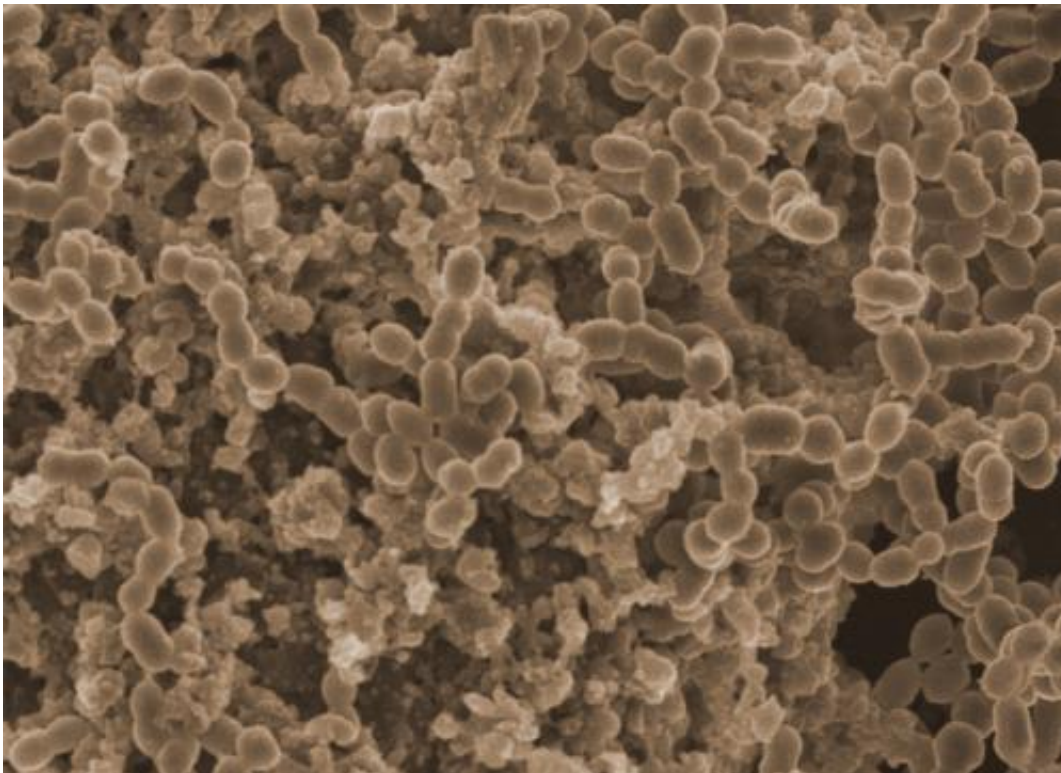


## Study: Toys, books, cribs can harbor bacteria for long periods

December 24 2013, by Ellen Goldbaum

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This SEM image shows a mature pneumococcal biofilm: the nearly round structures of *S. pneumoniae* bacteria are organizing together a matrix of smaller, oddly shaped material surrounding them that makes them more resistant to environmental stresses and antimicrobial agents. Credit: Laura Marks

(Medical Xpress)—Numerous scientific studies have concluded that two common bacteria that cause colds, ear infections, strep throat and more

serious infections cannot live for long outside the human body. So conventional wisdom has long held that these bacteria won't linger on inanimate objects like furniture, dishes or toys.

But University at Buffalo research published today in *Infection and Immunity* shows that *Streptococcus pneumoniae* and *Streptococcus pyogenes* do persist on surfaces for far longer than has been appreciated. The findings suggest that additional precautions may be necessary to prevent infections, especially in settings such as schools, daycare centers and hospitals.

"These findings should make us more cautious about bacteria in the environment since they change our ideas about how these particular bacteria are spread," says senior author Anders Hakansson, PhD, assistant professor of microbiology and immunology in the UB School of Medicine and Biomedical Sciences. "This is the first paper to directly investigate that these bacteria can survive well on various surfaces, including hands, and potentially spread between individuals."

*S. pneumoniae*, a leading cause of [ear infections](#) in children and morbidity and mortality from [respiratory tract infections](#) in children and the elderly, is widespread in daycare centers and a common cause of hospital infections, says Hakansson. And in developing countries, where fresh water, good nutrition and common antibiotics may be scarce, *S. pneumoniae* often leads to pneumonia and sepsis, killing one million children every year.

*S. pyogenes* commonly causes [strep throat](#) and skin infections in school children but also can cause serious infection in adults.

The UB researchers found that in the day care center, four out of five stuffed toys tested positive for *S. pneumoniae* and several surfaces, such as cribs, tested positive for *S. pyogenes*, even after being cleaned. The

testing was done just prior to the center opening in the morning so it had been many hours since the last human contact.

Hakansson and his co-authors became interested in the possibility that some bacteria might persist on surfaces when they published work last year showing that bacteria form biofilms when colonizing human tissues. They found that these sophisticated, highly structured biofilm communities are hardier than other forms of bacteria.

"Bacterial colonization doesn't, by itself, cause infection but it's a necessary first step if an [infection](#) is going to become established in a human host," he explains. "Children, the elderly and others with compromised immune systems are especially vulnerable to these infections."

He explains that studies of how long bacteria survive on inanimate objects have used cultures grown in laboratory media, called broth-grown planktonic bacteria, and invariably show that bacteria die rapidly.

"But we knew that this form of bacteria may not represent how they actually grow in the host," says Hakansson. "Since discovering that biofilms are key to the pathogenesis of *S. pneumoniae*, we wanted to find out how well biofilm bacteria survive outside the body."

The UB experiments found that month-old biofilm of *S. pneumoniae* and *S. pyogenes* from contaminated surfaces readily colonized mice, and that biofilms survived for hours on human hands and persisted on books and soft and hard toys and surfaces in a daycare center, in some cases, even after being well-cleaned.

"In all of these cases, we found that these pathogens can survive for long periods outside a human host," says Hakansson. But, he says, the scientific literature maintains that you can only become infected by

breathing in infected droplets expelled through coughing or sneezing by infected individuals.

"Commonly handled objects that are contaminated with these biofilm bacteria could act as reservoirs of bacteria for hours, weeks or months, spreading potential infections to individuals who come in contact with them," concludes Hakansson. He cautions that more research should be done to understand under what circumstances this type of contact leads to spread between individuals.

"If it turns out that this type of spread is substantial, then the same protocols that are now used for preventing the spread of other bacteria, such as intestinal [bacteria](#) and viruses, which do persist on surfaces, will need to be implemented especially for people working with children and in health-care settings," he adds.

**More information:** "Internalization and Trafficking of Nontypeable Haemophilus influenzae in Human Respiratory Epithelial Cells and Roles of IgA1 Proteases for Optimal Invasion and Persistence." Cara F. Clementi, Anders P. Håkansson, and Timothy F. Murphy. *Infect. Immun.* January 2014 ; 82:1 433-444 published ahead of print 11 November 2013. [DOI: 10.1128/IAI.00864-13](https://doi.org/10.1128/IAI.00864-13)

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