A Research Note

Purchased Cell Cultures for Detecting Foodborne Viruses

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ABSTRACT

Cell cultures purchased from three different manufacturers generally showed adequate and comparable sensitivity to poliovirus which had been inoculated experimentally into extracts of ground beef.

Methods to recover foodborne viruses have evolved recently to the point that any food microbiology laboratory can carry out the extraction procedures (4,6). Nevertheless, virus will only be detected if it produces a perceptible infection in a laboratory host (2). The laboratory host of choice is ordinarily tissue culture, and unfamiliarity with tissue culture procedures seems to be a major deterrent to virologic investigations in many food microbiology laboratories.

Present methods produce food extracts which could be submitted to a clinical virology laboratory for testing. If this is not feasible, one might well wonder whether the tissue cultures offered for sale in the catalogs of several companies would serve adequately for this purpose. The present study was designed to compare tissue cultures obtained in 1976 from three different manufacturers and those prepared in our own laboratory, from the standpoints of cost and of sensitivity to virus in a model food extract. Vendors were selected solely on the basis of prices quoted. They represent the low, middle, and high ranges of prices charged for apparently comparable cultures of each kind inoculated with virus-containing food extract. Vendors were selected solely on the basis of prices quoted. They represent the low, middle, and high ranges of prices charged for apparently comparable cultures at the time of these experiments; they are named here only for accuracy and completeness of reporting.

MATERIALS AND METHODS

Primary African green monkey (Cercopithecus aethiops) kidney tissue cultures were purchased from Industrial Biological Laboratories (IBL, Rockville, Md.), Grand Island Biological Company (GIBCO, Grand Island, N.Y.), and Flow Laboratories (FLOW. Rockville, Md.).

TABLE 1. Comparative specifications of African green monkey kidney cell cultures.

<table>
<thead>
<tr>
<th>Producer</th>
<th>Culture type</th>
<th>Unit price</th>
<th>Condition when received</th>
<th>Survival on experiment</th>
</tr>
</thead>
<tbody>
<tr>
<td>IBL</td>
<td>Primary</td>
<td>$2.75$</td>
<td>1 lot good</td>
<td>&gt; 10 days</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1 lot dead</td>
<td></td>
</tr>
<tr>
<td>Flow</td>
<td>Primary</td>
<td>$5.00$</td>
<td>2 lots good</td>
<td>&gt; 10 days</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2 lots good$^d$</td>
<td>8 days</td>
</tr>
<tr>
<td>GIBCO</td>
<td>Primary</td>
<td>$6.50$</td>
<td>2 lots good$^d$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Established</td>
<td>$0.50$</td>
<td>Not applicable</td>
<td></td>
</tr>
<tr>
<td>FRIP</td>
<td>Established</td>
<td>$0.64$</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*M alled as applicable

$^a$Some problems experienced with billings; primary cultures no longer produced.

$^b$Per 25-cm$^2$ styrene flask.

$^c$Per 30-cm$^2$ glass bottle, though 48-cm$^2$ glass bottles were shipped on one occasion.

$^d$One lot was received a week later than promised.

$^e$Produced at the Food Research Institute; this strain subsequently died out.

Results were recorded on the basis of whether virus effects were seen in each culture (Table 2). These were interpreted on the basis of the three-tube MPN table in Standard Methods for the Examination of Water and Wastewater (1); because the volume of inoculum had been 33 ml, rather than 10 ml per culture, numbers derived from the table were divided by 3.3. Of nine cultures of each kind inoculated with virus-containing beef extract in each trial, the number showing virus effects ranged from four to six, except for the Flow cultures in the second trial. This lot evidently was completely insensitive to PO1. Despite a wide range of
TABLE 2. Detection of poliovirus in ground beef extracts, using cell cultures from various producers.

<table>
<thead>
<tr>
<th>Producer</th>
<th>Experimental trial</th>
<th>1.1</th>
<th>0.11</th>
<th>0</th>
<th>MPN</th>
<th>95% confidence limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>IBL</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>13&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Flow</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>23</td>
</tr>
<tr>
<td>GIBCO</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>&lt;1</td>
</tr>
<tr>
<td>FRI</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>13</td>
</tr>
</tbody>
</table>

<sup>a</sup>Number of cultures showing virus effect, of three inoculated.
<sup>b</sup>In PFU/100 ml of sample, at highest tested virus concentration.

point estimates for the other cultures, all of the 95% confidence intervals included the true value of 11 PFU/100 ml; this indicates that the sensitivities of these cultures, as a function of producer and of lot, was within the experimental error inherent in sampling for virus.

We compared purchased cultures on the basis of price because their unit cost was much greater than that for cultures we produce. The relatively high unit cost might well not be a serious deterrent to those who will use only small numbers of cultures and would rather not equip their laboratories for production. Neither the quality of the cultures nor of the accompanying account services are clearly functions of the producer's price. The incidence of such problems as the lot of cultures which were unexpectedly insensitive to polioviruses shows that the consumer who delegates cell culture production must still do some careful quality control; this would include diligent record-keeping, close observation of uninoculated control cell cultures, and frozen storage of control cell culture materials for possible later verification of results. The changes in costs since these experiments were performed in 1976, as shown by the 1978 prices in Table 1, do not appear to us to affect the validity of these conclusions.

**ACKNOWLEDGMENTS**

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**REFERENCES**


**Crumbine Award, con't from p. 918**

including food protection, to more than 1,300,000 residents of Suffolk County. It covers an area of 922 square miles of eastern Long Island bounded by the waters of the Atlantic Ocean and Long Island Sound.

According to Charles W. Felix, Director, Environment, Health and Public Affairs of the Single Service Institute, “More than any other entry, the Suffolk program proved itself to exceed the norm in the four principal areas of measurement: program improvement, innovative and effective use of evaluation, effectiveness of planning and management, and information and education activities.”

The Crumbine Award jury, Felix said, placed special emphasis on the Suffolk County organization’s unique research project on sanitation and health effects in the shellfish industry of the Great South Bay of Long Island. This area is a leading shellfish producer, yielding between 50 and 80 percent of the hard clams marketed in the United States.

The Award jury also praised the Division for “the rare epidemiological accent given to traditional food sanitation practices” and for “remarkably effective utilization of limited manpower.” The agency’s program was further cited for its encouragement of no-smoking sections in restaurants and communications efforts in professional journals.

The Crumbine Award consists of a bronze medal and an engraved plate mounted on a walnut plaque. Bronze medallions are also presented to individual public health officials who are directly responsible for the winning agency’s program.

Established by the Single Service Institute in 1954, the Crumbine Award takes its name from the Kansas State Health Officer and public health pioneer who in 1909 first banned common drinking cups from public facilities. The Institute is the national trade association of manufacturers of single-use food service and packaging products.