

SOME DIETETIC FACTORS INFLUENCING THE MARKET FOR

Poi in Hawaii

VIRGINIA DERSTINE and EDWARD L. RADA



AGRICULTURAL ECONOMICS BULLETIN 3

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Poi in Hawaii

with emphasis on a survey of the use
of poi by the medical profession
and allied institutions

VIRGINIA DERSTINE, Special Economic Assistant
and
EDWARD L. RADA, Market Economist

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ABSTRACT

Scientific studies of poi, as reported in the literature, indicate that it is a carbohydrate food of high nutritional quality. If it is permitted to ferment for a few days, it has the unusual ability of undergoing a self-purifying process by which the number of bacteria in it are ultimately reduced and during which any pathogenic bacteria that might be present are killed. The fermentation process appears to be associated with the ease of digestion and the high assimilability of its component elements, such as calcium and phosphorus. This trait is very important for infants with comparatively weak digestive systems and for the aged and convalescent who find digestion difficult.

The mineral content of home-mixed poi (diluted to about 18 percent solids) compares favorably with that of white potatoes and rice on a per-serving basis. The calcium content is higher than that of white potatoes and rice. The phosphorus content is slightly lower than that of rice and potatoes and substantially lower than that of most enriched cereals as listed by Bowes and Church (Appendix A, table 4). The calcium and phosphorus of poi are well utilized by humans. On a per-serving basis, home-mixed poi contains more iron than potatoes and rice. Analyses of taro have shown the presence of minerals other than calcium, phosphorus, and iron; it also contains copper, magnesium, manganese, potassium, sodium, and zinc in small quantities.

Taro starch is as readily assimilated as that of rice and more so than potato starch. Like potatoes, but unlike rice, poi has an excess of basic elements in the ash which may be important in building and maintaining sound teeth. Poi in general is not a satisfactory source of vitamin A, but home-mixed poi contains more per serving (as reported by Bowes and Church, Appendix A, table 4) than potatoes or rice and most cereals or cereal products, which are practically devoid of vitamin A. It contains less ascorbic acid (vitamin C) and thiamine than cooked white potatoes. Rice and other cereals, however, contain no vitamin C. A serving of home-mixed poi has a higher caloric value (and a higher carbohydrate content) than brown and white milled rice, white potatoes, and the enriched cereals. All the food values of home-mixed poi are lower than those in an equal amount of taro because of the water that is added in converting taro to consumable poi.

Cooked taro compares favorably with rice, potatoes, and cereals (not enriched) in its B-vitamin content. It has more thiamine than white rice and about the same quantity as white potatoes and cooked brown rice. The riboflavin and niacin contents of cooked taro about equal those of rice and potatoes. Only the enriched cereal products have higher B-vitamin values.

Prepared baby foods, such as Pablum and other cereals with which poi would have to compete as a baby food, are all heavily fortified or enriched

with minerals and vitamins, especially thiamine (vitamin B₁), calcium, and phosphorus.

The survey of the medical profession revealed that a majority of the doctors in the Territory recommend poi both as a staple food for healthy infants and children and as a food for individuals with specific health problems. There is no substantial difference between the number of doctors who consider poi a good food for children and those who so recommend it in actual practice. The principal merits of poi as a food for children, in the opinion of territorial doctors, are that it is a nutritious carbohydrate food, highly digestible, with a good mineral and vitamin content, and that it is well tolerated and practically nonallergenic. It is impossible to determine from the returned questionnaires exactly how many allergies to poi have been known, but they seem to be relatively rare.

Poi's most popular therapeutic uses are in convalescent or soft diets, cases of malnutrition, allergies to cereals, for elderly persons without teeth, and for people with gastric ulcers. The specific ailments checked depend to some extent on the type of practice of the individual physician. For instance, a high percentage of pediatricians consider poi useful in cases of malnutrition and allergies to cereals, and the highest response from internists was for convalescent, soft diets (90 percent) and elderly persons with no teeth (90 percent), followed by malnutrition (70 percent), cereal allergies (60 percent), gastric ulcers (40 percent), and hyperacidity (40 percent).

A few doctors consider poi not sufficiently sterile for a baby food or for therapeutic use. It should be noted, however, that the questionnaire made no distinction between canned and fresh poi. Canned poi is generally considered sterile. There was no preponderant opinion as to whether poi should be eaten fresh or sour. Only five doctors (4 percent of the 126 replying) recommended sour poi or indicated that the fermentation of poi kills most of the harmful bacteria that might be present in it before it ferments.

The frequency of feeding poi to healthy infants and children apparently depends on the individual child—weight, age, appetite, or other factors. Most doctors suggested that babies should be started on poi at 2 to 4 months of age, 3 months being the age most frequently indicated. The majority of doctors responding indicated that, as a baby food, poi should be packaged in about 4-ounce sizes, but for therapeutic uses in 8- to 16-ounce sizes. Response to the questions concerning cereal allergy cases and patients on poi-containing diets was inconclusive. The only significant conclusion derived from the suggested improvement in poi is that almost half of the respondent doctors thought processing conditions should be more sanitary.

Six out of 97 doctors considered the likes and dislikes of the patient or family as a major factor in recommending poi. About half of the doctors stated that they leave the choice of taste, that is, "sweet or sour," to the patient or family. To obtain satisfactory answers to these questions, studies are needed to determine consumer taste preferences for poi and

whether its competitive position with other foods can be enhanced by altering its flavor, appearance, consistency, texture, or composition.

A number of doctors said they did not know enough about poi, and some requested data as to its food value and composition (see Appendixes D, E, and G). This report should satisfy the need for such information.

The institutional survey indicates that the use of poi in hospitals varies widely. Dietitians in general regard it as high in nutritional value and include it in many restricted diets (especially soft diets) and for children, although some consider it merely a substitute staple carbohydrate food for rice or potatoes. It appears that more poi would be used in several hospitals if they could afford to buy it. Tuberculosis hospitals serve poi to their patients to a considerably greater extent than do general hospitals (tuberculosis patients receive an average of slightly more than 1 pound per week per patient). Poi is well received by mental patients. Hansen's disease patients are the greatest consumers among the hospitals, averaging about 4 pounds per person per week. This may be because sufferers from this disease seem to have unusually large appetites and consume all food-stuffs in large quantities. The per capita consumption of poi among them is somewhat higher than the 3.6 pounds per week per patient used by a home for Hawaiians and part-Hawaiians, who might be expected to be heavy poi users.

As to the type of people who will or will not eat poi, opinion differs, although it seems that elderly people of any race not native to Hawaii are unlikely to eat it. People of any racial background may like poi if they are long-time residents, and are likely to eat poi if they have been accustomed to it since childhood. The preference for poi in the institutions, among the people who eat it, depends largely upon the meat dish, more patients choosing poi with fish than with meat. Only one institution reported that children will not accept poi readily, the experience in most hospitals being that they do.

The results of research and experiments to date lend confirmation to the general opinion that poi is a food of considerable nutritional value. There is need for more laboratory research to study further the nutritive qualities of poi and for clinical research by the medical profession to test its usefulness in various types of disorders or diseases.

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Cover picture courtesy of Stewart E. Fern

INTRODUCTION

This study was conducted in the spring of 1951 as part of an investigation of mainland market potentialities for Hawaiian taro products. Taro is an important agricultural crop in the Territory. For centuries poi, the most important taro product in the Islands, was a staple food for the Hawaiian people, but grain foods have largely replaced poi as the staff of life in the diet of most of the present residents of Hawaiian ancestry. However, poi is still a staple carbohydrate food for many people, particularly Hawaiians and individuals of part-Hawaiian ancestry. It is said that the fine physiques and sound teeth of the ancient Hawaiians testify to the adequacy of their diet (1, 9, 11, 13, 16), yet that diet was lacking in two items which are generally considered essential: grain and milk. The principal staple foods were taro (mostly in the form of poi), fish, and sweetpotatoes. The fruits available were coconuts, breadfruit, bananas, berries, and mountain apples. The main green vegetable was luau, the leaves of the taro plant; seaweeds were eaten, but as a relish rather than as a vegetable (12, 13, 14). It is also said that the early Hawaiians consumed as much as 10 to 20 pounds of poi (30 percent solids) daily, depending on the nature of their work and the amount of poi available (11). Since poi was consumed in such quantities and the Hawaiians possessed such fine bodies and teeth, it is generally assumed that poi was of special nutritional importance in their diet.

It is unlikely that poi can be introduced readily into the diet of the mainland adult population as a staple food, for several reasons: (1) the difficulty of changing eating habits of the usual mainland adult; (2) the inadequacy of taro production in Hawaii to supply an extensive mainland market; and (3) the abundance of less expensive competitive foods. The most likely immediate market for poi on the Mainland, therefore, would be as a therapeutic and/or baby food rather than as a staple.

Before instituting research to determine the size of a mainland market for poi as a therapeutic and/or baby food, an investigation was made and information assembled on the use of poi in the Hawaiian Islands for these purposes. Literature was reviewed to ascertain whether scientific investigations or clinical tests of the chemical and nutritional properties of taro and poi substantiate the established belief that these products have special nutritional importance. A mailed questionnaire survey of territorial physicians was conducted to determine the extent to which poi is recommended by them as a food for healthy infants and children and for therapeutic use. An investigation was also made of territorial hospitals to procure information on the actual consumption of poi in the hospitals and to obtain the comments of dietitians as to its use. A similar investigation was made of Oahu institutions other than hospitals, such as children's homes and homes for the aged.

MICROBIOLOGICAL, CHEMICAL, AND NUTRITIONAL PROPERTIES OF POI

Nearly all the scientific studies on the properties of poi have been conducted by the University of Hawaii, mostly in the past quarter century. A flurry of investigations took place in the 1930's when local interest was high in what appeared to be rosy prospects for the manufacture and export of nutritious taro products. Basic composition studies were completed at that time, but little follow-up work in nutritional and clinical tests has been performed. Condensed results of the important scientific investigations conducted to date that have a bearing on the planning and findings in this survey are presented in this section.

Poi is manufactured by a simple process of grinding the cooked taro corm (the bulbous, potato-like, underground stem) into a paste and mixing it with water. The amount of water added depends on the individual preference. By regulations of the Territorial Board of Health,¹ poi can be marketed in three consistencies: (1) that labeled "Poi" must contain at least 30 percent total solids; (2) poi containing sufficient water to make it less than 30 percent but not below 26 percent solids must be labeled "Sub-standard Poi"; and (3) poi mixed with water and containing less than 26 percent but not less than 18 percent solids must be labeled "Ready-Mixed Poi."

MICROBIOLOGICAL ASPECTS

One of the interesting aspects of fresh poi is the fermentation process which it undergoes. When freshly ground poi is mixed with water and left at room temperature to ferment, it smells slightly and changes from a heavy, sticky substance to a lighter and less viscous material, acquires an acid odor and a sour taste, and, depending on the variety of taro, bleaches or changes color. Some consumers prefer freshly ground poi, while others claim that it has a flat taste and that the sour, fermented product is more palatable.

Paiai, the cooked, crushed taro corms (not mixed with water), when wrapped in ti leaves as done by the early Hawaiians, could be kept for several months without fermentation. When water was added and the poi left to incubate, it fermented (1, 11). Canned or bottled poi, sterilized and hermetically sealed by heating, does not undergo the natural fermentation process after the container is opened. If exposed, however, this poi will mold or spoil in a few days. Fermentation does not occur in taro flour or dehydrated, ready-mixed poi when water is added. In this case, the acid-forming organisms normally present on cooked corms and in poi are killed during the drying process (5). The freezing of poi also stops fermentation.

The acid fermentation process that takes place in fresh poi is similar to that of the souring of milk or the preparation of sauerkraut and is due primarily to the action of lactic acid-producing bacteria (1). The micro-

¹ Public Health Regulations, Board of Health, Territory of Hawaii, chapter 4, section 5.

organisms present attack the carbohydrates, and, as fermentation proceeds, the starch content of poi decreases slightly (3, 11). Acid production is usually very rapid within the first 24 hours, changing from pH 6.3 to 4.5. Acidity increases less gradually thereafter; the lowest pH is reached during the fifth or sixth day of fermentation (1).

More recent bacteriological studies show that fresh poi, experimentally inoculated with pathogenic enteric bacteria and stored at room temperature, could purify itself—the pathogenic bacteria being killed—in about 3 days, probably in consequence of the fermentation process (6)

MINERAL AND VITAMIN CONTENT

A number of analyses have been made of the composition of taro and poi, and, as could be expected, the findings vary with the product analyzed. The research team of Bilger and Young (3), for instance, found the composition of fresh poi to be as shown in table 1.

Table 1.—Composition of fresh poi.

Component	Percent
Moisture	69.3
Starch (takadiastase)	27.0
Pentosans	1.3
Reducing sugars	0.5
Sucrose	0.03
Protein	0.31
Fat	0.07
Crude fiber	0.39
Ash	0.46
Phosphorus	0.057
Calcium	0.018

Earlier, Carey D. Miller (11) analyzed steamed taro corms (Appendix A, table 1) and the composition determined approximates that in table 1. Later, Payne, Ley, and Akau (15) analyzed air-dried, cooked taro of four different varieties (Appendix A, table 2). Their findings show some variation in composition among taro varieties. The upland varieties contained less starch but more of the complex sugars and ash than did wetland varieties. These investigators went farther than the others and determined the kinds and amounts of inorganic elements present in taro (Appendix A, table 3). They found that taro contains quantitatively more potassium than any other inorganic element. Phosphorus, calcium, and magnesium, as well as a number of other minor elements, were found in lesser amounts.

Again, the upland varieties, particularly *Mana opelu*, were the highest in mineral content. Nutritionists at the Hawaii Agricultural Experiment Station (11, 14, 16) have been concerned also with the vitamin content of taro and poi. The food values, including vitamin content, of taro and home-mixed poi and those of selected competitive foods are reported on a per-serving basis in Appendix A, table 4. Home-mixed poi (diluted to about 18 percent solids) is used for comparative purposes because this is the form in which poi is generally consumed. Standard and substandard

poi (see p. 8) are considered much too viscous to be eaten readily. About three fourths of a cup of home-mixed poi is the amount of the average serving.

In general, home-mixed poi has a vitamin-A content about three times that of potatoes and almost as much vitamin B₁ (thiamine). The thiamine content is substantially greater than that of white rice and about three fourths that of whole-wheat flour (16). Miller, Louis, and Yanazawa (14), in a recent study (1947) of the vitamin values of various foods grown and used in Hawaii, state that taro and poi are good sources of thiamine when compared on the caloric basis with whole-grain products. They conclude that, of these foods (including breadfruit, potatoes, sweetpotatoes, squash, and pumpkin) high in starch and sugar, it would seem to be as true as of whole grains that they have "adequate thiamine to take care of the metabolism of the carbohydrates which they contain. . . ."

Taro, for human use, must be cooked in one way or another to destroy the calcium oxalate crystals in the raw corms and leaves that cause extreme irritation in the mouth and throat (15).

Cooked taro is a highly nutritious, starchy food (Appendix A, table 4). Its caloric and carbohydrate values are slightly greater than those for cooked or baked white potatoes and brown rice but are slightly less than for cooked white rice. Its vitamin content of thiamine, riboflavin, and niacin about equals that of cooked white potatoes and generally exceeds that of rice.² The vitamin-A content is superior to that of potatoes and rice and all cereals and cereal products. Its mineral composition compares favorably with that of potatoes and rice and it exceeds both in calcium content. The greatest deficiency of taro and poi is in their protein content, as compared with potatoes, rice, and cereal foods. Almost all of the cereal foods listed in Appendix A, table 4, except rice and tapioca, are superior to taro and poi in protein content. Most of the cereals listed in this table are enriched with calcium and the B vitamins and cannot, therefore, be fairly compared with taro and poi in their content of these nutrients.

As a staple food, poi must be eaten in relatively large quantities to provide what nutritionists consider the minimum basic food requirements. It has been calculated, for example, that 5 pounds of poi (30 percent solids) daily would provide about three fourths of an adult's daily calcium requirement and more than the minimum daily requirement of phosphorus (11). Based on the information contained in Appendix A, table 4, it appears that the food values are somewhat lessened when taro is cooked, milled, and diluted with water to make poi.

ALKALINITY

In some foods the acid-forming elements exceed the alkaline, and in others the alkaline-forming elements predominate. The chief acid-forming elements in food are sulfur, phosphorus, and chlorine, usually found in meats and foods rich in protein. These foods are acidic in their effect

² Unpublished findings of the Foods and Nutrition Department, Hawaii Agricultural Experiment Station.

on the body. The important alkaline-forming elements—sodium, potassium, calcium, and magnesium—are generally predominant in fruits and vegetables (with some exceptions). These foods are alkaline in their effect on the body. In taro and poi the alkaline-forming elements exceed the acid-forming ones (Appendix A, table 3).

It has been claimed that a diet providing the proper acid-base balance with an alkali excess will insure sound teeth (9). When babies at the infant feeding center of the Ewa Plantation Health Project (started in 1930) were fed a diet in which poi and sweetpotatoes provided the carbohydrate supplement (potential alkalinity of the diet, 36 to 40 cc. N alkali solution), none developed odontoclasia (a form of tooth decay). A diet in which grain foods constituted the carbohydrate supplement (potential alkalinity of the diet, 6 to 10 cc. N alkali solution), fed to another group of children, did not prevent or arrest odontoclasia. Those who conducted the feeding experiments attribute the beneficial results of feeding taro and sweetpotatoes to the potential alkalinity of these foods. They believe that the type, rather than the amount, of carbohydrate in the diet seems to be the important factor in maintaining sound teeth in Hawaii (8).

DIGESTIBILITY

Langworthy and Deuel (10) found by experiment that the raw starches of rice and taro root were considerably more digestible than arrowroot and potato starches, taro starch being 98.8 percent assimilable. They concluded that there seems to be a direct relationship between the size of the starch granules and their digestibility. Payne, Ley, and Akau (15) measured the starch granule size of one variety of taro (**Kau uliuli**) and found it to be approximately one tenth the size of a potato starch granule but about the same order of magnitude as the starch granule of rice.

Studies on the utilization of calcium and phosphorus by rats and humans indicate that these elements are well utilized physiologically. The study with rats (17) showed that the calcium and phosphorus in taro were found to be 90 percent as readily utilized by young rats as that of calcium acid phosphate salts (the control diet). Generally, the calcium and phosphorus, as they exist in natural foods, are not always as well utilized.

In a separate study (18), calcium and phosphorus balances were determined on two healthy women (a Caucasian and a Japanese) on two diets, one high in taro and one high in white rice. Taro (in the form of poi) furnished about 80 percent of the calcium and 40 percent of the phosphorus in the first diet; rice furnished about 30 percent of the calcium and 35 percent of the phosphorus in the second diet. The conclusions were that the calcium and phosphorus of taro are well utilized by women, but that "the need for additional calcium balance experiments on Oriental and Caucasian subjects seems indicated."

NONALLERGENIC PROPERTIES

Historically speaking, the study of food allergies, their causes, and their effects is of recent origin in medical and allied professions. Starch allergies, especially corn and wheat, are known to be prevalent in the United States. A review of the literature on the subject and correspondence with

allergists indicate that little consideration has been given to the use of poi on the Mainland as a substitute nonallergenic food.

Dr. Albert H. Rowe (19), in an allergy handbook published in 1944, noted that "The most commonly eaten grains produce most allergy. Thus, wheat is certainly the chief offender in America, whereas in Japan rice, and in the Scandinavian countries rye may be the chief cause of allergy." He says of taro: "Taro, kalo (*Colocasia antiquorum esculenta*) is grown in many varieties in the Hawaiian Islands, Tahiti, Japan and the East and West Indies as an important source of starch. Poi is fermented paste pounded from its roots. The roots may be eaten as potatoes. The cooked leaves are a palatable vegetable." However, this author does not indicate whether he has tried taro or poi in any of his allergy-elimination diets.

Dr. Walter C. Alvarez (2) suggested taro or poi as a substitute allergy food, saying that "This tuber is tasty and highly digestible, and so different botanically from any American food that it should be acceptable to many highly allergic patients."

At one time, taro flour was produced in Hawaii by cooking the corms and grinding them into poi which is then refrigerated, shredded, dried, ground, and sifted. According to Payne, Ley, and Akau (15), Christine Laird, of the University of California Hospital in San Francisco, investigated taro flour for its allergic properties. They quote her report as follows:

Our products were made egg-, milk-, and wheat-free. They were distributed to patients attending the clinic and also to allergenic patients in the Hospital. Recipes were frequently altered to fit the restrictions of the patient's diet. At no time did we find a case which was sensitive to taro flour.

Due to the mineral and vitamin content, alkaline ash and caloric value of taro products they are a valuable adjunct to hospital diets.

Dr. Lawrence J. Halpin, an allergist of Cedar Rapids, Iowa, and a contributing editor to *Annals of Allergy*, states in a letter to Edward L. Rada (March 21, 1951) that, while stationed in Honolulu with the armed services in World War II, he "... had the opportunity to use poi as a cereal or grain substitute. It was very satisfactory for the purpose for which it was employed in my patients at that time. Such substitution of poi has not been continued since my return to the Mainland."

In another letter to Mr. Rada (June 12, 1951), Dr. Halpin mentioned a discussion with other mainland allergists on the possible use of poi:

Most of the comments on poi which I have received from my fellow allergists during the past several weeks have been made up of requests for samples of the material to try on known wheat-sensitive or other grain-sensitive patients. None of those men that have corresponded with me or with whom I have talked have had any personal experience with the use of poi. They, therefore, understandably have been rather reluctant to express an opinion other than the desire to try it and see whether such a substance would be an adequate substitute for wheat or any other grain to which a patient may be allergic.

SURVEY OF THE MEDICAL PROFESSION

The survey of the medical profession was conducted by means of a mailed questionnaire. The purpose was to obtain information from territorial physicians on the extent to which they recommended poi as (1) a staple food for healthy infants and children and (2) a therapeutic food for chil-

dren and adults. The doctors were encouraged to give frank, personal opinions about poi and to make suggestions for improving the product now marketed. A copy of the questionnaire is included in this report as Appendix B.

DESIGN OF QUESTIONNAIRE

Part A of the questionnaire (Poi as a Staple Food for Healthy Infants and Children) was designed to determine the extent to which poi is recommended as a staple food for healthy infants and children and its suggested or prescribed manner of use. It was believed important, preliminary to inquiring about recommended use in actual practice, to learn whether physicians considered poi a good staple food for children. If physicians theoretically consider poi a nutritional food but do not actually recommend it for children, it was felt that the reasons for the discrepancy between theory and practice might be significant. Therefore, doctors were asked to state whether or not they considered poi a good staple food and to give the reasons for their opinions.

Part B of the questionnaire (Poi for Therapeutic Uses) attempted to determine the extent to which poi is recommended by physicians for individuals (of any age) with specific health problems. Several specific health problems were listed—those which seemed (from the published data on the nutritional value and composition of poi) the most likely cases for which poi would be recommended. Special interest in the possible use of poi as a nonallergenic food in cases of allergy to wheat and other cereals prompted further inquiry along this line. Doctors were asked to state how many persons they knew to be allergic to poi. If poi allergies were common, particularly among cereal allergy cases, its use as a nonallergenic food would hardly be practical.

An illuminating response was not expected from Part C of the questionnaire (Suggested Improvements), except on nutritional questions, such as whether poi should be fortified with vitamins and minerals. The other questions were better suited to a consumer preference study, but they gave physicians an opportunity to make known their opinions. If a physician found the container, texture, color, or some other aspect of the product objectionable, it would probably have a bearing on the extent to which he would recommend poi to his patients.

NUMBER OF DOCTORS QUESTIONED AND RESPONSE TO QUESTIONNAIRE

Pretested questionnaires were mailed to physicians at the addresses listed in the "Roster of Physicians Licensed by the Territorial Board of Health as of August 15, 1950." The 351 physicians questioned excluded eye, ear, nose, and throat specialists, anaesthologists, and psychiatrists. Territorial Department of Health officials, retired doctors, those out of the Territory, or others not in active practice in the Territory at the time of the survey were not included in the 351 total or in any of the tabulations and calculations. The exclusions were based on information obtained from the Territorial Department of Health, the Territorial Medi-

cal Association, and returned questionnaires. The locations of the 351 practicing physicians questioned and of those responding are presented in table 2.

Table 2.—Number of territorial physicians questioned and responding and percentage responding, by location.

Location	Questioned	Responding	Percentage responding
Honolulu	235	104	44.3
Rural Oahu (all areas outside the city of Honolulu)	27	11	40.7
Hilo	26	9	34.6
Rural Hawaii (all areas outside the city of Hilo)	16	8	50.0
Mauui	24	13	54.2
Kauai	16	8	50.0
Molokai	5	4	80.0
Lanai	2	2	100.0
Total	351	159	45.3

The total of 159 usable questionnaires (45.3 percent) returned was considered representative of the Territory's practicing physicians. About 75 percent of the physicians practice on the island of Oahu (which includes the city of Honolulu); consequently, their response materially affected the percentage of total questionnaires returned.

Professional classification of the 351 doctors questioned and the number responding are shown in table 3.

Table 3.—Number of territorial physicians questioned and responding and percentage responding, by professional classification.

Professional classification	Questioned	Responding	Percentage responding
General practitioners	204	76	37.3
Plantation doctors	41	28	68.3
Surgeons	28	14	50.0
Obstetricians-gynecologists	23	8	34.8
Specialists in internal medicine	18	11	61.1
Pediatricians	17	14	82.4
Dermatologists-allergists	10	7	70.0
Bone specialists	6	0	0.0
Tuberculosis specialists	4	1	25.0
Total	351	159	45.3

A composite tabulation of the number of physicians questioned and responding by location and type of practice is presented in Appendix C, table 5.

FINDINGS OF THE SURVEY

Answers to the three basic questions

Do you consider poi a good staple food for healthy infants and children?

Do you, in actual practice, recommend to mothers that they include poi in the diet of healthy infants and children?

Do you, in actual practice, recommend the use of poi to individuals with specific health problems?

were tabulated and computed as percentages of the 159 questionnaires returned. The bases used for converting the answers to questions, other than the three basic questions, into percentage terms are indicated in the text below.

“Do you consider poi a good staple food for healthy infants and children?”

In answer to this question, 140 out of the 159 doctors responding answered “yes” (Appendix C, table 6). This represents 88.1 percent of respondent doctors. All 14 responding pediatricians considered poi a good food for children and 126 other doctors (almost 90 percent of those responding) were of the same opinion. Five answered “no”; four said they “did not know”; and 10 did not reply. Four of these 19 doctors, in reply to a subsequent question, however, stated that they recommend poi for children in actual practice (Appendix C, table 8). Three of the 10 physicians who did not answer the question replied that they did not see children in their practice. The reasons given by the five doctors who did not consider poi a good staple food for healthy infants and children are included in the list in Appendix D, pages 00 and 00.

Physicians who considered poi a good staple food for healthy infants and children were requested to state their reasons. Of the 149 responding, 98 (70 percent) complied (Appendix C, table 7). Many doctors listed several reasons, the most frequent (39 percent of the doctors responding) being that poi is nutritious, a good source of carbohydrates or calories, or a good substitute for cereal. (Included in this category were such answers as “Higher protein and calories than other baby food” and “Comparable to rice, potato, or bread.”)

Other more specific properties of poi were mentioned. High digestibility was given as a reason by one fourth of the doctors who consider poi a good food for children. About one out of eight said that poi is well tolerated or at least apparently not allergenic. The high mineral content of poi was mentioned by 23 doctors; minerals enumerated included fluorine, calcium, and iron. High vitamin content was listed by about 11 percent (one doctor thought it high in vitamin D). Only six doctors mentioned that poi leaves an alkaline ash and two that poi aids in preventing, or at least does not contribute to, dental caries. Approximately 9 percent (13 doctors) said that poi is palatable or well liked. Ten of the reasons (7 percent) were rather general, simply indicating that children seem to thrive on poi, or that observation, experience in feeding, or tests have proved it to be a good food for children. (See Appendix D for these reasons.)

“Do you, in actual practice, recommend to mothers that they include poi in the diet of healthy infants and children?”

In answer to this question, 79 percent of the physicians who returned questionnaires answered “yes” (either in all cases or in some cases) and 18 percent answered “no.” The remainder (less than 3 percent) did not

answer the question (Appendix C, table 10). Of the 140 doctors who consider poi a good staple food for healthy infants and children, 122 recommend it in actual practice, indicating a slight discrepancy between theory and practice. (See Appendix C, table 8.) All 14 respondent pediatricians recommend poi for children in their practice; 43 percent recommend it in all cases and 57 percent in some cases. Doctors other than pediatricians do not always recommend poi for children in their practices. Twenty percent do not recommend it in actual practice, 36 percent recommend it in all cases, and 41 percent recommend it only in some cases. Four doctors did not answer the question.

Geographically, the percentages of doctors who recommend poi in actual practice for healthy infants and children differed—74 percent in Honolulu, 78 percent in Hilo, and 91 percent in all other areas (Appendix C, table 9). The 3 percent who did not answer the question practice in Honolulu.

Doctors who do not, in actual practice, recommend poi for all healthy babies and children were asked to state their reasons. (See Appendix C, table 11, and Appendix D for added comments.) One fourth of those who recommend poi in some cases (17 out of 68) gave the following reasons for not recommending it in all cases.

Likes and dislikes of the patient was the most important reason given. Others were that poi is expensive and not always easily available or sterile enough. Only two doctors felt that poi is not a necessity, and two doctors considered the inconvenience of preparation a reason for not always recommending poi.

Twenty-nine of the 97 doctors replying to this question do not recommend poi at all for children in their practice. The principal reason is that two thirds of the doctors (18 out of 29) do not see children in their practice. Three doctors consider poi not sufficiently sterile and two others consider the processing not sufficiently sanitary. Two doctors believe that poi has harmful results if eaten in excess.

There seems to be some divergence of opinion among doctors as to the age when the feeding of poi to infants should begin (Appendix C, table 12). About 64 percent of the pediatricians and 55 percent of the other doctors would start feeding poi to babies from 2 to 4 months of age. Thirty-two of the 126 respondent doctors (25 percent) felt that poi feeding should begin after the age of 4 months. (One doctor stated that he would not start babies on poi until they were 18 months old.) On the other hand, 18 doctors reported that they would feed poi to infants under 2 months of age.

Physicians were asked how frequently poi should be fed to infants and children (Appendix C, table 13). More pediatricians (43 percent) checked "Not daily, but in rotation with cereal foods" than any other answer. Other pediatricians (21 percent) would feed babies poi "Every day, as part of a main meal." None indicated "Every day, as a between-meal feeding, in a milk drink." Some combination of the three suggested answers was checked by almost one third of the pediatricians. One did not answer the question. More than half of the other 112 doctors who recommend poi

for children indicated "Not daily, but in rotation with cereal foods"; one out of four checked "Every day, as part of a main meal"; and only 8 of the 112 doctors checked "Every day, as a between-meal feeding, in a milk drink." The remainder checked some combination of the three suggested answers and three did not answer the question.

Physicians were also asked whether they recommend that poi be fed to children in the sweet state or the sour, or whether the choice should be left to parents (Appendix C, table 14). The majority of the 126 doctors replying were rather evenly divided between the opinion that sweet poi should be given and that the choice should be left to the parents. "Sweet" was the answer of 42 percent of respondent doctors, and "Leave choice to parents" of 43 percent. Only 5 of the 126 doctors who recommend poi suggested that the sour state is preferable. One general practitioner, who recommends sweet poi, added "sterilized." A plantation doctor who leaves choice to parents commented, "I always recommend that poi be heated [boiled] before giving it to infants and babies so it will be sterilized." Remarks by two pediatricians were, "I recommend only 'canned poi,' or, if fresh poi is used, I request that it be pasteurized in a double boiler, which is a great nuisance" and "I recommend sterilized poi for infants, either sterilized at home or purchased in sterile containers (glass)."

"Do you, in actual practice, recommend the use of poi to individuals with specific health problems?"

In reply to this question, 113 doctors (71 percent) of the 159 who returned questionnaires answered "yes." Table 15 (Appendix C) indicates that there is little difference geographically in the opinion of territorial doctors on this subject. More than 70 percent of the doctors in all areas recommend poi therapeutically. Table 16 (Appendix C) shows that the response to this question by type of professional practice varies somewhat. Ten of the 11 doctors who practice internal medicine recommend poi for therapeutic use. More than 70 percent of the general practitioners and plantation doctors (considered as one group) and pediatricians and two out of three of the other specialists recommend poi for therapeutic purposes.

Reasons given by doctors who do not recommend poi for therapeutic use are grouped in Appendix C, table 17. The exact comments are listed in Appendix E. Six of the 43 doctors who do not recommend poi therapeutically gave reasons, such as not believing poi to be of any particular therapeutic benefit or no better than or not as good as other available foods. Five general practitioners do not recommend poi because they do not consider it sterile enough or because it is not manufactured under sufficiently sanitary conditions. Surprisingly, however, two of them do recommend it in some cases for healthy infants and children. About two thirds of the reasons given for not recommending poi for therapeutic use indicated that the physicians had never thought of it, that no need for it had arisen, or that they were not familiar with the food value and composition of poi.

Physicians were asked to check the specific health problems for which they recommend poi (Appendix C, table 18). Seventy percent of the doc-

tors (79 out of 113) indicated "convalescent, soft diet" as a specific use. "Malnutrition" was next in order, at 59 percent; "allergies to cereals" third, at 56 percent; and "elderly persons with no teeth" next, 53 percent. Poi is also recommended for gastric-ulcer patients (31 percent), nursing mothers (19 percent), prenatal cases (18 percent), and hyperacidity cases (13 percent).

Almost all pediatricians recommend the use of poi in cases of malnutrition and allergies to cereals. Two pediatricians included answers in addition to those checked—"Sometimes it helps constipation" and "Useful during febrile illness, because of palatability."

Internists, on the other hand, indicated almost unanimously that they recommend the use of poi when a convalescent, soft diet is required or for elderly persons with no teeth. A majority recommend poi for malnutrition and allergies to cereals. It is also recommended extensively for hyperacidity, gastric ulcers, and nursing mothers. One internist prescribes the use of poi in mild gastroenteritis, and another in certain types of colitis.

General practitioners and plantation doctors (81 percent) indicated "convalescent, soft diet" more than any other therapeutic problem as the principal reason for recommending poi. More than half recommend it for cases of malnutrition, elderly persons with no teeth, and allergies to cereals. Poi is recommended by this group less frequently for gastric ulcers, nursing mothers, prenatal cases, and hyperacidity.

Other therapeutic problems not listed on the questionnaire but for which physicians stated they have prescribed poi are: "Weight-gaining diets"; "some cancer patients"; "supplementary feeding"; "nervous dyspepsia"; and "feeding problems."

Replies to the questions asking how poi should be fed (sweet or sour) showed that 66 percent of the doctors who recommend poi for therapeutic use would leave the choice to the patients; 23 percent specified sweet poi and 4 percent sour poi. A few stated that their recommendation depended on the individual case (Appendix C, table 19).

"How many 'at home' patients now under your care are on a poi-containing diet, at your recommendation?"

This question was answered by less than half of the doctors who recommend poi for therapeutic use (Appendix C, table 20). Of the 62 doctors who answered the question, 44 had patients on a poi-containing diet, and 18 did not.

In connection with the above question, physicians were asked "How many of them have cereal allergies?" The responses to this question were such that it is impossible to show a relationship between cases of cereal allergies and the number of individuals on poi-containing diets. Neither was it possible to ascertain exactly how many individuals are allergic to poi (Appendix C, table 21). Seventy-nine percent of the 159 doctors returning questionnaires stated that they have never known of anyone allergic to poi, and 12 percent did not answer the question. Only 9 percent (14 doctors) indicated that they have known of poi allergy cases. Seven of these doctors were pediatricians. Six doctors have each known of only one individual allergic to poi. The other eight answered as follows:

"I have no definite figures on allergic reactions to poi. I probably see five or six a year. Cereal allergies are much more frequent—more so in mainland practice."

"A few."

"Five or six suspected, never confirmed in whole group. Two patients definitely allergic to poi."

"Only two cases."

"Several—perhaps two to six."

"Unknown."

"Rare case."

"About 1 percent, roughly. Have not time to go through my records but from memory would say this figure is about correct."

SUGGESTED IMPROVEMENTS IN POI

The percentage of doctors responding to the section on suggested improvements in poi was not high, and a wide variety of opinions was obtained from the doctors who did respond. (See Appendix F for remarks of doctors.) "Should be a uniform color" was checked by 41 doctors (26 percent). The preferred colors were diverse, including gray, pink, lavender, yellow, white, red, brown, and purple. Seven doctors checked "Texture should be changed," and four said that either it should not be changed or that the texture does not matter. A total of 41 doctors (26 percent of respondents) expressed an opinion on the question of fortifying poi with vitamins. Twenty-six of them thought poi should be fortified with vitamins; 10 doctors said it should not be; and 5 doctors said it was not necessary. "Fortify with minerals" elicited a response from 33 doctors, 17 of whom thought poi should be fortified with minerals; 10 doctors said it should not be; and 6 doctors said it was not necessary. Forty percent of the 159 doctors returning questionnaires thought the price of poi should be lower; 31 percent said the product is not sufficiently sterile; and 45 percent thought that processing should be more sanitary. Dehydrating to a powder form was considered a good idea by 41 (25 percent) of the doctors returning questionnaires.

In response to "Preferred type of container," 27 percent of the 159 doctors indicated glass, 9 percent tin, 20 percent cellophane bags, and 44 percent had no specific preference or did not answer the question.

Forty-nine percent of the doctors responding indicated a preference in size of container for baby food: 12 percent indicated 1 to 2 ounces; 18 percent, 2 to 4 ounces; 13 percent, 4 to 8 ounces; and 6 percent, 8 to 16 ounces. As a therapeutic food, 41 percent of the 159 doctors indicated preferences for size of container: 3 percent, 2 to 4 ounces; 14 percent, 4 to 8 ounces; 22 percent, 8 to 16 ounces; and 2 percent, 2 pounds.

Several interesting comments and suggestions were made by doctors, and considerable interest was shown by them in the various aspects of poi as a local baby and therapeutic food and for potential sale on the Mainland. Some doctors commented on their personal experience with poi—two said they did not like it themselves, two said they were brought up on it, and five mentioned the beneficial effects of poi on their own children (Appendix G).

Several questionnaires returned by doctors not in active medical practice were not usable for tabulation but nevertheless contained pertinent information. Their comments are listed in Appendix G.

INSTITUTIONAL SURVEY

The **Hawaii Diet Manual** (7) includes poi as a mid-afternoon poi cocktail in its recommended "full, house, regular, or general diet" and in many restricted diets. The latter diets include light or convalescent, edentulous, soft, full liquid, bland, modified Meulengracht, low residue-smooth, anemia, diabetic, pregnancy and lactation, elderly, and normal children's diets. Poi is also suggested as a substitute food for wheat allergies in infants (as Taro-Lactin or plain Taro-co). Publication of this manual was approved by the Honolulu County Medical Association and by the Hawaii Territorial Medical Association for the use of doctors, hospitals, clinics, plantations, and schools.

It was deemed of interest to ascertain the extent to which hospitals and other allied institutions include poi in the diets of individuals under their care. Therefore, Oahu hospitals and institutions such as homes for children, elderly people, and indigents were surveyed in the spring of 1951 to obtain information on the use of poi. Personal interviews were held at all Oahu institutions with head dietitians or other officials working with diets for patients, except for three plantation hospitals which were questioned by letter. Similar information was obtained by personal interview from most of the hospitals on Hawaii, Kauai, and Mōloakai. The remaining hospitals were questioned by letter. Answers were not received from five hospitals on Maui.

HOSPITALS

The weekly consumption of poi in territorial hospitals at the time of the survey is shown in table 4.

Table 4.—Amount of poi consumed per week by patients in territorial hospitals in spring, 1951.

Island	Hospitals	Patients	Poi consumed per week
	number	number	pounds
Oahu (includes one plantation health center)	21	5,264	2,041
Hawaii	10	366	340
Kauai	3	188	99
Molokai	2	275	1,125
Maui (five hospitals did not respond)	2	200	430
Lanai	1	5	—
Total	39	6,298	4,035

For the purpose of classification and analysis, the 39 hospitals are grouped by types as follows: general, plantation, tuberculosis, leprosarium, mental, private (convalescent homes and doctor-owned and -operated), children, and maternity. See Appendix C, table 22, for tabulation of hospitals by types, number of patients, and poi consumed per week.

Sixteen general hospitals in the Territory, with a total of 2,524 patients, reported the use of 461 pounds of poi per week. In one large hospital serving rice three times a day, poi is fed twice a day to tuberculosis patients, but to others only at their specific request. Those who request poi constitute less than 10 percent of the total number of patients and are mostly Hawaiians and Orientals. Occasionally a doctor will recommend poi to children in allergy cases. In another large general hospital, poi is served twice a week to those patients who choose it instead of rice or potatoes (10 to 15 percent of the total patients), but is given in the form of a poi cocktail to all soft-diet patients at 10, 2, or 8 o'clock, or oftener if desired. Poi is included in the elimination allergy diets.

In three out of four medium-size general hospitals (120- to 270-bed capacity), doctors occasionally recommend poi for children with allergies and for gastric ulcer cases, and it is included in other restricted diets (soft, diabetic, low sodium-high calcium). In one of these hospitals, poi is served on the house diet three times a week and would be used every day if the price were lower;³ practically everyone likes it except elderly Caucasians and Orientals. In another medium-size hospital, about one out of eight patients requests poi regularly instead of rice or potatoes (sometimes three times a day) and about half want it on "fish days." If this hospital could afford it, poi would be served to the staff also. Another hospital, which serves poi once a week with fish, would put it on the regular menu if the price were lower; it reported good results with children. The other medium-size general hospital serves poi only when it is specifically requested (only about 1 out of 85 asks for it), it is never on the house diet; and the dietitian "would not think of using it as a substitute for whole-grain cereal," believing that "one serving of poi per week might be all right," but that "it is no better nutritionally than rice or potatoes," and that "doctors have gone too far in recommending it, without checking the food value."

Sixty percent of the 16 small general hospitals (less than 120-bed capacity) reported that doctors occasionally recommend poi (in two of the hospitals, for sick babies); 40 percent reported that doctors do not. In 50 percent of these small hospitals, poi is included on restricted diets without recommendation from doctors, but the patient is given a choice between poi and rice or potatoes. Only one third of the small general hospitals occasionally include poi on the regular house diet. Two of the 16 small hospitals do not serve poi unless it is specifically requested. One hospital does not serve poi at all, but would if the price were lower.

One small hospital would like to give poi to all babies and serve poi cocktails to all soft-diet patients but cannot afford to do so at present prices. In another hospital, Hawaiian patients bring their own poi.

Comments from three of these small hospitals are as follows: (1) No trouble with children under 8 or 10; among Orientals, the 30- to 40-year

³ Paying 20 cents per pound in February. The average retail price of poi per pound in February 1951 was 20.6 cents; of rice, 11.7 cents; of potatoes, 6.3 cents (from the records of the office of Research and Statistics, Territory of Hawaii, Department of Labor and Industrial Relations).

age group is most likely to eat poi; (2) Orientals do not like it; (3) Filipinos will not eat it.

In six plantation hospitals, patients receive poi only upon specific request; in one case it is used "for special occasions." One plantation hospital reported that poi is recommended for home use in children's diets; another, that more would be used if the price were lower; and in four, doctors occasionally recommend it for specific cases. One hospital reported that poi is given to anyone who wants it as often as desired.

A plantation which operates a health center (not included in the six above-mentioned) includes poi in school lunches for 250 children who consume 240 pounds of poi per week and has fed it for 20 years to children from 3 months to 6 years of age.

The four tuberculosis hospitals, with a total of 994 patients, reported consuming 1,112 pounds of poi per week. The largest (in which about 95 percent of the patients are Orientals) has poi on the menu every day, and patients may choose it instead of rice or potatoes. On fish days practically everyone wants poi, elderly Orientals being the least likely to select it. This hospital also has requests for poi cocktails. Children receive poi every day.

Another tuberculosis hospital indicated that poi is on the menu every day at noon and that many Filipinos and Japanese like it, even employees. In the other two tuberculosis hospitals, patients who choose poi instead of rice or potatoes may have it. One hospital reported that the demand varies with the meat dish, those wanting poi being mostly Japanese and Filipinos who learned to eat it as children.

Approximately 360 Hansen's disease patients consume about 1,425 pounds of poi per week. It is served every day and practically all the patients eat it.

One mental hospital, where 450 pounds of poi are needed for one meal, does not purchase it regularly. It is sometimes used in edentulous diets but is rarely served to all patients; when used, it is served with a fish meal. More would be used if the price were lower; the hospital cannot afford it when the price rises above 14 or 15 cents a pound. (In this hospital, too, there is the problem of washing the poi off the stainless steel plates by hand before they are put into the dishwashing machine; this entails added labor.)

The other mental hospital serves poi twice a week (600 pounds per week) and reported that all 700 patients seem to like it. About 50 children (epileptics and those without palates) on liquid diets also receive it regularly.

Both children's hospitals reported that children take poi very well. It is served on the regular house diet, and one hospital gives it to babies and all those on soft diets.

The maternity hospital gives poi to the patients who prefer it to potatoes or rice. Only about 6 percent of the patients ask for it, and they are mostly Hawaiians and Portuguese.

Of the six private hospitals (capacity 8 to 50), two reported that doctors occasionally recommend poi for ulcer patients and high-carbohydrate, high-caloric diets. Four serve poi in the house diet (in two cases, once a

week), one reporting that "all races like it," and another that "patients do not take to poi cocktails." One hospital reported that its clientele is largely Oriental and that Hawaiian patients bring their own poi.

OAHU INSTITUTIONS OTHER THAN HOSPITALS

Homes for indigents, children, and the elderly, caring for a total of 1,283 persons, reported using approximately 385 pounds of poi per week. Kamehameha Schools, with 768 boarders, consume 345 pounds of poi for one meal per month. Poi would be served twice as often if the price were lower.⁴

A home for men and women of any age who are at least part Hawaiian, with 55 people, serves poi once a day, using 200 pounds per week. Everyone eats it, including four diabetics.

A home for children, with 46 girls ranging from 5 to 18 years of age, uses about 20 pounds of poi once a week. All eat poi, and twice as much would be used if the price were lower.⁵

A home for men of any age or race, with about 70 at present, uses 50 pounds per week, and poi is served twice weekly. Most of them eat it.

A home for girls (53 at present, ranging from 3 to 18 years of age) uses 24 pounds of poi every Friday with a fish meal. About three fourths of them eat poi.

A home caring for 71 boys serves poi only every 3 or 4 months, having tried it once a week and finding that the boys did not particularly like it.

Four other institutions use no poi at all: (1) a home for children (caring for 70 at present, between 5 and 16 years of age) reported that "lots of children do not like it"; the home served poi once daily up until 2 years ago; (2) a home for elderly Chinese men (100 at present) reported that "Old Chinese men do not use it"; (3) a home for unmarried expectant mothers (25 at the time of the survey) reported that poi is too expensive, and, although nutritional, it is too starchy for pregnant women; little rice or potatoes are served either; (4) a home for Caucasian women over 65 years of age (25 at the time of the survey) reported that most of the women have resided in the Islands only a few years and many will not eat any native foods.

⁴ Paying 15 cents per pound in February 1951.

⁵ Paying 22 cents per pound in February 1951.

APPENDIX A

Chemical and Nutritional Properties of Poi

Table 1.—Composition of steamed taro corms.

Component	Percent
Water	64.0
Protein (N×6.25)	1.18
Fat (ether extract)	0.169
Starch (acid hydrolysis)	29.31
Starch (saliva hydrolysis)	24.56
Sucrose	1.40
Reducing sugars	0.391
Ash	0.588
Calcium	0.0263
Phosphorus	0.0612

Source: Carey D. Miller, "Food Values of Poi, Taro and Limu," Bernice P. Bishop Mus. Bul. 37: 3-23. 1927.

Table 2.—Composition of air-dried cooked taro by varieties.

Component	Wetland varieties		Upland varieties	
	Piialii	Piko uliuli	Lehua palaii	Mana opelu
	percent	percent	percent	percent
Moisture (vac. 70°-75° C. for 18 hours)	6.60	6.37	6.40	4.05
Starch	71.60	73.70	69.60	69.12
Ash	1.76	1.43	1.83	2.38
Crude fiber	1.45	1.31	1.17	1.68
Dextrins	0.47	0.48	0.55	0.95
Ether extract	0.54	0.52	0.47	0.68
Pentosans	2.48	2.37	2.06	3.40
Protein (nitrogen×6.25)	1.75	1.85	1.91	2.36
Reducing sugar	0.49	0.48	0.66	0.77
Sucrose	0.08	0.10	0.10	0.09

Source: J. H. Payne, G. J. Ley, and George Akau, "Processing and Chemical Investigations of Taro," Hawaii Agr. Expt. Sta. Bul. 86. 1941.

Table 3.—Inorganic elements in air-dried cooked taro, by varieties.

Component	Wetland varieties		Upland varieties	
	Piialii	Piko uliuli	Lehua palaii	Mana opelu
	percent	percent	percent	percent
Ash	1.91	1.54	1.96	2.48
Calcium	0.059	0.089	0.106	0.169
Chlorine	0.081	0.069	0.084	0.109
Copper	0.0001	0.0003	0.0004	0.0001
Iron	0.0050	0.0043	0.0042	0.0050
Magnesium	0.054	0.082	0.086	0.114
Manganese	0.0012	0.0010	0.0001	0.0001
Phosphorus	0.119	0.150	0.113	0.274
Potassium	0.500	0.408	0.632	0.879
Sodium	0.0076	0.0066	0.0020	0.0042
Sulfur	0.0196	0.0147	0.0296	0.0316
Zinc	0.0001	0.0001	0.0005	0.0007

Source: J. H. Payne, G. J. Ley, and George Akau, "Processing and Chemical Investigations of Taro," Hawaii Agr. Expt. Sta. Bul. 86. 1941.

Table 4.—Food values of selected foods based on portions commonly used.

Food	Weight	Approximate measure	Calories	Protein	Fat	Cho	Ca	P	Fe	Vitamins						Approx. excess	Fiber
										A	Thiamine	Ribo-flavin	Niacin	Ascorbic acid	D		
										i. u.	mcg.	mcg.	mg.	mg.	i. u.		
Vegetables & Vegetable Products:	gm.			gm.	gm.	gm.	mg.	mg.	mg.	i. u.	mcg.	mcg.	mg.	mg.	i. u.	acid base	gm.
Poi, fresh (17% solids)	200.00	¾ cup	124	1.2	0	30.2	24	58	1.2	70	96	—	—	10	—	—	1.0
Potatoes:																	
Baked (wt. without skin)	100.00	1 medium, 2½" diam.	98	2.4	0.1	22.5	13	66	0.8	20	110	50	1.4	17	0	10.6	.5
Boiled, unpeeled	100.00	1 potato, 2⅝" diam.	83	2.0	0.1	19.1	11	56	0.7	20	100	40	1.2	15	0	9.0	.4
Taro:																	
Hawaiian, steamed*	100.00	¾ cup, cubed	130	1.2	0.2	31.1	26	61	0.9	75	105	—	—	5	0	—	.8
Japanese (dasheen)	100.00	4 small	66	1.4	0.1	15.3	13	32	0.2	80	125	—	—	4	0	—	.7
Cereals & Cereal Products:																	
Cream of wheat, 5 minute†	28.35	¾ cup, cooked	100	3.4	0.3	20.7	143	160	12.0	0	150	34	0.4	0	0	—	.1
Farina, Quaker, enriched†	28.35	¾ cup, cooked	103	2.9	0.1	21.8	125	32	1.5	0	125	77	1.0	0	400	—	.1
Gerber's barley cereal†	28.35	1 oz., 13 tbs.	107	3.8	1.0	20.7	137	239	19.6	0	570	170	2.9	0	0	—	.3
Gerber's cereal food†	28.35	1 oz., 11 tbs.	108	4.4	1.1	20.2	153	251	17.6	0	570	160	2.1	0	0	—	.3
Gerber's strained oatmeal†	28.35	1 oz., 13 tbs.	111	4.6	2.2	18.2	141	248	15.3	0	570	140	1.4	0	0	—	.3
Pabena†	28.35	¾ cup, 12 tbs.	100	4.0	0.6	19.8	227	210	8.5	(0)	300	—	—	0	0	0.3	.4
Pablum†	28.35	¾ cup, 12 tbs.	105	4.3	0.9	19.8	221	184	8.5	(0)	300	100	—	0	0	1.4	.3
Rice:																	
Brown†	28.35	1 oz., ¾ cup, cooked	102	2.1	0.5	22.0	11	86	0.6	(0)	91	14	1.3	0	0	—	.2
White, milled†	28.35	1 oz., ¾ cup, cooked	103	2.1	0.1	22.5	7	39	0.2	(0)	20	8	0.5	0	0	2.2	.1
White, cooked	168.00	1 cup	201	4.2	0.2	44.0	13	76	0.5	(0)	20	10	0.7	0	0	3.6	.1
Tapioca, granulated†	10.00	1 tbs.	36	0.1	Tr.	8.6	1	1	0.1	(0)	0	0	0	0	0	Neutral	Tr.
Wheatena†	28.35	¾ cup, cooked	101	2.9	0.6	21.7	8	93	0.1	(0)	37	43	1.1	0	0	3.1	.5

* Values after cooking.

† Dry weight before cooking.

Source (except for poi): Anna de Planter Bowes and Charles F. Church, **Food Values of Portions Commonly Used**. 7th ed. Philadelphia, 1951.

APPENDIX B

Medical Profession Questionnaire

Professional Title (Pediatrician, Plantation Doctor, General Practitioner, etc.)	City or District	Island
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Part A—POI AS A STAPLE FOOD FOR HEALTHY INFANTS AND CHILDREN

Do you consider poi a good staple food for healthy infants and children? Yes No

If you do, please state your reasons:

Do you, in actual practice, recommend to mothers that they include poi in the diet of healthy infants and children? Yes, in all cases. Yes, in some cases. No.

If you do recommend poi,

At what age should the feeding of poi be started? mos. old

How should it be fed: a. Every day, as part of a main meal.

Every day, as a between-meal feeding, in a milk drink.

Not daily, but in rotation with cereal foods.

b. Sweet. Sour. Leave choice to parents.

If you do not, in actual practice, recommend poi for all healthy babies and children, please state your reasons:

Part B—POI FOR THERAPEUTIC USES (Health Food)

Do you, in actual practice, recommend the use of poi to individuals with specific health problems? Yes. No. Sometimes.

If you do recommend it,

For what problems: Allergies to cereals Malnutrition Hyperacidity
 Gastric ulcers Prenatal Elderly persons
 Convalescent, soft Nursing mothers with no teeth
 diet

Other (enumerate)

How should it be fed: Sweet. Sour. Leave choice to patient.

How many "at home" patients now under your care are on a poi-containing diet, at your recommendation? persons. How many of them have cereal allergies?

If you do not, in actual practice, recommend poi for therapeutic use, please state your reasons:

How many children or adults have you ever known to be allergic to poi?

Part C—SUGGESTED IMPROVEMENTS IN POI

Should be a uniform color.....(preferred color.....)

Texture should be changed.....(preferred texture.....)

Fortify with vitamins.....(which vitamins?.....)

Fortify with minerals.....(which minerals?.....)

Price should be lower. Processing should be more sanitary.

Product is not now sufficiently sterile. Should dehydrate to powder form.

Preferred type of container: Glass. Tin. Cellophane bag.

Preferred size of container: For baby food,oz. For health food,oz.

Remarks:

Name..... Date.....

(Optional)

APPENDIX C

Tabulated Responses of Physicians

Table 5.—Number of practicing physicians in the Territory of Hawaii questioned in poi survey and number and percentage responding, by location and type of practice, spring 1951.*

Type of practice	Hono- lulu	Rural Oahu	Hilo, Hawaii	Rural Hawaii	Mau i	Kauai	Molokai	Lanai	Terri- tory
General									
Number questioned	137	17	20	7	12	9	2	—	204
Number replied	53	6	5	2	5	3	2	—	76
Percentage response	38.7	35.3	25.0	28.6	41.7	33.3	100.0	—	37.3
Plantation									
Number questioned	—	10	1	9	11	7	1	2	41
Number replied	—	5	1	6	8	5	1	2	28
Percentage response	—	50.0	100.0	66.7	72.7	71.4	100.0	100.0	68.3
Surgery									
Number questioned	27	—	1	—	—	—	—	—	28
Number replied	13	—	1	—	—	—	—	—	14
Percentage response	48.1	—	100.0	—	—	—	—	—	50.0
Obstetrics-gynecology									
Number questioned	21	—	2	—	—	—	—	—	23
Number replied	7	—	1	—	—	—	—	—	8
Percentage response	33.3	—	50.0	—	—	—	—	—	34.8
Internal medicine									
Number questioned	17	—	1	—	—	—	—	—	18
Number replied	10	—	1	—	—	—	—	—	11
Percentage response	58.8	—	100.0	—	—	—	—	—	61.1
Pediatrics									
Number questioned	17	—	—	—	—	—	—	—	17
Number replied	14	—	—	—	—	—	—	—	14
Percentage response	82.4	—	—	—	—	—	—	—	82.4
Dermatology-allergy									
Number questioned	8	—	—	—	—	—	2	—	10
Number replied	6	—	—	—	—	—	1	—	7
Percentage response	75.0	—	—	—	—	—	50.0	—	70.0
Bones									
Number questioned	6	—	—	—	—	—	—	—	6
Number replied	0	—	—	—	—	—	—	—	0
Percentage response	0.0	—	—	—	—	—	—	—	0.0
Tuberculosis									
Number questioned	2	—	1	—	1	—	—	—	4
Number replied	1	—	0	—	0	—	—	—	1
Percentage response	50.0	—	0.0	—	0.0	—	—	—	25.0
Total									
Number questioned	235	27	26	16	24	16	5	2	351
Number replied	104	11	9	8	13	8	4	2	159
Percentage response	44.3	40.7	34.6	50.0	54.2	50.0	80.0	100.0	45.3

* Type of practice based on information obtained from the Territorial Medical Society, Mabel Smyth Building, Honolulu; excludes territorial doctors now on the Mainland or in foreign countries, Board of Health officials, or doctors who are retired or for other reasons are not engaged in practicing; includes hospital residents and interns on Medical Society and Board of Health rosters.

Table 6.—Number and percentage of doctors responding, by professional classification, to the question: "Do you consider poi a good staple food for healthy infants and children?"

Replies	Pediatricians responding		Doctors other than pediatricians responding		Total doctors responding	
	number	percent	number	percent	number	percent
Yes	14	100.0	126*	86.9	140	88.1
No	0	0.0	5	3.4	5	3.1
Do not know	0	0.0	4	2.8	4	2.5
Did not answer	0	0.0	10†	6.9	10	6.3
Total	14	100.0	145	100.0	159	100.0

* One general practitioner remarked, "A staple food for young and old."

† Two obstetricians, one internist, one medical resident, three general practitioners, and three surgeons.

Table 7.—Number and percentage of doctors responding, by professional classification, to the question: "If you do, please state your reasons." (Do you consider poi a good staple food for healthy infants and children?)

Reasons	Pediatricians responding		Doctors other than pediatricians responding		Total doctors responding	
	number	percent	number	percent	number	percent
Nutritious, good source of carbohydrates or calories, or good substitute for cereal	8	57.1	47	37.3	55	39.3
Highly digestible	6	42.9	29	23.0	35	25.0
Mineral content	3	21.4	20	15.9	23	16.4
Well-tolerated or apparently not allergy producing	7	50.0	11	8.7	18	12.8
Vitamin content	1	7.1	14	11.1	15	10.7
Palatable or well-liked	5	35.7	8	6.3	13	9.3
Observation, experience, or tests show that children thrive on poi	—	—	10	7.9	10	7.1
Alkaline ash	1	7.1	5	4.0	6	4.3
Readily obtainable	1	7.1	4	3.2	5	3.6
Ease of preparation	1	7.1	3	2.4	4	2.8
Self sterilizing, contains yeast bacteria	—	—	3	2.4	3	2.1
Economical or relatively inexpensive	—	—	3	2.4	3	2.1
Aids in preventing, or at least is not conducive to, dental caries	—	—	2	1.6	2	1.4
Helps to regulate bowels	—	—	2	1.6	2	1.4
Easy to teach infants on the spoon	1	7.1	—	—	1	0.7
Good for child slow to gain	—	—	1	0.8	1	0.7
Fairly good source of protein	—	—	1	0.8	1	0.7
Total giving reasons*	12	85.7	86	68.3	98	70.0
No reasons given	2	14.3	40	31.7	42	30.0
Total doctors responding	14	100.0	126	100.0	140	100.0

* Columns do not add up to the figures shown because some doctors gave more than one reason.

Table 8.—Number and percentage of doctors responding, by professional classification, to the questions: "Do you consider poi a good staple food for healthy infants and children?" and "Do you, in actual practice, recommend to mothers that they include poi in the diet of healthy infants and children?"

Replies	Pediatricians responding		Doctors other than pediatricians responding		Total doctors responding	
	number	percent	number	percent	number	percent
Consider poi a good staple food for healthy infants and children						
Recommend it in actual practice	14	100.0	108	74.5	122	76.7
Do not recommend it in actual practice	0	0.0	18	12.4	18	11.3
Do not consider poi a good staple food for healthy infants and children						
Recommend it in actual practice	—	—	2	1.4	2	1.3
Do not recommend it in actual practice	—	—	3	2.1	3	1.9
Do not know whether poi is a good staple food for healthy infants and children						
Recommend it in actual practice	—	—	1	0.7	1	0.6
Do not recommend it in actual practice	—	—	3	2.1	3	1.9
Did not answer whether consider poi a good staple food for healthy infants and children						
Recommend it in actual practice	—	—	1	0.7	1	0.6
Do not recommend it in actual practice	—	—	5	3.4	5	3.2
Did not answer	—	—	4	2.7	4	2.5
Total doctors responding	14	100.0	145	100.0	159	100.0

Table 9.—Number and percentage of doctors responding, by location, to the question: "Do you, in actual practice, recommend to mothers that they include poi in the diet of healthy infants and children?"

Replies	Honolulu		Hilo		Rural*		Total	
	number	percent	number	percent	number	percent	number	percent
Yes	77	74	7	78	42	91	126	79
No	23	22	2	22	4	9	29	18
Did not answer	4	4	0	0	0	0	4	3
Total	104	100	9	100	46	100	159	100

* All areas on all islands other than Honolulu on Oahu and Hilo on Hawaii.

Table 10.—Number and percentage of doctors responding, by professional classification, to the question: "Do you, in actual practice, recommend to mothers that they include poi in the diet of healthy infants and children?"

Replies	Pediatricians responding		Doctors other than pediatricians responding		Total doctors responding	
	number	percent	number	percent	number	percent
Yes	14	100.0	112	77.2	126	79.3
In all cases	6	42.9	52*	35.8	58	36.5
In some cases†	8	57.1	60	41.4	68	42.8
No	0	0.0	29	20.0	29	18.2
Do not see children in their practice	0	0.0	18	12.4	18	11.3
Other reasons given	0	0.0	10	6.9	10	6.3
No reason given	0	0.0	1	0.7	1	0.6
Did not answer	0	0.0	4	2.8	4	2.5
Total doctors responding	14	100.0	145	100.0	159	100.0

* One general practitioner said: "Unacceptable in certain families because it is cheap" [implying pride, not cost]. A plantation doctor said: "Home-made poi may be contaminated with germs in preparation."

† Eight doctors in this group checked both "yes, in all cases" and "yes, in some cases," but are not included in the "yes, in all cases" group. One doctor included in the "yes, in some cases" group checked also "yes, in all cases" and "no." One plantation doctor said: "From time to time have used it for infant feeding especially when we distributed feedings to homes."

Table 11.—Number and percentage of doctors responding to the question: "If you do not, in actual practice, recommend poi for all healthy babies and children, please state your reasons."

Reasons	Recommend in some cases, but not in all cases	Do not recommend in actual practice	Total respondent doctors	
	number	number	number	percent
Do not see children in their practice	—	18	18	18.5
Likes and dislikes of patient or family	6	—	6	6.2
Expensive	5	—	5	5.2
Not sterile enough, high bacterial count	2	3	5	5.2
Not always easily available	3	—	3	3.1
Processing not sufficiently sanitary	1	2	3	3.1
Do not know enough about the food value	1	2	3	3.1
Not a necessity	2	—	2	2.1
Inconvenience of preparation	2	—	2	2.1
Harmful results if eaten in excess	—	2	2	2.1
Does not keep well	1	—	1	1.0
Eaten fresh instead of sour, has caused gastro-enteritis	—	1	1	1.0
Poi sensitivity in children	1	—	1	1.0
Makes children have loose stools	1	—	1	1.0
Low iron content	1	—	1	1.0
Total giving reasons*	17	28	45	46.4
No reasons given	51	1	52	53.6
Total doctors responding	68	29	97	100.0

* Columns do not add up to the figures shown because some doctors gave more than one reason.

Table 12.—Number and percentage of doctors responding, by professional classification, to the question: "If you do recommend poi, at what age should the feeding of poi be started?" (Do you, in actual practice, recommend to mothers that they include poi in the diet of healthy infants and children?)

Replies	Pediatricians responding		Doctors other than pediatricians responding		Total doctors responding	
	number	percent	number	percent	number	percent
Up to and including 2 months	4	28.6	14	12.5	18	14.3
From 2 up to and including 4 months	9*	64.3	61	54.5	70	55.6
From 4 up to and including 6 months	1	7.1	22	19.6	23	18.2
Over 6 months	0	0.0	9	8.0	9	7.1
Did not answer	0	0.0	6	5.4	6	4.8
Total doctors responding	14	100.0	112	100.0	126	100.0

* One said: "Because wheat is a very frequent cause of infantile eczema—I do not start infants on cereal until 7 months—also relatively low pancreatic amylase secreted to digest starches in infancy (Anderson's work). I prefer poi at 4 months—easier to digest."

Table 13.—Number and percentage of doctors responding, by professional classification, to the question: "If you do recommend poi, how should it be fed?" (Do you, in actual practice, recommend to mothers that they include poi in the diet of healthy infants and children?)

Replies	Pediatricians responding		Doctors other than pediatricians responding		Total doctors responding	
	number	percent	number	percent	number	percent
"Every day, as part of a main meal"	3	21.4	28	25.0	31	24.6
"Every day, as a between-meal feeding, in a milk drink"	0	0.0	8	7.0	8	6.3
"Not daily, but in rotation with cereal foods"	6	42.9	59	52.7	65	51.6
Different combinations of these three answers	4	28.6	14	12.5	18	14.3
Did not answer	1	7.1	3	2.7	4	3.2
Total doctors responding	14	100.0	112	100.0	126	100.0

Table 14.—Number and percentage of doctors responding, by professional classification, to the question: "If you do recommend poi, how should it be fed?" (Do you, in actual practice, recommend to mothers that they include poi in the diet of healthy infants and children?)

Replies	Pediatricians responding		Doctors other than pediatricians responding		Total doctors responding	
	number	percent	number	percent	number	percent
Sweet	3	21.4	50	44.6	53	42.1
Sour	0	0.0	5	4.5	5	3.9
Leave choice to parents	6	42.9	48	42.9	54	42.9
Different combination of these three answers	3	21.4	1	0.9	4	3.2
Did not answer	2	14.3	8	7.1	10	7.9
Total doctors responding	14	100.0	112	100.0	126	100.0

Table 15.—Number and percentage of doctors responding, by location, to the question. "Do you, in actual practice, recommend the use of poi to individuals with specific health problems?"

Replies	Honolulu		Hilo		Rural*		Total	
	number	percent	number	percent	number	percent	number	percent
Yes or sometimes	75	70.8	7	77.8	31	70.4	113	71.1
No	29	27.3	2	22.2	12	27.3	43	27.0
Did not answer	2	1.9	0	0.0	1	2.3	3	1.9
Total doctors responding	106	100.0	9	100.0	44	100.0	159	100.0

* All areas on all islands other than Honolulu on Oahu and Hilo on Hawaii.

Table 16.—Number and percentage of doctors responding, by professional classification, to the question: "Do you, in actual practice, recommend the use of poi to individuals with specific health problems?"

Replies	General practitioners and plantation doctors		Pediatricians		Internists		All other specialists		Total	
	number	percent	number	percent	number	percent	number	percent	number	percent
Yes and sometimes*	73	70.2	10	71.4	10	90.9	20	66.7	113	71.1
No†	30	28.8	4	28.6	1	9.1	8	26.7	43	27.0
Did not answer	1	1.0	0	0.0	0	0.0	2	6.6	3	1.9
Total doctors responding	104	100.0	14	100.0	11	100.0	30	100.0	159	100.0

* Comments: "Many mainland Caucasians and Orientals cannot eat poi because of its looks and not accustomed to it"—general practitioner. "Good deal depends on nationalities and individual tastes"—plantation doctor. "Is a food and not a drug, a vitamin"—plantation doctor. "Think it is a good food but very few people seem to like it"—surgeon.

† Of this group, 27 recommend poi as a staple food for healthy infants and children: 13 general practitioners, 9 plantation doctors, 4 pediatricians, 1 surgeon.

Table 17.—Number and percentage of doctors responding, by professional classification, to the question: "If you do not, in actual practice, recommend poi for therapeutic uses, please state your reasons."

Reasons	General practitioners and plantation doctors		Pediatricians		Internists		All other specialists		Total	
	number	percent	number	percent	number	percent	number	percent	number	percent
No special indication for its use; or need has not arisen	7	23.3	2	50.0	—	—	4	50.0	13	30.2
Do not know enough about the food value of poi	4	13.3	—	—	1	100.0	1	12.5	6	14.0
Poi of no special therapeutic use; or other foods just as good	4	13.3	1	25.0	—	—	1	12.5	6	14.0
Product not sufficiently sterile; or processing should be more sanitary	5	16.7	—	—	—	—	—	—	5	11.6
Never thought of it	3	10.0	—	—	—	—	—	—	3	7.0
Total giving reasons	23	76.6	3	75.0	1	100.0	6	75.0	33	76.8
No reasons given*	7	23.4	1	25.0	—	—	2	25.0	10	23.2
Total doctors responding	30	100.0	4	100.0	1	100.0	8	100.0	43	100.0

* Comment of one general practitioner: "Not prescribing poi as yet—may eventually." All nine other doctors, who did not give reasons, recommend poi as a staple food for healthy infants and children.

Table 18.—Number and percentage of doctors responding, by professional classification, to the question: "If you do recommend it, for what problems?" (Do you, in actual practice, recommend the use of poi to individuals with specific health problems?)

Problems	General practitioners and plantation doctors		Pediatricians		Internists		All other specialists		Total	
	number	percent	number	percent	number	percent	number	percent	number	percent
Convalescent, soft diets	59	80.8	2	20.0	9	90.0	9	45.0	79	69.9
Malnutrition	47	64.4	8	80.0	7	70.0	6	30.0	67	59.3
Allergies to cereals	41	56.2	9	90.0	6	60.0	7	35.0	63	55.7
Elderly persons with no teeth	44	60.3	—	—	9	90.0	7	35.0	60	53.1
Gastric ulcers	26	35.6	—	—	4	40.0	5	25.0	35	31.0
Nursing mothers	16	21.9	1	10.0	3	30.0	1	5.0	21	18.6
Prenatal	16	21.9	—	—	—	—	2	10.0	20	17.7
Hyperacidity	10	13.7	—	—	4	40.0	1	5.0	15	13.3
Other problems	8	11.0	2	20.0	2	20.0	3	15.0	15	13.3
Total who checked problems*	71	97.3	10	100.0	10	100.0	19	95.0	110	97.3
Did not answer	2	2.7	—	—	—	—	1	5.0	3	2.7
Total doctors responding	73	100.0	10	100.0	10	100.0	20	100.0	113	100.0

* Columns do not add up to the figures shown because some doctors checked more than one problem.

Table 19.—Number and percentage of doctors responding, by professional classification, to the question: "If you do recommend it, how should it be fed?" (Do you, in actual practice, recommend the use of poi to individuals with specific health problems?)

Replies	General practitioners and plantation doctors		Pediatricians		Internists		All other specialists		Total	
	number	percent	number	percent	number	percent	number	percent	number	percent
Sweet	17	23.3	3	30.0	2	20.0	4	20.0	26	23.0
Sour	3	4.1	0	0.0	1	10.0	0	0.0	4	3.5
Leave choice to patient	47	64.4	6	60.0	7	70.0	15	75.0	75	66.4
Different ways in different cases	5	6.8	1	10.0	0	0.0	0	0.0	6	5.3
Did not answer	1	1.4	0	0.0	0	0.0	1	5.0	2	1.8
Total doctors responding	73	100.0	10	100.0	10	100.0	20	100.0	113	100.0

Table 20.—Number of doctors responding to the question: "How many 'at home' patients now under your care are on a poi-containing diet, at your recommendation?"

Professional classification	Have patients on poi-containing diet	Do not have patients on poi-containing diet	Did not answer	Total
General practitioners and plantation doctors*	32	12	30	74
Obstetrician-gynecologists	1	2	4	7
Internal medicine	2	1	7	10
Pediatricians	6	0	4	10
Dermatologists-allergists	3	1	2	6
Surgeons	0	2	4	6
Total doctors responding	44	18	51	113

* Includes one tuberculosis specialist.

Table 21.—Number of doctors responding, by professional classification, to the question: "How many children or adults have you ever known to be allergic to poi?"

Professional classification	Doctors who have known cases of poi allergy	Doctors who have never known cases of poi allergy	Did not answer	Total
General practitioners	3*	64	9	76
Plantation doctors	1**	24	3	28
Obstetrician-gynecologists	—	7	1	8
Internists	2†	8	1	11
Pediatricians	7‡	6	1	14
Dermatologists-allergists	1§	6	—	7
Surgeons	—	10	4	14
Tuberculosis specialists	—	1	—	1
Total doctors responding	14	126	19	159
Percentage of total doctors responding	9	79	12	100

* Two replied, 1 case each; one replied, "exact number unknown."

** One replied, 1 case.

† One replied, 1; the other replied, "rare case."

‡ Two replied, 1 case each; the others replied, "2," "2 to 6 a year," "5 or 6 a year," "a few," "5 or 6 suspected (2 certain)."

§ One replied, "1 percent roughly."

Table 22.—Number of patients and amounts of poi consumed in hospitals in the Territory of Hawaii, spring 1951.

Type of hospital	Patients in the hospital	Patients who eat poi (approximate)	Poi consumed per week (average) pounds
General hospitals			
Hospital 1	1,200	75	200
Hospital 2	425	135	20
Hospital 3	270	120	90
Hospital 4	160	50	20
Hospital 5	92	10	40
Hospital 6	85	1	4
Hospital 7	65	6	12
Hospital 8	38	8	4
Hospital 9	36	32	24
Hospital 10	36	0	*
Hospital 11	30	5	14
Hospital 12	24	3	8
Hospital 13	24	0	0
Hospital 14	20	0	*
Hospital 15	15	12	25
Hospital 16	4	1	*
Total	2,524	458	461
Plantation hospitals*			
Hospital 17	33	0	0
Hospital 18	27	2	5
Hospital 19	20	2	2
Hospital 20	14	0	0
Hospital 21	10	0	0
Hospital 22	5	0	0
Total	109	4	7
Tuberculosis hospitals			
Hospital 23	600	600	350
Hospital 24	169	87	425
Hospital 25	138	69	250
Hospital 26	87	20	87
Total	994	776	1,112
Leprosariums			
Hospital 27	260	260	1,100
Hospital 28	99	80	325
Total	359	340	1,425
Mental hospitals			
Hospital 29	1,100	†	134
Hospital 30	700	700	600
Total	1,800	†	734
Private hospitals			
Hospital 31	30	5	10
Hospital 32	18	2	5
Hospital 33	15	13	4
Hospital 34	6	0	0
Hospital 35	6	†	1
Hospital 36	4	†	1
Total	79	†	21
Children's hospitals			
Hospital 37	80	80	20
Hospital 38	28	28	10
Total	108	108	30
Maternity hospitals			
Hospital 39	75	3	5
Total, all hospitals	6,048	?	3,795
Plantation health center	250	250	240

* Given only when specifically requested by patient.

† Number not known.

APPENDIX D

Comments on the Use of Poi for Healthy Infants and Children

Reasons given by physicians for considering poi a good food for healthy infants and children, included in category "Observations, experience, or tests show that children thrive on poi"

Remarks by doctors who gave no other reason:

"Because it is"—general practitioner.

"Weight gain is good"—plantation doctor.

"Long use has demonstrated"—dermatologist.

"Though I do not know the actual nutritional value, I suspect it is good as the children do well on poi"—general practitioner.

"Clinical results and tests"—general practitioner.

"It has been proved at the Ewa Health Center." "Feeding children from 3 months to 6 years of age at Ewa Plantation Health Center for 20 years"—general practitioner.

Remarks additional to reasons listed in other categories:

". . . because my children like it and are healthy"—thoracic surgeon.

"Infants fed on poi appear healthy"—general practitioner.

". . . the Hawaiians seem to have done well on it"—plantation doctor.

Comments of physicians who recommend poi for healthy infants and children in actual practice, in some cases, but not in all cases

"Poi is expensive and has the disadvantage of not keeping like the dried precooked cereals such as Pablum, Pabena, Gerber oatmeal, etc."—pediatrician.

"Expensive (relatively) and sometimes not available"—general practitioner.

"High bacterial count"—general practitioner.

"It is inconvenient for some parents to acquire poi in small amounts"—general practitioner.

"Most Oriental families do not have available daily poi; do not believe poi so essential that I insist they buy poi daily just to feed infants"—general practitioner.

"Chinese and Japanese families do not eat poi regularly as do the Hawaiians"—general practitioner.

"Product not sufficiently sterile" and "processing should be more sanitary"—general practitioner.

"Likes and dislikes"—internist.

"It is too expensive for many parents; many commercial cereals are less expensive and about as good. It is also a lot of bother"—plantation doctor.

"No food should be prescribed to the exclusion of others. Many of my patients cannot tolerate poi because of sensitivity to it, even though it is mostly carbohydrate"—allergist.

"I recommend it for those families in which parents and other children already eat poi and like it and want it as a part of their diet from now on"—obstetrician-gynecologist.

"Not a necessity—cost is high for food value received"—general practitioner.

"Those that are accustomed to its use or would like to try it"—general practitioner.

"Nonavailability (at times in this district [Wahiawa]), low iron content"—plantation doctor.

"If the mother wants it. I do not know enough about the composition of poi to say one way or the other"—general practitioner.

Comments of physicians who do not, in actual practice, recommend poi for healthy infants and children

“. . . frankly know very little about the food value of poi, so I have had nothing to do with it until now”—internist.

“Poi, so often eaten fresh instead of sour, has been the cause in some instances of severe gastroenteritis”—general practitioner.

“Not convinced it is being produced under sufficiently sterile conditions to recommend as infant and children’s food”—general practitioner.

“Poi becomes contaminated easily although it is fairly safe to eat when sour. Acidity kills most bacteria”—general practitioner.

“Personally I do not think we know much about the food value of poi ourselves.”
“Certainly, I do not care to prescribe the crude poi for infant use”—general practitioner.

“. . . because it is staple diet anyway among Hawaiians and they get it to excess, plus an excess of milk, leading frequently to a dietary anemia”—general practitioner.

“Too concentrated as source of carbohydrate—children eat too much—obesity is a disease”—surgeon.

“Not sufficiently sterile”—general practitioner.

“Any objection to poi is purely personal, caused largely by the caliber of poi factories in the Territory which are anything but a sanitary source of food production. If and when their standards are such as to equal at least those of a dairy or where pure food is processed, by at least mainland standards, then and then only will I prescribe poi more frequently. The Board of Health has done much to improve this situation”—general practitioner.

Remarks by doctors who do not advise on children

“No actual contact with pediatrics, but would recommend if I were . . .”—surgeon.

“I do not do this type of work, but if I did, I would certainly use it”—surgeon.

APPENDIX E

Comments on Poi for Therapeutic Uses

Comments of physicians who do not, in actual practice, recommend poi for therapeutic use

“There are other good and sometimes better foods for sick babies”—general practitioner.

“Using hypoallergic and other diets, other than poi”—general practitioner.

“Product is not now sufficiently sterile, and processing should be more sanitary”—general practitioner.

“People who eat poi continue to eat it. Others will not tolerate it”—general practitioner.

“Am not aware of any therapeutic value in poi”—plantation doctor.

“Have no real reason for its use”—general practitioner.

“Most of the patients for whom I might recommend it already use it, either regularly or occasionally”—plantation doctor.

“Have not come across problem for specific need”—pediatrician.

“Am not aware of any special advantages of poi for therapeutic use”—pediatrician.

“In pediatric practice we do not recommend any food as health foods, but if there are any allergies, poi would of course be considered just as we would also consider

other types of carbohydrates to replace the offending cereal or foods"—pediatrician.
 "Only because I am a general surgeon instead of a pediatrician"—surgeon.
 "Have never considered it"—plantation doctor.
 "Ignorance of therapeutic value of poi"—general practitioner.
 "I might use it more if I knew more of its properties"—plantation doctor.
 "Being unfamiliar with it personally, it does not occur to me as a staple food"—surgeon.

APPENDIX F

Comments Regarding Suggested Improvements of Poi

Color

Preferred color, pink: "Purple poi is generally unappetizing"—dermatologist. Preferred color, red: "Kauai red"—general practitioner.

Preferred color (other than pink, red, or gray): "Lavender"—general practitioner; "Gray or pink"—plantation doctor; "Red-brown"—general practitioner; "Gray, pinkish gray"—general practitioner; "Yellowish or purplish"—general practitioner; "Lighter"—general practitioner; "Red, pink, blue-gray"—general practitioner; "Natural"—general practitioner; "White"—plantation doctor; "Butter-yellow"—general practitioner; "Purple"—pediatrician; "Softer"—general practitioner; "Darker brown"—internist; "Present color not appetizing to beginners"—general practitioner; "Could use only piele variety; too hard to control all sources"—internist.

Texture

Texture should be changed. Preferred texture: "Mixed thin and strained"; "finer"; "solid form would be better for new users"; "smooth and thin"; and "thin."

Texture should not be changed. "Doesn't matter"—general practitioner.

Remark not tabulated: "I should think improvement in taste would be the main problem as I know of only a few people from the Mainland who can eat it because of its unpleasant taste which may be in some part related to its texture."

Vitamins

Should fortify with vitamins. Suggested vitamins: "Thiamine, niacin, riboflavin, ascorbic acid"—internist; "B-complex group"—two general practitioners; "probably B complex"—internist; "B complex and C"—general practitioner; "B, C, and D"—two general practitioners; "Multiple vitamins"—two general practitioners; "C, B"—surgeon; "B group and C if possible"—plantation doctor; "many as possible"—tuberculosis specialist; "B group and C"—plantation doctor; "whatever is lacking"—plantation doctor.

Should not fortify with vitamins. "Buy separately"—internist.

Not necessary to fortify with vitamins. "Doesn't matter"; "questionable"; "fortification only when other diet has definite deficiency."

Minerals

Should fortify with minerals. Suggested minerals: "Calcium and iron"—three general practitioners; "calcium and phosphorus"—two general practitioners; "iron"—two general practitioners and two plantation doctors; "iron and copper"—plantation doctor ("baby does not get enough iron early in diet"); "whatever is lacking"—plantation doctor.

Should not fortify with minerals. "Buy separately"—internist.

Price should be lower

"It would be used more if same cost as cereal"—pediatrician. Another pediatrician says price should be lower "if possible." "Especially bottled"—general practitioner.

Processing should be more sanitary

"For fresh poi"—pediatrician. Another pediatrician adds that he recommends fresh poi be sterilized for infants. "For sweet poi"—dermatologist. "Have no first-hand

knowledge of interiors of poi factories but outside appearances and locations of some suggest that improvement in sanitation is needed"—surgeon. "From stories I hear"—plantation doctor.

Product is not now sufficiently sterile

One pediatrician qualifies "Fresh product." One general practitioner qualifies that the product is not now "uniformly" sufficiently sterile.

Not tabulated: "Must be sterile to be sold in cans, the aciduric bacteria take care of pathogens"—internist. "Some brands of bottle poi very sterile now"—pediatrician.

Should dehydrate to powder form

"Would be useful for mainland use"—pediatrician. Another pediatrician says "Maybe." "Tarolactin is well liked and tolerated but too expensive"—pediatrician. "It could be precooked and palatable, I believe the dry form like Pabena, Pablum, Gerber oatmeal, etc., would definitely have great value"—pediatrician.

General practitioners: "Possibly." "Dehydrated in powder form would be the best marketing method." "For certain purposes."

Plantation doctors: "Might be more economical and easier to ship." "Think it would be preferable either in powder form or more diluted." "Tarolactin is very good."

Internist: "Would help." Dermatologist: "This would be ideal!" Surgeon: "Good idea. If in powder form, clean and easy to handle."

Comments of physicians regarding preferred type and size of container

Tin. "No glass!"—pediatrician.

Cellophane bag. "For everyday use"—general practitioner. "But smaller size"—general practitioner. "Have never used canned poi as bulk poi of good quality is always available"—plantation doctor. "Cheaper"—plantation doctor.

Glass or tin. "Tin for dehydrated poi"—general practitioner.

Glass or cellophane bags. "Container determines price or cost. Does not matter as long as bacterial count is low"—pediatrician. "Glass for infants, cellophane bag for children"—pediatrician. "Cellophane bag for local use"—general practitioner. "Glass for individuals who use small amounts of poi, cellophane bags for families who are accustomed to eating poi"—dermatologist.

Tin or cellophane bag. "Cellophane bag for local consumption only"—plantation doctor.

Miscellaneous. "Paper cartons"—general practitioner. "Tin, cellophane bag, and cardboard carton"—general practitioner. "I would say depends upon whether it is shipped far and upon the economical status of the people in various economical environments: for Hanalei type of rural people, cellophane bags; for Honolulu, glass or tin, etc."—plantation doctor and general practitioner.

APPENDIX G

Miscellaneous Comments

Suggestions which have not been tabulated

"There should be a greater supply"—internist.

"Taro cakes and pancakes, muffins, etc., are more palatable to most haoles"—general practitioner.

"Should be used for allergic children; other reasons not so good for Mainland since competition is too severe"—internist.

"Investigate quick-frozen; shredded or flaked like dry cereal. Chips were good but seldom available; also deep-fat fries, taro crunches with coconut"—general practitioner.

"I believe that unless the price can be greatly reduced it should be marketed as a food for allergic babies or adults. The mistake with Tarolactin was that milk products were mixed with the taro product, which, therefore, was of no value in most cases. It might well be marketed through some large industrial concern like Gerber, as they should be about ready for a new low-allergenic food"—pediatrician.

"Also consider taro for export—sliced or in chunks—for making patties or frying in slices (like potatoes)"—general practitioner.

"A more uniform source of supply"—plantation doctor.

"More people would eat poi if directions for preparation (i.e., mixing) were more available and if its beneficial effects were promulgated (e.g., yogurt, brewer's yeast, etc.)"—obstetrician.

"Poi is an excellent food for everybody, but at present it is not attractively marketed for the non-Hawaiian population"—general practitioner.

"Mainlanders as a rule do not like poi. There is not enough to supply the island demand"—general practitioner.

"An improvement could be made in the flavor as most people have to develop a taste for it as it is now"—physiologist.

"I do not feel that people not accustomed to the taste of poi would find it palatable enough for a health food"—plantation doctor.

Requests for information about poi on questionnaires received from doctors

"I would like to have the chemical analysis and the price of poi made known to the doctors. We would then have something to compare with other foods"—general practitioner.

"Please send me an analysis of poi"—plantation doctor.

"I should like any published data you have on poi"—plantation doctor.

"Would appreciate literature"—internist.

"I have been back in the Islands 6 months and, frankly, know very little about the food value of poi, so I have had nothing to do with it until now. Where can I get information on the subject?"—internist.

"Here poi is largely home-prepared. I am personally unacquainted with local commercial processing. Suggest that the Experiment Station could render a greater service in making food components of all island fruits and vegetables more widely known, especially to physicians"—internist.

"Do not know exact mineral and vitamin content; suggest testing all brands and circularizing results"—general practitioner.

"Let us have some scientific data on use"—surgeon.

Remarks on personal experience of respondents

"I am not a pediatrician, but I occasionally see babies and children for diabetes and heart disease. My own two children have been on poi since 2 months"—general practitioner.

"It is nutritious and a good wholesome food. Being Hawaiian, I was naturally raised on it and it continues as a main part of my diet. I have never known anyone who eats poi to suffer a deficiency disease"—dermatologist.

"I was brought up on poi with milk and poi with fish as an infant and during youth. Never had a very sick day until I was not able to eat it regularly"—industrial physician and surgeon.

"Don't like the stuff myself, so each individual to his own taste"—general practitioner.

"I consider it a good food for healthy infants and children because of its known caloric content, and because my own children like it and are healthy"—surgeon.

"Do no pediatrics. However, poi added to formula satisfied one of my own children at 3 to 4 months, when all (and I mean all!) other foods failed to satisfy his hunger. Method: evaporated milk formula thickened with poi; holes in nipple enlarged with red hot ice pick"—obstetrician.

"No actual contact with pediatrics, but would recommend poi if I were. My own children began eating it at 4 months; everyday, as part of main meal; sweet poi"—surgeon.

"I doubt if poi would ever have much appeal on the Mainland because of its taste; I feel you must learn to like it; I personally dislike it and don't recommend it unless others in family like it and it will always be available"—obstetrician-gynecologist.

Comments not noted elsewhere

"May I add an interesting commentary concerning poi. While I was training at the Children's Hospital of Harvard Medical School in Boston, a baby was brought in by his Army Officer father. He came to see me to learn where he could obtain poi for his child. The S. S. Pierce Company of Boston carried poi in stock!"—pediatrician.

"You can launch a good food like poi especially for infants but it will take a lot of money for advertising on a national scale"—pediatrician.

"This should be another industry for Hawaii to chalk up both for local and mainland markets"—plantation doctor, Hawaii.

"Poi powder is marketed on the Mainland by a Berkeley firm—Galen B Company—under a different name. It was extensively studied by the University of California Hospital. Poi is one item to make Hawaii industrially prosperous. I am in hearty approval of popularizing poi"—pediatrician.

Comments contained on unusable questionnaires

"Good source of thiamine, riboflavin, calcium, and phosphorus."

"Few allergies."

"Not too many calories and nonallergenic."

"Good source of calcium, phosphorus, and boron as well as easily digested carbohydrates, etc."

"Nutritious and forms bulk."

"Poi has more vitamins and minerals than polished rice. Poi can be used as a variety."

"Supplies needed calories in an easily digested form."

"Readily utilized by my own children on pediatrician's recommendation."

"We use poi at home principally because we like it."

"Children get poi in families using this staple. It is too expensive to be purchased especially for children in families not using this food for all members."

"We are receiving poi in large wooden barrels, which are unsanitary. Improvements along this line would help a great deal. Canned products on the markets have a peculiar floury taste"—hospital dietitians.

"Individualize all diet prescriptions whether for poi, potato, or other food stuffs."

"We have used poi as an alternate for cereal or potatoes and have been under the impression that few, if any, babies were allergic to the food."

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UNIVERSITY OF HAWAII
COLLEGE OF AGRICULTURE
AGRICULTURAL EXPERIMENT STATION
HONOLULU, HAWAII

GREGG M. SINCLAIR
President of the University

H. A. WADSWORTH
Dean of the College and
Director of the Experiment Station

L. A. HENKE
Associate Director of the Experiment Station

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