Update: Processed Meats Cookery and Sensory Evaluation

Brad W. Berry*

As a result of the successful efforts of the former AMSA Committee on "Meat Cookery and Sensory Guidelines" for fresh meats, an additional AMSA Committee was formed in 1977 to develop similar guidelines for processed meats. Early in its activities the new committee came to the realization that fulfilling the assigned tasks would not be easy. In contrast to the Guidelines for Fresh Meats, a much broader diversity of product types and forms exists for processed meats. Also, since seasonings and spices play such an important role in the manufacture of processed meats, flavor evaluation becomes an important factor in the evaluation of processed meats.

Unlike the situation for fresh meats where many university scientists are actively involved in sensory evaluation, much of the routine sensory evaluation for processed meats exists in the meat processing industry. Thus in 1978, the Committee mailed out a questionnaire to determine: (1) what processed meats products were being subjected to sensory, physical, mechanical and chemical testing and (2) what specific sensory, physical, mechanical and chemical traits were being evaluated for each category of processed meats.

The Committee had earlier realized that it would be impossible to develop Guidelines for each specific type of processed meats and thus with the aid of the questionnaire results, six broad product areas were selected for the development of Guidelines. These are:

- Ground beef and fabricated products
- Fresh sausage
- Frankfurters and bologna
- Semi-dry and dry fermented sausage
- Ham and associated products
- Bacon and bacon-like product

During the past year, the Committee has developed outlines of sensory, physical and chemical properties considered of importance in the evaluation of the six product types. These outlines are included as a part of this Update presentation. The Committee is currently preparing a final draft of the Guidelines for Ground Beef. The remaining Guidelines will be available for publication during the next year. These Guidelines will not address the issue of training panelists since this has been thoroughly covered in the previous AMSA Guidelines for Meat Cookery and Sensory Evaluation.

In closing I would like to thank the members of this committee who have devoted a considerable amount of their time to the efforts of the committee:

- A. E. Dethmers
- T. A. Gillett
- D. G. Olson
- W. H. Marshall
- W. G. Moody
- B. A. Rainey
- W. C. Schwartz

Also, I would like to thank the members of AMSA who responded to the Committee's request for assistance and information at the 1979 RMC.

Sensory, Physical and Chemical Properties Considered of Importance in the Evaluation of Ground Beef

I. Sensory (Flavor, Aroma, Appearance, Texture)

A. Flavor*

1. Ground beef intensity
2. Atypical
   a) rancid
   b) putrid
   c) other

B. Aroma

1. Ground beef
2. Atypical
   a) rancid
   b) putrid
   c) other

C. Appearance (Surface and Internal)

1. Color
   a) lean
   b) fat
   c) additives
2. Lean/fat ratio
3. Visual texture
   a) particle size
   b) amount of connective tissue (raw)
   c) condition of surface (fat, water, neither)
4. Size, shape

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Reciprocal Meat Conference Proceedings, Volume 33, 1980

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D. Texture/mouthfeel*
   1. Juiciness*
   2. Tenderness*
   3. Amount of connective tissue*
   4. Particle size
   5. Chewiness—rate of breakdown

II. Physical (Appearance, Texture, Yield, Density, Water Holding Capacity)
   A. Appearance
      1. Color—tristimulus
      2. Dimensional changes
   B. Texture *
      1. Firmness
      2. Shear
      3. Penetration
      4. Elasticity
      5. Tensile strength
   C. Yield*
      1. Weights*
      2. Measures
   D. Density
   E. Water holding capacity

III. Chemical (Flavor, Aroma; Composition)
   A. Flavor, Aroma
      1. Rancidity, TBA, Peroxide
      2. Other
   B. Composition*
      1. Proximate composition*
         a) lipid*
            i) extractable lipid*
            ii) cholesterol
            iii) fatty acid composition
         b) protein*
            i) total*
            ii) collagen
         c) moisture*
            i) total*
            ii) free
            iii) bound
         d) ash
            i) total
      2. Hydrogen ion concentration
      3. Nutritional analyses

Appendix

1. Asterisks indicate characteristics that the committee recommends being considered for evaluation in any processed meats study.
2. Characteristics related to microbiology are not given since another AMSA Committee is developing guidelines in this area.
3. In certain instances it may be desirable to evaluate characteristics (i.e., color) both before and after preparation (cooking) for sensory, physical and chemical properties.

Sensory, Physical and Chemical Properties
Considered of Importance in the Evaluation of Pork Sausage (Links and Patties)

I. Sensory (Flavor, Aroma, Appearance, Texture)
   A. Flavor*
      1. Spice/sage
      2. Pork intensity
      3. Salt
      4. Sweet
      5. Pepper/heat ("hot" varieties)
      6. Atypical
         a) sour
         b) rancid, oxidized (fat)
         c) "piggy," boar
         d) metallic, bitter
         e) putrid
   B. Aroma*
      1. Spice/sage
      2. Pork intensity
      3. Sweet
      4. Pepper ("hot" varieties)
      5. Atypical
         a) sour/soured
         b) rancid, oxidized (fat)
         c) "piggy," boar
         d) putrid
         e) other
   C. Appearance
      1. Color
         a) lean
         b) fat
         c) additives
      2. Visual texture
         a) particle size/distinctness
         b) uniformity
         c) denseness
      3. Size/shape
      4. Lean/fat ratio
   D. Texture/mouthfeel*
      1. Resiliency (casing products)
      2. Firmness—internal
      3. Denseness—internal
      4. Juiciness
      5. Chewiness—rate of breakdown
      6. Uniformity of texture
      7. Consistency (coarse, fine)
      8. Amount of gristle
      9. Oiliness
      10. Fatty/greasy mouthfeel

II. Physical (Appearance, Texture, Yield)
   A. Appearance
      1. Color—tristimulus
      2. Dimensional changes
   B. Texture—surface and internal
      1. Firmness
      2. Shear
      3. Penetration
4. Elasticity
5. Tensile strength

C. Yield*
   1. Weights*
   2. Measures*

III. Chemical (Flavor, Aroma; Color; Composition)
A. Flavor, aroma
   1. Rancidity, TBA, peroxide
   2. GLC—spice volatiles
B. Color
   1. Heme pigments
C. Composition*
   1. Proximate composition
      a) lipid*
         i) extractable lipid
         ii) cholesterol
         iii) fatty acid composition
      b) protein*
         i) total*
         ii) collagen*
      c) moisture*
         i) total*
         ii) free
         iii) bound
         iii) water-activity*
      d) ash
         i) total
   2. Percent salt
   3. Hydrogen ion concentration and total
   4. Carbohydrate
   5. Nutritional analyses
   6. Moisture-protein ratio

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Sensory, Physical and Chemical Properties
Considered of Importance in the Evaluation of Frankfurters

I. Sensory (Flavor, Aroma, Appearance, Texture)
A. Flavor*
   1. Typical
   2. Smoke
   3. Salt
   4. Spice
   5. Atypical
      a) rancid
      b) putrid
      c) other
B. Aroma*
   1. Typical
   2. Smoke
   3. Spice
   4. Atypical
      a) rancid
      b) putrid
      c) other
C. Appearance*
   1. Color
   2. Visual texture
      a) particle size
      b) fat caps
      c) gel caps
      d) air pockets
      e) surface aberrations or defects
   3. Size, shape
D. Texture/mouthfeel
   1. Juiciness
   2. Firmness
   3. Resiliency (bite)
      a) surface
      b) internal
   4. Consistency (smooth to mealy)
   5. Chewiness—rate of breakdown

II. Physical (Appearance, Texture, Yield, Density, Water Holding Capacity)
A. Appearance
   1. Color—tristimulus
   2. Dimensional changes
B. Texture*
   1. Surface and internal
      a) firmness
      b) shear
      c) penetration
      d) elasticity
      e) flecture
      f) tensile strength
C. Yield*
   1. Weights*
   2. Measures
D. Density
E. Water holding capacity

III. Chemical (Flavor, Aroma; Color; Composition)
A. Flavor, aroma
   1. Rancidity, TBA, peroxide
   2. Other
B. Color
   1. Nitroso compounds
   2. Heme pigments
   3. Smoke components
C. Composition*
   1. Proximate composition
      a) lipid*
         i) extractable lipid
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3. In certain instances it may be desirable to evaluate characteristics (i.e., color) both before and after preparation (cooking) for sensory, physical and chemical properties.

Sensory, Physical and Chemical Properties Considered of Importance in the Evaluation of Dry and Semi-Dry Sausage

I. Sensory (Flavor, Aroma, Appearance, Texture)

A. Flavor*
1. Smoke
2. Salt
3. Spice
4. Fermented sour
5. Beef/pork intensity
6. Atypical
   a) rancid
   b) staleness, loss of spice
   c) putrid
   d) other

B. Aroma*
1. Smoke
2. Spice
3. Fermented sour
4. Beef/pork intensity
5. Atypical
   a) rancid
   b) staleness, loss of spice
   c) putrid
   d) other

C. Appearance*
1. Color, internal and external
2. Visual texture
   a) particle size
   b) distinctiveness and amount of fat/lean particles
   c) uniformity of particle size
   d) visual texture of casing/skin
   e) fat smear
   f) gel pockets
   g) air pockets
   h) casing separation

II. Physical (Appearance, Texture, Yield)

A. Appearance
1. Color—tristimulus
2. Dimensional changes

B. Texture*—surface and internal
1. Firmness
2. Shear
3. Penetration

C. Yield*
1. Weights*
2. Measures

D. Density

III. Chemical (Flavor, Aroma; Color; Composition)

A. Flavor, aroma
1. Rancidity, TBA, peroxide
2. Other

B. Color
1. Nitroso compounds
2. Smoke components

C. Composition*
1. Proximate composition
   a) lipid*
      i) extractable lipid
      ii) cholesterol
      iii) fatty acid composition
   b) protein*
      i) total*
      ii) salt soluble protein
      iii) collagen
   c) moisture*
      i) total*
      ii) free
      iii) bound
      iii) water-activity*
      d) ash
2. Nitrite, nitrite compounds
3. Cure accelerators
4. Smoke components
5. Hydrogen ion concentration and total
6. Carbohydrate
7. Nutritional analyses
8. Moisture-protein ratio

Appendix

1. Asterisks indicate characteristics that the committee recommends being considered for evaluation in any processed meats study.

2. Characteristics related to microbiology are not given since another AMSA Committee is developing guidelines in this area.

3. In certain instances it may be desirable to evaluate characteristics (i.e., color) both before and after preparation (cooking) for sensory, physical and chemical properties.

Sensory, Physical and Chemical Properties Considered of Importance in the Evaluation of Ham

I. Sensory (Flavor, Aroma, Appearance, Texture)

<table>
<thead>
<tr>
<th>Category</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Flavor*</td>
<td>1. Smoke</td>
</tr>
<tr>
<td></td>
<td>2. Sweet</td>
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<tr>
<td></td>
<td>3. Salt</td>
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<td></td>
<td>4. Cured pork intensity</td>
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<td></td>
<td>5. Acid (country ham only)</td>
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<td>6. Atypical</td>
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<tr>
<td></td>
<td>a) sour</td>
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<td>b) rancid</td>
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<td>c) “piggy,” boar</td>
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<td>d) metallic, bitter</td>
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<td></td>
<td>e) putrid</td>
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<td></td>
<td>f) other</td>
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<tr>
<td>B. Aroma*</td>
<td>1. Smoke</td>
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<tr>
<td></td>
<td>2. Sweet</td>
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<td></td>
<td>3. Briny</td>
</tr>
<tr>
<td></td>
<td>4. Cured pork intensity</td>
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<td></td>
<td>5. Atypical</td>
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<tr>
<td></td>
<td>a) sour</td>
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<td></td>
<td>b) rancid</td>
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<tr>
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<td>c) “piggy,” boar</td>
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<td></td>
<td>d) putrid</td>
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<tr>
<td></td>
<td>e) other</td>
</tr>
<tr>
<td>C. Appearance</td>
<td>1. Color, internal, external uniformity and redness</td>
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<tr>
<td></td>
<td>2. Particle size (not all types)</td>
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<td></td>
<td>3. Fat content and distribution</td>
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<td>4. Connective tissue content</td>
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<td>5. Muscle size and orientation</td>
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<td>6. Air pockets</td>
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<td></td>
<td>7. Fat and gelatin pockets</td>
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<td></td>
<td>8. Surface aberrations</td>
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<td></td>
<td>9. Size and shape</td>
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<tr>
<td>D. Texture/mouthfeel*</td>
<td>1. Firmness—internal and skin</td>
</tr>
<tr>
<td></td>
<td>2. Chewiness—rate of breakdown</td>
</tr>
<tr>
<td></td>
<td>3. Uniformity of texture</td>
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<tr>
<td></td>
<td>4. Juiciness</td>
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<tr>
<td></td>
<td>5. Amount of gristle</td>
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</tbody>
</table>

II. Physical (Appearance, Texture, Yield)

<table>
<thead>
<tr>
<th>Category</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Appearance</td>
<td>1. Color—tristimulus</td>
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<tr>
<td></td>
<td>2. Dimensional changes</td>
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<tr>
<td>B. Texture—surface and internal</td>
<td>1. Firmness</td>
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<tr>
<td></td>
<td>2. Shear</td>
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<tr>
<td></td>
<td>3. Penetration</td>
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<td>4. Bind (tensile strength)</td>
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<td></td>
<td>5. Sliceability</td>
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<td></td>
<td>6. Elasticity</td>
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<tr>
<td>C. Yield: (Processing, Chilling, Slicing, Cooking)</td>
<td>1. Weights</td>
</tr>
<tr>
<td></td>
<td>2. Measures</td>
</tr>
</tbody>
</table>

III. Chemical (Flavor, Aroma; Color; Composition)

<table>
<thead>
<tr>
<th>Category</th>
<th>Characteristics</th>
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</thead>
<tbody>
<tr>
<td>A. Flavor, aroma</td>
<td>1. Rancidity, TBA, peroxide</td>
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<tr>
<td></td>
<td>2. Other</td>
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<tr>
<td>B. Color</td>
<td>1. Nitroso compounds</td>
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<tr>
<td></td>
<td>2. Heme pigments</td>
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<tr>
<td></td>
<td>3. Smoke compounds</td>
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<tr>
<td>C. Composition*</td>
<td>1. Proximate composition</td>
</tr>
<tr>
<td></td>
<td>a) lipid*</td>
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<td>i) extractable lipid</td>
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<td>ii) cholesterol</td>
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<td>iii) fatty acid composition</td>
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<td>b) protein*</td>
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<td>i) total*</td>
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<td>ii) salt soluble protein</td>
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<td>iii) collagen</td>
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<td>c) moisture*</td>
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<td>i) total*</td>
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<td>ii) free</td>
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<td></td>
<td>iii) bound</td>
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<td></td>
<td>iii) water-activity*</td>
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<td>2. Nitrite, nitrite compounds</td>
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<td></td>
<td>3. Cure accelerators</td>
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<td>4. Percent salt</td>
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<td>5. Smoke components</td>
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<td></td>
<td>6. Hydrogen ion concentration and total</td>
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<td>7. Carbohydrate</td>
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<td>8. Nutritional analyses</td>
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<td></td>
<td>9. Moisture-protein ratio</td>
</tr>
</tbody>
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3. In certain instances it may be desirable to evaluate characteristics (i.e., color) both before and after preparation (cooking) for sensory, physical and chemical properties.
Sensory, Physical and Chemical Properties Considered of Importance in the Evaluation of Bacon (and Pork/Beef Strips)

I. Sensory (Flavor, Aroma, Appearance, Texture)

A. Flavor *
1. Smoke
2. Sweet
3. Salt
4. Cured pork/beef intensity
5. Atypical
   a) sour
   b) rancid
   c) "piggy," boar (or "cowy")
   d) metallic, bitter
   e) putrid

B. Aroma *
1. Smoke
2. Sweet
3. Briny
4. Cured pork intensity
5. Atypical
   a) sour
   b) rancid, oxidized (fat)
   c) "piggy," boar
   d) other

C. Appearance *
1. Color of raw lean, fat and top of strip; fried strip
2. Amount of lean in relation to fat in strips*
3. Distribution of lean in relation to fat in strips
4. Size/shape
5. Particle size (formed products)
6. Ease in separating slices—raw
7. Visual texture
   a) crispiness/hardness
   b) dryness/moistness
   c) oiliness
   d) crinkliness—surface

D. Texture/Mouthfeel
1. Hardness (crispness) and/or fracturability (brittleness)
2. Juiciness
3. Chewiness—rate of breakdown
4. Amount of gristle
5. Consistency (fibrous, etc.)
6. Fatty/greasy mouthfeel

II. Physical (Appearance, Texture, Yield)

A. Appearance
1. Color—tristimulus
2. Dimensional changes in length, width, thickness and crinkling of strip

B. Texture
1. Tensile strength
2. Shear
3. Elasticity
4. Adhesion—one slice to another

C. Yield* (Processing, Chilling, Slicing, Cooking)
1. Weights
2. Measures

III. Chemical (Flavor, Aroma; Color; Composition)

A. Flavor, aroma
1. Rancidity, TBA, peroxide
2. Other

B. Color
1. Nitroso compounds
2. Heme pigments
3. Smoke compounds

C. Composition *
1. Proximate composition
   a) lipid*
      i) extractable lipid
      ii) cholesterol
      iii) fatty acid composition
   b) protein*
      i) total*
      ii) salt soluble protein
      iii) collagen
   c) moisture*
      i) total*
      ii) free
      iii) bound
      iii) water activity
   d) ash
2. Nitrite, nitrite compounds*
3. Sodium isoascorbate
4. Percent salt
5. Melting point of fat
6. Hydrogen ion concentration
7. Carbohydrate
8. Smoke components
9. Nutritional analyses

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Discussion

R. L. Reddish, University of Florida: Did you consider the different cookery methods that would be used for a given product in quantity foodservice uses, such as large institutions, hospitals, schools and fast food chains, as well as for the individual consumer?

B. W. Berry: To date we have not really gone that far. We intend to make such suggestions, and also recommend a given type of cookery procedure for the researchers. Our objective is to come up with a cookery procedure so that results...
can be comparable from researcher to researcher and also so
that the industry can look to our research and see exactly
what we have done.

R. L. Reddish: How did you select the products for study?
B. W. Berry: We haven't done any testing. All that we are
doing at this point is attempting to come up with guidelines
on testing. We are trying to develop the guidelines by using
the information that many of you have sent to us. The com-
mittee's expertise is being utilized and we are considering the
possibility of a workshop.