NORFLOXACIN NICOTINATE IN THE TREATMENT OF PSEUDOMONAS AERUGINOSA INFECTION IN THE GENITAL TRACT OF A BULL

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ABSTRACT

Consecutively collected semen samples from a breeding bull were found to be contaminated with Pseudomonas aeruginosa. Palpation through the bull's scrotum revealed inflammatory changes suggestive of chronic orchiepididymitis in one testicle. For 10 months, all the bull's 13 ejaculates were discarded because the post-thaw viability was <20%. Norfloxacin nicotinate was injected intramuscularly into the bull at 5 mg/kg daily for 7 days. Serum and semen samples were collected at 24-h intervals during the course of treatment and afterwards and were assayed for NFN concentrations. Drug concentrations in the semen, by microbiological assay, during treatment and up to 120 h after the last treatment ranged from 2.6 to 5.1 µg/ml, 14.2 to 43.2 times the corresponding serum drug levels. P. aeruginosa was not isolated from the semen 4 or 15 days after the last injection but was re-isolated after 32 and 64 days. A second similar course of NFN was administered and P. aeruginosa was not isolated from semen samples collected on four occasions, 6, 22, 44 and 94 days after the last treatment.

Keywords: antibiotic, bull, orchitis, epididymitis, norfloxacin nicotinate, Pasteurella aeruginosa, testicle, semen, serum, treatment

Abbreviations: HPLC, high-pressure liquid chromatography; IM, intramuscular; MIC, minimal inhibitory concentration; NFN, norfloxacin nicotinate

INTRODUCTION
Bacterial diseases of the genital system comprise one of the factors associated with depressed reproductive performance.

While the prevalence of the major diseases of reproduction in the bovine has been reduced in some countries, improvement has been matched by a growing importance of other bacteria, some non-specific, as a cause of reproductive disorders (Eaglesome and Garcia, 1992). Microorganisms may be present in bull semen and may be transmitted to cows during natural or artificial breeding, possibly leading to the development of genital diseases. Often these organisms may be non-pathogenic, while some are opportunistic pathogens, such as Pseudomonas aeruginosa, Actinomyces (Corynebacterium) pyogenes, Streptococcus and Staphylococcus spp., coliforms, and certain anaerobes, moulds and yeasts (Eaglesome et al., 1992). We describe here our experience in treating a P. aeruginosa genital tract infection in a bull with norfloxacin, an antibacterial fluoroquinolone recently introduced into veterinary medicine.
METHODS AND MATERIALS

The bull was located in one of the two artificial insemination centres in Israel. It was 4 years old and had 2.5 years of service before it was noticed that one testicle was enlarged. Although libido appeared normal, palpation through the bull's scrotum revealed extensive changes indicative of chronic orchiepididymitis. Routinely conducted microscopical examinations of the semen 13 times during 10 months required the semen to be discarded each time because the post-thaw viability was <20%. Before collecting samples of ejaculates for bacteriological culture, the underside of the bull was washed, the hair about the penis was clipped and the preputial cavity was doused with sterile water and then thoroughly dried. The penile sheath was then disinfected with 70% ethanol. These procedures have been reported (Gunsalus et al., 1941) to result in at least a tenfold reduction in the bacterial counts from bull semen. The ejaculation was collected using conventional aseptic procedures. Semen collection was performed by rectal massage 10 min after intravenous administration of 5 ml Combelen (Bayer AG, Leverkusen, Germany) to cause prolapse of the penis. Freshly collected refrigerated semen samples, without antibiotics or extender, were presented for bacteriological culture, which was usually performed on the day of collection or after overnight storage at -20°C.

Semen samples were plated on 5% sheep blood agar and Mackonkey agar (Difco, Detroit, MI, USA), both undiluted and diluted 1:20 with sterile saline solution. The incubated plates were examined for typical colonies. Colonies suspected of being P. aeruginosa were identified by standard procedures (Gilardi, 1991). If growth did not occur, the diluted semen was incubated overnight at 37°C and then plated on cetrimide agar. This procedure usually results in more isolations than direct plating. Antibiotic sensitivity testing (Bauer et al., 1966) of the P. aeruginosa isolated from semen indicated resistance to all antimicrobial drugs available for veterinary use, with the notable exception of polymyxin B, colistin and the fluoroquinolones norfloxacin and enrofloxacin tested. The minimal inhibitory concentration of norfloxacin for the P. aeruginosa isolates was determined by the agar dilution procedure (Jones et al., 1985).

After a diagnosis of intrinsic P. aeruginosa infection had been established from the results of the bacteriological culture tests on consecutively collected semen samples (Table I), a course of intramuscular norfloxacin nicotinate was administered. The product used was QuinAbic (Abic Ltd, Pharmaceutical & Chemical Industries, Netanya, Israel), available as a sterile aqueous solution of 14% NFN, equivalent to 10% norfloxacin base. Deep IM injections were given in the lower 1/3 neck area once daily for 7 consecutive days at a dose equivalent to 5 mg norfloxacin base/kg per day, alternating between the left and the right lateral neck regions. A second, similar IM course of NFN treatment was given commencing 45 days after the first course. A 10-day course had originally been planned to optimize therapeutic success but treatment was discontinued after the seventh day because clinical signs suggesting indigestion and excessive swelling of the injection site developed. The bull was clinically normal 3–4 days after the end of each course of treatment.

Samples of semen and jugular vein blood were collected immediately before the first treatment, 24 h after the first, third and sixth treatment, and 48, 120 and 360 h after the last (seventh) treatment (Table I). The concentrations of norfloxacin in the serum and semen samples were determined by microbiological assay (Shem-Tov et