

Ophthalmia Neonatorum in Kittens Associated to *Staphylococcus simulans* in Khartoum State, Sudan: A Case Report

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Abstract: This case reported the type of the bacterium associated with ophthalmia neonatorum in kittens in Khartoum. Twenty-five-day-old three domestic kittens were admitted to the Veterinary Teaching Hospital, Faculty of Veterinary Medicine, University of Khartoum for consultation because they could not open their eyes even after the elapse of the period in which the eyes had been expected to open. The clinical examination of the kittens revealed an elevated rectum temperature, increased respiratory and heart rates, swollen eyes and bilateral purulent ocular discharges. The manual separation of the upper and lower eyelids in each kitten revealed the presence of a chemosis and a congestion of the conjunctivae. Two samples were collected from each kitten using ophthalmic swabs. After the retrieval of the sample materials, the kittens were treated using oxytetracycline ophthalmic ointment and oxytetracycline injectable solution. The samples were subjected to microbiology examinations. Coagulase-negative *Staphylococcus simulans* bacteria were isolated from all collected samples. The isolated bacteria were subjected to susceptibility tests to antimicrobial drugs and they were found sensitive to the most used drugs including tetracycline and novobiocin and resistant to bacitracin. Two affected kittens responded satisfactorily to the selected treatment and one of them did not respond. In conclusion, it may be proposed that *Staphylococcus simulans* may associate ophthalmia neonatorum in kittens in Sudan and the bacterium can be suggested as the causative agent to this condition.

Key words: Ophthalmia Neonatorum • *Staphylococcus simulans* • Kittens • Khartoum

INTRODUCTION

Ophthalmia neonatorum (ON) is an infection of the conjunctiva (The thin layer of the tissue that lines the eyelids) or cornea (The transparent structure that makes up the front part of the eye). It occurs before or just after the opening of the eyelids in kittens, usually during the first 10 to 14 days of life. The eyelids of the normal kittens remain fused for 4-12 days post-partum. Ophthalmia neonatorum can be extremely serious and earlier intervention is necessary. The condition is often seen associated with feline herpes virus-1 and *Staphylococcus spp.* [1]. There is no available published data (Up to our knowledge) which has documented the association of ON with *Staphylococcus simulans* (*S. simulans*) or *Staphylococcus felis* (*S. felis*) bacteria. However, the correlation between conjunctivitis in adult cats and

S. simulans and *S. felis* bacteria has been reported [2]. *Staphylococcus simulans* and *S. felis* are coagulase-negative staphylococci and they have the similar phenotypic characteristics except for that *S. felis* is sensitive to bacitracin and *S. simulans* is resistant to this antibiotic [3]. *Staphylococcus simulans* and *S. felis* have been reported as the causative agents of many diseases in humans [4-6] however, *S. simulans* is occasionally found in healthy humans [7]. In cats, *S. simulans* and *S. felis* normally inhabiting many sites of the cat body including the conjunctivae [2, 8-10] but due to predisposing factors such as concurrent infections, these bacteria may become potential pathogens and cause serious infections in cats [11]. In this aspect, *Staphylococcus felis* and *S. simulans* have been recognized as possible pathogens to urinary tract in cats [12] thus, the infection of birth canal of the mother at the

time of birth and unclean environment may predispose the kittens to ON. As the transmission of *S. simulans* and *S. felis* from animal to human has been suggested [7] thus, the importance of this case comes from the probable transmission of such pathogens between cats, owners and veterinary staff. Data on the field of pet medicine as general and cat ophthalmology in particular is scanty in Sudan (Up to our knowledge), therefore, the report of this case might add a merit to the field of pet medicine and cat ophthalmology.

Case History: Twenty-five-day-old three domestic kittens which were born in one litter were admitted to the Veterinary Teaching Hospital, Faculty of Veterinary Medicine, University of Khartoum in the year 2015 for consultation because they could not open their eyes even after the elapse of the period in which the eyes had been expected to open.

Handling of the Case: At the Veterinary Teaching Hospital, General and special clinical examinations to the three kittens were carried out. Rectum temperature, Respiratory and heart rates for each kitten were assessed and the results were recorded. The upper and lower eyelids in each kitten were manually separated and the eyes were opened and clinically were examined. The findings were recorded. Two samples were collected from each kitten (One sample from each eye) using eye swabs and the samples were immediately sent to the Microbiology Laboratory, Faculty of Veterinary Medicine, University of Khartoum. After the retrieval of the sample materials, the discharges and debris which were found on the outer skin of the eyes and on the surface of the face in each kitten were cleaned away using a warm solution of 0.9% sodium chloride (Normal saline), then a solution of 2% boric acid was applied to rinse the eyes and the outer skin of the eyes. Immediately, after the rinsing, the three cases were treated using an ophthalmic ointment of oxytetracycline in a concentration of 5% which was applied topically two times a day for 5 days in both eyes and an injectable solution of oxytetracycline in a concentration of 5% which was administered intramuscularly in a dose of 10 mg/kg body weight daily for 5 days. The animals were monitored daily to evaluate the outcome of the treatment. The ability of the kittens to open or close the eyelids normally, the disappearance of the ocular discharges, Alleviation of the rectum temperature, improved heart and respiratory rates,

resumption of the suckling and the gradual return to the normal activities, all were used as indicators for the response to treatment. In the laboratory, each swab sample was initially plated in sheep blood agar and MacConkey's agar media and incubated aerobically at 37°C for 24-72 hours. The plates were monitored daily and the findings were reported. Purification of cultures was done in nutrient agar media. According to the criteria of identification described elsewhere [13] the phenotypic characteristics of the colonies and cells and the biochemical reactions of the isolates were used for the primary identification of the isolated bacteria. The isolates were subjected to motility, oxidase, catalase, acid production from sugars, urease and slide and tube coagulase tests. The susceptibility to novobiocin 30µg/ml and bacitracin 0.04U/ml antibiotics was used for the discrimination between *S. simulans* and *S. felis* as outlined by Igimi *et al.* [3]. Antimicrobial susceptibility tests were carried out by disc diffusion using standard Kirby-Bauer method [14]. The sizes of the inhibitory zones were measured and the results were interpreted as resistant (R) or sensitive (S) according to the Clinical and Laboratory Standards Institute (CLSI) guidelines [15].

RESULTS

The visual examination to the eyes revealed that the upper and the lower eyelids in each kitten were fused together and they were swollen (Fig.1). Thick purulent discharges from the canthi of both eyes were seen on the surface of the face in each kitten. The clinical examination to the three kittens revealed high rectum temperature (=39.9°C), tachycardia (150-200 beat/minutes) and an increased respiratory rate (40-50 breath/minutes). The special ophthalmic examination revealed the presence of a chemosis and a congestion of the conjunctivae.

In the laboratory, visible colonies appeared in all sheep blood agar plates after 24 hours incubation. Gram-positive cocci, which appeared singly, in pairs and predominantly in clusters, were detected on Gram-stained smears. The six isolated bacteria were identical. They shared the phenotypic characteristics. They were non-motile coagulase-negative Gram-positive cocci. The phenotypic characteristics of the isolates, the biochemical tests used and the results obtained are shown in table1. Coagulase-negative *Staphylococcus sp.* was identified. The isolated bacteria were sensitive to the most used antimicrobial drugs including tetracycline and

Table 1: Phenotypic characteristics and the results obtained from biochemical tests of *Staphylococcus simulans* isolated from 25-day-old kittens suffering from ophthalmia neonatorum in Khartoum State, Sudan

Phenotypic Character	Obtained result	Phenotypic Character	Obtained result
Pigment formation	-	Susceptibility to novobiocin 30µg/ml	Sensitive
Motility	-	Susceptibility to bacitracin 0.04 U/ml	Resistant
Coagulase test	-	Acid production from sucrose	+
Urease test	+	Acid production from lactose	+
Catalase test	+	Acid production from fructose	+
Oxidase test	-	Acid production from mannitol	+
Nitrate reduction	+	Acid production from maltose	+

Table 2: Antimicrobial Susceptibility in *Staphylococcus simulans* isolated from domestic kittens suffering from ophthalmia neonatorum in Khartoum State, Sudan

Antimicrobial drug (µg/ml)	Code	DIZ ¹ (mm ²)/ Int ³	Antimicrobial drug (µg/ml)	Code	DIZ ¹ (mm ²)/ Int ³
Tetracycline (30)	TE	22/S	Ampicillin/sulbactam (20)	AS	19/S
Chloramphenicol (30)	CH	22/S	Co-trimoxazole (25)	BA	20/S
Gentamicin (10)	GM	19/S	Cefotaxime (30)	CF	21/S
Novobiocin (30)	NV	21/S	Tazobactam/piperacillin (100/10)	TZP	22/ S
Bacitracin (0.04) ⁴	B	0/R	Ciprofloxacin (5)	CP	20/S
Ceftriaxone (30)	CR	20/S	Amikacin (30)	AK	19/S

¹Diameter of inhibitory zone, ² millimeter, ³ interpretation, ⁴ Bacitracin contains 0.04 units/ml, S, sensitive, R, resistant.



Fig. 1: Closed eyelids in a 25- day- old domestic kitten suffering from ophthalmia neonatorum associated to *Staphylococcus simulans* in Khartoum State, Sudan



Fig. 2: A 25- day- old domestic kitten showed a satisfactorily response to the treatment from ophthalmia neonatorum associated to *Staphylococcus simulans* using oxytetracycline 5% ophthalmic ointment and intramuscular injection



Fig. 3: A 25- day- old domestic kitten with ophthalmic pathological changes as a sequel to ophthalmia neonatorum associated to *Staphylococcus simulans* after treatment using oxytetracycline 5% ophthalmic ointment and intramuscular injection

novobiocin, however, they were resistant to bacitracin 0.04 U/ml. The used antibiotics, their codes, their concentrations and the obtained results of the susceptibility tests are shown in Table 2. The results obtained from the antimicrobial susceptibility tests were compatible with the chosen treatment protocol (oxytetracycline) and the therapeutic protocol has been continued as had been prescribed. Two kittens revealed marked improvement 48 hours post-treatment (Fig. 2) and in one kitten, the systemic clinical signs were slightly improved, however, the affected kitten has developed persistent ophthalmic pathological changes (Fig. 3).

DISCUSSION

The domestic cats draw their importance from that they are in a close contact with humans. The infections with *Staphylococcus spp.* are important to cats because these bacteria are the most commonly transmitted bacteria and they can pass from animals to humans. Ocular diseases of the cats during the early life may precipitate persistent pathological changes in the eyes [16]. The isolation of *Staphylococcus simulans* from the affected eyes of the three kittens in this case suggests that *Staphylococcus simulans* may be the bacterial agent that may cause ophthalmia neonatorum in kittens in Khartoum. The result also suggests the role of the mother as a source of infection for this condition because the kittens handled in the case were born in one litter and infection to the kittens via the birth canal has been reported [2]. The higher rectum temperature and the higher heart and respiratory rates reported in this case, compared to the normal values of these parameters outlined elsewhere [17] indicated the systemic involvement of the infection. The systemic involvement of the infection in this case augments the seriousness of the case due to the possibility of the dissemination of the bacterium. The link between *Staphylococcus spp.* and conjunctivitis in cats at any age has been reported [2]. *Staphylococcus aureus* and *Staphylococcus epidermidis* are commonly isolated as commensal organisms from the normal feline conjunctivae and eyelids [18]. Although *S. simulans* has been reported as the most frequent normal flora of cat body as well as pathogenic bacterium of cats, there is no available data which has reported the association of *S. simulans* with ophthalmia neonatorum. The isolated bacterium may be *S. felis* if further sophisticated characterization is made as *S. simulans* and *S. felis* are phenotypically similar and it is difficult to distinguish between them from their phenotypic characteristics [3]. In this case, the susceptibility of the isolated bacterium to novobiocin and bacitracin antibiotics was used to distinguish between these two species as outlined by Igimi *et al.* [3] however, the characterization of the bacteria using molecular techniques is still required. It is also likely that the domestic cats can potentially act as a reservoir of many zoonoses [19] and play a role in transmitting antibiotics-resistant bacteria to the humans and the resistance to antimicrobial agents in coagulase-negative Staphylococci has been reported [20]. Also the isolation of a methicillin-resistant *S. simulans* from human

patients has been reported [21]. However, fortunately, in this case, the isolated *S. simulans* was sensitive to the most tested antibacterial agents excluding bacitracin. The possibility of transmission of resistant bacteria from cats to humans can be added to the importance of *S. simulans* infection in domestic kittens.

CONCLUSIONS

In conclusion, it may be proposed that *Staphylococcus simulans* may associate ophthalmia neonatorum in kittens in Sudan and the bacterium may be suggested as the causative agent of this condition and the kittens' experience this disease should be handled carefully as the transmission of this bacterium to human is possible.

Competing Interests: The authors declare that there is no conflict of interest regarding the publication of this paper.

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