Antibiotic Resistance of *Staphylococcus aureus* Strains Isolated from Fish Processing Factory Workers

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One hundred and twenty two strains of *Staphylococcus aureus* isolated from throats and palms of 39 workers from 6 fish processing factories situated in and around Cochin were tested for their sensitivity to nine commonly used antibiotics - ampicillin, chloramphenicol, erythromycin, kanamycin, neomycin, penicillin, polymyxin - B, streptomycin and tetracycline. Highest percentage of resistance was observed towards ampicillin followed by penicillin i.e. 64.75% and 59.84%. Resistance towards other antibiotics like tetracycline, polymyxin-B, erythromycin, kanamycin, neomycin, chloramphenicol and streptomycin were shown by 22.95, 16.39, 7.38, 5.74, 5.74, 3.28 and 1.64% of the isolates respectively.

Staphylococci are ubiquitous in nature and can produce many toxic substances that may be involved in human infections caused by the organism other than those related to the ingestion of food. Attempts to control these organisms by chemoprophylaxis and chemotherapy through the use of antimicrobial agents particularly antibiotics have resulted in the increased prevalence of resistance of these organisms (Barber *et al.*, 1949; Nakhla, 1973). Resistance may appear rapidly or slowly depending on the organisms concerned, the volume and type of drug used and the method of application. In developed countries stringent control of antibiotic use coupled with effective surveillance of antibiotic resistance pattern in the population have successfully reduced the prevalence of the antibiotic resistance to these agents (Bulger & Sherris, 1968). The situation is different in a developing country like India. Information concerning the drug resistant pattern of the prevailing pathogenic bacteria and the appearance of new resistant characteristics is of utmost value for a proper selection of antimicrobial agents for the therapeutic purpose (Sundaram *et al.*, 1982). During the early years of antibiotic era few penicillin resistant strains were isolated. With the introduction of newer antibiotics there is change in the antibiotic resistant pattern of Staphylococci (Barber *et al.*, 1949; Gupta & Chakravarthi, 1954; Goyal & Madhavan, 1961; Rao *et al.*, 1966; Bhaskaran & Jayakar, 1969; Bhujwala & Mohapatra, 1972; Nanu & Soman, 1980; Vijayalakshmi & Bhaskaran, 1981; Sanjeev *et al.*, 1983 a). The most important problem in dealing with staphylococcal infection has been the progressive emergence of the organism resistant to various antibiotics and chemotherapeutic agents due to the widespread and indiscriminate use of antibiotics.

In view of the above an attempt was made to study the antibiotic resistance pattern of *S. aureus* isolated from the throats and palms of fish processing factory workers.

Materials and Methods

122 strains of *S. aureus* were isolated from the throats and palms of 39 persons working in 6 fish processing factories situated in and around Cochin city (Sanjeev *et al.*, 1987). All the strains were tested for their antibiotic sensitivity by disc diffusion method. The following are the antibiotics tested and their disc potency: ampicillin - 10 mcg, chloramphenicol - 30 mcg, erythromycin - 15 mcg, kanamycin - 30 mcg, neomycin - 30 mcg, penicillin - 10 U, polymyxin - B - 300 U, streptomycin - 10 mcg and tetracycline - 30 mcg.

Sterile cotton swab was inserted into 18 h old nutrient broth culture of the organism and rotated it while pressing against the
upper inside wall of the tube above the culture fluid level to remove the excess inoculum. The swab was then streaked on to the surface of present nutrient agar plates and allowed to surface dry for 10 min at room temperature. The antibiotic discs having the standard strength were placed apart on the plates using sterile forceps in such a way that there is no chance of overlapping. The plates were then incubated at 37°C for 24 h and the zone of inhibition around each disc was measured and interpreted as suggested by Anderson (1973).

Results and Discussion

The results of the antibiotic sensitivity tests of the 122 strains of S. aureus isolated from the fish processing factory workers are given in Table 1. The highest percentage of resistance was found with ampicillin (64.75 %) followed by penicillin (59.84 %). Resistance towards other antibiotics like tetracycline, polymyxin-B, erythromycin, kanamycin, neomycin, chloramphenicol and streptomycin were 22.95, 16.39, 7.38, 5.74, 3.28, and 1.64 % of the isolates respectively.

Previous studies have shown that out of 116 strains of S. aureus isolated from frozen and dried fishery products, highest percentage of resistance was found with ampicillin (39.66 %) followed by penicillin (38.79 %) and tetracycline (13.79 %) (Sanjeev et al., 1985 a). The results of both the studies are in agreement when compared with the highest resistance i.e. maximum resistance was shown towards ampicillin, penicillin and tetracycline by the isolates in descending order. Coagulase positive staphylococci do not constitute the normal flora of fresh marine fish. 49.50 % of the fish handlers were found to be the carriers of S. aureus (Sanjeev et al., 1987). In view of the antibiotic sensitivity pattern and the above stated reasons it can be stated that fish and fishery products get contaminated by S. aureus from fish handlers. Enterotoxin (s) production pattern of the S. aureus isolates from fishery products and fish processing factory workers also supports the above statement (Sanjeev et al., 1985b; 1987).

In Poland, Kurylowiez and Slopek (1946) studied 200 strains of S. aureus and found only 1 % penicillin resistant strains but all the isolates from market beef were found resistant to penicillin (Nanu & Soman, 1980). The high incidence of antibiotic resistant strains among S. aureus has been attributed to the unrestricted and often unnecessary use of antibiotics. The antibiotic resistant strains of S. aureus in fishery products and fish processing factory workers pose a threat to public health activities and clinical practices; so the unrestricted and often unnecessary use of antibiotics has to be checked.

Table 1. Antibiotic resistance of 122 strains of S. aureus isolated from 39 fish processing factory workers

<table>
<thead>
<tr>
<th>Antibiotics</th>
<th>No. of isolates resistant</th>
<th>%</th>
<th>No. of isolates showing intermediary sensitivity</th>
<th>%</th>
<th>No. of isolates sensitive</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ampicillin</td>
<td>79</td>
<td>64.75</td>
<td>15</td>
<td>12.30</td>
<td>28</td>
<td>22.95</td>
</tr>
<tr>
<td>Erythromycin</td>
<td>9</td>
<td>7.38</td>
<td>40</td>
<td>32.79</td>
<td>73</td>
<td>59.84</td>
</tr>
<tr>
<td>Kanamycin</td>
<td>7</td>
<td>5.74</td>
<td>3</td>
<td>2.46</td>
<td>112</td>
<td>91.80</td>
</tr>
<tr>
<td>Neomycin</td>
<td>7</td>
<td>5.74</td>
<td>11</td>
<td>9.02</td>
<td>104</td>
<td>85.25</td>
</tr>
<tr>
<td>Penicillin</td>
<td>73</td>
<td>59.84</td>
<td>7</td>
<td>5.74</td>
<td>42</td>
<td>34.43</td>
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<tr>
<td>Tetracycline</td>
<td>28</td>
<td>22.95</td>
<td>14</td>
<td>11.48</td>
<td>80</td>
<td>65.57</td>
</tr>
<tr>
<td>Streptomycin</td>
<td>2</td>
<td>1.64</td>
<td>13</td>
<td>10.66</td>
<td>107</td>
<td>87.70</td>
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<tr>
<td>Chloramphenicol</td>
<td>4</td>
<td>3.28</td>
<td>3</td>
<td>2.46</td>
<td>115</td>
<td>94.26</td>
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<tr>
<td>Polymyxin–B</td>
<td>20</td>
<td>16.39</td>
<td>50</td>
<td>40.98</td>
<td>52</td>
<td>42.62</td>
</tr>
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</table>

FISHERY TECHNOLOGY
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References


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