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Bacterial contamination of saline nasal spray/drop solution in patients with respiratory tract infection

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This study evaluated the potential for bacterial contamination of saline nasal spray/drop solution after 3 days of clinical use in patients. Twenty patients with upper respiratory infection used the saline as a spray, and 20 patients used the solution as drops. Bacterial growth was present in 18 (90%) solution containers of the spray group and in 3 (15%) solution containers of the drops group ($P < .005$). Twenty isolates were recovered from the spray group and 3 from the drops group. The predominate isolates included *Staphylococcus aureus*, *Staphylococcus epidermidis*, alpha *Streptococcus* species, *Pseudomonas aeruginosa*, *Escherichia coli,* and *Proteus* spp. This study demonstrates the contamination of nasal saline-dispensing solution used as a spray with micro-organisms that are part of the normal skin and nasal flora and gram-negative organisms of potential enteric origin. These data support the use of nasal saline-dispensing solution as drops, rather than as spray. They also illustrate the risk for crossinfection if a nasal solution is used by more than 1 patient. (Am J Infect Control 2002;30:246-7.)

Bacterial contamination of dispensing solutions is of great concern because it can be a route of introduction of micro-organisms to mucous membranes.[1-4] Past studies of bacterial contamination have been conducted with eye drops,[1,2] nebulizer,[3] and aerosol solutions.[4] No analysis of the potential contamination of nasal saline solution has been previously done.

This study evaluated the potential for bacterial contamination of saline nasal spray/drop solution after clinical use in patients.

MATERIAL AND METHODS

The study subjects were patients seen in the outpatient clinic who were given a saline nasal spray/drop solution ([Ayr Saline Nose Spray/Drops; BF Ascher & Co; Lenex, Kan] containing sodium chloride 0.65%, monobasic potassium phosphate/sodium hydroxide buffer, and the preservatives thimerosal and benzalkonium chloride with deionized water) to treat symptoms of upper respiratory infection. The solution was administered 4 to 6 times a day for 3 days. Individuals who received antimicrobial therapy were excluded.

The first group of 20 patients was instructed to use the saline as a spray (spray group), which involved introducing the tip of the vial into the nostril, and the next 20 patients were told to use the solution as drops (drops group) dispensed by gravity, which did not involve introducing the tip of the vial into the nostril. The patients were instructed on how to use the dispenser and were told to return the container of unused solution on the fourth day. Compliance was determined with a checklist given to each patient.

A 0.2-mL sample of the unused saline solution was cultured quantitatively for aerobic bacteria, as previously described.[5] Statistical analysis was done with the Student *t* test.

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RESULTS

Bacterial growth was present in 18 (90%) of the spray group and in 3 (15%) of the drops group ($P < .005$). The bacterial counts varied from 10^2 to 10^5 and did not differ between the patient groups or between the bacterial isolates.

Twenty isolates were recovered from the spray group and 3 from the drops group (Table 1). The predominate isolates included *Staphylococcus aureus* (6 in the spray group and 1 in the drops group), *Staphylococcus epidermidis* (4 in the spray group and 1 in the drops group), alpha streptococcus species (3 in the spray group and 1 in the drops group), *Pseudomonas aeruginosa* (3 in the spray group), *Escherichia coli*, and *Proteus* spp. (2 each in the spray group).

Table 1. Bacterial isolates recovered from saline nasal spray/drop solution in 40 patients with respiratory tract infection

Bacterial isolates	Spray group (n = 20)	Drops group (n = 20)
Staphylococcus aureus	6	1
Staphylococcus epidermidis	4	1
Alpha-hemolytic streptococcus	3	1
Pseudomonas aeruginosa	3	0
Proteus spp.	2	0
Escherichia coli	2	0
Total	20	3

DISCUSSION

This study demonstrates the contamination of nasal saline-dispensing solution used as a spray with micro-organisms that are part of the normal skin and nasal flora (staphylococcus and streptococcus) and gram-negative organisms of potential enteric origin. Even though these bacteria can colonize the nasal cavity,[6] they have also been recovered from infected sinuses.[7,8] *S aureus* was isolated from the sinuses of patients with chronic maxillary sinusitis[7] and acute sphenoid sinusitis.[8] *P aeruginosa* was recovered from the sinuses of nosocomial sinusitis and from infected sinuses in immunocompromised patients.[9]

The results of this study support the use of nasal saline-dispensing solution as drops, rather than as spray. This product is commonly used in patients with a variety of upper and lower respiratory infection, in which bacterial contamination may have the potential for increasing the bacterial nasal load. It also illustrates the risk of crossinfection if a nasal solution is used by more than 1 patient. Avoiding contact with the nostrils seems to prevent contamination of the vial with micro-organisms, thus maintaining the cleanliness of the solution. It is, however, recommended that if intranasal spraying of the saline is desired, used vials should be frequently discarded and replaced with fresh ones.

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