



TECHNICAL BULLETIN: Viral-Bacterial Interaction in Infections of Colonized Surfaces

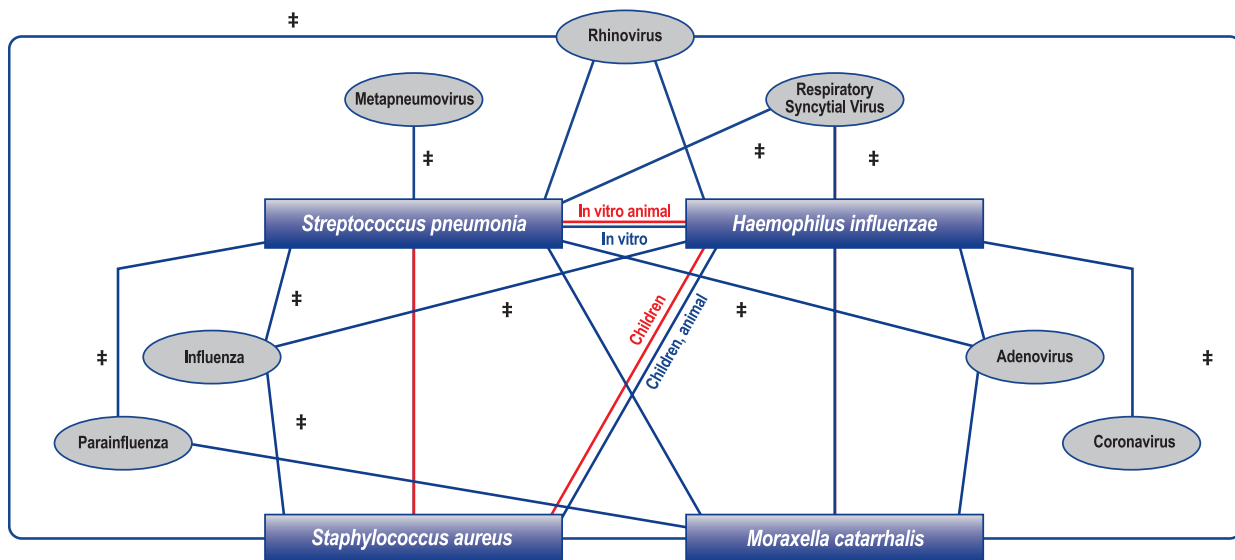
The concept of a respiratory tract infection has evolved from a single organism link to one of a more complex poly-microbial nature.^{1,2,3} These interactions involve infections such as otitis media, acute/chronic sinusitis, and pneumonia that represent both synergistic and antagonistic pathogen interactions.^{4,5}

In 2004, the “source” (or ecological niche of all respiratory infections) was described by Bogaert and her colleagues and identified as the nasopharynx.⁶ With access to new multiplex diagnostic methods over the past few years, it is now recognized that the microbial communities of the upper respiratory tract are inherently complex and must be considered in the diagnosis and the management of the patient; e.g. prescribing an antibiotic or not.

Using the work of Bosch and his colleagues, we now know that respiratory tract infections are caused by viruses and bacteria that interact to colonize, attach to and penetrate mucosal surfaces, and evade normal defense mechanisms present in underlying tissue. Depending upon the virulence and combination of the organisms involved, the basement membrane can be penetrated; often with a more severe or prolonged course of infection.⁷

Viruses and bacteria, virus and virus, or bacterial and bacteria, often use their synergies to initiate infection. These interactions are best illustrated in the following figure:

Figure 1: Virus and Bacteria Interactions



Although it is clear that certain viruses, such as respiratory syncytial and influenza, can cause disease on their own, the illustration demonstrates the synergistic effect in their persistent colonization or infection (blue lines).⁸ The red lines indicate antagonism. There is accumulating evidence in animal models as well as in vitro studies (‡) that these positive associations may influence the progression of as well as the intensity of disease.

In a similar way, the interaction of viruses and bacteria on other colonized surface infection cannot be ignored; e.g. the gastrointestinal tract. Valentini and his colleagues clearly demonstrated that coinfection in acute gastroenteritis was directly associated with both the severity and duration of infection. In the 232 patients that were studied, 151 were infected with one or more pathogens and had a more severe clinical presentation that was independent of both age and living environment. A coinfection with a virus (Rotavirus and/or Adenovirus) or another bacterial pathogen (*C. difficile*, *C. perfringens*, *Salmonella*, *Campylobacter*, or toxin producing *E. coli*), increased symptoms or signs that included the following:

1. *Maximum number of stools/24 h*
2. *Duration of diarrhea (days)*
3. *Maximum number of vomiting episodes/24 h*
4. *Duration of vomiting (days)*
5. *Fever*
6. *Dehydration*
7. *Length of stay in a hospital*

Coinfections with Rotavirus and *C. difficile* were shown to be most frequent and one of the author's conclusions was that children with coinfection represent a subgroup of patients with acute gastroenteritis who need increased care during hospitalization. Therefore, their identification with appropriate diagnostic tests is important in order to properly manage expectation of the clinical course.⁹

References:

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