Prevalence of *Listeria* in soil

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One hundred thirty soil samples from agricultural fields and animal-inhabited areas were examined for the presence of *Listeria*. The microorganism was identified in 23 (17.7%) samples. *L. monocytogenes* was detected in 7 samples (5.4%), *L. ivanovii* in 2 (1.5%), *L. innocua* in 10 (7.7%) and *L. welshimeri* in 4 samples (3.1%). Prevalence of *Listeria* in soil from agricultural fields (17.5%) did not differ considerably from that in the soil and animal-inhabited area (18.0%), but *L. ivanovii* was isolated only from the latter source. Frequency of occurrence of different species of *Listeria* differed from place to place.

**Keywords:** *Listeria, Listeria monocytogenes, Prevalence, Soil*

It is more than seventy years since *Listeria monocytogenes* was recognized as an animal pathogen, but getting more attention these days due to increasing number of clinical cases and foodborne outbreaks of listeriosis in human beings. Listeriosis is a serious zoonotic disease characterized mainly by meningitis, meningoencephalitis, abortion and septicemia with high mortality rates, though it is largely confined to pregnant women, neonates and patients with underlying immunosuppression

Among animals, ruminants are most commonly affected and the microorganism is responsible for causing encephalitis, abortion, septicemia and mastitis in cattle, sheep and goats.

Listeriosis has been recognized and studied mainly in the industrialized nations but cases of listeriosis among human beings and animals have also been recorded in different parts of India.

*Listeria* comprises a genus of bacteria adapted to saprophytic environments. Thus, the environment may constitute an important source of the microorganism. Since the last decade, there have been major advances in understanding of the microorganism, but major gaps still remain in our understanding about epidemiology of listeriosis.

Keeping in view the paucity of information on the status and epidemiology of *Listeria* infection in the country, the present investigation was carried out to study the prevalence of the microorganism in the soil.

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Agricultural area

<table>
<thead>
<tr>
<th>Source of sample</th>
<th>No. of samples</th>
<th>No. of samples carrying Listeria</th>
<th>L. monocytogenes</th>
<th>L. ivanovii</th>
<th>L. innocua</th>
<th>L. welshimeri</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture field 1</td>
<td>40</td>
<td>8 (20.0%)</td>
<td>4 (10.0%)</td>
<td>—</td>
<td>3 (7.5%)</td>
<td>1 (2.5%)</td>
</tr>
<tr>
<td>Agriculture field 2</td>
<td>20</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Agriculture field 3</td>
<td>20</td>
<td>6 (30.0%)</td>
<td>—</td>
<td>—</td>
<td>4 (20.0%)</td>
<td>2 (10.0%)</td>
</tr>
<tr>
<td>Total</td>
<td>80</td>
<td>14 (17.5%)</td>
<td>4 (5.0%)</td>
<td>—</td>
<td>7 (8.8%)</td>
<td>3 (3.8%)</td>
</tr>
</tbody>
</table>

Animal-inhabited area

<table>
<thead>
<tr>
<th>Source of sample</th>
<th>No. of samples</th>
<th>No. of samples carrying Listeria</th>
<th>L. monocytogenes</th>
<th>L. ivanovii</th>
<th>L. innocua</th>
<th>L. welshimeri</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cattle farm</td>
<td>20</td>
<td>2 (10.0%)</td>
<td>—</td>
<td>—</td>
<td>1 (5.0%)</td>
<td>1 (5.0%)</td>
</tr>
<tr>
<td>Sheep farm</td>
<td>15</td>
<td>3 (20.0%)</td>
<td>1 (6.7%)</td>
<td>1 (6.7%)</td>
<td>1 (6.7%)</td>
<td>—</td>
</tr>
<tr>
<td>Veterinary Clinic</td>
<td>15</td>
<td>4 (26.7%)</td>
<td>2 (13.3%)</td>
<td>1 (6.7%)</td>
<td>1 (6.7%)</td>
<td>—</td>
</tr>
<tr>
<td>Total</td>
<td>50</td>
<td>9 (18.0%)</td>
<td>3 (6.0%)</td>
<td>2 (4.0%)</td>
<td>3 (6.0%)</td>
<td>1 (2.0%)</td>
</tr>
<tr>
<td>Total</td>
<td>130</td>
<td>23 (17.7%)</td>
<td>7 (5.4%)</td>
<td>2 (1.5%)</td>
<td>10 (7.7%)</td>
<td>4 (3.1%)</td>
</tr>
</tbody>
</table>

Identification—Suspected isolates were purified on tryptic soy agar with 0.6% yeast extract and examined for their morphology and Gram’s reaction. These were further subjected to different cultural and biochemical tests using standard procedures. The isolates were identified according to Bergey’s Manual of Systematic Bacteriology and Bergey’s Manual of Determinative Bacteriology. The identity of representative isolates was confirmed by using Micro-ID Listeria Kits (Remel, USA). Four representative isolates of L. monocytogenes were got, confirmed and serotyped from the Public Health Laboratory Service, London.

Pathogenicity—The isolates of L. monocytogenes (7) were examined for pathogenicity in Swiss albino mice. Prevalence of Listeria spp. in different kinds of specimens is presented in Table 1. Among the 130 samples of soil from agricultural fields and areas with animal activity, Listeria spp. were detected in 23 (17.7%) samples. L. monocytogenes was detected in 7 samples (5.4%). All these isolates were pathogenic in nature and caused infection in mice. Mortality in mice was recorded after 2-5 days of inoculation. The microorganisms were reisolated from liver, spleen and intestine of the infected animals. All the four isolates of L. monocytogenes sent for serotyping belonged to serotype 4b. The other species of Listeria detected in the samples, included L. ivanovii (1.5%), L. innocua (7.7%) and L. welshimeri (3.1%). Among these species, L. monocytogenes and L. ivanovii have been the currently recognized pathogens, but the detection of L. innocua and L. welshimeri is also significant, because few reports are available regarding their association with disease. L. innocua has been associated with meningocerephalitis in animals, while L. welshimeri is associated with human infection.

Prevalence of Listeria in the soil samples from agricultural fields (17.5%) was not much different from that in the samples collected from animal-inhabited area (18.0%) with the exception that L. ivanovii was isolated only from the latter source. However, the frequency of occurrence of different species of Listeria differed from place to place.

Presence of Listeria in the environment of animal farms in this part of the country has also been reported earlier. The microorganisms have been isolated from soil and plants as well, the prevalence of L. monocytogenes ranging from 9 to 44% by several earlier workers. Soil contaminated with Listeria may lead to contamination of vegetation and plants which in turn may act as a source of infection for animals and human beings.

Survival and multiplication of the organism in the soil have been documented. Weis and Seeliger have shown the presence of high numbers of L. monocytogenes in the surface soil in the fields which can be correlated with the reports of disease outbreaks among animals. Such outbreaks may, in turn, increase the probability of contamination of environment and animal products resulting in greater risk to human health.

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References