**The Pulsifier®**
**An Improved Instrument for the Preparation of Food Samples for Microbiological Analysis**

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**Introduction**

Micro-organisms, including pathogenic bacteria, attach with varying affinities to the surface of food samples. Conventional paddle-type food sample processors process samples by crushing until a homogenate e.g. a puree has been produced. The Pulsifier®, Figure 1 (Microgen Bioproducts Ltd, Surrey, UK) provides an alternative technology for the processing of food samples for microbiological analysis. Rather than beating or crushing food samples the Pulsifier® produces a combination of shock waves and intense stirring using a rapidly oscillating ring, Figure 2. The resultant shock waves and intense agitation liberate micro-organisms whilst leaving the food sample essentially intact. Due to the minimal food matrix destruction, the resultant “pulsificate” is easy to pipette, filter and free of EIA and PCR inhibitors.

Trials were performed to determine the efficiency of the “pulsification” process using a number of important food pathogens (E. coli 0157, Salmonella spp and Listeria monocytogenes) for a range of soft and hard food types.

**Materials and Methods**

**Food Samples:**

Separate batches of frozen peas, minced beef and potato powder were purchased from retail supermarkets and 25gm samples were examined to ensure that they were free from the target organisms. The absence of Listeria monocytogenes and Salmonella spp was confirmed using the methods described in BS 5763: Part 18 and Part 4 respectively. The absence of E. coli 0157 was confirmed by enrichment in mTSB+n for 6 hours at 42°C, followed by immunomagnetic separation and culture on CT-SMAC which was incubated at 37°C for 24 hours.

**Enumeration of Key Pathogens:**

In the case of Salmonella spp and E. coli 0157, four 25gm samples of each food type were inoculated with approximately 10⁴ cells/ gm. The samples were placed into 225ml of an appropriate pre enrichment medium after which 2 were placed in the Pulsifier® for 60 seconds and 2 placed in a Seward Stomacher® 400 for 60 seconds.

The evaluation of the recovery of Listeria monocytogenes was performed using four 10gm samples of each food type. Each sample was processed as previously described with the exception that samples were diluted in 90ml Buffered Peptone Water after which they were processed using either the Pulsifier® or Stomacher® as described previously.

To determine the release of the respective pathogens after processing using the Pulsifier® or Stomacher®, plate counts were performed in the following manner:

- **Salmonella spp:** 0.1ml samples were plated onto XLD at T=0 and after 18 hours incubation at 37°C. Plates were incubated at 37°C for 24 hours.
- **E. coli 0157:** after incubation of the pre enrichment broth for 6 hours at 42°C (pea and beef homogenates) and 37°C (potato homogenate), 0.1ml samples were removed and plated onto CHROMagar® 0157 and incubated at 42°C or 37°C for 24 hours.
- **Listeria monocytogenes:** after samples were processed using the Pulsifier® or Stomacher®, they were incubated at 20°C for 1 hour after which 0.1ml samples were removed and plated onto PALCAM agar and incubated at 37°C for 48 hours.

After incubation, plates containing <150 colonies were selected and mean colony counts of the specific pathogens performed.

**Results:**

Analysis of both the initial (T=0) and final (T=18) plate counts for Salmonella spp (Table 1.) demonstrated that there was no significant difference between the counts obtained at either time using either the Pulsifier® or Stomacher®.

The counts performed after 6 hours pre enrichment for E. coli 0157 and Listeria monocytogenes after 1 hour pre enrichment are found in Table 2. Once again, no significant difference in counts was detected.

**Table 1. Recovery of Salmonella spp after stomaching or pulsification.**

<table>
<thead>
<tr>
<th>Sample</th>
<th>Organism</th>
<th>Method</th>
<th>Log CFU/gm (T=0)</th>
<th>Log CFU/gm (T=18)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peas</td>
<td>E. coli 0157</td>
<td>Pulsifier®</td>
<td>3.13</td>
<td>7.58</td>
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<tr>
<td></td>
<td></td>
<td>Stomacher®</td>
<td>3.08</td>
<td>7.17</td>
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<td>Minced Beef</td>
<td>E. coli 0157</td>
<td>Pulsifier®</td>
<td>3.13</td>
<td>9.48</td>
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<tr>
<td></td>
<td></td>
<td>Stomacher®</td>
<td>3.21</td>
<td>9.63</td>
</tr>
<tr>
<td>Potato</td>
<td>E. coli 0157</td>
<td>Pulsifier®</td>
<td>2.82</td>
<td>9.67</td>
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<tr>
<td></td>
<td></td>
<td>Stomacher®</td>
<td>3.04</td>
<td>9.68</td>
</tr>
</tbody>
</table>

**Table 2. Recovery of E. coli 0157 and Listeria monocytogenes after stomaching or pulsification.**

<table>
<thead>
<tr>
<th>Sample</th>
<th>Organism</th>
<th>Method</th>
<th>Log CFU/gm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peas</td>
<td>Listeria monocytogenes</td>
<td>Pulsifier®</td>
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<td>Listeria monocytogenes</td>
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<tr>
<td></td>
<td></td>
<td>Stomacher®</td>
<td>3.45</td>
</tr>
</tbody>
</table>

**Conclusion:**

Analysis of the data resulting from this evaluation demonstrated that there was no significant difference in the counts obtained with either stomaching or pulsifying samples.

This data confirms the observations of other workers who have determined that the Pulsifier® is equally as good as the Stomacher® for the recovery of bacteria from a wide variety of food samples (1,2).

In addition, the Pulsifier® was found to offer a number of additional significant advantages over the Stomacher® including:

- Cleaner samples (Figure 3):
  - Allows the supernatant to be easily drawn off.
  - Allows more accurate pipetting and less clogging.
  - Reduces the need for filter bags.
  - Facilitates the use of filtration methods (2), automatic platers and Petri Film®.

- Less destruction of the sample:
  - Lower incidence of bag breakages with hard foods.
  - Minimal release of food enzymes which may effect bacterial viability.
  - Minimal release of PCR and EIA inhibiting substances.

**References:**


Pulsifier® is a registered trademark of Microgen Bioproducts Ltd.
Stomacher® is a registered trademark of Seward Medical Ltd.
Petri Film® is a registered trademark of 3M.