

# **A low-sodium solution for airway care: results of a multicenter trial**

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# BACKGROUND

- Normal saline is sometimes instilled into the endotracheal tube preparatory to airway suctioning, to assist in removing thick secretions that can restrict gas flow through the tube.
- Tracheal and nasal secretions and saliva contain natural antimicrobial substances that are damaged by high concentrations of sodium and chloride. One such substance is LL-37, a 37-amino-acid peptide with broad antimicrobial properties.

→ We speculated that a solution patterned after unstimulated secretions would be better than saline

**Table 1** Constituents of saliva from infants and adults, contrasted with the constituents of 0.9% saline and ETCare<sup>18,21,22</sup>

	<i>Na (mmol/l)</i>	<i>K (mmol/l)</i>	<i>Cl (mmol/l)</i>	<i>Ca (mmol/l)</i>	<i>Mg (mmol/l)</i>	<i>P (mmol/l)</i>	<i>Protein (mg/dl)</i>	<i>pH</i>
Infant	7.9±7.0	21.5±6.3	33.9±24.5	1.8±1.2	0.6±0.5	3.0±1.8	194±157	6.1±0.3
Adult	8.0±3.0	20.8±4.1	23.9±8.3	1.3±0.5	0.3±0.2	6.5±1.2	194±128	6.3±0.4
0.9% NaCl	154	0	154	0	0	0	0	5.0
ETCare	7.8	24.5	36.7	1.8	0.6	3	194	6.5

→ We speculated that a solution patterned after unstimulated secretions would be better than saline.

Contituents of saliva from infants, contrasted with the contituents of 0.9% saline and ETCare

mmol/l	Na	K	Cl	Ca	Mg	P	Protein	pH
0.9%NaCl	154	0	154	0	0	0	0	5.0
Enfant	7.9±7 0	21.5±6.3	33.9±24.5	1.8±1. 2	0.6±0.5	3.0 ±1.8	194 ±157	6.1 ±0.3
ET care	7.8	24.5	36.7	1.8	0.6	3	194	6.5

# METHODS

## **(1) A randomized trial (Neonatal Intensive Care, McKay-Dee Hospital Center, USA )**

We previously described a low-sodium physiologically based solution for airway care and reported a small (n = 60), which showed trends toward less ventilator-associated pneumonia (VAP) and less chronic lung disease (CLD) with the new solution.

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Christensen RD, Rigby G, Schmutz N, Lambert DK, Wiedmeier SE, Burnett J, et al. **ETCare: a randomized, controlled, masked trial comparing two solutions for upper airway care in the NICU.** J Perinatol 2007;27(8):479-484.

# METHODS

**(2) A multicenter trial** (4 largest NICUs in the Intermountain Healthcare system, USA)

We conducted a before-and-after study with a parallel control group

- During year 1 (2007-2008), all 4 NICUs used saline for airway care.
- During year 2 (2008-2009), one NICU ( nused the test solution exclusively while the other NICUs used saline exclusively. No other liquids were used for airway care.

	<b>Period 1</b>	<b>Period 2</b>
neonates	2233	2309
endotracheal intubation	598	518
saline	598	431
test solution	0	87

# METHODS

The 2 study outcomes were:

- ✓ **Ventilator-associated pneumonia**  
(cases/1,000 ventilator days)
- ✓ **Chronic lung disease, defined 3 ways:**
  - *supplemental oxygen at 28 days*
  - *supplemental oxygen at 36 weeks gestation*
  - *supplemental oxygen on hospital discharge.*



# RESULTS

- There were no significant differences in birth weight, gestational age at birth, sex, or number of patients admitted to the NICUs between Period 1 and Period 2
- The number of days mechanical ventilation did not significantly differ between the saline and test-solution groups.

# RESULTS

- NICU 4 had a decrease in VAP rate, from 4.2 VAPs/1,000 ventilator days with saline, to 1.6 VAPs/1,000 ventilator days with the test solution (P .04), and also had the lowest prevalence of chronic lung disease (P < .001 for each definition).

Table 2. Overall VAP Rates

NICU	VAP Rate* (mean and 95% CI)		<i>P</i>
	Period 1	Period 2	
1	2.0 (0.81–2.75)	3.1 (1.80–4.34)	.88
2	2.0 (1.01–3.09)	2.6 (1.41–3.74)	.79
3	2.2 (1.57–3.99)	2.6 (1.41–3.75)	.92
4	4.2 (2.74–5.72)	1.6 (0.70–2.55)	.04
Total	2.6 (1.48–3.85)	2.4 (1.35–3.65)	.93

\* Cases per 1,000 ventilator days.

VAP = ventilator-associated pneumonia

NICU = neonatal intensive care unit

Figure 1: shows the monthly VAP rates at NICU 4.

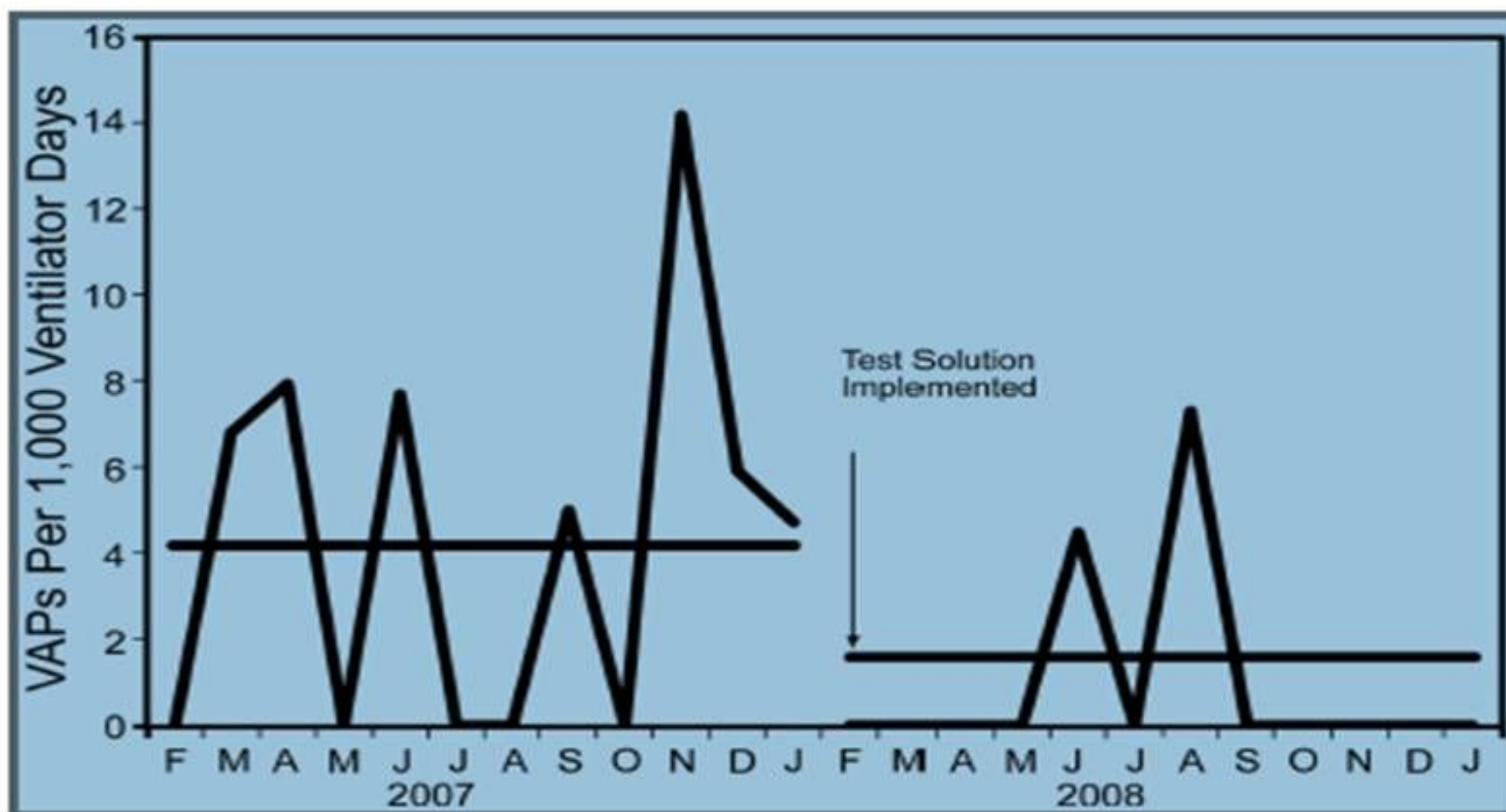


Fig. 1. Ventilator-associated pneumonia (VAP) cases per 1,000 ventilator days each month in neonatal intensive care unit 4, February 1, 2007, through January 31, 2009.

# CONCLUSIONS

The low-sodium solution significantly reduced the ventilator-associated pneumonia and chronic lung disease rates in neonates.