

# This Week's Citation Classic®

**Beachey E H.** Bacterial adherence: adhesin-receptor interactions mediating the attachment of bacteria to mucosal surfaces. *J. Infect. Dis.* 143:325-45, 1981.  
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This paper reviewed the concepts of bacterial adherence, important for mucosal colonization, a prerequisite for many bacterial infections. Examples were given of the use of purified adhesion or receptor materials as competitive inhibitors of adherence or of the bacterial adhesion components as anticolonization vaccines. [The SCI® indicates that this paper has been cited in over 485 publications.]

## How Infectious Bacteria Attach

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Edwin H. Beachey, MD, born in Arthur, Illinois, on April 11, 1934, was 55 years old and at the peak of his career when he died October 17, 1989, in Memphis, Tennessee. He would have assumed the editor-in-chief position of *Infection and Immunity*, a journal he served with distinction as one of its editors for six years, had he not learned he had cancer on May 26, 1989. At the time of his death, Ed was professor of medicine and of microbiology and chief of the Division of Infectious Diseases, Department of Medicine at the University of Tennessee College of Medicine, Memphis. He was also director of the Infectious Diseases Research Program and associate chief of staff for Research and Development at the Memphis Veterans Administration Medical Center.

Along with an international reputation for his pioneering work on the immunopathogenesis of rheumatic fever, Ed was a pioneer in the important field of bacterial adherence, with milestone observations involving both gram-positive and gram-negative bacteria. For example, he demonstrated that the streptococcal colonization ligand is lipoteichoic acid, which forms a complex network with M protein and which binds via its lipid moiety to fibronectin on epithelial cells.<sup>1,2</sup> He was

also among the first to show that the mannose-binding adhesin of type 1 fimbriae in *Escherichia coli* consists of a minor protein determinant that is widely conserved among other gram-negative bacteria of the family Enterobacteriaceae.<sup>3</sup> He was a leader in showing how antimicrobials perturbed the bacterial adhesin.<sup>4,5</sup>

At the time of the publication of this review article a decade ago, Beachey had already established himself as perhaps the leading authority on bacterial adherence, owing in part to the publication the prior year of the ground-breaking book, *Bacterial Adherence*, which he had edited.<sup>6</sup> Because of this recognition and because the subject of bacterial adherence had become an important area of study, Ed was asked to give a major address to the Infectious Diseases Society of America at their annual meeting in New Orleans in the fall of 1980. All such talks are subsequently published by the society in its journal, as was Ed's, early the next year. My own interpretation of the phenomenal success of this publication is that this paper uniquely summarized the highlights of the field at a critical stage in its development. Ed captured the major principles of bacterial adherence, including its importance in the pathogenesis of infectious disease and the means by which investigators should approach its study from a molecular standpoint. Ed provided the ground rules for establishing the biologic specificity of the bacterial adherence substance and of the mammalian receptor. With the subsequent explosion of interest in the field, it was natural for workers to cite as canonical this concise and effective distillation of a complex topic.

Beachey influenced a whole generation of scientists through his work and writings, as well as those lucky individuals (like myself) who spent time training with him. Although many will remember him primarily for his scholarly contributions, those of us who knew him will also remember his warmth, modesty, and limitless generosity.

1. Ofek I, Beachey E H, Jefferson W & Campbell G L. Cell membrane-binding properties of group A streptococcal lipoteichoic acid. *J. Exp. Med.* 141:990-1003, 1975. (Cited 175 times.)
2. Beachey E H & Courtney H S. Bacterial adherence: the attachment of group A streptococci to mucosal surfaces. *Rev. Infect. Dis.* 9:S475-81, 1987. (Cited 10 times.)
3. Abraham S N, Sun D, Dale J B & Beachey E H. Conservation of the D-mannose-adhesion protein among type 1 fimbriated members of the family Enterobacteriaceae. *Nature* 336:682-4, 1988. (Cited 5 times.)
4. Schifferli D M & Beachey E H. Bacterial adhesion: modulation by antibiotics with primary targets other than protein synthesis. *Antimicrob. Agents Chemother.* 32:1609-13, 1988. (Cited 5 times.)
5. . . . . Bacterial adhesion: modulation by antibiotics which perturb protein synthesis. *Antimicrob. Agents Chemother.* 32:1603-8, 1988. (Cited 5 times.)
6. Beachey E H, ed. *Bacterial adherence*. London: Chapman and Hall, 1980. 466 p.

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