

# Saline Nasal Irrigation for Upper Respiratory Conditions

DAVID RABAGO, MD, and ALEKSANDRA ZGIERSKA, MD, PhD, *University of Wisconsin School of Medicine and Public Health, Madison, Wisconsin*

Saline nasal irrigation is an adjunctive therapy for upper respiratory conditions that bathes the nasal cavity with spray or liquid saline. Nasal irrigation with liquid saline is used to manage symptoms associated with chronic rhinosinusitis. Less conclusive evidence supports the use of spray and liquid saline nasal irrigation to manage symptoms of mild to moderate allergic rhinitis and acute upper respiratory tract infections. Consensus guidelines recommend saline nasal irrigation as a treatment for a variety of other conditions, including rhinitis of pregnancy and acute rhinosinusitis. Saline nasal irrigation appears safe, with no reported serious adverse events. Minor adverse effects can be avoided with technique modification and salinity adjustment. (*Am Fam Physician*. 2009;80(10):1117-1119, 1121-1122. Copyright © 2009 American Academy of Family Physicians.)

► **Patient information:** A handout on saline nasal irrigation, written by the authors of this article, is provided on page 1121.

Upper respiratory conditions, such as acute and chronic rhinosinusitis, viral upper respiratory tract infection (URTI), and allergic rhinitis, are common disorders that negatively affect patients' quality of life. Saline nasal irrigation is an adjunctive therapy for upper respiratory conditions, likely originating in the ayurvedic medical tradition.<sup>1</sup> Its use, including indications, solutions, and administration devices, was first described in medical literature in the early 20th century.<sup>2</sup> Saline nasal irrigation is an effective management strategy for many sinonasal conditions.<sup>3</sup> In a survey of 330 family physicians, 87 percent reported recommending it to their patients for one or more conditions.<sup>4</sup>

Nasal irrigation is performed by instilling saline into one nostril and allowing it to drain out of the other nostril, bathing the nasal cavity. Saline nasal irrigation can be performed with low positive pressure from a spray or squirt bottle, or with gravity-based pressure using a vessel with a nasal spout, such as a neti pot. Both are available over the counter.

## Mechanism of Action

The exact mechanism of action of saline nasal irrigation is unknown. One possibility is that the breakdown of the protective function of the nasal mucosa plays a role in upper respiratory conditions. Saline nasal irrigation may improve nasal mucosa function through several physiologic effects,

including direct cleansing<sup>5,6</sup>; removal of inflammatory mediators<sup>7,8</sup>; and improved mucociliary function, as suggested by increased ciliary beat frequency.<sup>9,10</sup>

## Indications and Effectiveness CHRONIC RHINOSINUSITIS

Chronic rhinosinusitis (i.e., persisting for longer than 12 weeks) is the most common indication for saline nasal irrigation.<sup>4</sup> Based on positive clinical and functional outcomes, a Cochrane review concluded that saline nasal irrigation is an appropriate adjunctive therapy for the symptoms of chronic rhinosinusitis.<sup>11</sup> The strongest study in the review reported that patients with chronic sinus symptoms who used 2 percent liquid saline daily in addition to routine care had a 64 percent improvement in overall symptom severity compared with patients who used routine care alone.<sup>12</sup> Patients also showed significant improvement in disease-specific quality of life at six months<sup>12</sup> and at 18 months.<sup>13</sup> These results were not reported for spray saline.<sup>14</sup> Patients who used liquid saline also reported significantly decreased use of antibiotics and medication-based, non-saline nasal sprays.<sup>12</sup>

Two studies evaluated the effect of liquid saline on chronic rhinosinusitis in the context of workplace airborne irritants.<sup>15,16</sup> After performing daily nasal irrigation with liquid saline, woodworkers (n = 45) exposed to varying levels of wood dust demonstrated significantly improved sinus symptoms,

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mucociliary clearance, and expiratory nasal flow.<sup>15</sup> A similar study of volunteer woodworkers also reported positive findings.<sup>16</sup>

### VIRAL UPPER RESPIRATORY TRACT INFECTION

Liquid and spray saline nasal irrigation have been evaluated for the treatment and prevention of viral URТИ. A Cochrane review is in progress.<sup>17</sup> Two studies assessing treatment reported conflicting results.<sup>18,19</sup> The studies used different outcome measures, which limits comparability. In a three-arm randomized controlled trial (RCT), 143 adults with viral URТИ received hypertonic spray saline, normal saline, or no treatment.<sup>18</sup> The treatments did not have a measurable effect on the duration or severity of nasal symptoms compared with the control group. However, in an RCT of 200 adults with viral URТИ, patients treated with micronized saline spray had improved rhinometric resistance, nasal volume, mucociliary transit time, and symptom severity scores compared with patients using liquid saline.<sup>19</sup> Compliance rates were not reported, making it difficult to compare micronized saline with liquid saline nasal irrigation.

An RCT of 60 adults evaluated the effectiveness of daily spray saline irrigation as preventive therapy for viral URТИ.<sup>20</sup> Patients performing preventive saline nasal irrigation reported significantly fewer infections, shorter symptom duration, and fewer days with nasal symptoms compared with those who did not perform preventive nasal irrigation.

Effects of daily saline irrigation were evaluated in a two-phase RCT of 390 children with URТИ.<sup>21</sup> The children were randomized into two groups. The first group received routine care and performed isotonic saline nasal irrigation with liquid or fine spray. The second group received routine care, but did not perform nasal irrigation. The trial consisted of a three-week treatment phase, followed by a nine-week prevention phase. In both phases, the patients performing nasal irrigation reported significantly better outcomes on nasal secretion, obstruction, and medication use assessments.

### ALLERGIC RHINITIS

Saline nasal irrigation has been reported to benefit patients with allergic rhinitis. One study assessed the effects of small molecule spray (mist), large molecule spray, and liquid saline nasal irrigation on the concentration of inflammatory mediators in nasal secretions in patients with seasonal allergic rhinitis.<sup>8</sup> The liquid and

### SORT: KEY RECOMMENDATIONS FOR PRACTICE

Clinical recommendation	Evidence rating	References
Nasal irrigation is an effective adjunctive therapy for symptoms of chronic rhinosinusitis.	A	11, 12
Based on limited evidence, nasal irrigation may be an effective adjunctive treatment for symptoms of irritant rhinitis, allergic rhinitis, and viral upper respiratory tract infection; and for postoperative care after endoscopic sinus surgery.	B	8, 15, 16, 19-21, 23, 25
Nasal irrigation has been recommended for mild to moderate rhinitis of pregnancy, acute rhinosinusitis, sinonasal sarcoidosis, and Wegener granulomatosis.	C	24, 26, 27

A = consistent, good-quality patient-oriented evidence; B = inconsistent or limited-quality patient-oriented evidence; C = consensus, disease-oriented evidence, usual practice, expert opinion, or case series. For information about the SORT evidence rating system, go to <http://www.aafp.org/afpsort.xml>.

large molecule spray forms of saline significantly reduced the levels of histamine and leukotrienes. A small RCT evaluated children with laboratory-confirmed, pollen-triggered rhinitis and found that antihistamine medication plus liquid saline nasal irrigation significantly reduced allergy symptom severity and antihistamine medication use, compared with antihistamines alone.<sup>22</sup> In another study, patients with a history of allergic rhinitis reported improvement of allergy symptoms when using liquid saline nasal irrigation.<sup>23</sup>

### OTHER INDICATIONS

In consensus guidelines, saline nasal irrigation is considered safe and possibly effective for mild to moderate rhinitis of pregnancy and acute rhinosinusitis,<sup>24</sup> although no clinical trials have assessed the treatment for these indications. A recent survey of family physicians who prescribe saline nasal irrigation showed that 17 percent have recommended it for rhinitis of pregnancy and 67 percent have recommended it for acute rhinosinusitis.<sup>4</sup> Saline nasal irrigation has also been recommended for postoperative care of patients undergoing endoscopic sinus surgery,<sup>25</sup> for sinonasal sarcoidosis,<sup>26</sup> and for Wegener granulomatosis,<sup>27</sup> although there is little evidence to support these uses.

### Contraindications and Adverse Events

Saline nasal irrigation appears safe, with no studies reporting serious adverse events. Minor adverse effects are common, including a sense of discomfort and nervousness during the first use.<sup>23</sup> Fewer than 10 percent of patients using saline nasal irrigation reported adverse effects, such as self-limited ear fullness, stinging of the nasal mucosa, and epistaxis (rare).<sup>12,14,28</sup> Adverse effects were ameliorated with technique modification

and salinity adjustment,<sup>23</sup> and did not cause patients to discontinue nasal irrigation.<sup>12,14</sup> Similar adverse effects occurred with spray and liquid saline.<sup>14</sup>

Contraindications for saline nasal irrigation include incompletely healed facial trauma, because of the potential to leak saline into unwanted tissue planes or spaces; and neurologic or musculoskeletal problems, such as significant intention tremor, that increase the risk of aspiration.

### Approach to the Patient

Patients with an appropriate indication should be considered for a trial of saline nasal irrigation. Optimal salinity is unknown, although 0.9 to 3 percent saline solutions have been used most often. Optimal pH and temperature are also unknown, but are likely patient-specific.<sup>23</sup> In the United States, lukewarm tap water appears safe for saline preparation; sterile water or premixed solution is recommended if potability is in doubt.

Saline nasal irrigation techniques are easily taught in primary care settings. Patients have identified effective education methods (e.g., coached practice, patient handouts) as key to successful initiation and maintenance.<sup>23</sup> Free evidence-based bilingual resources (e.g., a recipe for saline solution, instructions for irrigation, troubleshooting tips, links to audio and video teaching media) are available from the University of Wisconsin School of Medicine and Public Health at <http://www.fammed.wisc.edu/research/past-projects/nasal-irrigation>.

### The Authors

DAVID RABAGO, MD, is an assistant professor in the Department of Family Medicine at the University of Wisconsin School of Medicine and Public Health in Madison.

ALEKSANDRA ZGIERSKA, MD, PhD, is a clinical instructor and research fellow in the Department of Family Medicine at the University of Wisconsin School of Medicine and Public Health.

Address correspondence to David Rabago, MD, University of Wisconsin School of Family Medicine and Public Health, 777 South Mills St., Madison, WI 53715 (e-mail: [david.rabago@fammed.wisc.edu](mailto:david.rabago@fammed.wisc.edu)). Reprints are not available from the authors.

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### REFERENCES

- Rama S, Ballentine R, Hymes A. *Science of Breath. A Practical Guide*. Honesdale, Pa.: Himalayan Institute Press; 1998.
- Wingrave W. A clinical lecture on the nature of discharges and douches. *Lancet*. 1902;159(4107):1373-1375.
- Brown CL, Graham SM. Nasal irrigations: good or bad? *Curr Opin Otolaryngol Head Neck Surg*. 2004;12(1):9-13.
- Rabago D, Zgierska A, Peppard P, Bamber A. The prescribing patterns of Wisconsin family physicians surrounding saline nasal irrigation for upper respiratory conditions. *WJM*. 2009;108(3):145-150.
- Karadag A. Nasal saline for acute sinusitis. *Pediatrics*. 2002;109(1):165.
- Kurtaran H, Karadag A, Catal F, Avci Z. A reappraisal of nasal saline solution use in chronic sinusitis. *Chest*. 2003;124(5):2036-2037.
- Ponikau JU, Sherris DA, Kephart GM, et al. Striking deposition of toxic eosinophil major basic protein in mucus: implications for chronic rhinosinusitis. *J Allergy Clin Immunol*. 2005;116(2):362-369.
- Georgitis JW. Nasal hyperthermia and simple irrigation for perennial rhinitis. Changes in inflammatory mediators. *Chest*. 1994;106(5):1487-1492.
- Boek WM, Graamans K, Natzijl H, van Rijk PP, Huizing EH. Nasal mucociliary transport: new evidence for a key role of ciliary beat frequency. *Laryngoscope*. 2002;112(3):570-573.
- Talbot AR, Herr TM, Parsons DS. Mucociliary clearance and buffered hypertonic saline solution. *Laryngoscope*. 1997;107(4):500-503.
- Harvey R, Hannan SA, Badia L, Scadding G. Nasal saline irrigations for the symptoms of chronic rhinosinusitis. *Cochrane Database Syst Rev*. 2007;(3):CD006394.
- Rabago D, Zgierska A, Mundt M, Barrett B, Bobula J, Maberry R. Efficacy of daily hypertonic saline nasal irrigation among patients with sinusitis: a randomized controlled trial. *J Fam Pract*. 2002;51(12):1049-1055.
- Rabago D, Pasic T, Zgierska A, Mundt M, Barrett B, Maberry R. The efficacy of hypertonic saline nasal irrigation for chronic sinonasal symptoms. *Otolaryngol Head Neck Surg*. 2005;133(1):3-8.
- Pynnonen MA, Mukerji SS, Kim HM, Adams ME, Terrell JE. Nasal saline for chronic sinonasal symptoms: a randomized controlled trial. *Arch Otolaryngol Head Neck Surg*. 2007;133(11):1115-1120.
- Holmström M, Rosén G, Wählander L. Effect of nasal lavage on nasal symptoms and physiology in wood industry workers. *Rhinology*. 1997;35(3):108-112.
- Rabone SJ, Saraswati SB. Acceptance and effects of nasal lavage in volunteer woodworkers. *Occup Med (Lond)*. 1999;49(6):365-369.
- Kassel JC, King D, Spurling GKP. Saline nasal irrigation for acute upper respiratory tract infections (Protocol). *Cochrane Database Syst Rev*. 2007;(4)CD006821.
- Adam P, Stiffman M, Blake RL Jr. A clinical trial of hypertonic saline nasal spray in subjects with the common cold or rhinosinusitis. *Arch Fam Med*. 1998;7(1):39-43.
- Passali D, Damiani V, Passali FM, Passali GC, Bellussi L. Atomized nasal douche vs nasal lavage in acute viral rhinitis. *Arch Otolaryngol Head Neck Surg*. 2005;131(9):788-790.
- Tano L, Tano K. A daily nasal spray with saline prevents symptoms of rhinitis. *Acta Otolaryngol*. 2004;124(9):1059-1062.
- Slapak I, Skoupá J, Strnad P, Hornik P. Efficacy of isotonic nasal wash (seawater) in the treatment and prevention of rhinitis in children. *Arch Otolaryngol Head Neck Surg*. 2008;134(1):67-74.
- Garavello W, Romagnoli M, Sordo L, Gaini RM, Di Bernardino C, Angriano A. Hypersaline nasal irrigation in children with symptomatic seasonal allergic rhinitis: a randomized study. *Pediatr Allergy Immunol*. 2003;14(2):140-143.
- Rabago D, Barrett B, Marchand L, Maberry R, Mundt M. Qualitative aspects of nasal irrigation use by patients with chronic sinus disease in a multimethod study. *Ann Fam Med*. 2006;4(4):295-301.
- DeGuzman DA, Bettcher CM, Van Harrison R, et al. Guidelines for clinical care. Allergic rhinitis. Ann Arbor, Mich.: University of Michigan Health System; October 2007. <http://cme.med.umich.edu/pdf/guideline/allergic07.pdf>. Accessed July 7, 2009.
- Seppely M, Schweri T, Häusler R. Comparative randomised clinical study of tolerability and efficacy of Rhinomer Force 3 versus a reference product in post-operative care of the nasal fossae after endonasal surgery. *ORL J Otorhinolaryngol Relat Spec*. 1996;58(2):87-92.
- Long CM, Smith TL, Loehr TA, Komorowski RA, Toohill RJ. Sinonasal disease in patients with sarcoidosis. *Am J Rhinol*. 2001;15(3):211-215.
- Tami TA. Granulomatous diseases and chronic rhinosinusitis. *Otolaryngol Clin North Am*. 2005;38(6):1267-1278, x.
- Tomooka LT, Murphy C, Davidson TM. Clinical study and literature review of nasal irrigation. *Laryngoscope*. 2000;110(7):1189-1193.