission showed a leukocyte count of 13,400 cells/mm<sup>3</sup> (with a mature neutrophil count of 87%), hemoglobin of 10.8 g/dL, and a platelet count of 611,000 cells/mm<sup>3</sup>; electrolyte levels and results of liver function tests were normal, but a total cholesterol count

of 267 mg/dL and a triglyceride level of 440 mg/dL were found. The level of C-reactive protein was elevated (17.90 mg/dL). Coagulation factors were within normal values, with the exception of a fibrinogen value of 917 mg/dL. Levels of complement components C2, C3, C6, C7, C8, and H factor were greatly elevated. The cerebrospinal fluid (CSF) sample obtained in the casualty ward had a leukocyte count of 5,000 cells/mm<sup>3</sup> (90% neutrophils, 10% lymphocytes), with glucose and protein levels of 20 mg/dL and 207 mg/dL, respectively. The patient received a 2-week course of intravenous cefotaxime (2 g every 4 h) and recovered without sequelae.

Gram smear of the CSF sediment was consistent with purulent meningitis. Culture on chocolate agar showed scarce growth of small, colorless mucoid colonies that showed positive reactions in oxidase and catalase tests. Gram stain of colony smears showed gram-negative diplococci and the API NH system (bioMérieux, Marcy l'Etoile, France) classified the bacterium as *Neisseria gonorrhoeae* (with a score of 87%). The result of the Phadebact Monoclonal GC test (Boule Diagnostics, Boule, Sweden) was positive. Cultures of endocervix, rectal, and pharyngeal samples obtained before treatment were negative. The strain was  $\beta$ -lactamase negative by chromogenic cephalosporin method (BBL Cefinase, Cockeysville, MD, USA) and classified as serogroup IA *rst* by agglutination with specific antisera (*Neisseria* Reference Center, Majadahonda, Madrid, Spain). The strain auxogroup, determined in modified Heckels media, (2) was arginine-hypoxanthine-uracil (AHU). Plasmid profile was obtained by standard alkaline DNA extraction (3) and showed a plasmid of  $\approx$ 4.7 Md. The isolate was susceptible to penicillin (0.12  $\mu$ g/mL) and cefotaxime (0.050  $\mu$ g/mL) and resistant to tetracycline (16  $\mu$ g/mL) and ciprofloxacin (4  $\mu$ g/mL) by the agar dilution method (4).

Final identification of the bacterium was achieved by sequencing the 16S rRNA gene. The primers pA 5'-AGAGTTTGATCCTGGCTCAG-3' and pH\* 5'-AAGGAGGTGATCCAG CCGCA-3' (Sigma-Genosys, Haverhill, England), as described by Edwards et al. (5), were used for amplification of 16S rRNA sequences. The PCR product was directly sequenced, and the nucleotide sequence matched the 16S rRNA gene of *N. gonorrhoeae* deposited in databases. The partial sequence of the 16S rRNA gene of *N. gonorrhoeae* determined in this study has been deposited in the European Molecular Biology Laboratory database under accession no. AM921674.

Neurologic manifestations of gonorrhea were observed as early as 1805 (6). However, the first well-documented case of gonococcal meningitis was not reported until 1922 (7) and so far, only  $\approx$ 24 cases have been reported since 1922. In the preantimicrobial drug era, disseminated gonococcal infection (DGI) predominantly affected men (78%) but now is seen most frequently in women (97%) (1).

Other studies have listed factors that may facilitate spread of asymptomatic gonococcal infection, such as pregnancy (1,8), menstruation, viral hepatitis, differences in virulence between strains of gonococci, and host immunologic differences. The role of immunosuppressive conditions such as alcoholism or pregnancy remains unclear (9).

Knapp and Holmes (10) reported that 89% of *N. gonorrhoeae* isolated from patients with DGI were AHU auxotypes; proline dependence was also associated with DGI. These isolates were prevalent in Scandinavia and areas of the United States (Pacific Northwest, Minnesota, Wisconsin) with large Scandinavian-heritage populations. Isolated frequently in the 1970s, these strains are rarely isolated now. In other geographic areas, particularly South America, isolation of this type of strain is unusual.

In the past, all isolates recovered from patients with meningitis were susceptible to penicillin and tetracycline. Strains highly susceptible to penicillin generally require AHU for growth (10). Nevertheless, in the antimicrobial drug era, an increase in strains with an intermediate susceptibility to penicillin and a less invasive nature has been detected. More recently, penicillin-resistant strains recovered from patients with DGI and arthritis have emerged.

Gonococcal meningitis is a milder disease than meningitis caused by the pneumococcus or meningococcus because 6 of 9 patients seen before 1938 who were not treated with antimicrobial drugs survived (10) with no reported relapses or major neurologic sequelae, as in this case. In summary, we report an infrequent case of gonococcal meningitis in a pregnant adolescent with good clinical evolution and without sequelae or complications in her pregnancy.

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### Letters

Letters commenting on recent articles as well as letters reporting cases, outbreaks, or original research are welcome. Letters commenting on articles should contain no more than 300 words and 5 references; they are more likely to be published if submitted within 4 weeks of the original article's publication. Letters reporting cases, outbreaks, or original research should contain no more than 800 words and 10 references. They may have 1 Figure or Table and should not be divided into sections. All letters should contain material not previously published and include a word count.

## Echinococcoses and Tibetan Communities

**To the Editor:** The People's Republic of China accounts for >500,000 cases of echinococcosis and more disability-associated life years (DALYs) lost because of this disease than any other world region (1,2). Hydatid cysts of *Echinococcus granulosus* (cystic echinococcosis [CE]), or the more pathogenic lesions with multiple vesicles caused by *E. multilocularis* infection (alveolar echinococcosis [AE]), usually grow slowly in the liver, so that severe illness and death may eventually occur in a high proportion of those with untreated infections (3,4). Apart from surgery, long-term anthelmintic therapy (>6 months) with the benzimidazole compound albendazole, although parasitostatic only, has a beneficial outcome in >50% of cases (5). To control the transmission of this zoonosis, veterinary public health measures must be emphasized (6).

In 2004 the Chinese Ministry of Health (MoH) undertook a nationwide assessment of 8 parasitic diseases, including malaria, schistosomiasis, and echinococcosis. To identify echinococcosis, 7 provincial MoHs carried out a mass abdominal screening of 34,500 persons using portable ultrasound scanners. The overall prevalence (2.5%) was highest in Tibetan communities in the Tibet Autonomous Region and in northwestern Sichuan and Qinghai Provinces (these latter regions form part of the eastern Tibetan Plateau). Collaborative studies involving the Sichuan Center for Disease Control and Prevention (based in Chengdu) and an international consortium of research institutes partly funded by the US National Institutes of Health (Bethesda, MD, USA) have shown an increasingly serious public health problem at the village, township, and county levels. In Shiqu County

of Ganze Tibetan Autonomous Prefecture, 414 (12.9%) of nearly 3,199 persons surveyed by ultrasound (with serologic confirmation) exhibited CE or AE, including 19% in this category (7). The effects of human echinococcosis are substantial, with >50,000 DALYs lost in a population of 63,000 in Shiqu County (8).

Despite increased urbanization in China, >70% of Tibetans still live as seminomadic pastoralists on the high grasslands at an altitude >3,500 m. Most Tibetan herdsman families keep at least 1 dog, and large numbers of ownerless stray dogs are tolerated by pastoralists and Buddhist monks. Risk factors for human echinococcosis (both CE and AE) in Tibetan communities usually include occupation, age (older persons are at higher risk), gender (higher risk for female), environment (pastoral landscapes), livestock ownership, and a history of dog ownership, as well as indicators of low socioeconomic status, including poor water quality and illiteracy (7,9). The prevalence levels of human AE in Ganze Tibetan Autonomous Prefecture (Sichuan Province) are among the highest recorded anywhere in the world. This situation presents a formidable challenge for early diagnosis, optimal affordable treatment, and prevention and control. Markham Hospital in Aba Tibetan Autonomous Prefecture (Sichuan) performed 1,200 operations for echinococcosis from 1992 through 2005, 20% for AE disease. For remote, high-altitude, pastoral Tibetan communities, however, long-term albendazole therapy is the only realistic treatment option, but regular follow-up of patients is difficult in these poorly accessible communities.

To address the public health concerns and consider options for controlling hydatidosis/echinococcosis in the eastern Tibetan Plateau, an International Workshop on Treatment, Prevention and Control of Echinococcosis was held in Chengdu in May 2006