Le Infezioni in Medicina, n. 2, 111-114, 2007

Casi clinici

Case reports

Human meningitis caused by *Streptococcus suis*: the first case report from north-eastern Italy

Un caso di meningite da Streptococcus suis *nell'uomo: primo case report dal Nord Est d'Italia*

Alessandro Camporese[1], Gianni Tizianel[1], Graziano Bruschetta[1], Barbara Cruciatti[2], Angelo Pomes[2]

[1]Unità Operativa di Microbiologia Clinica e Terapia Antibiotica, Azienda Ospedaliera S. Maria degli Angeli, Pordenone, Italy
[2]Unità Operativa di Neurologia, Azienda Ospedaliera S. Maria degli Angeli, Pordenone, Italy

INTRODUCTION

Streptococcus suis, an important pathogen of pigs, is endemic in most pig-rearing countries of the world. In pigs, the natural habitat of *Streptococcus suis* is the upper respiratory tract, particularly the tonsils and nasal cavities, as well as the genital and alimentary tract [1]. Pig-to-pig spread is mainly by nose-to-nose contact or by aerosol over short distances. *Streptococcus suis* is a Gram-positive, facultatively anaerobe coccus, possessing cell wall antigenic determinants related to Lancefield group D, although it is genetically unrelated to other members of this group. During the last years, 26 new capsular types or serotypes have been described, reaching a total of 35 serotypes in 1995 [2].
Of them, serotype 2 is the most frequent serotype recovered from diseased pigs and is the cause of serious infections in humans, especially in people in close contact with swine or pork products [3, 4].
The association between human infection and contact with pigs has been noted since the discovery of the disease and is thought to occur mainly via cuts or abrasions (including minor abrasions) when handling infected carcasses, but infection via ingestion or through mucous membranes - such as the conjunctiva - has been suspected in some cases [4, 5].
Human infection with *Streptococcus suis* is rarely reported from the world literature. The first human cases of *Streptococcus suis* infection were reported in 1968 in Denmark and only one case was reported in Italy in 1995 [5, 6]. Human infection may be severe, with meningitis, septicaemia, endocarditis, and deafness.
Meningitis remained the most common presentation of infection, followed by sepsis, which had a higher mortality rate, particularly for splenectomized patients. Deafness is a distinct sequelae after recovery from *Streptococcus suis* infection, especially in patients with meningitis [5]. On August 2005, the Ministry of Health in China has reported 206 cases of human disease associated with an outbreak of *Streptococcus suis* in pigs. Of these human cases, 38 have been fatal [7].

CASE REPORT

Here we describe one case of *Streptococcus suis* meningitis diagnosed and treated at S. Maria degli Angeli Hospital in Pordenone, a city located in the North-East of Italy. As far as we know, this is the second case of *Streptococcus suis* meningitis reported from Italy and the first one from the North East of Italy. A 30-year-old man working as butcher at a local meat processing factory was admitted to our hospital, because suffered from high fever with chills and headache the day before.
At admission, temperature was 37°C, blood pressure 120/80, pulse rate 70 beats/min. Phys-

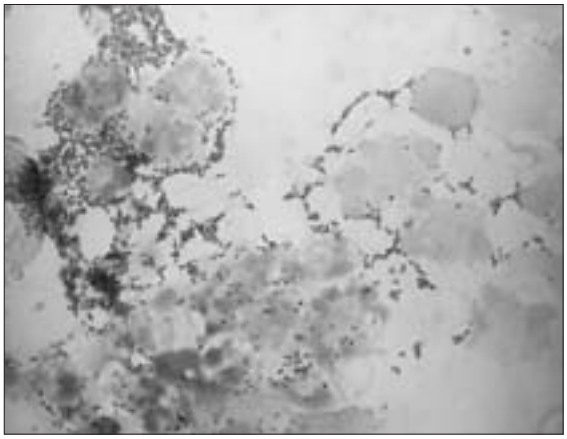

Figure 1 - Patient CFS Gram stain showed numerous polymorphonuclear leucocytes with Gram positive diplococci.

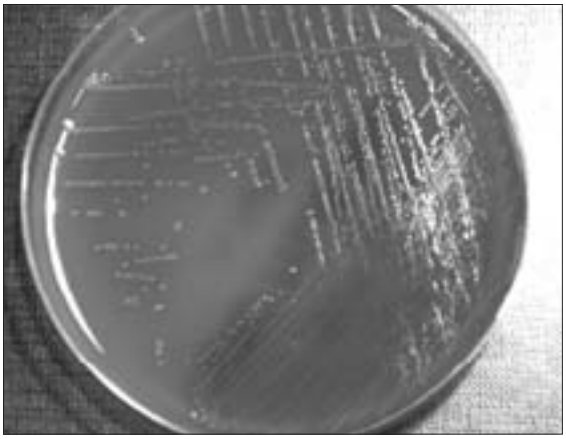

Figure 2 - Gray-whitish, alfa-hemolytic colonies of *Streptococcus suis* on Trypticase soy agar supplemented with 5% sheep blood.

ical examination revealed neck stiffness, photophobia, headache, decreased consciousness, Kernig's sign and remarkable agitation. Bacterial meningitis was immediately suspected. After a lumbar puncture for cerebrospinal fluid (CSF) examination, 2 g ceftriaxone, 500mg levofloxacin and 10 mg desametasone i.v. were administered immediately.

Laboratory data showed white blood cell count $32.7x10^3$/microl (neutrophils 29,43 x 10^3/microl); the other serum parameters were within the normal range.

A chest X-ray, a CT scan and MRI with mdc of the brain were also normal. The CSF was turbid and revealed neutrophil-predominant pleocytosis (310/microliter PMN), with elevated CFS protein concentration (533 mg/ml), and low glucose concentration (11 mg/dl). CFS microscopic examination demonstrated numerous polymorphonuclear leucocytes and Gram-positive diplococci (Figure 1). *Streptococcus pneumoniae* meningitis was suspected and the antibiotic treatment with ceftriaxone (2 g i.v. every 12 h) and levofloxacin (500 mg i.v. every 12 h) was continued.

The isolate grew well and fast in culture (only 15 hours after lumbar puncture), was catalase-negative and showed gray-whitish colonies of alfa-hemolysis, like viridans group streptococci, on Trypticase soy agar supplemented with 5% sheep blood (KIMA, Italy) in 5% CO2 and ambient air at 35°C (Figure 2). Phenotypic reaction profile obtained with the API Rapid ID32 Strep system (bioMerieux, France) demonstrated a biotype profil 33072041110, with *Streptococcus suis* II identity accordance of 99,8% (Table 1).

Vitek2 GPI Card (bioMerieux, France) was not able to identify the isolate. At this point, a more detailed patient's history, as well as in other cases reported to date [10], revealed close contact without gloves with unprocessed pork meat about 24 hours before clinical events, and physical examination revealed little abrasions on the hands.

Antimicrobial susceptibility testing was performed by Kirby Bauer disc diffusion method, using Mueller-Hinton Agar II supplemented with defibrinated sheep blood (Becton Dickinson, USA). E-test (AB Biodisk, Sweden) was performed only for beta lactams. All antimicrobial agents tested (penicillin, cefotaxime,

Table 1 - Phenotypic reaction profiles obtained with the API Rapid ID32 Strep system (bioMerieux, France). Biotype profil 33072041110: *Streptococcus suis* II identity accordance of 99,8%.

ADH+	GLU+	GAR-	GUR+	GAL+	PAL-	RIB-	MAN-
SOR-	LAC+	TRE+	RAF+	VP-	APPA+	GAL-	PYRA-
NAG-	GTA-	HIP-	GLYG-	PUL+	MAL+	MEL-	MLZ-
SAC+	LARA-	DARL-	MDG+	TAG-	MAN-	CDEX-	URE-

imipenem, levofloxacin, vancomycin and macrolides/lincosamides) were susceptible. Based on the *in vitro* susceptibility testing, on the third day of hospitalization levofloxacin was suspended and antibiotic treatment continued only with ceftriaxone monotherapy (2 g i.v. every 12 h).
Patient's condition gradually improved and 10 days after all abnormalities disappeared and patient was discharged without sequelae and under a stable condition, after a sterile follow-up lumbar puncture, without evidence of infection. No deafness was demonstrated by brainstem auditory evoked potentials.

DISCUSSION

Streptococcus suis infection has been considered a zoonotic occupational disease since its discovery. The most important risk factor in acquiring the infection is contact with pigs or uncooked pig products, typically farmers, veterinary personnel, abattoir workers and butchers. This case demonstrates that *Streptococcus suis* should be seriously considered in the differential diagnosis of human meningitis especially in adults with a recent history of close contact with pigs or unprocessed pork meat.
Because not all commercial identification systems for streptococci could offer adequate speciation for *Streptococcus suis*, when viridans group streptococci are isolated from patients with meningitis and sepsis, adequate identification systems should be available, and prompt and correct identification of isolates to the species level should be performed, especially in areas with a high prevalence of *Streptococcus suis* disease or in patients who demonstrated an occupational exposure to swine and pork. Prevention of the disease in humans depends upon control in pig populations: this presents a difficult challenge to veterinary authorities and the pig industry.
In fact, because of the non-availability of suitable immunoprophylaxis, control of *Streptococcus suis* infection depends mainly on the use of antimicrobials, but neither vaccination nor therapy of all animals will eliminate it.
Prevention through public health surveillance is important and awareness should extend to everyone who have an occupational exposure to swine and pork and to everyone who prepares and cooks pork, including those doing so in their homes. Those with open wounds should wear gloves when handling raw or uncooked pork, and all those who prepare pork should wash their hands and clean their utensils thoroughly after preparation.

Key Words: *Streptococcus suis*, meningitis, case report

SUMMARY

We describe the first case of *Streptococcus suis* meningitis in the north-east of Italy. We would like to stress that *Streptococcus suis* should be seriously considered in the differential diagnosis of human meningitis especially in adults with a recent history of close contact with pigs or unprocessed pork meat.

RIASSUNTO

Viene descritta la prima segnalazione nel Nord Est d'Italia di un caso di meningite nell'uomo da Streptococcus suis.
Questo agente eziologico deve essere seriamente sospettato nella diagnosi differenziale di meningite ogni qualvolta ci si trovi di fronte a un paziente con una anamnesi di recenti contatti con maiali o prodotti della loro macellazione.

REFERENCES

[1] Kopic J., Paradzik M.T., Pandak N. *Streptococcus suis* infection as a cause of severe illness: 2 cases from Croatia. *Scand. J. Infect. Dis.* 34, 683-684, 2002.

[2] Gottschalk M.., Higgins R., Jacques M., Mittal K.R., Henrichsen J. Description of 14 new capsular types of *Streptococcus suis*. *J. Clin. Microbiol*. 27, 2633-2636, 1989.

[3] Higgins R., Gottschalk M. Streptococcal diseases. In: *Diseases of Swine* (Straw, B.E., D'Allaire, S., Mengeling, W.L., Taylor, D.J., Eds) 1999, pp 563-570. Iowa State University Press, Ames.

[4] Gottschalk M.. Porcine *Streptococcus suis* strains as potential sources of infection in humans: an underdiagnosed problem in North America? *J. Swine Health Prod.* 12, 197-199, 2004.

[5] Perch B., Kristjansen P., Skadhauge K. Group R streptococci pathogenic for man: two cases of meningitis and one fatal case of sepsis. *Acta Pathol. Microbiol. Scand.* 74, 69-76, 1968.

[6] Perseghin P., Bezzi G., Troupioti P., Galina M. *Streptococcus suis* meningitis in an italian blood donor. *Lancet* 346, 1305-1306, 1995.

[7] Huang Y.T., Teng L.J., Ho S.W., Hsueh P.R. *Streptococcus suis* infection. *J. Microbiol. Immunol. Infect*. 38, 306-313, 2005.

[8] Outbreak associated with *Streptococcus suis* in pigs in China. WHO update. Available from: http://www.who.int/en/

[9] Gottschalk M., Higgins R., Bourdreau M. Use of polyvalent coagglutination reagents for serotyping of *Streptococcus suis*. *J. Clin. Microbiol.* 31, 2192-2194, 1993.

[10] Mazokopakis E.E., Kofteridis D.P., Papadakis J.A., Gikas A.H., Samonis G.J. First case report of *Streptococcus suis* septicaemia and meningitis from Greece. *Eur. J. Neurol.* 12, 486-489, 2005.