Comparison of Different MRS (De Man, Rogosa and Sharpe) Broth Brands (with different Peptone source) for Effectiveness of Lactic Acid Bacteria Strain J19 (Enterococcus faecium) to Reduce Listeria monocytogenes.

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Introduction

According The Center for Disease Control and Prevention Listeria monocytogenes has been implicated in several outbreaks of foodborne illness. Nationwide, 1,651 cases of Listeriosis occurred during 2009-2011 and were reported with a case-fatality rate of 21%.

Listeria monocytogenes is a pathogen that is ubiquitous in nature, which is commonly associated with soil, plants, animal products and food processing environments.

Probiotics are live microorganisms, which when administered in adequate amounts, confer a health benefit.

Lactic acid bacteria display numerous antimicrobial activities that is due mainly to the production of organic acids, bacteriocins and antifungal peptides that have of capacity to of reduce the growth of pathogens like Listeria monocytogenes.

Objective

To compare how different peptone sources in De Man, Rogosa & Sharpe (MRS) broth affect the effectiveness of J19 (Enterococcus faecium) to reduce Listeria monocytogenes. Potentially peptone source can influence the J19 LAB strain in production of antilisterial compounds.

Methodology

Table #1: Composition of MRS Broth Brands

<table>
<thead>
<tr>
<th>Ingredients of MRS Broth Brands</th>
<th>Criterion™ 19</th>
<th>EMD Millipore</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beef Extract</td>
<td>10.0 g</td>
<td>10.0 g</td>
</tr>
<tr>
<td>Yeast Extract</td>
<td>5.0 g</td>
<td>4.0 g</td>
</tr>
<tr>
<td>Glucose</td>
<td>20.0 g</td>
<td>20.0 g</td>
</tr>
<tr>
<td>Sodium Acetate</td>
<td>5.0 g</td>
<td>5.0 g</td>
</tr>
<tr>
<td>Ammonium Citrate</td>
<td>2.0 g</td>
<td>2.0g</td>
</tr>
<tr>
<td>Di-ammonium Phosphate</td>
<td>2.0 g</td>
<td>2.0 g</td>
</tr>
<tr>
<td>Tween 80</td>
<td>1.0 g</td>
<td>1.0 g</td>
</tr>
<tr>
<td>Magnesium Sulfate</td>
<td>0.1 g</td>
<td>0.2 g</td>
</tr>
<tr>
<td>Magnesium Sulfate</td>
<td>0.05 g</td>
<td>0.04 g</td>
</tr>
</tbody>
</table>

Figure 3: Reduction of Listeria monocytogenes in Meat Peptone MRS Broth Vs Casein Peptone MRS Broth

Figure 4: Growth of J19 (Enterococcus faecium) in Meat Peptone MRS Broth Vs Casein Peptone MRS Broth

Results

- At 0 hours, Listeria monocytogenes in both groups of controls were at approximately log10 6.00 CFU/ml.
- In Meat Peptone MRS Broth, the J19 (Enterococcus faecium) strain effectively reduced Listeria monocytogenes at a statically significant (P < .05) level in comparison to the controls at six-hour time point.
- In addition, the J19 strain performed better in Meat Peptone MRS Broth and reduced Listeria monocytogenes to undetectable levels after 12 hours; At 12 hours, the J19 reduced Listeria monocytogenes in Casein Peptone MRS Broth treatment, and survival was at log10 2.72 CFU/ml.
- The Casein Peptone MRS Broth treated with J19 did not fully inhibit Listeria monocytogenes until 48 hours.

Conclusions

- Intrinsic factors like the ingredients of the middle can influence the inhibitory activity of LAB against pathogens. In other words the Peptone source influence the J19 (Enterococcus faecium) LAB strain in production of antilisterial compounds.
- The food industry needs to select the most effective peptone source to achieve the best inhibition of Listeria monocytogenes.
- The peptone source could represent a difference of 1 to 2 logs of pathogen reduction, which is equivalent to 90 to 99% more reduction of pathogen.

References: