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Short Communication
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# Changes in Acute Otitis Media Pathogens

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## Short Communication

In their 1971 book on otolaryngology, when the authors graduated from university, they identified the pathogen of acute otitis media as *Staphylococcus aureus*. A few years later, they had the opportunity to work in a private hospital. They assessed patients who had just developed the disease and had not received antibiotics. Tests were requested at a laboratory center that had a clinical laboratory technician who was skilled in clinical bacteriology. Since about 50 cases were collected, the detected bacteria were tallied and described in the textbook. There were only two to three strains of *S. aureus*.

The primary bacteria were *Streptococcus pneumoniae* (60.3%), *Haemophilus influenzae* (24.4%), and *Streptococcus pyogenes* (6.9%) (Table 1) [1].

It was markedly different from that described in the book.

Here, the authors describe their specimen collection method. They disinfected the ear canal with an iodine solution before tympanotomy. The middle ear reservoir fluid that was drained after tympanotomy was collected not with a sterile swab but with an aspirator equipped with an Ishigami suction device (Figure 1) containing 1 mL of trypticase soy broth to prevent the death of bacteria by drying. For culture testing, chocolate agar and rabbit blood agar were used, which enabled the growth of *H. influenzae* and *S. pneumoniae*. It took about 10 years for the authors to obtain consent from Japanese otolaryngologists to publish the data. Japan, which was defeated in World War II, suffered from a shortage of supplies after 1945. Due to the chaos after the war, it was a time of satisfaction if something was detected after testing, tests based on clinical bacteriology would have been performed in only a few institutions. *S. aureus* was easy to detect because it could live for several days even with poor nutrition. On the other hand, *S. pneumoniae* and *H. influenzae* die in one to two hours when not in contact with the preserving medium [2]. *S. pneumoniae* and *H. influenzae* culturing became common after the launch of transport media (modified Amuse medium, Seed Swab No. 2, Eiken Institute) in 2002.

Even in 2000, when multidrug-resistant pneumococcus was prevalent, many professors boasted that penicillin-intermediate resistant *S. pneumoniae* and penicillin-resistant *S. pneumoniae* did not exist in Japanese universities. It is presumed that even the university hospital could not identify multidrug-resistant pneumococcus. During the same period, the authors collaborated with 10 private clinics and found that 75% of the pneumococci detected were multidrug-resistant.

**Figure 1:** Bacteria culture specimen collection and preservation methods.
• Otitis media secretion collection using the Ishigami suction device
• Cryopreserved at 4°C

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**Table 1:** Changes in acute otitis media with time (Japan).

| Generation | 1930s | 1950s | 1970s | |
|---|---|---|---|---|
| Reporter and reporting year | Ito 1934 [5] | Fukuda 1952 | Asano 1972 [6] | Sugita 1979 |
| Specimen site | Tympanotomy | Tympanotomy, puncture, ear discharge | Ear discharge | Tympanotomy |
| Medium used | Chocolate agar Rabbit blood agar | Bovine blood agar | Not entered | Chocolate agar 7% rabbit blood agar Trypticase soy broth test tube medium |
| Testing location | Physician | University Hospital Central Laboratory | Central laboratory | Private laboratory |
| Detection rate | *S. pneumoniae* - 51.2%<br>*H. influenzae* - 16.2%<br>*S. pyogenes* - 31.3%<br>*S. aureus* - 1.3% | *S. pneumoniae* - 10.6%<br>*H. influenzae* - 0.0%<br>*S. pyogenes* - 18.1%<br>*S. aureus* - 45.7% | *S. pneumoniae* - 2.2%<br>*H. influenzae* - 2.2%<br>*S. pyogenes* - 15.6%<br>*S. aureus* - 46.7% | *S. pneumoniae* - 60.3%<br>*H. influenzae* - 24.4%<br>*S. pyogenes* - 6.9%<br>*S. aureus* - 3.8% |

**Table 2:** *S. aureus* detection rate and otitis media secretion collection methods in foreign countries [3].

| Reporter | *S. aureus* detection rate (%) | Method for collecting otitis media secretions |
|---|---|---|
| Sparrenvohn | 60 | Ear discharge |
| Fransen | 42 | Ear discharge |
| Valeentein | 22 | Ear discharge |
| Rudberg | 29 | Tympanostomy |
| Henry & Kun | 12 | Tympanostomy |
| Nielsenn | 1.8 | Paracentesis aspiration of the tympanic membrane |
| Lahikainen | 1.7 | Paracentesis aspiration of the tympanic membrane |

Is *S. aureus* the pathogen? *S. aureus* is statistically more likely to be detected in otorrhea cases than in tympanotomy cases (Table 2) [3]. Since acute otitis media is due to an infection of the Eustachian tube, it cannot be the pathogen in otitis media unless it is present in the nasopharynx. Middle ear effusion and nasopharyngeal swabs were collected from one patient with acute otitis media, and the bacteria detected were compared.

There are 73 strains that cause acute otitis media and 76 strains that cause nasopharyngitis. For middle ear effusion, *S. pneumoniae* was detected at the rate of 46%, *H. influenzae* at 43.8%, and S. aureus at 2.7%. The nasopharyngeal swab showed *S. aureus* at 0%, which was considered to be contamination in the external auditory canal [4-6].

Knowledge of specimen collection methods, specimen storage (preservation media), culture media, and colony identification on media is required to obtain correct test results.

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