

pose potential health risks, particularly to young children.

While California has reported more cases of baylisascariasis than any other state, few published studies have reported on the distribution and prevalence of this helminth in the region. In 2001, we conducted a study to determine the presence of *B. procyonis* in the Santa Barbara area by examining roadkill raccoons recovered by animal control staff and stored in a refrigerated facility. On examination, the digestive tract from the stomach to the rectum was removed and tested for *B. procyonis* worms and eggs. Of 26 raccoons examined, 24 (92%, 95% confidence interval 75%–99%) were positive for *B. procyonis* infection. *B. procyonis* worms were found in 85% of the animals examined and eggs were found in 73%. Pet food was frequently found (43%) in the stomach contents of examined raccoons, indicating that such food was made accessible to these animals, either intentionally or inadvertently by residents.

B. procyonis has been identified along the central coast of California, which expands the known range of this helminthic zoonotic agent. This finding, coupled with other published studies, indicates that *Baylisascaris* may be prevalent throughout the state (1,2). Although our study was based on a small sample of selected raccoons, the high infection rate is cause for concern and indicates the potential for human exposure. A presumptive case of *B. procyonis* infection in an 11-month-old child was reported in Santa Barbara in 2003 (1).

Determining the distribution and prevalence of *B. procyonis* is necessary to inform local healthcare providers, public health authorities, and the public of the potential risk. Using road-kill raccoons is a relatively easy method for quickly assessing the presence of *B. procyonis* in a community. Also, this approach avoids trapping and handling live animals

and allows stomach contents to be examined to determine where raccoons are feeding. Data from such assessments must be interpreted with caution, since they may not represent all raccoons in an area.

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Streptococcus iniae Discitis in Singapore

To the Editor: *Streptococcus iniae* is a well-recognized fish pathogen that can cause meningoencephalitis in tilapia and trout (1) and necrotizing myositis in red drum (2). We describe the first known human case of *S. iniae* infection in Singapore. This is the second report of spinal infection with this bacterium; however, commercial kits may misidentify *S. iniae*.

The first cases of *S. iniae* infection in humans were reported in Toronto, Canada, in 1995–1996 and included

eight patients with bacteremic hand cellulitis and one patient with endocarditis, meningitis, and arthritis (3). Two additional cases were discovered retrospectively, a patient in Ottawa, Canada, with septic arthritis of the knee and a patient from Texas with bacteremic cellulitis. At least two more strains have been isolated from patients in Vancouver, Canada (4). Recently, Lau et al. described two cases of infection in Hong Kong. The first patient had bacteremic cellulitis; the second is recognized as the first patient with *S. iniae* osteomyelitis of the spine (5).

A 73-year-old female Chinese healthcare worker was admitted on October 5, 2003, to Singapore General Hospital. Her symptoms were fever for 3 days before admission and lower back pain that had progressively worsened for the past 2 months, causing her to become bedridden. She was ambulatory before the back pain started and had no history of a fall or injury to the back.

Upon examination, the patient's temperature was 37.1°C. She did not appear septicemic and was hemodynamically stable. No evidence of cellulitis was found, and neurologic examination of the upper limbs showed no abnormalities. Movement and strength of both lower limbs were limited by pain. Reflexes and plantar responses were normal, and no focal tenderness over the spine was found; chest x-ray results were normal. Laboratory tests showed the following: leukocytes 12.91 x 10⁹/L, hemoglobin 9.9 g/dL, platelets 261 x 10⁹/L, serum albumin 20 g/L, bilirubin 17 μmol/L, alkaline phosphatase 132 U/L, alanine transaminase 16 U/L, and aspartate transaminase 23 U/L. Renal function tests were within normal limits. The erythrocyte sedimentation rate was 115 mm/h, and C-reactive protein was 88.4 mg/L. No bacteria were grown from blood cultures. Treatment with empiric intravenous cefazolin was started.

Magnetic resonance imaging (Figure) of the patient's lumbar spine revealed discitis and osteomyelitis at the L3/L4 level, with associated epidural and paravertebral abscesses. Anterior drainage of the abscesses and fusion with an iliac crest graft were performed on day 5 of hospitalization. Tissue samples obtained during this operation showed pus cells and gram-positive cocci. Cultures grew a β -hemolytic streptococcus which did not group with Lancefield groups A, B, C, D, F, or G antisera and was positive for pyrrolidonylarylamidase, negative for bile-esculin, and failed to grow in 6.5% NaCl. The API 20 Strep (bioMérieux, Marcy l'Etoile, France) identified the isolate as *S. dysgalactiae* subsp. *equisimilis* (profile number 4563117). Because *S. dysgalactiae* subsp. *equisimilis* are negative for pyrrolidonylarylamidase, we sequenced the 16S rRNA gene, which was identical to that of *S. iniae* ATCC29178 isolated in 1976 from a subcutaneous abscess of a captive Amazonian dolphin (6). The isolate was susceptible to penicillin, chloramphenicol, clindamycin, and vancomycin by antimicrobial disk diffusion tests (7).

The patient was asked specifically about exposure to fresh fish and other aquatic creatures before she became ill. She regularly prepared fresh fish bought from the local market and had sustained superficial cuts on her fingers before her back pain started. Though she did not recall any upper limb infection or previous septicemic episode, she likely had a transient bacteremia which spread to her lumbar spine.

The patient was given 2.4 g of intravenous penicillin every 4 hours for 6 weeks; she showed clinical improvement with decreasing erythrocyte sedimentation rate and C-reactive protein levels. At the time of discharge she was ambulatory with a walker.

Most confirmed cases of *S. iniae* infection to date have occurred in per-

sons of Asian, predominantly Chinese, ethnicity. This phenomena is thought to result from a cultural preference for fresh, whole fish in cooking. Although *S. iniae* infection in fish is often associated with aquaculture, human infection has not been noted in fish-farm workers. A decline in immune function may be important in pathogenesis since most cases reported have been in elderly persons (mean age 70 years, range 40–81 years) (5).

The diagnosis of *S. iniae* infection may be missed because commercial identification kits do not include *S. iniae* in their databases. The Hong Kong and Singapore isolates were identified by the API 20 Strep system as *S. dysgalactiae* subs. *equisimilis*, and some Canadian isolates were identified by the VITEK system (bioMérieux, Marcy l'Etoile, France) as *S. uberis* (3). This problem may be compounded because physicians who are not familiar with the infection would not question the patient about exposure to fresh fish.

Apart from *S. iniae*, few other β -hemolytic streptococci are pyrrolidonylarylamidase positive. β -hemolytic enterococci and *S. pyogenes* are groupable with antisera to Lancefield group D and A antigens, respectively, and are easily identified by routine laboratory methods (8). *S. porcinus* is a rare human pathogen resistant to bacitracin, which produces a positive CAMP reaction and may react with antisera to Lancefield group B antigen (9).

All β -hemolytic streptococci that are ungroupable by Lancefield antisera should be tested for pyrrolidonylarylamidase. If this test is positive, the patient should be questioned about exposure to fresh fish, and identification of the isolate should be confirmed by molecular means.

A retrospective review of laboratory records showed that we had isolated β -hemolytic streptococci nongroupable with Lancefield groups A, B, C, D, F, or G antisera only five



Figure. Magnetic resonance imaging scan of spine showing features compatible with discitis involving L3/L4 with surrounding paravertebral and psoas inflammation and epidural abscess.

times in the last 2 years. Most of these were from respiratory sources and unlikely to be *S. iniae*. Therefore, we believe that *S. iniae* infection in Singapore is uncommon. However, the geographic range of this emerging zoonosis is likely to increase as clinicians and microbiologists become more aware of this pathogen.

The 16S rRNA gene sequence for this isolate has been submitted to GenBank (accession number AY581891).

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Rubella Epidemic Strain, Greece, 1999

To the Editor: A recent extensive study on global distribution of rubella virus genotypes by Zheng et al. (1) showed that most of the isolates tested were rubella genotype I (RGI) and that subgenotypes within RGI were

apparent. Of these subgenotypes, three were currently active, one in the United States and Latin America, one in China represented by two specimens, and one international subgenotype that originated in Asia and spread to Europe and North America. More RGI subgenotypes, which have not yet been identified in specimen collections, may be currently active. In Zheng, et al. the distribution of rubella subgenotypes is shown; Greece is one of the four European countries where only RGI viruses were found. This letter provides more information about rubella in Greece and the strain that was responsible for the 1999 epidemic there.

Rubella virus is endemic in Greece. Vaccination in the private sector only was introduced in 1981 with a monovalent rubella vaccine. In 1989, a single dose of the measles-mumps-rubella (MMR) vaccine was introduced in the national vaccination program for 15-month-old infants. Because of the rubella outbreak of 1993, the vaccination policy changed. In 1997, a second vaccination was recommended for 11- to 12-year-old children. However, another major rubella epidemic occurred in 1999, beginning in late December 1998 and lasting until May 1999, with a peak in the number of cases in January. During this period, 1,438 rubella cases were reported throughout Greece; 765 were in the northern part of the country. In previous rubella epidemics in Greece, children were most affected. However, in the 1999 epidemic, a higher incidence rate was observed mostly among 15- to 19-year-old persons (2). During this epidemic, four cases of congenital rubella syndrome were reported. Because of this epidemic, the vaccination policy was revised. The new policy consists of two doses of the MMR vaccine, one to be given at 15 months of age and another to be given at 4-6 years of age (3).

During the 1999 epidemic, oral samples were collected from patients

within a week of the onset of symptoms. Most of the samples were sent to Colindale, London, for testing; a few of them were stored at -70°C in our laboratory at the School of Medicine, Aristotle University of Thessaloniki, Thessaloniki, Greece. In 1999, four universities in the United Kingdom reported cases of rubella infection. Greek students were attending all of these universities; the students had spent the Christmas holidays in Greece and then returned to the United Kingdom. The U.K. rubella strains were identical to those of the Greek epidemic strain (4). We amplified and sequenced a 143-bp segment of the E1 gene by using reverse transcription-nested polymerase chain reaction from the samples stored in our laboratory (5). All 10 samples tested contained very similar or identical sequences, so we used one of them as the epidemic rubella strain. Comparing the Greek strain (Thess1/GRE99, accession no. AY540614) with rubella sequences taken from GenBank, we found that it belonged to the international (1997-2000) rubella RGI subgenotype. Although the genome region tested was short, the Greek rubella strain was highly homologous to the strains isolated from Germany in 1999 (G432/GER99, accession no. AF551761) and from Italy in 1997 (6423/PV/ITA97, accession no. AY161374). However, the Greek strain had a genetic difference of approximately 5% from strains isolated from Italy (4844/ITA93, accession no. AY161364), the United Kingdom (DNY/UNK93, accession no. AF039131) in 1993, and Germany (D075/GER92, accession no. AF039118) in 1992 and (G696/GER98, accession no. AY326342) in 1998. We also found that the Greek strain differed by 6% from the RA27/3 vaccine strain, predominantly used for RGI.

Zheng et al. (1) showed that the RGI-ITA97 genotype strain was