New Serologically Distinguishable Type of Coagulase-Positive Staphylococcus of Canine Origin

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Of 150 coagulase-positive staphylococcal isolates from infections in dogs, 9 isolates with biochemical properties of human biotype were characteristically agglutinated by absorbed antiserum to staphylococcal strain 17, while only 110 of 141 isolates with biochemical properties of staphylococci of canine origin were agglutinated by absorbed antiserum to strain 61218. However, upon development of a new agglutinating serum, absorbed antiserum to strain 887, all but one of the remaining 31 isolates could be classified as being of canine biotype. Absorbed antiserum 887 should therefore aid in the comprehensive identification of staphylococci of canine origin in dogs, as well as in epidemiological studies of the interchange of staphylococci between canine pets and people.

In a previous study (8), some staphylococcal isolates from infections in dogs with biochemical properties of staphylococci of canine origin were agglutinated by absorbed antiserum to staphylococcal strain 61218, known to react with staphylococci of canine biotype (6) as well as with absorbed antiserum to staphylococcal strain 17, specific for staphylococci of human origin (7). Further investigation of this incongruity resulted in the recognition of canine staphylococcal strain 887, representative of the cultures in question, which was determined to share antigenic components with strain 61218, as well as with strain 17. However, after treatment of antiserum 17 with strain 887, subsequent to its absorption with strain 61218 (the procedure used until then [8] for the preparation of absorbed antiserum 17), the new diagnostic serum 17 was found to have retained its specificity for staphylococci of human origin, while it ceased to agglutinate any of the isolates involved. These then reacted only with absorbed antiserum 61218 and thus proved to be staphylococci of canine biotype.

Although in the above-described study staphylococci of human and canine origin were identified serologically, some isolates were not agglutinated by either of the two absorbed antisera. When such staphylococcal strains were again encountered in a subsequent serological survey of isolates from canine infections, this deficiency was investigated. This report deals with the data obtained.

The organisms were isolated from dogs in the Veterinary Hospital, University of Pennsylvania, by the Clinical Pathology Laboratory. Most of the isolates were from skin infections; the remainder were recovered from various other sites.

Because all the staphylococcal cultures studied were coagulase positive, reference to their coagulase activity is generally omitted in this report.

The fibrinolysin test, the coagulase test with human and canine plasma, the production of immune sera, the preparation of absorbed immune serum to strain 61218, and the slide agglutination test were done as previously described (6). Absorbed immune serum to strain 17 was prepared as previously described (7). The preparation of absorbed immune serum to strain 887 was analogous to that of absorbed immune serum 61218, i.e., immune serum 887 was absorbed in succession with strains 17 and Cowan I (11). The API Staph-Ident system (Analytab Products, Plainview, N.Y.) designed for the taxonomic classification of staphylococci (2) was used for species identification of representative groups of the isolates studied.

The 150 isolates studied could be divided into two categories with respect to their biochemical characteristics (Table 1). Nine of the isolates coagulated human plasma, with or without coagulation of dog plasma, and seven of them were fibrinolytic. Thus, these isolates had the biochemical earmarks of Staphylococcus aureus of human origin (6). That two of the isolates did not cause fibrinolysis is in accord with the reported observation that a small percentage of human staphylococci do not exhibit this property (9). All nine isolates were agglutinated by absorbed antiserum to strain 17 and not by absorbed antiserum to strain 61218. Therefore, all of them could be classified as being of human biotype causing infections in dogs. The remaining 141 isolates possessed the biochemical properties of staphylococci of canine origin in that they coagulated canine plasma without coagulating human plasma and were nonfibrinolytic (7). Of these, 110 were agglutinated by absorbed antiserum 61218, and none were agglutinated by absorbed antiserum 17.

The 31 unclassified isolates were then tested with absorbed antiserum to strain 887 to determine any possible relationship of these isolates to the recently identified group-representative canine staphylococcal strain 887 (8). All but one of these isolates yielded positive results in the agglutination test with absorbed antiserum 887 (Table 1). Furthermore, when the 110 isolates positive in the agglutination test with absorbed antiserum to strain 61218 were tested with absorbed antiserum 887, all were agglutinated by the latter as well. On the other hand, all nine isolates of human biotype were negative in the test. The data showed that while most of the isolates of canine biotype recovered from dog infections were agglutinated by absorbed antiserum 61218, virtually all reacted with the newly developed absorbed antiserum 887. Thus, according to the serological results, 30 of the 141 isolates did not share an antigen with strain 61218 in that they were agglutinated exclusively by absorbed antiserum 887. On that basis, two antigenic groupings of staphylococci of canine biotype were represented, i.e., a predominant group reacting with absorbed antisera 61218 and 887 and a second group, consisting of a new serotype, agglutinating
TABLE 1. Results of biochemical and serological reactions, including that with the newly developed agglutinating serum to strain 887, of 150 staphylococcal isolates from canine infections

<table>
<thead>
<tr>
<th>Group</th>
<th>No. of isolates</th>
<th>No. of isolates with biochemical reaction</th>
<th>Human biotype</th>
<th>Canine biotype</th>
<th>No. of isolates positive with absorbed antiserum</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>61218/17-CI</td>
<td>17/6128-887</td>
<td>887/17-CI</td>
</tr>
<tr>
<td>A</td>
<td>9</td>
<td>9</td>
<td>0</td>
<td>9</td>
<td>0</td>
</tr>
<tr>
<td>B</td>
<td>31</td>
<td>31</td>
<td>0</td>
<td>0</td>
<td>30</td>
</tr>
<tr>
<td>C</td>
<td>110</td>
<td>110</td>
<td>110</td>
<td>0</td>
<td>110</td>
</tr>
</tbody>
</table>

* Antiserum/strain(s) with which antiserum was absorbed. 17-CI, Strains 17 and Cowan I.

with absorbed antiserum 887 only. The new agglutinating serum 887 was therefore indispensable for the identification of virtually all the canine staphylococci examined.

It is of interest to note that Pillet et al. (11) in studying staphylococcal isolates from infections in dogs found that only about 78% of 51 isolates with biochemical characteristics of staphylococci of canine origin were agglutinated by absorbed antiserum to strain 61218, leaving the primary host relationship of 22% of their specimens unresolved. In the present study, too, approximately 21% of the isolates with biochemical properties of staphylococci of canine biotype would have remained unclassified except that with the additional aid of absorbed antiserum to strain 887 all but 1 of 31 such isolates could be characterized.

The results of examination of 70 isolates by the API Staph-Ident system are presented in Table 2. There was no difference between strains 887 and 61218 with regard to their classification by the Staph-Ident system, in that 58 of the 60 isolates of the two serotypes combined were identified as Staphylococcus intermedius (3), the predominant species of staphylococci reported in canine infections (1). Thus, the isolates designated as of canine origin by the agglutination test, regardless of the serotype, were identified as S. intermedius. However, because this species of staphylococci is encountered in other animal species as well (1) and may thus be transmitted to humans, the primary canine host relationship of such bacteria when isolated from people could be ascertained only by the serological method. On that basis, as previously reported (6, 7), staphylococci recovered from humans, including isolates from skin infections, have been identified as being of canine biotype. Furthermore, while the newly developed agglutinating serum to strain 887 made it possible to distinguish two serotypes, a factor advantageous in epidemiological studies, no such differentiation was possible by the Staph-Ident system, the API profile numbers in each of the two groups being similar. The inability to resolve subspecies within the S. intermedius species by means of the API strip method was previously reported (5).

The nine isolates classified as S. aureus by the Staph-Ident method were serologically determined to be of human origin. Thus, the agglutination test proved essential in identifying the primary source of the bacteria associated with these infections in dogs, since S. aureus is not limited to humans (1).

The data showed that taxonomic classification of the isolates identified S. aureus and S. intermedius but that serological characterization was necessary to determine the specific primary host of the bacteria. This constitutes a prerequisite in tracing a source of infection, especially in view of the ubiquity of staphylococci and the ready interchange of the bacteria between one species and another. Consequently, the newly developed agglutinating serum to strain 887, aside from improving the serological identification of staphylococci of canine origin in dogs, should contribute to more specific recognition of the source of the bacteria of canine biotype when encountered in humans, thereby aiding in epidemiological and epizootiological investigations of staphylococcal zoonosis attributable to close contact between people and pets (4, 6, 10).

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LITERATURE CITED