

milder than the 1996 outbreak, with less illness and death; most patients had uncomplicated dengue fever, and only a few had DHF/DSS. Of the 874 serum samples that we tested, 456 (52.3%) were positive for dengue-specific immunoglobulin M antibodies by enzyme-linked immunosorbent assay (Panbio, Sinnamon Park, Queensland, Australia), and more than one third of these were from patients in the 21- to 30-year age group (8).

Dengue virus types 1, 2, and 3 have all been isolated during previous dengue outbreaks in Delhi, but a particular type has always predominated. During the 1996 outbreak of DHF/DSS, we had 26 isolates of dengue virus type 2, but only 1 isolate was identified as dengue type 1 (5). However, we subsequently showed that dengue virus type 1 continued to circulate during the postepidemic period and became the predominant strain (9). Dengue virus type 3 has recently reemerged in South Asia, including north India (10). We now report this culture-confirmed outbreak of dengue from Delhi, during which the simultaneous transmission of all 4 dengue virus types has been demonstrated for the first time in India, with no particular type predominating. This finding suggests that dengue is now truly endemic in this region.

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Borrelia burgdorferi and *Anaplasma phagocytophilum* Coinfection

To the Editor: In central Europe, *Anaplasma phagocytophilum* and *Borrelia burgdorferi* are transmitted by the hard tick *Ixodes ricinus* (1). Acute human granulocytic ehrlichiosis (HGE) caused by *A. phagocytophilum* has rarely been documented in Europe (2). Typical symptoms include fever, headache, myalgia, leukopenia, thrombocytopenia, and abnormal liver function test results. The serologic prevalence ranges from 1.9% to 14% in Germany (1), while clinically apparent infections of HGE have not been reported.

Acute Lyme borreliosis in Europe is associated with erythema migrans (3), recognized in up to 90% of patients (4). Erythema migrans may be accompanied by systemic symptoms such as fever, fatigue, myalgia, arthralgia, headache, or stiff neck (3,4). In southern Germany, an incidence of 111 per 100,000 inhabitants has been reported (4).

A 60-year-old woman from northern Germany was admitted with temperature of $\leq 40^{\circ}\text{C}$, headache, myalgia, and generalized weakness that had begun 6 days earlier. She had noticed an erythema migrans on her right thigh 4 days before she sought treatment. At admission, a tender, 5×8 cm rash and a central papule were seen, but without central clearing. The clinical examination was otherwise normal. Three weeks earlier she had been on a trekking tour in Austria and Slovenia but had not been aware of any tick bites.

The leukocyte count was $3,030/\mu\text{L}$ (normal 4,000–9,000), with 65% neutrophils, 24% lymphocytes, 10% monocytes, and 1% lymphoid cells. The following results were observed: platelets $127,000/\mu\text{L}$ (normal 150,000–450,000), aspartate aminotransferase

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108 U/L (normal <31), alanine aminotransferase 154 U/L (normal <34), gamma-glutamyl transferase 98 U/L (normal <38), lactate dehydrogenase 317 U/L (normal <247), alkaline phosphatase 314 U/L (normal <237), direct bilirubin 4.7 $\mu\text{mol/L}$ (normal <3.4), C-reactive protein 132 mg/L (normal <5), and neopterin 30 nmol/L (normal <10). All other routine laboratory parameters were normal.

May-Grünwald-Giemsa (Fluke, Neu Ulm, Germany)-stained whole-blood smears did not show *Anaplasma* initially and during follow-up. On admission serum antibody tests were negative for *A. phagocytophilum*, *B. burgdorferi*, hepatitis A, B, and C, human herpes virus 6, herpes simplex virus 1 and 2, Epstein-Barr virus, cytomegalovirus, and tick-borne encephalitis virus. Because Lyme borreliosis and possible HGE were suspected, the patient was treated with oral doxycycline 200 mg once daily for 3 weeks. Within 4 days after initiation of treatment, the patient recovered completely; thrombocytes and leukocytes had normalized. Liver enzyme levels were still elevated but had normalized at a follow-up examination 28 days later.

Four days after the initial examination, results for *Borrelia*-specific immunoglobulin M (IgM) antibodies were positive, while results for IgG antibodies remained negative (Table). Four weeks after the onset of symptoms, a test for *A. phagocytophilum*-specific IgM antibodies was positive and IgG was negative thereafter

(Table). An initial EDTA blood sample that was stored frozen and examined retrospectively as well as follow-up EDTA blood samples were negative for *A. phagocytophilum* in a polymerase chain reaction (PCR) assay.

One year after initial examination, results for *Borrelia*-specific IgM antibodies were positive and results for *A. phagocytophilum*-specific antibodies were negative (Table). Although HGE has not been reported in Germany, a coinfection with *B. burgdorferi* and *A. phagocytophilum* should be considered in patients with erythema migrans and atypical changes for Lyme borreliosis such as fever, leukopenia, thrombocytopenia, and elevated liver function test results.

The patient had traveled to an area where both tickborne pathogens, *A. phagocytophilum* and *B. burgdorferi*, were endemic. Erythema migrans and antibody follow up suggested Lyme borreliosis. High fever, leukopenia, thrombocytopenia, and elevated liver enzyme levels indicated HGE. *Anaplasma* PCR was negative, possibly because blood samples were tested retrospectively after 3 months of storage at -20°C . However, a commercially available indirect fluorescent antibody assay was able to demonstrate seroconversion of HGE-specific IgM antibodies 1 month after the initial onset of symptoms. According to manufacturer's information, specificity ranged from 97.5% to 100%; sensitivity was 71.4% at 60 days after *A. phagocytophilum* infection. *A. phagocytophilum* IgG anti-

bodies were not detected during follow-up, likely because of prompt treatment with doxycycline.

Wormser et al. (5) suggested that *Borrelia*-specific antibodies might indicate false-positive results in patients with HGE infection. Our case, however, meets criteria of a newly acquired infection with *B. burgdorferi* sensu lato, with an erythema migrans and seroconversion of *Borrelia*-specific IgM antibodies.

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Table. Results of serologic tests at diagnosis and during follow-up*

| Time (d) after onset of symptoms | <i>Anaplasma (Ehrlichia) phagocytophilum</i> (IFA)† | | <i>Borrelia burgdorferi</i> (ELISA)‡ | | <i>Borrelia burgdorferi</i> (Immunoblot)§ | |
|----------------------------------|---|------------------|--------------------------------------|----------|---|----------|
| | IgM | IgG | IgM | IgG | IgM | IgG |
| 6 | Negative (<1:20) | Negative (<1:32) | Negative | Negative | Negative | Negative |
| 10 | ND | ND | Positive | Negative | ND | ND |
| 28 | Positive (1:40) | Negative (1:32) | Positive | Negative | Positive | Negative |
| 107 | Positive (1:20) | Negative (<1:32) | Positive | Negative | Positive | Negative |
| 380 | Negative (<1:20) | Negative (<1:32) | Equivocal | Negative | Positive | Negative |

*Symptoms (fever, headache, myalgia) started 6 days before presentation. IFA, immunofluorescent assay; ELISA, enzyme-linked immunosorbent assay; Ig, immunoglobulin; ND, not done.

†Genzyme Virotech, Germany. Positive titers: IgM $\geq 1:20$, IgG $\geq 1:64$.

‡Behring, Germany.

§In-house Immunoblot, Max von Pettenkofer-Institut, Munich, Germany.

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Corynebacterium pseudogenitalium Urinary Tract Infection

To the Editor: A 64-year-old man was admitted to the urology department of Cochin Hospital in Paris, France, for acute urinary retention. He had a history of recurrent urolithiasis and undocumented urinary tract symptoms. At admission, a urethral catheter was inserted, and a plain radiograph showed 2 bladder stones and milk of calcium calcifications. Three days later, he underwent extracorporeal shock wave lithotripsy treatment, and empiric antimicrobial drug therapy with intravenous ceftriaxone, 1 g/day for 3 days, was administered. Three consecutive urinalyses showed a pH of 9, crystals of struvite, hematuria, and 10^5 leukocytes/mL. Gram-positive rods with rounded ends and nonparallel sides, arranged in palisades or in V shapes, were observed, which suggested the presence of corynebacteria. Urine cultures were positive and yielded a pure culture of 10^5 CFU/mL of *Corynebacterium* spp.

The isolated strain showed slight growth after 24 or 48 h of incubation on horse blood agar medium but abundant growth on the same medium

containing 1% Tween 80 under aerobic conditions (5% CO₂). Colonies were white, opaque, smooth, convex, and nonhemolytic. This lipid-requiring strain was catalase positive and strongly urease positive. Testing with the API-Coryne strip (bioMérieux, Marcy l'Etoile, France) showed that the strain was nitrate-reduction positive and produced acid from glucose, ribose, sucrose, and maltose. However, this strain, which was designated CCH052683, did not hydrolyze gelatin or esculin. It was identified as *Corynebacterium* group F1 (the corresponding numeric profile of the gallery API-Coryne was 3001325).

The strain was correctly identified to the species level as *Corynebacterium pseudogenitalium* by using polymerase chain reaction and sequencing 16 rRNA as previously described (1,2). Comparison of 785 nucleotides (546-1,331) gave a 16S rDNA similarity value of 99.9% between the sequences of the isolated strain and *C. pseudogenitalium* ATCC 33039/NCTC11860 (European Molecular Biology Laboratory accession no. X81872).

The strain was sensitive to penicillin, ampicillin, gentamicin, rifampin, vancomycin, teicoplanin, tetracycline, sulfamethoxazole, trimethoprim, fusidic acid, ciprofloxacin, and norfloxacin and resistant to erythromycin, lincomycin, and nitrofurantoin. Ceftriaxone was replaced by norfloxacin (400 mg twice a day) for 1 month. The patient improved and remained healthy 6 months after therapy.

Nondiphtheric corynebacteria are of increasing importance. They have been observed in human specimens, and many new taxa of coryneform bacteria have been described (3). Interest in their taxonomy is increasing, and molecular, phenotypic, and biochemical analyses have resulted in the reclassification of this genus (3). *C. pseudogenitalium* was described in

1979 by Furness et al. (4) for lipophilic corynebacteria isolated from urinary tract and was not considered a pathogen, in contrast to *C. genitalium*. However, these 2 species were not included in the official list of recognized species.

C. pseudogenitalium was divided into 5 types based on biochemical patterns, and strains of the type C-5 were differentiated from other types on the basis of urease production. The biochemical and physiologic characteristics of this C-5 type were similar of those of the coryneform group F-1 described by the Centers for Disease Control and Prevention (CDC). In 1995, a comprehensive study on lipophilic corynebacteria demonstrated by DNA-DNA hybridization the similarity between a reference strain of *C. pseudogenitalium* type C-5 and reference strains of the CDC coryneform group F-1 (1). The CDC group F-1 make up 2 genomic groups at the species level. As shown by 16S rDNA gene comparisons, isolate CCH052683 belongs to the genomic group, including a reference strain of *C. pseudogenitalium* type C-5 ATCC 33039 (CCUG 27540, sequence X81872) and a reference strain of CDC group F-1 (CDC G4330, sequence X81905) (Figure). The other genomic group of CDC group F-1 is represented by strain CDC G5911 (sequence X81904). The molecular genetic investigations identified our isolate as *C. pseudogenitalium* and placed it in 1 of the 2 genomic groups of CDC group F-1, which cannot be differentiated by biochemical tests (1).

The pathogenicity of this bacterium was associated with strong urease activity. This activity is similar to that of other urease-positive microorganisms, such as *C. urealyticum* and *Proteus* spp. (5,6), which infect the urinary tract. Unfortunately, the bladder stones were not analyzed after extracorporeal shock wave lithotripsy treatment. The *C. pseudogenitalium*