HAEMOPHILUS INFLUENZAE ASSOCIATED WITH ACUTE RESPIRATORY ILLNESSES IN YOUNG CHILDREN

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Summary
A total of 303 young children with acute respiratory tract illnesses were examined for viral and bacterial agents. The isolation of Haemophilus influenzae from 58 (19.1%) of the children was described in relation to respiratory viruses and other bacterial agents isolated at the same time. H. influenzae was isolated alone in 24 instances. Streptococcus pneumoniae and respiratory syncytial virus were the most common bacterial and viral agents associated with H. influenzae. Only 7.5% of the 40 laboratory confirmed cases of influenza yielded H. influenzae in their respiratory secretions.

INTRODUCTION
Haemophilus influenzae is one of the important bacterial species associated with acute infection of the respiratory tract. Several investigators have found a high incidence of H. influenzae predominating in throat flora coinciding with symptoms of acute respiratory tract disease. A possible causal role of H. influenzae in these infections was suggested by Dick et al. and Bridger when they observed the disappearance of this organism coinciding with the recovery of the patients after antibiotic therapy.

Several studies have shown that infections by H. influenzae and other bacterial pathogens combined with or superimposed on viral infections are not infrequently found in children with acute respiratory illnesses. Such mixed infections may cause more severe illness than that of the primary viral disease.

This report describes the isolation of H. influenzae and other bacterial species from children with acute respiratory tract infections together with isolation of respiratory viruses.

MATERIALS AND METHODS
From March 1974 to November 1977, respiratory secretions from 303 young children with acute respiratory tract infections were cultured for viral and bacterial agents. The children were included in the study if they had symptoms and/or signs of an acute respiratory tract infection and were cooperative during specimen collection. The ages of these children ranged from one month to 10 years of age. Many of the children were less than 2 years old.

Throat and/or pernasal swabs or nasopharyngeal mucus were collected from each child for cultural examination. The nasopharyngeal mucus was collected in sterile plastic disposable mucus extractors.

Isolation of Bacteria
Specimens were cultured within two hours of collection onto blood agar and chocolate agar plates, prepared with 10% defibrinated ox blood in blood agar base (Oxoid) as well as charcoal blood agar (Difco) containing 0.25 units of penicillin. The blood agar and chocolate agar plates were incubated at 36°C in a candle jar for one to two days and examined for the presence of H. influenzae and other likely pathogens, such as Streptococcus pneumoniae, B-haemolytic streptococci and Staphylococcus aureus. The charcoal blood agar plates were incubated aerobically at 36°C and examined after 2, 4 and 7 days for colonies of Bordetella pertussis. The bacterial pathogens were identified as follows: H influenzae by its requirement for X and V factors, Strep. pneumoniae by its sensitivity to optochin, Staph. aureus by a positive coagulase test and B. pertussis by slide agglutination with specific antiserum.

Isolation of Viruses
Respiratory virus isolations were carried out in parallel with bacterial isolations using separate throat and/or pernasal swabs but with the same sample of nasopharyngeal mucus. Specimens were sent to the virology laboratory as soon as possible usually on wet ice. In the laboratory the specimens were inoculated into

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appropriate tissue cultures or frozen at \(-70^\circ\text{C}\) until tissue cultures were available. The methods used for isolation and identification of respiratory viruses have been described previously.\(^9\)

No attempt was made to isolate coronavirus and cytomegalovirus as well as \textit{Mycoplasma pneumoniae} and other fastidious bacteria.

RESULTS

Viral and/or bacterial pathogens were recovered from 165 (54.4\%) of the children. Viral agents only were recovered from 79 children (26.1\%), bacterial agents only from 61 children (20.1\%) and both viral and bacterial agents from 25 (8.2\%) of the children.

\textit{H. influenzae} was isolated from 58 children, an isolation rate of 19.1\%. Six of the isolates (10.3\%) were capsulated; three were type a, two type b and one type f. \textit{H. influenzae} was the sole likely pathogen isolated from 24 children. In the other 34 children, \textit{H. influenzae} was isolated simultaneously with other bacterial agents in 19 cases, with viral agents in 7 cases and with both viral and other bacterial agents in 8 cases, as shown in Table 1.

\textit{Strep. pneumoniae} was isolated with \textit{H. influenzae} from 24 cases, including 7 cases of laboratory confirmed virus infections. Respiratory syncytial virus was recovered together with \textit{H. influenzae} from 6 cases including 2 cases with rhinovirus isolates. There was also one

\begin{table}[h]
\centering
\caption{Haemophilus influenzae Isolated from Children with Acute Respiratory Illnesses}
\begin{tabular}{l|c}
\hline
& Number of Children \\
\hline
\textit{H. influenzae} isolated as sole agent: & 24 \\
\textit{H. influenzae} isolated with other bacterial agents: & 19 \\
\textit{Streptococcus pneumoniae} & 17 \\
\textit{Staphylococcus aureus} & 2 \\
\textit{H. influenzae} isolated with viral agents: & 7 \\
Respiratory syncytial virus (RSV) & 3 \\
Parainfluenza virus & 2 \\
Rhinovirus & 1 \\
RSV and Rhinovirus & 1 \\
\textit{H. influenzae} isolated with other bacterial agents: & 8 \\
RSV and \textit{Strep. pneumoniae} & 1 \\
Influenza A or B virus and \textit{Strep. pneumoniae} & 3 \\
RSV, Rhinovirus and \textit{Strep. pneumoniae} & 1 \\
Parainfluenza virus and \textit{Strep. pneumoniae} & 1 \\
Parainfluenza virus and \textit{bordetella pertussis} & 1 \\
Adenovirus and \textit{Strep. pneumoniae} & 1 \\
\hline
Total & 58 \\
\end{tabular}
\end{table}
other case of infection with rhinovirus and 4 cases with parainfluenza viruses. In one of these cases, parainfluenza type 2 virus was isolated together with Bordetella pertussis and H. influenzae in a 1-month-old child with bronchitis.

Among the respiratory viruses isolated from 104 children in this study, there were 25 influenza type A and 15 influenza type B viruses. H. influenzae was associated with only three of these viruses (one type A and two type B viruses).

**DISCUSSION**

It has been noted in previous studies that when H. influenzae was isolated from acute respiratory tract infections, it was often found in association with at least one other potential pathogen, either bacterial, mycoplasmal or viral agents. In the present study, over half the H. influenzae isolates were associated with viral and other bacterial agents. It is possible that in the remaining cases where H. influenzae was recovered alone, other agents of respiratory infections like Mycoplasma pneumoniae, coronavirus and cytomegalovirus, could have been present but no isolations were done for these agents.

Previous investigators have also noted that H. influenzae and Strep. pneumoniae were frequently isolated together from respiratory secretions in patients with viral infections. The biologic significance of this association is not clear. There is no clear evidence of synergism in the production of disease. However, the severity of respiratory illness may be related to infection by multiple agents. With respiratory viral infections there may be a change in the growth of pathogenic bacteria and in some cases this change may contribute to prolonged and more severe disease.

In the present study H. influenzae was associated with only 7.5% of the 40 laboratory-confirmed cases of influenza. This finding is in keeping with the observation that H. influenzae did not play a significant role in recent outbreaks of influenza.

The isolation rate of 19.1% of H. influenzae from these 303 symptomatic children is higher than the isolation rate of 13 to 15% of H influenzae in the pharynx of asymptomatic children in the Kuala Lumpur and Petaling Jaya area. Since both capsulated and non-capsulated strains of H influenzae was not isolated substantially more frequently in the children with respiratory illnesses, their isolates of H. influenzae may merely represent normal throat flora. However, many of the sick children with heavy growth of H. influenzae improved clinically after antibiotics were given to eradicate the organisms.

It was unfortunate that paired serum specimens could not be obtained from these children with acute respiratory illnesses to demonstrate any change in titre of antibodies to H. influenzae. Sell et al were able to demonstrate rising titres of specific H influenzae antibodies in many young children with acute respiratory infections who have profuse growth of H influenzae in their nasopharyngeal cultures.

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**REFERENCES**


