

Title: PSEUDOMONAS ADHERENCE TO NASAL TURBINATE MUCOSA IS AN ACCURATE ESTIMATE OF TRACHEOBRONCHIAL ADHERENCE

Authors: M. Niederman, M.D., T. Rafferty, M.D., C. Sasaki, M.D., W. Merrill, M.D., R. Matthay, M.D., and H. Reynolds, M.D.

Affiliation: Depts. of Anesthesiology, Medicine, and Surgery (Otolaryngology), Yale University School of Medicine, New Haven, CT 06510

**Introduction.** Cell surface defense mechanisms play a major role in combating pathogenic organisms. The degree of in-vitro bacterial adherence to buccal epithelium correlates with the degree of in-vivo oropharyngeal colonization. Buccal mucosal cells (squamous) are histologically unlike tracheobronchial cells (ciliated columnar). However, nasal turbinate mucosa is composed of ciliated columnar epithelial cells. Accordingly, the following study was performed to determine whether the degree of bacterial adherence to nasal turbinate cells accurately reflects that of tracheobronchial cells.

**Methods.** Cells were obtained from multiple sites simultaneously in 5 awake bronchoscopy subjects (age range 24-55 years) and 12 intubated general anesthesia (N<sub>2</sub>O/enflurane) patients (age range 29-64 years) undergoing a variety of surgical procedures (orthopedic, general, genitourinary and otological). Informed written consent in accordance with a Human Investigation Committee - approved protocol was obtained. Buccal and nasal turbinate cells were obtained with a Coakley curette and tracheobronchial cells were obtained with a 3.0 mm bronchial brush via a fiberoptic bronchoscope through the endotracheal tube. The cells were washed and hypotonically lysed to remove non-adherent bacteria and red cells. Cells (10<sup>5</sup>/ml) were mixed with <sup>14</sup>C labeled, lag phase, mucoid *Pseudomonas aeruginosa* (P) in a bacteria to cell ratio of 100:1. After mixing at 37°C for 2 hours, cells were centrifuged at 150 G and the washed pellet applied to a membrane of 8 μ pore size through which non-adherent bacteria were filtered. Scintillation counting quantitated bacteria adhering to cells trapped on the membrane. Quantitative culture of the inoculum allowed results to be expressed as bacteria adhering per cell after correcting to equalize bacteria to cell ratios for each individual's study. Results are expressed as mean ± standard error of the mean. Results were analyzed statistically using Student's t-test for paired data.

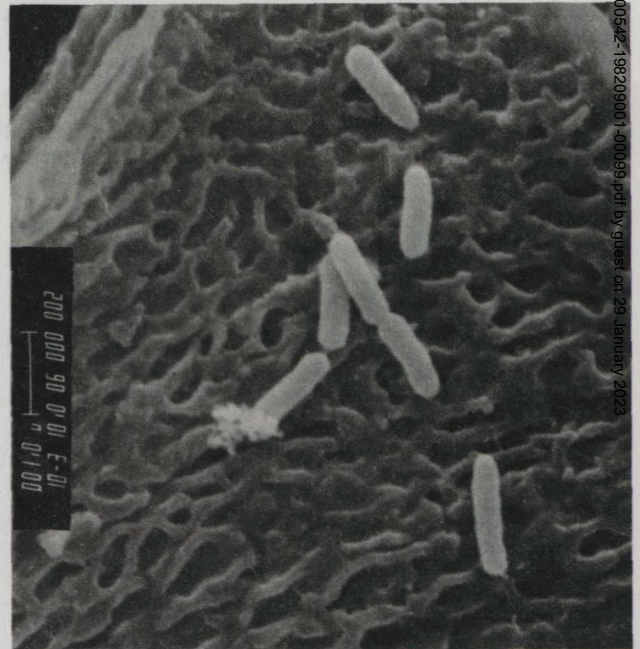
**Results.** P. adherence (expressed as bacterial/Cell) to tracheobronchial cells was 4.6 ± 0.8 (range 1.3 to 11.7), to nasal turbinate cells 4.7 ± 0.6 (range 1.6 to 7.9) and to buccal cells 0.8 ± 0.2 (range 0.1 to 2.4). P. adherence in appropriately paired specimens showed no

difference between awake and anesthetized subjects (P=0.3). The degree of P. adherence to the nasal turbinate cells was significantly related (P < 0.05) to the degree of P. adherence to the tracheobronchial cells. The degree of P. adherence to the buccal cells was unrelated to that of either the nasal turbinate or the tracheobronchial cells.

**Discussion.** We conclude that (1) nasal turbinate and tracheobronchial cells adhere P. more avidly than buccal cells; (2) P. adherence to buccal cells does not closely estimate P. adherence to tracheobronchial cells; (3) induction of anesthesia with N<sub>2</sub>O and enflurane does not alter observed relationships; (4) it may be appropriate to use the degree of P. adherence to nasal turbinate cells as an indicator of the degree of P. adherence to tracheobronchial cells in future studies defining groups at risk for postoperative pneumonia.

**References.**

1. Johanson WG Jr, Higuchi JH, Chaudhuri TR, Woods DE: Bacterial adherence to epithelial cells in bacillary colonization of the respiratory tract. *Am. Rev. Resp. Dis.* 121:55-63, 1980



Scanning electron micrograph of the <sup>14</sup>C labelled Pseudomonads adhering to the nasal turbinate cells.