Biological Characteristics of *Salmonella weltevreden* Typing Phages

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**ABSTRACT.** The important biological characteristics of *Salmonella weltevreden* (3,10 : r : z\(_6\)) typing phages were studied. On the basis of these, the phages could be classified into three groups: phages \(\Phi I\) and \(\Phi II\), phages \(\Phi III\), \(\Phi IV\) and \(\Phi VI\), and phage \(\Phi V\).

*Salmonella weltevreden* (3,10 : r : z\(_6\)) was found to be one of the commonest salmonella serotypes in India and has acquired much public health importance because of its isolation from diverse sources, human, animal and sewage (Singh and Garg 1971; Basu and Sood 1975). A phage-typing scheme based on the sensitivity to lysis by a set of six typing phases selected out of 146 strains of bacteriophages was developed using 1094 *S. weltevreden* strains from various sources (Seed and Basu 1979). Using this scheme, the epidemiological incidence and geographical distribution of its phage types in India during 1958—1974 was studied (Sood and Basu 1981).

In this note, we examine some of the biological characteristics of the six typing phages, viz. plaque morphology, antigenicity relationships (Adams 1959), heat inactivation and activation energy (Krueger 1932), sensitivity to sodium citrate (Adams 1952) and urea (Burnet 1933), host specificity to 1094 strains of *S. weltevreden* and 375 strains belonging to 36 other salmonella serotypes at RTD and 1000 RTD's (Sood and Basu 1982), and specificity to S—R dissociation. The results are presented in Table I. All showed a similar mean activation energy of about 400 kilojoules but differed in other characteristics.

Thus *S. weltevreden* typing phages could be broadly classified into 3 groups: (1) Phages with comparatively larger plaque size, antigenically related, similar heat inactivation range (68—72 °C), inhibited by citrate but insensitive to urea, specific for smooth strains of host and not specific for *S. weltevreden* alone — phages \(\Phi I\) and \(\Phi II\); (2) phages with small plaque size, antigenically related, most heat-stable, insensitive to both citrate and urea and specific for smooth strains of *S. weltevreden* and except phage \(\Phi VI\) specific
### Table I. Biological characteristics of *S. weltevreden* typing phages Φ I—Φ VI

<table>
<thead>
<tr>
<th>Typing phages</th>
<th>Plaque size mm</th>
<th>Antigenic relationship with phages</th>
<th>Temperature of inactivation ºC</th>
<th>Mean activation energy kJ</th>
<th>Citrate sensitivity</th>
<th>Urea sensitivity</th>
<th>Host specificity for <em>S. weltevreden</em></th>
<th>Specificity for S—R dissociation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Φ I</td>
<td>2</td>
<td>Φ II</td>
<td>68—72</td>
<td>438</td>
<td>+</td>
<td>—</td>
<td>—</td>
<td>specific for S form</td>
</tr>
<tr>
<td>Φ II</td>
<td>2</td>
<td>Φ I</td>
<td>68—72</td>
<td>400</td>
<td>+</td>
<td>—</td>
<td>—</td>
<td>ditto</td>
</tr>
<tr>
<td>Φ III</td>
<td>1—2</td>
<td>Φ IV, Φ VI</td>
<td>75—80</td>
<td>405</td>
<td>—</td>
<td>—</td>
<td>+</td>
<td>ditto</td>
</tr>
<tr>
<td>Φ IV</td>
<td>1</td>
<td>Φ III, Φ VI</td>
<td>72—78</td>
<td>366</td>
<td>—</td>
<td>—</td>
<td>+</td>
<td>ditto</td>
</tr>
<tr>
<td>Φ V</td>
<td>&lt; 1</td>
<td>not related</td>
<td>55—60</td>
<td>399</td>
<td>activity increased</td>
<td>+</td>
<td>—</td>
<td>attacks both S and R forms</td>
</tr>
<tr>
<td>Φ VI</td>
<td>1</td>
<td>Φ III, Φ IV</td>
<td>72—78</td>
<td>408</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>specific for S form</td>
</tr>
</tbody>
</table>