Simplified semiquantitative culture using washed sputum from children with lower respiratory tract infections

Microbiologic diagnosis of bacterial lower respiratory tract infection in children is difficult because invasive diagnostic approaches, such as bronchoscopy or lung biopsy, are usually not available for children. Previously, we showed the usefulness of a semiquantitative culture using sputum obtained from children. However, this method requires sputum to be washed three times to reduce bacteria from the upper respiratory tract, and is tedious to perform as routine laboratory work. The purpose of our present study was to evaluate a simplified culture method for identifying causative pathogens in childhood lower respiratory tract infection.

We studied 268 children who were admitted to Saitama Medical School, Japan from February 1999 to August 2001 with the diagnosis of lower respiratory tract infection. Sputum was obtained by inducing the children to cough, as described previously. The specimens were classified according to the Geckler classification and washed in sterile saline by vigorous stirring using a bacterial loop. The core of the sputum was collected and inoculated on to agar plates and incubated. For the simplified method, colonies were identified and bacteria with almost pure growth or with colony numbers of more than 50% on the plate were defined as pathogens. For 60 specimens we used sputum remaining from the simplified method, which was washed in fresh saline twice more and cultured. This was the same methodology used in the original method. Results were compared between the two methods. Informed consent was obtained from the parents of all children.

Most specimens were classified into Geckler 5: fewer than 10 squamous epithelial cells and more than 10 neutrophils for each low power (×100) field. The pathogens identified by the original/simplified methods were as follows: Haemophilus influenzae, 17/19; Streptococcus pneumoniae, eight/eight; Pseudomonas aeruginosa, six/three; methicillin resistant Staphylococcus aureus, six/three; Streptococcus agalactiae, two/two; and Stenotrophomonas maltophilia, one/two. No significant pathogens were identified in 21 and 24 specimens by the simplified and original methods, respectively. Mixed pathogens were identified in three and one specimen, respectively. In 56 samples, results were the same with both methods, with an agreement rate of 93% (56 of 60).

Pathogens identified by the simplified method in 268 children were as follows: H influenzae 33%, S pneumoniae 16%, and S aureus 3%. No significant pathogens were identified in 123 specimens (46%).

The diagnostic value of sputum in children is not clear because expectorated sputum is difficult to obtain. We successfully obtained sputum by inducing the children to cough. In addition, the simplified semiquantitative culture using washed sputum showed a high agreement rate with the original method, which involved three washes. We recommend this simplified method as a less invasive method to clarify bacterial pathogens in lower respiratory tract infections among children.
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