

From
Consumers' Digest
August 1937

HEALTH HAZARDS IN CONTAMINATED

By

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IT HAS been aptly said that the vitamins, those invisible accessories of our diets, are the little things of nutrition. Equally so, it may be said, the heavy metals, such as mercury and arsenic, are the little things of therapeutics, the art and science of treating disease. These metals are, in many respects also, the tiniest things of toxicosis, the state of protracted ill health. Indeed, they may be the most insidious underminers—chemo-enemies—of normal cellular and tissue activity. This seems paradoxical, for apparently, on the one hand, these metals may be beneficial to health, but on the other, they may be detrimental. In other words, they can blow both hot and cold. To the uninitiated this paradox seems a surprising state of affairs. Not so to the medical scientist, who knows that the vitamins and hormones, which also exist in traces and are necessary for health, may, when abused, produce chronic illness or serious disease. Nevertheless, it is right here that much confusion exists. Laymen, and many scientists too, are apt to think only of the sudden outbursts of symptoms of poisoning as the only manifestations of dangerous effects. Dramatic, if not violent, effects do occur from the use or swallowing of large doses of the heavy metals. These, however, are not concerned in the slowly developing and continuing effects of tiny quantities to which vast populations are exposed,

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is made, is all that it is said to be: so many feet deep, highest suspension bridge in the world, can that little speck up there against the sky be a car? etc. Yet this traveler felt, perhaps because of having already been through so many canyons, that this one did not add appreciably to her experiences, and that she would have done better to have chosen the tunnel route and reached Denver much earlier, in time for a fast train to Chicago.

References

Yellowstone National Park. A forty-two page circular, illustrated, with maps and bibliography. (Available from the Director of the National Park Service, Washington, D. C., free of charge.)

Yellowstone National Park. A twenty-page circular of detailed information for ticket agents regarding tours, hotels, facilities, etc., season of 1937, with rates, bus schedules, map, etc. (Available from, or at passenger traffic departments of, Chicago, Burlington & Quincy, Northern Pacific, Union Pacific, and Chicago, Milwaukee, St. Paul & Pacific railroads.)

Grand Teton National Park. A thirty-six page circular, illustrated, with maps and bibliography. (Available from the Director of the National Park Service, Washington, D. C., free of charge.)

Diet and the Teeth

In conclusion therefore it seems to me useless to try and stamp out dental decay amongst the civilized nations whilst the diet is mainly composed of demineralized and white bread and demineralized and devitalized white sugar.

—C. N. Peacock, L.D.S., in *Nutrition and Dental Health*

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Of particularly great concern are those heavy metals used to combat the insect pests which exist in myriads and would deprive us of the foods for our very existence. The commonest of these metals in use are lead and arsenic. We can obtain the food abundantly and economically with the aid of lead and arsenic, but these same metals may defeat the joy and the purpose of consuming that food. If we do not use the lead and arsenic, we may not have the food. If we are to have the food, we may have to take some lead and arsenic with it. It would seem a problem of relative values—some good at the expense of some harm. What we desire to know is whether our health is really in danger, if we eat such contaminated food. Many expert scientists, who have investigated the possibility, think it is. Some few people, not experts, have claimed these things to be trivial. Therefore, what experts think may prove enlightening and useful, particularly about lead, which in many respects is more important in this connection than is the arsenic.

Although lead arsenate is actually the spray residue that concerns fruit and vegetable growers and public health authorities, it is the lead which will bear emphasis, because this metal has long been recognized as an insidious menace to the health of the people. Lead has generally been regarded as a cumulative poison, a fact which has been repeatedly corroborated by the most rigid investigations. Time and again, it has been shown that lead accumulates in the viscera and bones from which it is gradually and continuously released according to conditions in the body. It is this continued streaming of lead through the body, whether the metal comes from storage-depots within the body or from channels of absorption, that causes cumulative injuries to important bodily functions. These injuries result in manifestations of impaired health which are not generally recognized by the layman as originating with the

eating of contaminated food. Growers generally do not appreciate the dangers of chronic cumulative poisoning, which is quite a different thing from acute or sudden poisoning. Chronic poisoning is really a disease and not a poisoning in the ordinary sense.

The disturbances in the beginning resemble those from some common disorders. Most practicing physicians now recognize that many people, residing in localities where insecticidal sprays are used, show symptoms which can be ascribed to lead or arsenic or both. These symptoms are characterized by loss of appetite, malaise, loss of body weight, weakness, fatigue on exertion, anemia, constipation or other gastrointestinal disturbances, and later pains in joints and nerve paralysis. Lowering of resistance to infections and predisposition to disease are also believed to occur. In the absence of other known causes, such symptoms always should arouse suspicion of injuries from lead. These symptoms are known to be more common, or are more aggravated, during spraying seasons. Conclusive evidence of toxicity can be obtained from analysis of excreta for lead and from examination of the blood, but a diagnosis of suspected poisoning can also be made without evidence of lead in the excreta. A correlation of all evidences with a history of exposure to lead generally enables a physician to arrive at a correct diagnosis.

On occasion, I have had the opportunity of making estimates of probable amounts of contaminated fruit or vegetables which might be regarded as being detrimental to health. These estimates are based on the results of experimentation with animals and on reported intoxications in man. They can only be approximate, since considerable individual variations exist, and actual conditions in the alimentary canal determine the rate and degree of absorption of the poison. Since it is believed that only one one-thousandth of a grain, or a barely visible pinch, of lead, swallowed daily for some weeks or months, may produce mani-

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festations of illness, it was estimated in one case that from seven and one-half grains, a quantity equal to about one and a half aspirin tablets, to two teaspoonfuls, of a certain apple pomace, a dried product from apples, eaten daily by an adult for several weeks or months would be deleterious to health. For the actions of arsenic, about four tablespoonfuls of the contaminated pomace would have to be consumed, since it is believed that somewhat more arsenic than lead is required, or about five thousandths of a grain daily, for chronic intoxication. This contaminated pomace was to be used in a variety of ways; in households, for preparing jellies, vinegar and cider, and in husbandry, for feeding livestock. In another case, it was estimated that, for the effects of lead, one whole contaminated apple eaten daily for weeks or months would be hazardous to health; for effects of arsenic, three or four apples daily. In still another case, about four teaspoonfuls of a contaminated cauliflower, when eaten regularly, were estimated as being capable of producing signs of ill health. Very recently I had the opportunity of considering the potential health hazards of cabbage contaminated with lead arsenate, seized in a public market in the Southwest. Analysis showed an arsenic content of 0.02 to 0.45 grain, and a lead content of 0.09 to 1.24 grain, per pound of cabbage. Since one to two grains of arsenic may be toxic or fatal to an adult, one pound of this cabbage contained one fourth to one half a toxic or fatal dose. Frequently large quantities of cabbage are used in preparations of soups, cold-slaw, extractives and the like, which may exercise unusual solvent actions on metals due to use of heat and presence of acids, salts and proteins. Rather large portions of such culinary products may be consumed. For instance, an ordinary portion of cold-slaw eaten by an adult is said to be about four ounces, and if it were prepared from this contaminated cabbage, an adult would eat at the same time something like one sixteenth to one sixth the killing dose of arsenic, let alone a

not inconsiderable amount of lead. I did not hesitate to declare this cabbage unfit for human consumption and a real menace to health, capable of producing acute poisoning. Of course, when the lead and arsenic act together, the effects are additive, and the amount of contaminated food producing illness is less than if either metal were present alone. The effects of these poisons would be even more pronounced in children than in adults, because they may consume more poison or more contaminated food in proportion to body weight.

It should be remembered that, although sprayed apples and vegetables are carefully washed by special methods, before marketing, there is a certain unremovable residue of lead arsenate which remains on the skin, around the stem and in fractures and inaccessible parts. Careless washing, or no washing at all, may leave very dangerous residues of these poisons. It is interesting to note that hydrochloric acid is used in the washing process to remove the excess of lead arsenate from apples. This same acid is a natural constituent of the digestive juice of the stomach where the unremoved lead arsenate, the so-called tolerance limit, is dissolved and made absorbable from the alimentary canal. So the water-insolubility of the lead arsenate is not a guarantee against its toxic effects in the body. It has been argued that apples are commonly wiped or peeled before eating and the stems are not consumed. However, careless wiping does not remove the poisons, and children are likely to be forgetful or inefficient.

The toxic effects of lead are also manifested in domestic animals living on contaminated feeds, pastures and water supplies. This means that the sources of food supplies for people may be contaminated where spraying is done carelessly. Economic losses in live stock have been so large in sprayed regions as to cause growers to give up business. Interesting experiences are frequently related by growers which testify to the actual menace to the domestic animals

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in these regions. Turkeys allowed to run in sprayed apple orchards are known to have developed lead poisoning. Horses nibbling on alfalfa or other vegetation grown between the sprayed trees are reported to have died in three or four years. Drift carried to pastures during aeroplane-spraying of adjoining ranches has resulted in repeated payments of indemnities for poisoned live stock. A valley in the Pacific Northwest has received as much as 7,000,000 pounds annually of lead arsenate, and this has been going on for about twenty years. Possibly, in the neighborhood of 50,000 tons of lead arsenate have permanently contaminated the soil of this valley. But the local population assumes the poison is washed away with the rains, or blown away by the winds which generously sweep these regions. Nothing is farther from the truth. The soil retains permanently by adsorption most of the poison strewn upon it, the poison only to be gradually released and taken up by the vegetation growing on such soil. It has been argued that rodents live contentedly in the contaminated soil, and keep on multiplying and menacing the industry even more than spray residues. Some say the bodies of these animals, and even of the people, may contain traces of lead and arsenic, and what of it, if they do.

Although lead may be found in traces in body fluids and tissues of many people, owing to the general use of sprays, ethyl gasoline and contaminated food products, this is not an argument for its harmlessness or its naturalness to the body. On the contrary, medical authorities now believe that such a general presence of lead in the population is a contributory factor to, if not a direct cause of, some common disorders whose etiology has hitherto remained obscure. Among the latter are included even such diseases as cancer, arteriosclerosis and nephritis, although there is a considerable division of opinion here. Moreover, lead never was intended by nature to be a constant or "natural" element of the body; neither arsenic, for that matter. Lead is no longer

prescribed or used internally as a medicinal agent by qualified physicians; arsenic may be used, but only under supervision of a qualified physician. Colloidal lead, which has been tried in cancer, is an experimental proposition far from being generally accepted. It is misleading and improper to speak of "normal lead," as it is never present in the body in the absence of exposure, and serves no useful purpose when it is present. Certain sources of diet may not be entirely free from lead (also arsenic), but that is no justification for condoning or allowing its presence. Obviously, therefore, exposure to lead in any form or by any channel, which will cause its appearance in the body, can not be regarded other than as a hazard to health.

Investigations, which disregard established facts or fail to recognize accepted principles and procedures commonly employed in modern studies of chronic intoxications, are likely to result in premature conclusions or deceptive announcements. Just recently some commercially inspired studies, which are reported to have pooh-poohed the lead arsenate of spray residues as a health hazard, are likely to create misleading impressions and a false sense of security. Unless and until such reports are submitted to experts capable of assessing their true value, they must be regarded as being at complete variance with disinterested researches conducted by scientists the world over. The promotion of commercial enterprise with the aid of insidious poisons, such as lead, is unwarranted when done without control or discrimination and with an utter disregard of the effects of such practice on man. The burden of proof rests with those who would maintain or encourage the contrary without warning or protection of the public.

What is to be done? It would help all concerned, the growers, the enforcement authorities and the people generally, if some independent or government agency would undertake a complete "epidemiologic-toxicologic" survey of a region which has been well sprayed for years. This would

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get at all the facts concerning soil, animals, people, vegetation, industrial regulation, desirability of tolerance limits for the poisons and other related matters of interest. This would help the government enforcement agencies in carrying out the will of the people. The United States Department of Agriculture has already done a great deal to make the public conscious of, and protect it against, this menace, but there are apparently also limitations to its power and influence. It is evident from the results of recent prosecutions of many violations that the public is not yet awake to the real situation. The merits of the problem are often obscured, or smoke-screened, by irrelevant matters and trivialities. Government control is interpreted as persecution of, or interference with, legitimate business. The truth is that the federal authorities are actually concerned with the economic aspects, as well as with health hazards. In fact, they are the only ones doing anything constructive about the situation. A great deal of research is being done under federal guidance to determine the best possible insecticides whose health hazard would be negligible and the costs minimal. The proper way to deal with the health hazard of heavy metals, like lead, is to eliminate their use altogether and to develop new insecticides of a totally different kind. This is actually being done experimentally, and it is not too much to hope that practical success will soon be achieved.

In the meantime, producers should avoid the use of lead arsenate or other arsenicals on vegetables like cabbage, cauliflower, Brussels sprouts, broccoli, spinach, kale, celery and snap beans, which are consumed in their entirety. They should use the most effective means possible for removing spray residue from the surface of apples and other deciduous fruits; and they should not use the skins of sprayed fruits in the production of cider, vinegar, jelly, stockfeed or other food products. Consumers should be careful to wash as thoroughly as possible all vegetables and deciduous

fruits that might have been exposed to spraying. Apples that are to be eaten with the skins on should be scrubbed with a wet brush, rinsed and have the skin removed around the stem and blossom end. The parings or skins of commercially grown fruits and the pods, husks or tops of commercially grown vegetables should not be fed to poultry or live stock.

Nothing has been said here about other insecticides which have been tried, such as nicotine, selenium and fluorine. All these have proved unsatisfactory, for one reason or another. Either they are inefficient or impractical as insecticides or they are equally or more dangerous to health. The ravages of children's teeth in fluorine-infested regions of the Southwest and the monstrosities among domestic animals in the selenium-infested regions of the North should serve as sufficient warnings to the people of hitherto unsuspected or neglected hazards. These disasters should be ample reminders of the insidious menace of the metallo-poisons to people everywhere. Of immediate concern, of course, are lead and arsenic, with a greater emphasis on lead, because these are the metals which are used deliberately, though permissively within limits, in such enormous quantities. These provide a large scale exposure of thousands of people and animals and are concealed in and contaminate their articles of diet, without their knowledge or consent. Administrative regulations, which permit so-called tolerance limits of these poisons on foods, are undoubtedly applied with good intentions, and are legally essential for effective public protection under the present terms of the law. However, they are purely arbitrary and do not meet objections raised by scientists. To the latter, the health hazards of these tiny chemo-enemies are real and important. It seems clear that only those chemical substances, which are relatively non-injurious to human health and thoroughly established by scientific research on animals and men, should be used to satisfy the demands for efficient insecticides.