

# Bacteria on the hands of school-age children at a Pediatric Hospitalization Unit

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## Bacteria on the hands of school-age children at a Pediatric Hospitalization Unit

### Abstract

**Objective.** To estimate the prevalence of bacteria isolated in samples from the hands of school-age children at a hospitalization unit. **Methodology.** In 2009, strains were cultured from the hands of 90 school-age children at the pediatric hospitalization unit of Hospital Estadual Bauru (São Paulo, Brazil). After culture of the samples, the isolated bacteria were identified. **Results.** In 98% of the samples taken from the children, bacteria were isolated. *Coagulase-negative Staphylococcus* was isolated in 64% of the samples, followed by *Staphylococcus aureus* (5%) and *Pseudomonas aeruginosa* (1%). **Conclusion.** In most of the samples from the children's hands, bacteria were isolated. Therefore, educative actions about hygiene habits in- and outside the hospital environment should be reinforced, aimed at children and their companions.

**Key words:** handwashing; cross infection; hygiene; pediatrics.

## Bacterias presentes en las manos de los niños en edad escolar en la Unidad de Internación Pediátrica

### Resumen

**Objetivo.** Estimar la prevalencia de bacterias aisladas en las manos de los niños en edad escolar en una unidad de internación. **Metodología.** En 2009 se hicieron cultivos de las manos de 90 niños en edad escolar de la unidad de internación pediátrica del Hospital Estadual Bauru (São Paulo, Brasil). Se hizo cultivo de las muestras y posteriormente se realizó identificación de las bacterias aisladas. **Resultados.** En el 98% de las muestras tomadas a los niños se hicieron aislamientos de bacterias. *Stafilococcus coagulasa negativa* se aisló en el 64% de las muestras; *Staphylococcus aureus*, en un 5%, y *Pseudomonas aeruginosa*, en un 1%. **Conclusión.** En la mayor parte de las muestras de las manos de los niños internados se aislaron bacterias, por lo que

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se deben reforzar las acciones educativas a los niños y a sus acompañantes en relación con los hábitos de higiene en el ambiente hospitalario y fuera de él.

**Palabras clave:** lavado de manos; infección hospitalaria; higiene; pediatría

## Bactérias presentes nas mãos dos meninos em idade escolar na unidade de internação pediátrica

### Resumo

**Objetivo.** Estimar a prevalência de bactérias isoladas em mostras das mãos dos meninos em idade escolar numa unidade de internação. **Metodologia.** Em 2009 se fizeram cultivos das mãos de 90 meninos em idade escolar da unidade de internação pediátrica do Hospital Estadual Bauru (São Paulo, Brasil). Fez-se cultivo das mostras e posteriormente se fez identificação das bactérias isoladas. **Resultados.** No 98% das mostras tomadas aos meninos se fizeram isolamentos de bactérias. *Stafilococcus coagulasa* negativa se isolou no 64% das mostras, seguiram-lhe *Staphilococcus aureus* (5%) e *Pseudomonas aeruginosa* (1%). **Conclusão.** Na maior parte das mostras das mãos dos meninos internados se isolaram bactérias, pelo que se devem reforçar as ações educativas aos meninos e a seus acompanhantes em relação com os hábitos de higiene no ambiente hospitalar e fora dele.

**Palavras chave:** lavagem de mãos; infecção hospitalar; higiene; pediatria.

## Introduction

Hand washing is considered the simplest and most economical measure to prevent healthcare related infections.<sup>1</sup> The population should adopt the hand washing habit as early as in childhood. This practice is important, takes little time, is cheap and prevents several illnesses, including virus and bacteria-borne diseases.

A survey on hand washing habits, involving 227 mothers of children between 4 and 12 years of age in Brazil,<sup>2</sup> showed that 65% of children have fecal coliforms on their hands, and that one in every four mothers guarantees that their children wash their hands after using the bathroom.

According to UNICEF data, 3.5 million children under five years of age die every year due to diarrheic disease and acute respiratory infections.<sup>3</sup>

Bacteria colonize the human skin. Hand microbiota includes transitory and resident bacteria. Most infections are frequently caught through contact with patients or contaminated surfaces and caused by transitory germs that colonize the

upper skin layer. They can more easily be removed through hand washing. Resident flora, located in deeper skin layers, is more difficult to remove and normally is not associated with cross-infections.<sup>4</sup>

Various publications exist in which the importance of hand washing among health professionals is discussed,<sup>5-13</sup> but there is a lack of studies on the same theme among health service users.

The aim of this study was to estimate the prevalence of bacteria present on the hands of school-age children at the pediatric hospitalization unit of Hospital Estadual Bauru.

## Methodology

A descriptive and cross-sectional study was developed in 2009. The convenience sample

included 90 children between six and ten years of age.

The study was developed at Hospital Estadual Bauru (HEB), a health institution that uses resources from the São Paulo State Health Secretary. The Hospital Estadual Bauru offers a pediatric hospitalization service with 44 beds (11 intensive care and 33 internal medicine and surgery), including three isolation beds. This hospitalization unit includes a toy library that is open 24-hours per day and provides leisure and entertainment to children and their companions. Activities are scheduled and oriented and supervised by the hospital psychologist, some residents and volunteers.

No washing routine exists for the toys used at the toy library. The volunteers only disinfect some toys with 70% alcohol and dry them with clean cloths. The use of plastic toys and history books, comics and magazines is permitted, in accordance with the orientations of the hospital's Hospital Infection Control Service. The inclusion criteria were: child between six and 10 years of age, hospitalized for at least 24 hours at the HEB and companion's signature of the informed consent term. Samples were collected from the children's two hands, using sterile swabs.

In total, 90 children were observed, equivalent to 180 samples. Stuart transport medium was used. The samples were analyzed at the hospital's clinical analysis laboratory to identify the microorganisms according to its protocol, which included seeding on Petri dishes in Agar MacConkey and Manitol culture media, followed by 24 hours of incubation at 37<sup>o</sup>, after which the presence or absence of bacterial growth was analyzed. In case of non-growth, samples were incubated for an additional 24 hours and, if no microorganisms grew, the sample was considered negative. If bacterial colonies were present, morphology and staining characteristics were analyzed through Gram colonization, followed by the respective identification tests in line with

the laboratory protocol. Bacterial prevalence was calculated by dividing the number of samples in which the bacteria was isolated by the total number of samples. The result of this quotient was multiplied by 100.

This research received approval from the Research Ethics Committee at Botucatu Medical School (No. 2971-2008). The children's companions or responsible caregivers were invited to permit the children's participation in the study and, after explanations, they signed the informed consent term.

## Results

In the sample of 90 children, 61.1% were male. In total, 52.2% of the children's hospitalizations were due to surgery (52.2%) and the remainder (48.8%) to clinical reasons. Concerning the hands, bacterial growth was found on 77.7% of right and 68.8% of left hands ( $X^2=1.82$ ,  $p=0.177$ ). The analysis of hands per gender revealed statistically significant differences: for the right hands, 51.1% of girls and 85.5% of boys showed bacterial growth, against 51.1% of girls and 70.9% of boys for the left hands (right:  $X^2=13.90$ ,  $p<0.001$  and left:  $X^2=4.14$ ,  $p=0.04$ )

No bacteria were isolated from any of both hands in only two children (2.3%), 25 (27.7%) showed the growth of microorganisms on one hand and, among the remaining 63 (70.0%) bacteria were isolated from both hands (the same microorganism in 59 and different ones in four children).

*Coagulase-negative Staphylococcus* was the most isolated bacteria in all samples (64.4%), followed by *Staphylococcus aureus* (5.0%). Table 1 displays the prevalence levels of bacteria isolated on the right and left hands.

In two samples, *Coagulase-negative Staphylococcus* and *Pseudomonas* were found simultaneously, both on the right hand.

**Table 1.** Prevalence of bacteria isolated on the hands of children hospitalized at the HEB. Bauru, 2009

Bacteria	Hand		% Total (n=180)
	% Right (n=90)	% Left (n=90)	
<i>Acinetobacter</i>	1.1	0.0	0.6
<i>Escheirichia coli</i>	0.0	1.1	0.6
<i>Pseudomonas aeruginosa</i>	3.3	1.1	1.1
<i>Staphylococcus aureus</i>	4.4	5.6	5.0
<i>Coagulase-negative Staphylococcus</i>	70.0	61.1	64.4
No growth	23.3	31.1	27.2

## Discussion

The hands are one of the most concerning vehicles in the transmission of microorganisms and hand hygiene is related with reduced infection risks among hospitalized children.

The results obtained in this research show that bacteria were isolated in 98% of hospitalized children, higher than the results Ray *et al.*<sup>14</sup> reported among Hindu school-age children. In this study, *Coagulase-negative Staphylococcus* was the most isolated pathogen (64.4%), followed by *S. aureus* (5.0%). For Ray *et al.*<sup>14</sup>, the most frequent microorganism was *S. aureus* with 44.0%. These results underline that hands serve as vehicles to transmit microorganisms, which makes the hand washing technique fundamental for control purposes.

The difference between the bacterial growth results obtained for the right and left hands, with higher prevalence rates of pathogens on both hands among males in comparison with females, could be associated with development characteristics: boys develop different kinds of games, generally involving body contact (fights and pushes) and explore the environment with the help of their hands, while girls consider bodily hygiene more important.<sup>15-17</sup>

Health education is one of the core strategies to reduce HAI. Therefore, adult orientation

and supervision in some hygiene practices is fundamental.<sup>18</sup> The present study results suggest that hand washing habits may not be present among adults, and therefore is not required of the children. This situation has been confirmed in some studies, indicating that adults are not good models for this practice, including kindergarten educators<sup>20</sup> and even health staff.<sup>7,11,19,20</sup> Adults should encourage children concerning basic hygiene principles and uphold these as values and principles in their education.<sup>21</sup>

In conclusion, bacteria were isolated in most of the samples from the hands of hospitalized children. Therefore, educative actions about hygiene habits in- and outside the hospital environment should be reinforced, aimed at children and their companions.

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