codex alimentarius commission

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

WORLD HEALTH ORGANIZATION

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JOINT FAO/WHO FOOD STANDARDS PROGRAMME

CODEX COMMITTEE ON FOOD ADDITIVES AND CONTAMINANTS
Thirty-fifth Session
Arusha, Tanzania, 17 - 21 March 2003

PROPOSED DRAFT CODE OF PRACTICE FOR THE PREVENTION AND REDUCTION OF LEAD IN FOOD

Governments and international organizations wishing to submit comments on the following subject matter are invited to do so **no later than 1 January 2003** as follows: Netherlands Codex Contact Point, Ministry of Agriculture, Nature Management and Fisheries, P.O. Box 20401, 2500 E.K., The Hague, The Netherlands (Telefax: +31.70.378.6141; E-mail: info@codexalimentarius.nl, with a copy to the Secretary, Codex Alimentarius Commission, Joint FAO/WHO Food Standards Programme, FAO, Viale delle Terme di Caracalla, 00100 Rome, Italy (Telefax: +39.06.5705.4593; E-mail: Codex@fao.org).

BACKGROUND

1. The 24th Session (July 2001) of the Codex Alimentarius Commission (CAC) agreed that the Codex Committee on Food Additives and Contaminants (CCFAC) should develop a Code of Practice on the Prevention and Reduction of Lead Contamination in Food and recommended that the Food and Agriculture Organization (FAO) guidelines on lead-soldered cans could be useful in this regard [Guidelines for Can Manufacturers and Food Canners: FAO Food and Nutrition Paper No. 36, FAO, Rome, 1986].[1] The 34th Session (March 2002) of CCFAC agreed that a drafting group, under the direction of the United States, with the assistance of Australia, Brazil, Canada, Denmark, India, Italy, United Kingdom, Philippines, Thailand, and OIV, would elaborate a proposed draft Code of Practice for the Prevention and Reduction of Lead in Food, subject to confirmation by the Codex Executive Committee (CEXEC).[2] The 50th Session of the CEXEC confirmed this as new work for the CCFAC.[3]

INTRODUCTION

2. Lead is a toxic heavy metal with widespread industrial uses, but no known nutritional benefits. The toxic effects of lead in food have been reviewed several times by the FAO/WHO Joint Expert Committee on Food Additives (JECFA).[4,5,6,7] Chronic exposure to lead at relatively low levels can result in damage to the kidneys

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[1] ALINORM 01/41, para. 124.
[2] ALINORM 03/12, para. 138.
[3] ALINORM 03/3A, para. 64 and App. III.
[4] JECFA. Sixteenth Report of the Joint FAO/WHO Expert Committee on Food Additives. WHO Technical Report Series No. 505, FAO Nutrition Meetings Report Series No. 5. Geneva, 1972.
[5] JECFA. Twenty-second report of the Joint FAO/WHO Expert Committee on Food Additives. WHO Technical Report Series No. 631, WHO Food Additives Series No. 13. Geneva, 1978.
[6] JECFA. JECFA Monograph 622: Lead. WHO Food Additives Series 21. Geneva, 1987.

and liver, and to the reproductive, cardiovascular, immune, hematopoietic, nervous, and gastrointestinal systems. Short-term exposure to high amounts of lead can cause gastrointestinal distress, anemia, encephalopathy, and death. The most critical effect of low-level lead exposure is reduced cognitive and intellectual development in children.[8]

3. There is no blood lead level that is definitively known to be safe, but 30 mcg/dL has been identified as the lead level of concern for adults and 10 mcg/dL has been identified as the lead level of concern for children, infants, and pregnant women. Blood lead levels have been used to extrapolate tolerable intake levels for lead in food.[9, 10]

4. Children, infants, and fetuses are more vulnerable than adults to lead poisoning. Children and infants absorb lead more readily than adults, consume more food on a body weight basis, and develop neurological problems at lower lead levels than adults.[11] A critical point is that neurological decrements in young children have been shown to be irreversible.[12] A model of lead exposure prepared by JECFA suggests that even short-term low-level exposures, particularly in small children, can impact neurobehavioral development. Because of children's greater sensitivity, previous regulatory efforts to reduce lead exposure from food have been targeted at protecting children.[13]

5. Lead is found naturally in many areas of the world, but industrial use of this metal has led to widespread lead contamination in air, soil, and water, and on plants (including crop plants). Industrial uses of lead include battery production, lead soldering, armament production, and use of lead compounds in lead-containing paints, glazes, pesticides, and gasoline additives. The effect of widespread lead usage in the modern era is demonstrated by the report that modern humans from industrialized areas have a skeletal lead burden 500 times greater than that of prehistoric humans.[14]

6. Humans can be exposed to lead in the workplace, through hobbies, through lead-contaminated soil and air, and through food and water. In some instances, lead exposure has occurred through skin contact by leaded gasoline or by finely particulate lead compounds.[15] For adults who are not exposed to lead occupationally, the major source of lead exposure is food and drink. In contrast, the major source of lead for children may be lead-containing dust and soil.[16,17] Direct ingestion of lead paint chips is also an important source of exposure for children.

Sources of lead in food

7. Lead contamination of food arises from numerous sources, including air, soil, water, food processing and handling, and food packaging (e.g., lead-soldered cans or other lead-containing packaging).

8. Atmospheric lead, e.g., from industrial pollution or leaded gasoline, can contaminate food through deposition on agricultural crop plants. The amount of deposition varies with proximity to the lead source (e.g., roadway, smelter), plant species, and weather conditions. Leafy crops are more susceptible to contamination from deposition than other crops.[18]

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[7] JECFA. Fifty-third report of the Joint FAO/WHO Expert Committee on Food Additives. Who Food Additive Series 44. Geneva, Switzerland, 2000.
[8] JECFA, 1972.
[9] CX/FAC 99/19, December 1998.
[10] Carrington, C.D. and P.M. Bolger. An Assessment of the Hazards of Lead in Food. Reg Toxicol Pharmacol 16, 265-272, 1992.
[11] Bolger, P.M., et al. Identification and reduction of sources in dietary lead in the United States. Food Add Contam 13, 53-60, 1996.
[12] Landrigan, P., A.C. Todd, and R.P. Wedeen. Lead Poisoning. Mt Sinai J Med 62, 360-364, 1995.
[13] Ibid.
[14] Flegal, A.R., D.R. Smith, and R.W. Elias. Lead Contamination in Food (Ch. 4). Advances in Environmental Science and Technology 23, 85-120, 1990.
[15] Lilley,-S-G; Florence,-T-M; Stauber,-J-L, The use of sweat to monitor lead absorption through the skin. Sci-Total-Environ. 1988 Oct 15; 76(2-3): 267-78.
[16] Environmental Health Criteria (EHC) 165: Inorganic Lead. Geneva: World Health Organization, 1995.
[17] Jones, T.F., et al. Hidden threats: lead poisoning from unusual sources. Pediatrics 104, 1223-1225. 1999
[18] Flegal, A.R., et al., 1990.

9. Soil may also be a source of lead in agricultural crop plants, either through uptake or through deposition of leaded soil on plant surfaces. Sources of lead in the soil include deposition from atmospheric lead, as well as prior use of lead-containing pesticides (e.g., lead arsenate), application of sewage sludge[19] or lead-contaminated phosphate fertilizer[20], degradation of lead paint from nearby buildings[21], and lead ordnance stored on former munition sites.[22] Soil properties, such as pH, and crop variety will affect uptake of lead from soil.[23] Livestock may accumulate lead by direct consumption of soil or by eating plants grown on lead-contaminated soil.[24]

10. Contamination of surface waters (oceans, rivers, lakes) can result from atmospheric deposition, from drainage of lead-contaminated soil into water, and from leaching of lead from lead shot and lead sinkers.[25,26] Lead can be accumulated by certain shellfish.[27] However, consumption of fish and shellfish has not been linked to frank lead poisoning.[28]

11. Water used to prepare food can be a dietary source of lead. Contamination can occur when water is used as an ingredient; foods cooked in water also can absorb lead from the water.[29] Contamination is higher for foods prepared with more water.[30] The main source of lead in water for drinking and food processing is leaching from fixtures in the water distribution system, such as lead pipes or connectors, lead solder, and brass fixtures. Acidic water increases the rate of leaching. The World Health Organization (WHO) has established a maximum level for lead in drinking water of 0.010 mg/L.[31] In the U.S., an action level of 0.015 mg/L has been established for drinking water that addresses leaching of lead from distribution pipes. For bottled drinking water, the U.S. has established a maximum lead level of 0.005 mg/L, because leaded distribution pipes are not used and because, under good manufacturing practices, bottled water producers can readily produce bottled water products with lead levels below 0.005 mg/L. In the European Union (EU), the current maximum limit for lead in drinking water is 0.05 mg/L. This limit will decrease to 0.025 mg/L in November 2003 and to 0.01 mg/L in November 2013.[32] The EU limit for bottled water is 0.010 mg/L.

12. Lead may contaminate food during processing if there are sources of lead in food processing areas, such as lead paint or lead-containing equipment. For example, lead contamination has been reported in winery equipped with bronze, brass and copper installations (taps, pipes, pump, housings, barrel outlets, presses, filters)[33 34] and lead-soldered equipment in maple syrup facilities.[35] Even when the core equipment in a food processing facility is lead-free, lead contamination can result from the use of lead-containing materials to repair metal equipment.[36,37,38] Lead repair of milling equipment has caused small-scale but serious episodes of lead contamination in flours.[39,40] Other reported sources of lead contamination include tinning of brass

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[19] Reilly, C. Metal Contamination of Food, 2nd Ed. New York: Elsevier, 1991.
[20] TNO Report STB-01-39, September 2001.
[21] Ohio State University Extension Fact Sheet: Lead Contamination in the Garden (HYG-1149-93).
[22] Sample of soil from a decommissioned munitions site in British Columbia revealed lead concentrations up to several thousand parts per million. The discovery led to a substantial loss of potatoes in storage and a recall of distributed stodk.
[23] Albering, H.J., et al. Human health risk assessment: a case study involving heavy metal soil contamination after the flooding of the River Meuse during the winter of 1993-1994. Environ Health Perspect 107: 37-43, 1999.
[24] Flegal, A.R., et al., 1990.
[25] Lead: Danish Notification 98/595/DK, http://europa.eu.int/comm/food/fs/sc/sct/out63_en.pdf.
[26] EHC 165, 1995.
[27] Lead: Danish Notification 98/595/DK, http://europa.eu.int/comm/food/fs/sc/sct/out63_en.pdf.
[28] Reilly, C., 1991; Danish Notification 98/595/DK.
[29] Flegal, A.R., et al., 1990.
[30] EHC 165, 1995.
[31] World Health Organization. Guidelines for drinking water quality, 2nd ed., Vol. 1. Recommendations, 1993.
[32] Council Directive 98/83/EC of 3 November 1998 on the quality of water intended for human consumption. Official Journal L330, 0032 – 0054, 05/12/1998.
[33] Kaufman, A. Lead in wine. Food Add Contam 15, 437-445, 1998.
[34] International Office of Vine and Wine: Scientific and Technical Notebook On Lead
[35] Reeder, D. Lead in maple syrup production. www.dartmouth.edu/~dreeder/lead.html
[36] EHC 165, 1995.
[37] Council of Europe. Guidelines on metals and alloys used as food contact materials (23.03.2001).
[38] Reilly, C., 1991.
[39] Hershko, C., et al. Lead poisoning by contaminated flour. Rev Environ Health 8, 17-23, 1989.

utensils, boiling water in tin pails[41], and the use of lead-soldered radiators and a bathtub, respectively, to prepare privately distilled liquor[42] and wine.[43] Lead contamination from repaired equipment or equipment inappropriate for food use reportedly occurs more frequently in home or small-scale production of foods than in food processing plants.[44] Drying food or food ingredients with dryers powered by leaded gasoline has also been shown to cause lead contamination.[45,46]

13. Lead-soldered cans have been an important source of lead contamination of food. This source of exposure has declined in countries where use of lead-soldered cans has been restricted or prohibited. As an example, mean lead levels in canned foods in one country declined from 0.20 mg/kg in 1982-1983 to 0.01 mg/kg in 1990-1991, primarily in response to efforts by the domestic canning industry to reduce use of lead solder in canned (noninfant) foods.[47] In areas of the world where lead-soldered cans are still used, such cans may still be an important source of lead contamination. Food in lead-soldered cans remains a problem in international trade.

14. Tin may contain lead as a contaminant. Various governments and organizations have set standards for maximum lead content for tin used in tinplate for food cans. For example, ASTM International has set a maximum concentration of 0.010 percent lead for "Grade A" tinplate.[48] Although lead in the tin layer of uncoated cans could potentially migrate into foods, this possibility is mitigated to some extent by the fact that the tin in the tin layer dissolves preferentially versus lead, due to the electrochemical properties of these two metals.[49,50]

15. Other packaging items have been identified as potential sources of lead contamination, including colored plastic bags and wrapping papers, cardboard containers that contain lead or are colored with lead-containing dyes, lead foil capsules on wine bottles, and lead-glazed ceramic or lead-containing metal vessels used for packaging or storing foods.[51]

16. Consumption and storage of foods and beverages in lead-glazed ceramicware and lead crystal by consumers can also be a source of lead contamination of food. In response, regulations have been adopted setting allowable levels for lead leaching from ceramicware and lead crystal and requiring warning labels on decorative ceramicware that leaches high lead levels.[52,53,54] The extent of migration from ceramicware depends on firing conditions (temperature, time, glaze) as well as the type of food and length of storage.[55] Consumer outreach has also been used to warn consumers against using as food containers craft ceramics or ceramics imported for decorative purposes, and against storing foods and beverages, particularly acidic ones,

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[40] Dona, A., et al. Flour contamination as a source of lead intoxication. J Toxicol Clin Toxicol 37, 109-112, 1999.
[41] EHC 165, 1995.
[42] Morgan, B.W., K.H. Todd, and B. Moore. Elevated blood levels in urban moonshine drinkers. Ann Emerg Med 37, 51-54, 2001.
[43] Mangas, S., R. Visvanathan, and M. van Alphen. Lead poisoning from homemade wine: a case study. Environ Health Perspect 109, 433-435, 2001.
[44] Reilly, C., 1991.
[45] "Lead poisoning associated with imported candy and powdered food coloring." MMWR Morb Mortal Weekly Rep 47, 1041-1043, 1998.
[46] FDA. New source of lead and other contamination. In Inspectors Technical Guide (ITG), Ch. 17, 6/18/74.
[47] Bolger, P.M., et al., 1996.
[48] ASTM International. B339-00. Standard Specification for Pig Tin. West Conshohocken, Pennsylvania, United States, 2000.
[49] Reilly, C. 1991.
[50] "Guidelines for can manufacturers and food canners." FAO Food and Nutrition Paper No. 36, FAO, Rome, 1986
[51] Bolger, P.M., et al., 1996; Reilly, C., 1991.
[52] Muir, M., and M. Campbell. Why barns are red: the health risks from lead and their prevention. Toronto, Ontario: Metropolitan Toronto Teaching Health Units, 1995.
[53] Council of Europe, 2001; Bolger, P.M., et al., 1996.
[54] Council Directive 84/500/EEC of 15 October 1984 on the approximation of the laws of the Member States relating to ceramic articles intended to come into contact with foodstuffs. Official Journal L277, 0012-0016, 20/10/1984.
[55] EHC 165, 1995.

in lead-containing items, such as crystal.[56] Other containers implicated in lead contamination in homes include pewter mugs, imported kettles, samovars, urns, and appliances with lead-soldered seams.[57,58]

17. Other reported lead-contaminated foods or food ingredients include raisins (grapes) treated with lead-containing fungicides[59]; game meat containing lead shot[60]; calcium supplements made from calcium sources with elevated lead levels, such as dolomite or bone meal[61,62]; various ethnic, traditional, or native remedies[63,64]; contaminated spices[65]; and food colors[66] and food additives.[67]

Reduction efforts

18. There have been worldwide efforts to reduce lead exposure from food. Such efforts have focused on implementing standards for allowable lead levels in food and food additives; ending the use of lead-soldered cans, particularly for infant foods; controlling lead levels in water; reducing leaching from lead-containing vessels or restricting their use for decorative purposes; and identifying and reacting to additional sources of lead contamination in foods or dietary supplements.

19. Although not targeted specifically at food, efforts to reduce environmental sources of lead, including restrictions on industrial emissions and restricted use of leaded gasoline, have also contributed to declining lead levels in food.

20. As a result of such efforts, lead levels in food in certain countries have declined over the last quarter century. As an example, the estimated lead intake for adolescent males in the U.S. declined to 3 micrograms/day in 1991, from a level of 60-90 micrograms/day in the decade prior to 1982. Likewise, lead levels in infant foods in the U.S. declined from 80 – 90 percent from the 1970s to the 1980s.[68] In Denmark, food monitoring has shown a decrease among adults in dietary lead intake from 42 micrograms/day in 1983-1987 to 18 micrograms/day in 1997.[69] These declines demonstrate the effectiveness of lead control efforts.

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56 Bolger, P.M., et al., 1996; Council of Europe, 2001; Muir, M., and M. Campbell, 1995.

57 Shannon, M. Lead poisoning from an unexpected source in a 4-month-old infant. Environ Health Perspect 106, 313-316, 1998.

58 Scarlett, J.D., et al. Lead poisoning by a mug. Med J Aust 163, 589-590, 1995.

59 Dabeka, R.W., A.D. McKenzie, and K. Pepper. Lead contamination of raisins sold in Canada. Food Add Contam 19, 47-54, 2002.

60 Reilly, C., 1991.

61 Whiting, S.J. Safety of some calcium supplements questioned. Nutr Rev 95-105, 1994.

62 Bolger, P.M., et al., 1994.

63 Lead poisoning associated with use of traditional ethnic remedies-California, 1991-1992. JAMA 270: 808, 1993.

64 Jones, T.F., et al., 1999.

65 Kakosy, T., et al. Lead intoxication epidemic caused by ingestion of contaminated ground paprika. J Toxicol Clin Toxicol 34, 507-511, 1996.

66 MMWR, 1998; Reilly, C., 1991.

67 Bolger, P.M., et al., 1996.

68 Ibid.

69 Larsen, E.H., et al. Monitoring the content and intake of trace elements from food in Denmark. Food Add Contam 19, 33-46, 2002.

PROPOSED DRAFT CODE OF PRACTICE FOR THE PREVENTION AND REDUCTION OF LEAD CONTAMINATION IN FOODS

1. Lead is a toxic heavy metal with widespread industrial uses, but no known nutritional benefits. The toxic effects of lead in food have been reviewed several times by the FAO/WHO Joint Expert Committee on Food Additives (JECFA).[70,71,72,73] Chronic exposure to lead at relatively low levels can result in damage to the kidneys and liver, and to the reproductive, cardiovascular, immune, hematopoietic, nervous, and gastrointestinal systems. Short-term exposure to high amounts of lead can cause gastrointestinal distress, anemia, encephalopathy, and death. The most critical effect of low-level lead exposure is reduced cognitive and intellectual development in children.[74] In its 1987 evaluation, JECFA concluded "that all possible steps should be taken to ensure that lead levels in food are as low as possible, and that contributions from other environmental sources are minimized."[75]

2. Lead exposure can occur through food and water, as well as in the workplace, through hobbies, and through exposure to lead-contaminated soil and air.

3. Lead contamination of food arises from numerous sources, including air and soil. Atmospheric lead from industrial pollution or leaded gasoline can contaminate food through deposition on agricultural crop plants. Soil lead arising from lead-containing ordnance stored on former munitions sites and from ammunition used in rifle or military firing, atmospheric deposition, or inappropriate application of pesticides, fertilizers, or sewage sludge can contaminate agricultural crop plants through uptake or through deposition of the soil on plant surfaces. Contaminated plants and soil are, in turn, a source of contamination of livestock.[76,77,78]

4. Water is also a source of lead contamination of food. Surface water sources can be contaminated through runoff (drainage), atmospheric deposition, and, on a local level, by leaching of lead from game shot or fishing sinkers. Contaminated surface waters are a potential source of contamination of aquatic food animals.[79,80] For drinking water and water for food preparation, the use of lead pipes or lead-containing fixtures in water distribution systems is a primary source of contamination.

5. Lead contamination of food can also arise from food processing, food handling, and food packaging. Sources of lead in food processing areas include lead paint and lead-containing equipment, such as piping and lead-soldered machinery. In the packaging area, lead-soldered cans have been identified as a very important source of lead contamination of food. Other packaging items that are potential sources of lead contamination include colored plastic bags and wrapping papers, cardboard containers that contain lead or are colored with lead-containing dyes, lead foil capsules on wine bottles, and lead-glazed ceramic, lead crystal, or lead-containing metal vessels used for packaging or storing foods.[81]

6. There have been worldwide efforts to reduce lead exposure from food. Such efforts have focused on implementing standards for allowable lead levels in food and food additives; ending the use of lead-soldered cans, particularly for infant foods; controlling lead levels in water; reducing leaching from lead-containing vessels or restricting their use for decorative purposes; and identifying and reacting to additional sources of lead contamination in foods or dietary supplements. Although not targeted specifically at food, efforts to

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[70] JECFA. Sixteenth Report of the Joint FAO/WHO Expert Committee on Food Additives. WHO Technical Report Series No. 505, FAO Nutrition Meetings Report Series No. 5. Geneva, 1972.
[71] JECFA. Twenty-second report of the Joint FAO/WHO Expert Committee on Food Additives. WHO Technical Report Series No. 631, WHO Food Additives Series No. 13. Geneva, 1978.
[72] JECFA. JECFA Monograph 622: Lead. WHO Food Additives Series 21. Geneva, 1987.
[73] JECFA. Fifty-third report of the Joint FAO/WHO Expert Committee on Food Additives. Who Food Additive Series 44. Geneva, Switzerland, 2000.
[74] JECFA, 1972.
[75] JECFA, 1987.
[76] Reilly, C., 1991
[77] TNO Report STB-01-39, 2001.
[78] Flegal, A.R., et al., 1990.
[79] Lead: Danish notification 98/595/DK
[80] EHC 165, 1995.
[81] Bolger, P.M., et al., 1996; Reilly, C., 1991.

reduce environmental sources of lead, including restrictions on industrial emissions and restricted use of leaded gasoline, have also contributed to declining lead levels in food.

7. Codex, intergovernmental organization, and many countries have set standards for allowable levels of lead in various foods.[82,8384] Low levels of lead in foods may be unavoidable, because of the ubiquitous nature of lead in the modern industrial world. However, following good agricultural and manufacturing practices can minimize lead contamination of foods. Because many useful interventions for reducing lead rely on actions by consumers, a section with suggestions for modifying consumer practices has also been included in this Code.

I. RECOMMENDED PRACTICES BASED ON GOOD AGRICULTURAL PRACTICES (GAP) AND GOOD MANUFACTURING PRACTICES (GMP

AGRICULTURAL

1. Leaded gasoline is a major contributor to atmospheric lead. National authorities should consider reducing or eliminating the use of leaded gasoline in agricultural areas.

2. Agricultural lands near industrial facilities, roadways, and ordnance depots, rifle ranges and military firing ranges may have higher lead levels than more isolated lands. Land near buildings with weathered exterior paint also may have high lead levels, a particular concern when such buildings are situated near livestock or small gardens. Where possible, farmers should test lead levels in soils that are near lead sources or that are suspected of having elevated lead levels to determine if lead levels exceed recommendations for planting by local authorities.

3. Farmers should avoid using lands that have been treated with lead arsenate pesticide, such as former orchards, to grow crops that may accumulate lead internally (such as carrots and other root crops) or on their surface (such as leafy vegetables).

4. Farmers should avoid growing crops on lands that have been treated with sewage sludge that does not adhere to maximum allowable lead levels set by national authorities.

5. Leafy vegetables are more vulnerable than non-leafy vegetables or root vegetables to deposition from airborne lead. Cereal grains also have been reported to absorb lead from the air at a significant rate.[85] In areas where atmospheric lead levels are higher, farmers should consider choosing crops that are less vulnerable to airborne deposition.

6. Farmer should avoid using compounds that contain lead (such as lead arsenate pesticide) or may be contaminated with lead (e.g., improperly prepared copper fungicide or phosphate fertilizer) in agricultural areas.

7. Dryers powered with leaded gasoline have been found to contaminate drying crops with lead. Farmers and processors should avoid using dryers or other equipment powered by leaded gasoline on harvested crops.

8. Crops should be protected from lead contamination (e.g., exposure to atmospheric lead, soil, dust) during transport to processing facilities.

9. Home or small-scale commercial gardeners should also take steps to reduce lead contamination. Avoid planting near roadways and buildings painted with lead-based paint. If gardens are located in an area with potentially high lead levels, test soil before planting.[86] Good gardening practices for soils with mildly elevated lead levels include mixing organic matter into the soil, adjusting soil pH to reduce availability of

[82] ALINORM 01/12, Appendix XI.
[83] Organization for Economic Cooperation and Development. Risk Reduction Monograph No. 1: Lead—Background and National Experience with Reducing Risk. Paris: OECD, 1993.
[84] International office of vine and wine. Resolutions Oeno-Eco 1/90, Oeno 4/93 and Oeno 1/96
[85] Council of Europe, 2001.
[86] Ohio State University Extension Fact Sheet: Lead Contamination in the Garden (HYG-1149-93).

lead to plants, choosing plants that are less vulnerable to lead contamination, and using liners to reduce contact deposition of soil on plants.[87] Some lead levels are considered too high for gardening.[88] It may be possible to build up gardening beds with lead-free soil in such areas. Gardeners should consult with local agricultural services, where available, for advice on what lead levels are too high for gardening and advice on how to garden safely in lead-contaminated soils.

10. Agricultural water for irrigation should be protected from sources of lead contamination and monitored for lead levels to prevent or reduce lead contamination of crops. For example, well water used for irrigation should be properly protected to prevent contamination and routinely monitored.

11. Local and national authorities should make farmers aware of appropriate practices for preventing lead contamination of farmlands.

DRINKING WATER

12. National authorities should consider establishing allowable lead levels or appropriate treatment techniques for controlling lead levels in drinking water. The WHO has established a guideline value for maximal lead levels in drinking water of 0.010 mg/L.[89]

13. Administrators of water systems with high lead levels should consider treatment techniques, such as increasing the pH of acidic waters, to minimize corrosion and reduce leaching of lead in the distribution system.

14. Where appropriate, administrators of water systems should consider replacing problematic lead piping and other lead-containing fixtures.

FOOD INGREDIENTS AND PROCESSING

15. National authorities should consider establishing standards limiting the amount of lead allowed in foods and food ingredients, including the traditional foods of their countries. Alternatively, selected foods and dietary supplements should be monitored to ensure that lead levels do not rise above normal background levels.

16. Food processors should choose food and food ingredients, including ingredients used for dietary supplements that have the lowest lead levels possible. They should also consider whether the land used to produce crops has been treated with lead-containing pesticides or sewage sludge.

17. During processing, maximum removal of surface lead from plants should be practiced, e.g., by thoroughly washing vegetables, particularly leafy vegetables; removing the outer leaves of leafy vegetables; and peeling root vegetables, where appropriate. (Home gardeners should also follow such steps if their soil has elevated lead levels.)

18. Food processors should ensure that the water supply for food processing complies with maximum limits for lead established by the national or local authorities.

19. Food processors should examine piping within facilities to ensure that older piping is not adding lead to water supplies inside the facility. Such piping may include brass fixtures, in addition to lead-soldered pipes.

20. Food processors should use food-grade metals for all metal surfaces that come into contact with food and beverages.

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[87] Ibid; Muir, M., and M. Campbell, 1995.
[88] Ohio State University Extension Fact Sheet: Lead Contamination in the Garden (HYG-1149-93).
[89] WHO, 1993.

21. Food processors should not use lead solder to repair broken equipment in food processing facilities. They should also not substitute non-food-grade equipment that may be present in a food processing facility for broken food-grade equipment.

22. Food processors should ensure that lead paint peelings do not become a source of lead contamination in processing facilities. If food processors carry out lead paint abatement, they should also ensure that appropriate cleanup procedures are followed to prevent further dispersion of lead paint and dust, which could create a greater hazard.

23. Food processors should occasionally test incoming raw materials and finished products for lead to verify that their control measures are functioning effectively.

PRODUCTION AND USE OF PACKAGING AND STORAGE PRODUCTS

24. To provide maximum protection against lead contamination, food processors should not use lead-soldered cans. Alternatives to lead-soldered cans are discussed in Food and Nutrition Paper 36 from the FAO, "Guidelines for can manufacturers and food canners. Prevention of metal contamination of canned foods," as well as JECFA Monograph 622.[90] These alternatives include using two-piece cans (which lack side seams) rather than three-piece cans, using cementing and welding to bond seams instead of soldering, using lead-free (tin) solders, and using alternative containers, such as glass.[91]

25. Where it is not feasible to avoid the use of lead-soldered cans, methods for reducing lead exposure from lead-soldered cans are discussed in depth in FAO Food and Nutrition Paper 36. Lead can be released from the solder surface itself, or from solder dust or solder splashes deposited inside the can during the can-making process. Methods for reducing splashing and dust formation include avoiding the use of excess flux, controlling exhaust over the work area to minimize dust deposition, controlling the temperature of the fluxed can body and solder, post-solder lacquering of the interior surface or interior side seams of cans, careful wiping of excess solder from finished cans, and washing soldered cans before use. For a detailed description of proper manufacturing practices with lead-soldered cans, the FAO paper should be consulted.

26. Tinplate used for food cans should meet international standards for maximum allowable lead concentration. ASTM International has set a maximum concentration of 0.010 percent lead for "Grade A" tinplate.[92]

27. Lead dyes or lead-based printing inks should not be used for packaging, such as for brightly colored candy wrappers. Even if such wrapping does not come in direct contact with foods, children may be tempted to put the brightly colored wrappers in their mouths.

28. Plastic bags or boxes with exteriors treated with lead-based dyes or lead-based printing inks should not be used for packing food. Handling of these items during cooking or reuse by consumers for storing other food items can cause lead contamination.

29. Packing foods for sale in traditional lead-glazed ceramics should be avoided because these ceramics may leach significant quantities of lead into the foods.

30. Lead foil capsules should not be used on wine bottles because this practice may leave lead residues around the mouth of the bottle that can contaminate wine upon pouring.

31. National authorities should consider setting standards for lead migration from lead-glazed ceramicware, lead crystal, and other lead-containing items that might potentially be used for food storage or preparation by consumers.

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[90] JECFA Monograph 622. Lead. WHO Food Additives Series 21: Toxicological Evaluation of Certain Food Additives and Contaminants, 1987.
[91] Ibid.
[92] ASTM International, 2000.

32. Decorative ceramicware that has the potential to leach unacceptable quantities of lead should be clearly labeled as not for food use.

33. Ceramicware producers should use manufacturing procedures and quality control mechanisms that minimize lead leaching.

CONSUMER PRACTICES

34. Local and national authorities should consider educating consumers about appropriate practices to reduce lead contamination in the garden and the home.

35. Consumers should avoid storing foods, particularly acidic foods or foods for infants and children, in decorative ceramicware, lead crystal, or other containers that can leach lead. Foods should not be stored in opened lead-soldered cans or stored in reused lead-dyed bags and containers. Consumers should avoid daily use of ceramic mugs when drinking hot beverages such as coffee or tea, unless the mugs are known to have been made with a lead glaze that is properly fired or with a non-lead glaze.

36. Consumers should wash vegetables and fruit thoroughly to remove dust and soil that may contain lead. Washing hands before preparing food will also help remove any lead-contaminated dust or soil from hands.

37. Where lead in water distribution systems is a problem, consumers should let water run from faucets before use to allow corroded lead from piping to be flushed out of the system. Hot water from the faucet should not be used for cooking or food preparation.