Use of a New Iodine Formulation to Reduce Expenses from Produce Spoilage & Food Waste

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Iotech International

Formulation of Iodine

Iodine Metabolism

Chronic Safety of Oral Iodine Administration
Iodine History of Use

3600 B.C.
Seaweed/Sponge Goiter size

1908
Tincture of Iodine Introduced

2015
Stable Molecular Iodine Introduced

1811
Iodine discovered By Courtois

1955
Iodophors (PVP-I) Introduced
Povidone-Iodine vs. Stable Molecular Iodine

- 10% PVP
- IODECH

**Molecular iodine**
- 3 ppm
- 300 ppm

**Non molecular iodine species**
- 16,600 ppm
- < 10 ppm

*Tri-iodide(I₃)*; Iodide anion(I); Hypoiodous acid(HOI); Iodate(IO₃)

The only form of iodine that kills microbes
## Stable Molecular Iodine

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>PVP-I</th>
<th>Stable Molecular Iodine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stronger – kills pathogens quickly</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>Faster</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>Less toxic</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>Less irritating</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>Non-staining</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>Spectrum of activity</td>
<td>✗</td>
<td>✓</td>
</tr>
</tbody>
</table>
Stable Molecular Iodine vs. Povidone Iodine (PVP-I)

3 ppm Stable Iodine

IOTECH

3 ppm Molecular Iodine

PVP-I
Strawberries Treatment

Treated Day 30
Unretouched Photo

Untreated Day 30
Unretouched Photo
Blackberries Treatment

Treated Day 30
Unretouched Photo

Untreated Day 30
Unretouched Photo
Raspberries Treatment

Treated Day 12
Unretouched Photo

Untreated Day 12
Unretouched Photo
Treated produce remained fresh more than 5 X longer than untreated produce.

Report: Department of Food, Science and Technology, University of Nebraska
Combatting Foodborne Illnesses
Effectiveness

- 47.8 million cases annually in U.S.
- Public Health Pathogens
  - E-coli
  - Salmonella
  - Listeria
- Norovirus (22.5 million cases annually)

All completely inactivated within 90 seconds by stable molecular iodine.*

*Source: ATS Laboratories, Eagan, MN.
Safety

- Essential nutrient (required for thyroid hormone synthesis)
- Iodized salt
- Iodine deficiency
  - Infant mortality
  - Cancer
  - Goiter
  - Congenital abnormalities
  - Impaired mental/physical development
  - Fibrocystic breast disease
Primary Iodine Consumption Related Health Risks

- Iodine Deficiency Disorders (IDD) refers to all ill-effects due to iodine deficiency
- In 1990, WHO estimated that 28.9% of global population was iodine deficient
  - 11.2 million had overt cretinism and
  - 43 million at mental impairment
- Therefore, IDD is the leading cause of preventable mental retardation in the world
  - REF: Mastorakos: The Iodine Deficiency Disorders Text

Fig. 1. Scope of iodine deficiency disorders. (UNICEF, 1995)
US Trends in Iodine Consumption

The First National Health and Nutrition Examination Survey (NHANES I) took place between 1971 and 1974 found 2.6% of US citizens were iodine deficient.

NHANES III, conducted between 1988 and 1994, found 11.7% of all US citizens are iodine deficient.

Journal of Clinical Endocrinology and Metabolism 1998;88:3401-3408
### Japanese Health Statistics

<table>
<thead>
<tr>
<th>Category</th>
<th>Comparison to U.S.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average intake of iodine</td>
<td>10 times greater</td>
</tr>
<tr>
<td>Average life expectancy</td>
<td>5 years longer</td>
</tr>
<tr>
<td>Breast cancer mortality</td>
<td>1/3 U.S. Rate</td>
</tr>
<tr>
<td>Prostate cancer rate</td>
<td>1/10 U.S. Rate</td>
</tr>
<tr>
<td>Cardiac deaths (ages 35-74)</td>
<td>6/10 U.S. Rate</td>
</tr>
<tr>
<td>Infant deaths</td>
<td>4/10 U.S. Rate</td>
</tr>
</tbody>
</table>
Safety (cont’d)

Treated Fruits and Vegetables Residual on Representative Formulation
US RDA 150 ug

- Servings fruits and vegetables to reach RDA: 2.7
- Daily servings to reach tolerable limit: 13
- Tolerable limit: 5X > average daily intake
Ex-US Global Food Waste

- 1.3 B tons (amount of waste)
- $750 B (economic cost to producers)
- 3.3 B tons (greenhouse gases generated)

Visually spoiled
2.9
Past expiration
1.9
Discarded due to fear of spoilage
0.9

Household Food Waste¹
Visually fine/Afraid of Risk
57% of U. S. Household food waste is discarded for spoilage-related reasons.
43% of U. S. Household food waste is discarded for non-spoilage-related reasons.

3.9B lbs. of Food Spoiled Annually

Agrifood Research, Finland, 2011
2011 Estimates: Centers for Disease Control and Prevention
Supermarket Losses

One supermarket chain with less than 1000 stores, suffers $300 million annually in shrinkage.

Seafood  8.9%
Fresh fruits  8.4%
Fresh meats  4.5%
Fresh vegetables  8.4%

USDA Economic Bulletin #44 March 2009
Potential Beneficiaries

Where Employed

- Growers: Field, sorting sheds
- Wholesalers: Storage facility
- Retailers: Misters, produce department
- Consumers: At home
Stable molecular iodine is a credible candidate to reduce food spoilage and kill pathogens associated with food-borne illnesses.