

Lead Industries Association

420 LEXINGTON AVENUE

NEW YORK 17, N.Y.

FELIX EDGAR WORMSER, PRESIDENT
W.C. BROWNELL, VICE PRESIDENT
J.A. MARTINO, VICE PRESIDENT
ROBERT LINDLEY ZIEGFELD,
SECRETARY-TREASURER

MANFRED BOWDITCH
DIRECTOR OF HEALTH AND SAFETY

April 9, 1952

Robert A. Kehoe, M.D., Director
Kettering Laboratory
U. of Cincinnati College of Medicine
Eden Avenue
Cincinnati 19, Ohio

Dear Bob:

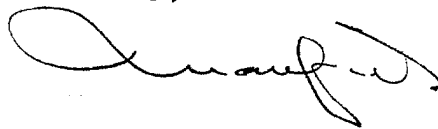
I am enclosing an article on gelatin desserts and pie fillings from the April issue of "Consumers' Research Bulletin," which you will note to be quite generously sprinkled with references to lead.

There can be no question that lead in any amount is an undesirable ingredient in any article of food, and if one group of manufacturers keeps its products lead-free and another does not, no one can quarrel with the recommendation that, other factors being equal, the former should be favored.

On the other hand, our past experience with these people has shown that they can go pretty far astray in such matters, and it therefore seems worth while to seek expert opinion on their current discourse. I am accordingly placing it before you with the hope that you will criticize it from the viewpoint of the tolerances given, and am sending it to George Wheatley for his thoughts as a pediatrician.

Should it later seem expedient to write to the publishers, I shall, of course, refrain from quoting you by name if you so ask.

Sincerely,



MB:JA



Gelatin Desserts and Pie Fillings

Editor's Note: In the preceding article, "Phosphates and Phosphoric Acid, Undesirable Food Ingredients," in the March 1952 Consumers' Research Bulletin, we discussed the potentially harmful effects of compounds of phosphorus introduced into the diet artificially through various common food substances in which phosphoric acid or phosphates are now widely used. Some of these foods are gelatin desserts, pie fillings, soda fountain beverages, bottled soft drinks, ready-to-bake mixtures, jellies, and cake and roll mixes. The study led clearly to the conclusion that added phosphate or phosphoric acid is definitely undesirable in foods. A number of harmful effects are produced when the amount of phosphorus taken into the body through foods and beverages is high (unbalanced) in relation to the amount of calcium. Among the undesirable effects are: the imposition of an extra burden on the kidneys; faulty bone formation, and an increased tendency toward rickets in young children; a tendency to anemia, and reduced absorption of iron (a vitally necessary mineral element, particularly for women). Animal experiments showed poor reproductive performance when there was excessive phosphorus in the diet.

THERE IS great personal variation in regard to the individual's reaction to the mineral content of his diet. There may be many persons whose systems correct sufficiently well an imbalance of minerals in the diet that they may not suffer any serious or objectionable effects from additional quantities of phosphorus in their food or beverages. There are others who may show a sensitivity to an intake of phosphorus that is even slightly above normal. Phosphorus is an element that is avail-

able in adequate amounts in various foods consumed by everyone, so that there would not normally be any need for its being taken medicinally or through foods containing extra amounts of phosphorus compounds.

It is a fact that, generally, if the needs of the body for calcium and protein are met through common foods in the diet, the phosphorus that is needed will also be provided, since the common foods that are most effective in supplying calcium

and protein are also the best sources of phosphorus. Natural food sources that are especially high in phosphorus are peas and beans of all types; various cheeses; peanuts, liver, turkey, eggs, fish, nuts, cocoa, and chocolate; and products made of wheat, rye, oats, corn, and rice. Anyone who uses regularly considerable amounts of any of these foods should bear in mind that his phosphorus intake may be rather higher than normal; hence he should exercise more care than ordinary to avoid using foods such as desserts containing phosphates, and bakery goods made with baking powder, and other foods that contain phosphorus in relatively high concentration.

As this study was intended to be a preliminary one, the analyses were not made comprehensive or complete (partly because of the considerations of cost involved); the figures were, however, found to give sufficiently good indication of the characteristics of several products to be a helpful guide to the consumer. Data on a particular sample are not to be considered completely characteristic of a brand because of the variations in composition, as noted, for instance, in the difference in phosphorus content of two samples of *Ann Page* gelatin of different flavors.

Gelatin is nutritionally of very little value, and is very costly for the amount of food value provided, so that it is essentially a luxury food. It is the only protein food that is in fairly wide use whose protein is of a highly incomplete character so that alone it can neither maintain life nor promote growth. (The chief deficiencies of gelatin in respect to the protein amino acids are in tryptophane, valine, and tyrosine.) Gelatin is in wide use as a dessert for children and invalids and also for people who are trying to limit their food intake in order to counteract a tendency to obesity. Experiments purporting to show that drinking large quantities of gelatin in water or fruit juice will materially aid in reducing fatigue and increasing physical prowess are not supported by adequate evidence of scientific investigators.

Fifteen of the 24 desserts tested, mostly those found to have the highest content of phosphate, were assayed for arsenic and lead. CR has for many years advised its subscribers of the harm done by heavy-metal contaminations in foods and beverages, particularly small amounts of arsenic and lead. The action of these poisonous metallic contaminants is cumulative, and they may produce no detectable harm over the short run or even a period of perhaps several years. The average person is exposed to small but continuous amounts of arsenic and lead from the surfaces of fruits and vegetables, certain factory-prepared foods, and many sources other than food and drink, including frequently his water supply. For these reasons, CR has long felt it necessary to urge that no unnecessary intake of these metals should ever be permitted.

They are particularly dangerous to young children and are more harmful to women than to men. For these reasons CR some years ago set up its own tolerances, or contamination limits, for use in its ratings (0.3 parts per million of lead and 0.5 ppm. of arsenic, as arsenic trioxide); we have seen no reason to warrant a change in these. As a matter of fact, the indications are, if anything, that they should be reduced. Phosphate and phosphoric acid as used in foods are likely to be produced from materials, principally phosphate rock or bones, containing in their natural state arsenic, lead, fluorine, and other undesirable mineral substances, and the removal of these is very difficult to effect. Since the phosphate rock and the triple superphosphate used for fertilizing the fields is not purified, it will be seen that a good deal of arsenic, lead, and fluorine may get into the food supply through soils that are fertilized heavily with chemical fertilizers (in some places soils have actually become non-productive because of long-continued spraying or dusting with lead-arsenic compounds used for control of insects affecting crops). Metaphosphates and polyphosphates are also used in the conditioning and softening of water supplies; these may also be sources of undesirable metallic contaminations. The baking powder industry is believed to be the second largest consumer of phosphate rock after the fertilizer industry, and baking powder, as is well known, is a relatively important source of unwanted arsenic, lead, and fluorine in the diet.

In its May 1940 BULLETIN, CR commented, "The most important practical objection to the use of gelatin in any form is that it is an almost certain source of lead and arsenic. . . it seems . . . undesirable to add needlessly any known source of metallic contamination to the diet."

The wide variations in the chemical findings reported in the concluding part of this article regarding similar products by different manufacturers would seem to indicate a failure to employ a sufficiently tight degree of chemical control in manufacturing processes; in some cases the amount of lead present was surprisingly high, but the fact that some manufacturers were able to keep it at very low levels proved that proper selection of raw materials and due attention by a chemical analyst during the manufacturing process could readily solve the problem. A comparison of *Ann Page* imitation strawberry gelatin and *Jell-O* of the same flavor revealed a comparable amount of phosphate in each product, but there was approximately $2\frac{1}{2}$ times as much arsenic and lead found in the imitation-strawberry *Jell-O* as in the *Ann Page* imitation-strawberry gelatin. Likewise a comparison of imitation cherry-flavor *Jell-O* and *Royal* gelatin of the same flavor revealed that both products were relatively high in lead, but again the *Jell-O* sample tested contained more arsenic than the similar *Royal* gelatin of the same flavor. As regards phos-

phate content, imitation cherry-flavor *Jell-O* ranked among the highest (0.23%); the amount in imitation cherry-flavor *Royal* gelatin was negligible.

Gelatin dessert powders contain only about 10 percent of gelatin, the rest being about 85 percent sugar and 2 percent tartaric or citric acid and some flavoring matter. As two brands of *plain* or *unflavored* gelatin tested by CR have shown relatively small amounts of heavy-metal contamination, as will appear later, it may be that the arsenic and lead that are found in the gelatin dessert powders originate in other ingredients such as the phosphate or the dye. Because the *plain* gelatin is found to be relatively uncontaminated (and was found so in previous tests by CR), and since the housewife's own flavoring ingredients are less likely to add unfavorable metallic contamination, it would seem that the best course for the housewife to pursue is that which CR recommended several years ago, to buy plain gelatin and flavor it in one's own kitchen to suit one's own individual taste, using fruit juices and other natural flavors, rather than the synthetic flavorings used in manufactured gelatin, and avoiding, too, the use of commercial food dyes, which have in the past been found to be a fairly common potential source of metallic contamination. Some food dyes, too, even though certified as safe for use in foods and beverages, are open to objection as being potentially cancer-causing agents, a fact which has been brought out in recent testimony through the Congressional committee investigating food adulteration in the last few months (though presumably the Food and Drug control over food dyes has provided consumer protection against this hazard, a hazard known to have existed at an earlier period in connection with at least one important food dye — see the article on "Colors for Foods, and Colored Foods" in the June 1945 CONSUMERS' RESEARCH BULLETIN). It is suggested that the housewife mix gelatin desserts in a glass or white-glazed chinaware container for, as our BULLETINS have noted from time to time, there is at least some danger that a significant degree of metallic contamination may be introduced from acid foods prepared or stored in enamelware containers. In making tart desserts, the housewife will do well to avoid fruit juices which are strongly acid; among the natural food substances, lemon juice is particularly bad in its potentialities of harm to the teeth. Investigators have noticed that this juice, often used by persons suffering from rheumatism, or as a laxative, or to prevent colds, or in reducing diets, has caused extensive dissolution of the dental structure, particularly if it is taken daily and at other than mealtimes. (The harmful effect of an acid is, of course, diminished by dilution in eating a meal.) The advertising of *California Sunkist Lemons* is largely responsible for the belief of many persons that lemon juice should be taken regularly for

health. (It seems likely that lemon juice should be used rather sparingly, and in fairly high dilution, as a food ingredient.)

It is to be hoped that some manufacturer will take notice of the situation discussed herein, regarding contamination of prepared gelatin desserts, and will offer a line of dessert gelatin and similar products with respect to which the strictest precautions have been taken to insure protection against metallic and bacterial contaminations. The problem is not an easy one, but it can be gotten under control just as a similar problem was a number of years ago when manufacturers of chocolate and cocoa had difficulties with the occurrence of significant amounts of lead contamination developing during the production and shipment of cocoa beans and during factory processing. At that time the manufacturers succeeded, after careful research, in arriving at an almost complete correction of the difficulty, so that at the present time objectionable contamination of chocolate and cocoa with lead has almost ceased to be a problem, it is said, for Food and Drug administrators.

In connection with the study of the desserts, the test included a rating for palatability by means of a seven-member panel on the basis of three main factors: odor, flavor, and primary taste. This rating covered 22 of the 24 desserts; in two instances (*Junket Sherbet Mix* and *Jell-O Rice Pudding*), flavor ratings are not given because there were not a sufficient number of similar products for comparison. Ratings as to odor were based on trueness and concentration of the odors. Each product was also observed for "off-odors" (such as terpene-like odors due to oxidation of flavors and "artificial-like" odors possessed by certain poor imitation flavors). Some of the products were without noticeable odor, although a slight aroma would have seemed desirable. Flavor, being a mixed sensation of taste, touch, smell, and sight, is a difficult factor to evaluate. The four primary tastes are sweet, bitter, sour, and saline. An effort was made to evaluate each product for the trueness and fullness of the expected primary taste and also for the over-all flavor.

For the purposes of judging the odor, flavor, and primary-taste factors, the pie fillings were prepared with distilled water and not with eggs and/or sugar (as they would be in practice in most cases); this was in order that the original flavor would not be masked by the addition of the flavorful eggs or sugar or both. In this connection it may be noted that *Airline* pie filling, which is ready for use as marketed, ranked near the top as to odor, flavor, and primary taste, and was on a par with imitation cherry-flavor *Jell-O* and lime-flavor *Royal* gelatin. *Sundaettes* (crushed pineapple), which is an ice cream topping, was generally regarded as the most palatable product of the group. Least favored in the flavor, primary taste, and odor ratings were the

following: *Ann Page Sparkle Orange Gelatin*, *Ideal Lime Gelatin*, and *Lem Pie Filling* (lemon). (*Lem Pie Filling* was found to have the highest titratable acidity, calculated as citric acid, of all the products in the group tested.¹) It must be understood that the scoring in such a study is always influenced by flavor preference, and this should be given consideration by readers, as any given person may possibly find quite palatable a product which others only find moderately so, just as some like the flavor of certain popular bottled soft drinks and others do not find their taste pleasing at all.

The dessert products listed below in the A, B, and C classifications are arranged in relative order of desirability from the standpoint of low phosphate content. Palatability ratings for all products except two already named in the preceding text are designated with the following symbols: superior flavor rating ***; average flavor rating **; below average flavor rating *.

All the products except *Grayslake Gelatin*, *Knox Gelatine*, and *Sundaettes Crushed Pineapple* contained artificial color.

A. Recommended

French's Good Luck Lemon Flavor Pie Filling (Good Luck Food Co., Inc., Rochester, N.Y.) 2 pkg., 17c; **. Ingredients include citric acid and lemon oil².

Junket Sherbet Mix (Chr. Hansen's Laboratory, Inc., Little Falls, N. Y.) 2 pkg., 29c. Orange Flavor (not rated for flavor). Contains citric acid.

Sundaettes (Distributed by Airline Foods Corp., New York City) Crushed pineapple, 15c each; *** (see text). Contains citric acid, and benzoate of soda (0.1%).

Ann Page Sparkle Lemon Flavor Pie Filling (Distributed by The Great A & P Tea Co., N.Y.C.) 3 pkg., 19c; *. Contains citric acid and oil of lemon.

Airline Cherry Pie Filling (Airline Foods Corp.) 31c each; ***. Contains synthetic flavor and tartaric acid, and benzoate of soda, a preservative (0.1%).

B. Intermediate

The following products were desirable from the standpoint of low phosphate content but they were not further assayed for arsenic and lead; they are thus for the present given a B rating.

Ann Page Sparkle Orange Flavor Gelatin Dessert. Orange; 3 pkg., 19c; *. Contains citric and/or tartaric acid.

¹As far back as 1937, Professor Clarence A. Mills (Dept. of Experimental Medicine, University of Cincinnati) commented, in an epochal paper on the relation of hardness and acidity of drinking water to tooth decay, on research showing that "the ingestion of certain acids, such as hydrochloric, sulphuric or phosphoric, will cause liberation of calcium from bones and teeth in large amounts, and its excretion in the urine."

In experiments on the dissolving of teeth by acid materials conducted by J. W. Trask, E. E. Ziegler, and E. C. Maloof (Journal of the American Dental Association, July 1940), the dissolution of dental structure increased rapidly with a drop in pH values and the most significant solvent action was found, with one or two exceptions, when the pH was below 4, corresponding to citric, phosphoric, lactic, acetic, tartaric, and oxalic acids. The solutions of all these acids, used in the test by Trask, Ziegler, and Maloof, gave pH values well below 4. All the flavored gelatins and other products (except the *Jell-O Rice Pudding*) in the test had pH values in this range (below 4). The most recent indications are that titratable acidity of the food or beverage is more important than the pH in determining the action of acids on teeth. It has also been noted that the citrate ion is particularly likely to produce damage to teeth. Much more damage has been found to be done by the acid fruit juices than by an equivalent amount of the fruit itself.

Royal Gelatin Dessert (Standard Brands, Inc., N.Y.C.) 3 pkg., 25c; Imitation Pineapple Flavor *; Imit. Raspberry**; Lime***. The imitation pineapple product contains citric acid and sodium citrate; the other two contain fumaric acid and sodium citrate. The imitation pineapple and raspberry have artificial flavor.

Junket Danish Dessert. Currant-Imit. Raspberry, 11c each; **. Contains citric acid and natural raspberry "enhanced with artificial flavor."

Ideal Gelatin Dessert (Distributed by American Stores Co., Philadelphia) Lime Flavor; 3 pkg., 19c; *. Contains citric acid, sodium citrate, and oil of lime.

C. Not Recommended

Lem Pie Filling (The Morrison Co., Philadelphia 40) Lemon; 2 pkg., 21c; *. Contains citric and/or tartaric acid, lemon oil, edible oil, calcium phosphate.

Jell-O Rice Pudding (General Foods Corp., N.Y.C.) 3 pkg., 25c (not rated for flavor). Contains vanilla and artificial flavors and tricalcium phosphate.

7-Minit Lemon Flavor Pie (6-O'clock Foods, Inc., Norristown, Pa.) 23c each; **. (This package contained pie-crust mix and filling; only the filling was tested by CR.) Contains citric acid, lemon oil, powdered lemon juice. Pie-crust mix contains baking powder.

Jell-O Gelatin Dessert. 3 pkg., 25c; Lemon**; Lime*.

Contain citric acid, sodium citrate and/or phosphate.

Ann Page Sparkle Gelatin Dessert. Imit. Raspberry**. Contains citric acid, disodium phosphate, and natural raspberry "enhanced with artificial flavor."

The following products, satisfactory from the standpoint of phosphate and arsenic content, were relatively high in lead.

Sundaettes. Crushed Strawberries**. Contains citric acid, and benzoate of soda (0.1%).

Royal Gelatin Dessert. Lemon**; Imit. Cherry**. (The gelatin dessert of the imitation cherry flavor was high in lead content; something over 2 ppm. was found on each of two samples.) The lemon product contains citric acid, sodium citrate; the imitation-cherry product contains fumaric acid, sodium citrate, and artificial flavor.

My-T-Fine Lemon Flavor Pie Filling (Packed by Penick & Ford, Ltd., Inc., N.Y.C.) 9c each; **. (This product had the highest lead content of all products tested; 4 and 5 ppm. were found on two samples tested.) Contains citric acid, lemon oil.

The following products were undesirably high in both phosphate and lead content.

Ann Page Sparkle Gelatin Dessert. Imit. Strawberry**. Contains citric acid, disodium phosphate, and natural strawberry "enhanced with artificial flavor."

Jell-O Gelatin Dessert. Imit. Cherry***; Imit. Strawberry*. (The second-named product was high in lead content; 3 ppm. were found on two samples.)

²In view of the recent disclosure by physicians that orange peel oil may cause symptoms of illness in babies, including skin rash, regurgitation and intestinal disturbances, it seems doubtful that even food products for adults should be flavored with a flavoring oil prepared from the peel of lemon, orange, or lime as appears in the ingredients listings on a number of products in the present study (or lemon, orange, or lime extract since extracts are legally made by dissolving the peel oil of lemon, orange, or lime in alcohol). "Flavors" are not the same as extracts. Flavors are prepared with a vehicle other than alcohol, but otherwise they have the same origin, in oil of the peel of the fruit.

Both contain citric acid, sodium citrate and/or phosphate, and natural cherry or strawberry "enhanced with artificial flavor."

Plain (unflavored) Gelatin

B. Intermediate

The following two brands of gelatins have been rated only on lead and arsenic content; since both are plain gelatin products, i.e., unflavored, unsweetened, and uncolored, no palatability tests were run on them.

Knox Unflavored Gelatine (Charles B. Knox Gelatine Co., Inc., Johnstown, N. Y.) and *Grayslake Gelatin* (unflavored) (Grayslake Gelatin Co., Grayslake, Ill.) These

two unsweetened, unflavored, and uncolored brands of gelatin were tested for arsenic and lead. *Knox Gelatine* (23c each) showed 0.25 ppm. of arsenic and 0.5 ppm. of lead. The *Grayslake Gelatin* (1/4-lb. pkg., 60c) was somewhat better, with only a trace, or less than 0.05 ppm., of arsenic and 0.4 ppm. of lead. The lead in the *Knox Gelatine* was above CR's tolerance of 0.3 ppm., and the arsenic content was safely under the 0.5 limit. *Grayslake Gelatin* was well within the limit on arsenic and a little over the limit on lead. It must be borne in mind, however, that there will be appreciable variations on different samples and these analyses are not to be taken as indicative of the arsenic and lead content that may be found in *all* samples of plain gelatin now being marketed, which may run higher or lower than the figures given above.