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How To Lessen the Content of Lead in Maple Products

(PROGRESS REPORT)

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The suggestions made and the information set forth in this publication are, in the judgment of the writer, the best which are now available. Much research work will be carried on during the coming sugar-bush season with a view of attempting to discover some practicable means of preventing contamination of maple products with lead. Obviously, the results of such work will not be available until after the 1938 sugar season has closed. Meantime, for 1938, it behooves the producers to take such precautions as are practicable to lessen the extent of contamination or, indeed, to eliminate it entirely. It is recommended that sugar makers:

Gather sap often and boil it promptly.

Beware of sour sap.

Use every practicable means of keeping equipment clean. Discard terneplate evaporators.

Be especially careful in the use of terneplate buckets and other equipment.

Remove lead paint from all old equipment.

Use as little solder as possible in repairing equipment—and if possible, only pure tin solder.

Be careful in buying new equipment.

UNTIL FURTHER ADVISED, use no paint or enamel as a protective coating on buckets, etc.

Have their sirups tested for lead content at the State Department of Agriculture, in Montpelier. DO NOT SEND THE BEST SIRUP if sincerely desirous of knowing the facts. The best sirup may be lead-free, whereas average and especially late-run sirups may carry much lead.

What may a sugar maker hope to gain by adopting the suggestions made above?

1. The likelihood of lead contamination is lessened.
2. The likelihood of improved quality of his sirup—lighter color, finer flavor—is enhanced.
3. The likelihood of higher sales value is increased.

The Federal Food and Drug Administration, having found that maple products made in this country and in Canada sometimes contain lead, looks upon them when thus contaminated as “adulterated” and forbids their sale. Some shipments were seized last year. Some Vermont syrups and sugar unquestionably have contained lead. It comes from the equipment—never from the tree:

- a. From terneplate buckets, spouts, evaporators, pipe lines, tanks (terneplate contains from 50 per cent upwards of lead) ;
- b. From lead paint used to paint buckets, tanks, etc. ;
- c. From lead solder used in making or repairing equipment.

In order that the likelihood of lead contamination may be lessened, sugar makers should be guided by the following suggestions:

¹Some terneplate is dull, soft, readily scratched; some is not. If in doubt, take a bucket or spout to the county agent and he will tell whether or not it is terneplate.

1. Gather Sap Often and Boil It Promptly.—If proper equipment is used and sap is promptly gathered and boiled, the sirup should contain little or no lead.

2. Beware of Sour Sap.—Sap should not be allowed to stand for a long time in buckets or tanks,

3. lest it sour. The acid which develops in sour sap acts on metals and dissolves lead. Sap gathered promptly and boiled promptly is likely to carry far less lead than if it is allowed to stand before boiling. If circumstances arise which prevent prompt boiling and the sap is likely to become warm in the storage tank, it may be iced. A few hours' exposure on a warm day may do great harm. Leaving partially boiled sap in the evaporator between runs is very apt to increase its lead content. Late-run saps are quite likely to become somewhat sour and to pick up considerable lead. Sirup made from such saps should be laboratory tested and, if found to contain undue amounts of lead, should be delead (see item 9).

4. Keep Equipment Clean.—Every possible effort should be put forth to keep equipment clean while in use as well as while in storage.

5. Terneplate¹ Evaporators Should Be Discarded.—Terneplate contains 50 to 90 per cent lead. No protective coating is likely to be found which will withstand the temperature obtaining in an evaporator. Terneplate spouts, buckets, and tanks may convey lead into sirup. Sugar makers using them should gather often, boil promptly, and be wary of late runs. Such buckets, etc., are potential menaces.

6. Lead Paint Should Be Removed From All Equipment.—This may be easily and cheaply done. If aluminum or other paint has been used and is flaking off or has imparted a taste to the sirup, it may also be easily and cheaply removed. Bakelite, however, is not readily removed.) Two-thirds of a pound of tri-sodium phosphate dissolved in one gallon of hot water works well and quickly. The hotter the solution, the quicker it works. The solution may be poured into the bucket and a stiff brush rubbed over the painted surface, which is then rinsed thoroughly with hot water and dried. Wood cleanses more slowly than metal. Wood surfaces being cleansed may be washed with vinegar before being rinsed with water. The phosphate is cheap and commonly used in creameries as a cleansing powder and can probably be bought there or at drug stores.

7. Use As Little Solder As Possible in Repairing Equipment and use only pure tin containing no antimony—the so-called tin solder and not the usual 50, 50 solder. If repairs are made by a local tinsmith, be sure he uses only pure tin. However, it is very hard indeed to use and may be out of the question. Then the sugar maker may be in trouble.

7. Be Careful in the Purchase of New Equipment.—The writer considers tin evaporators, or the equivalent of tin, preferable to those made of galvanized iron, viewed from the standpoint of lead elimination. He feels that the purchase of galvanized iron evaporators is not to be advised under present circumstances, for zinc is already under suspicion and the zinc used in the cheaper grades of galvanized iron usually contains some lead. No protective coating can possibly be applied to an evaporator, and tin solder is very hard to use in closing up the seams. There seems to be less objection to the use of galvanized iron for tanks and buckets, especially if and when an adequate protective coating is developed. All equipment which can be soldered with pure tin should be so soldered, since the ordinary solder containing 30 or more per cent lead is very likely to transmit lead into the sirup. However, pure tin solder is extremely hard to use. Much solder which is said to be made of pure tin contains from two to five per cent antimony, which is as bad as or worse than lead.

8. Use No Paint or Enamel As Protective Coating On Buckets, FOR THE TIME BEING.—Experience indicates that advice based solely on laboratory tests is unsafe. Furthermore, not every paint or enamel that is said to be lead-free or sold as lead-free is actually lead-free. Most paints which are not specially made contain some lead, enough to cause contamination. Some contain lead compounds added to hasten their drying. Boiled linseed oil and other dryers, as well as varnishes, shellacs, etc., are apt to contain lead. Some aluminum paints contain lead. The state commissioner of agriculture and the secretary of the state board of health in December, 1936, suggested the use of two enamels and three aluminum paints for covering leaded surfaces. In the 13 months which have elapsed since the issuance of this suggestion, much study has been given to this problem. These enamels and paints have been used by several sugar makers in practical sugar-bush operations with varying degrees of success. Apparently, some of the trouble was due to the difficulty of applying these coverings

²Several powders consisting mainly, but not of necessity entirely, of tri-sodium phosphate are on the market under such names as "Climaline," "Minero-phospho," "Oakite," "Phosphite," "Purine," "Westolite." These—or the commercial tri-sodium phosphate—may perhaps be found at creameries or may be bought elsewhere.

properly. They usually have proved unsatisfactory. Many chemists and others have tested several commercial products under laboratory conditions. Thus far, no protective coating seems to have been found which is surely successful, although some give much promise. After much discussion, the committee appointed by the Vermont commissioner of agriculture to study the situation at a meeting held December 21, 1937, stated that:

"It is the sense of this committee that it is unwise and impracticable to recommend to producers that they coat contaminating surfaces with any material that has not been tested in the field for one season. Such tests are to be made (during the spring of 1938 and the committee is to set up a suitable organization so that the coating found to be most suitable may be expeditiously applied to all unsatisfactory equipment in the summer of 1938."

It further expressed the opinion that:

"Meetings of producers should be called in which the seriousness of the situation should be brought to their attention as well as ways of avoiding lead contamination. Other sources of contact with the producer, such as the Grange, Farm Bureau and Extension Service, should be utilized in spreading the information."

Extensive trials will be carried on in the sugar bush in Quebec, New York, Vermont (under Experiment Station auspices), and else-where during the coming sugar season. Several protective coatings will be used under practical conditions. It is hoped that some feasible means of excluding lead at its source may be found, in which event Vermont sugar makers will be promptly advised in order that the coating may be applied far in advance of the 1939 sugar season.

IT IS TO BE REGRETTED THAT VARIOUS PARTIES, ILL-INFORMED OR MISINFORMED, ARE SUGGESTING THIS, THAT, OR THE OTHER PAINT FOR USE ON SAP BUCKETS. IT IS HOPED THAT FEW SUGAR MAKERS WILL BE THUS MISLED.

9. Deleading may be done in processing plants, but no satisfactory process has been devised that the producer can use.

It is claimed by some that filtering hot sirup through a felt strainer will remove some of the lead. It may very well remove coarser particles if any such occur; that it will lessen the amount in solution or in fine suspension is not as certain.

10. Testing for Lead.—The testing service at the office of the commissioner of agriculture in Montpelier will be continued in 1938. Sugar makers should understand that a test of one sample of first-run sirup does not tell the whole story. Samples should be taken (a half-pint) either from the evaporator, settling tank, or shipping container. They should represent the average rather than the best. It were better to know the worst by having the worst tested than to fool one's self by getting only the best tested. Packages should be carefully packed, properly labeled and carriage charges should be prepaid. The analysis fee—50 cents per sample—should accompany the package.

Important

It should be clearly understood that the fact that no suggestions are made for the time being concerning protective coatings does not mean that sugar makers should feel free to proceed as in the past, taking no special pains whatsoever to exclude lead. On the contrary, they should use every feasible means to that end, gathering sap frequently, boiling it promptly, preventing the souring of sap insofar as possible, doing away with terneplate evaporators and being especially careful in the use of terneplate buckets, etc., removing lead paint from buckets, tanks, etc., covering lead solder surfaces with pure tin solder, the latter being a difficult task. The reason why no suggestions as to protective coatings are made is simply this: that the committee representing the industry, appointed by the state commissioner of agriculture, having canvassed the entire situation, does not at the present time advise the use of coatings, preferring to wait until several such have been tried out under the practical conditions obtaining in the sugar bush before it makes definite recommendations.