

# SOME AMERICAN PLANTS CONSIDERED AS SOURCES OF VITAMINES, AND AS PARTS OF A DIET FAVORABLE TO THE PRESERVATION OF THE TEETH<sup>1</sup>

J. F. McCLENDON

*Physiological Laboratory of the University of Minnesota Medical School, Minneapolis, Minn.*

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## I. INTRODUCTION

It seems evident, from data compiled by Pickerill, that savage races have very good teeth, whereas about 95 percent of the number of civilized persons have dental caries; and also that this condition is not due to heredity, since the change in the teeth follows the process of civilization, no matter how rapidly this process is effected. That diet has something to do with tooth preservation seems probable, since a pyorrhea-like affection is characteristic of scurvy and the teeth become imperfect as a result of rickets. Dr. Edwin F. Robb,<sup>2</sup> working in my laboratory, has shown that in scurvy the calcium stores of the body are depleted, and that much calcium passes out in the urine. The bones dissolve by enlargement of the marrow cavities. I have found osteodentine in the pulp cavity in scurvy.<sup>2</sup>

<sup>1</sup> This paper was received for publication on August 29, 1920, and is one of many available papers that we have not been able to publish promptly. This paper was referred to, in the last preceding issue, as due for publication in this number (McClendon and collaborators: JOURNAL OF DENTAL RESEARCH, 1921, iii, p. 40).—Ed.

<sup>2</sup> Robb, McClendon, and collaborators: JOURNAL OF DENTAL RESEARCH, 1921, iii, p. 39.

Until we know more about the nature and causes of the "deficiency" diseases, we cannot determine how prevalent they are. Many ill defined illnesses may be incipient cases of "deficiency" diseases. With the possible exception of pellagra (and related diseases, such as acrodynia), which seems to depend on protein deficiency, all the "deficiency" diseases appear to be due to lack of some chemical substance of unknown composition, called vitamepe for lack of a better name. Durand found dental caries in a larger percentage of children that had been fed in infancy on sweetened condensed milk, than in children that had been breast fed. Condensed milk has a low vitamine content, due to partial destruction of vitamins by heat and to dilution of vitamins with a vitamine-free substance, sugar.

It seems very probable that, if we knew all the foods eaten by savage races and ate them in the amounts eaten by savages, the incidence of dental caries would be greatly decreased. This opinion specially includes the diet of the infant during the period when the teeth are developing. Since savages had practically no "artificial" infant food except the banana, which is said not to be indigenous to America and certainly was not to the greater part of North America, American Indians must have nursed their infants for a long period. It is said that the Fijians nursed their infants three years and gave them bananas and other things in addition. It seems necessary to conclude that the infants of American Indians could not have survived if the period of nursing had not been as long as that.

Ethno-botanists list a number of plants that were and are eaten by children of American Indians. While the papoose was not allowed to crawl around, it must have been dependent on what was given to it. I have seen mothers chew food until it was soft and then give it to infants to eat. This method of feeding was probably common among savages. The fact that some infants, that have been breast fed for three years, are undernourished, does not indicate the presence of deleterious substance in the milk, but rather an insufficiency of some substance that could be supplied by the suitable *addition* of other food, without the necessity for weaning.

I had occasion to make observations of the diet and teeth of Mexicans, during the years from 1888 to 1903, in various parts of Mexico

and on the Mexican border. The Mexican has good teeth. The conclusion from these casual observations of the teeth of the Mexican—that they are good teeth—is corroborated by the records of the U. S. Army Draft Boards, in the contrast of the poor teeth of the general draftees with the excellent teeth of the draftees along the Mexican border that included men of Mexican descent. As to the food eaten by Mexicans: my observations, coming long after the Spanish settlers had introduced sugar-cane, peaches, oranges and other plants, do not relate to the primitive diet, but they indicate that certain accounts that have been published about that diet are misleading. Hopewell-Smith states that “the Indians of Mexico seldom employ condiments for flavoring food, which is generally simple in character and taken cold.” On the contrary, the further I travelled from railroad communication, the better flavored I found the diet of the Mexicans. When we bear in mind that yuccas and nolas, such as *Dasylerion texanum*, too woody for a horse or cow to eat, are used by Mexicans for making beverages, the impression will be gained that the Mexican uses everything possible for food and drink. We now know that yeast is a rich source of water-soluble vitamins. The Mexicans imbibed cultures of wild yeast in the fermented pulque, sotol, and other drinks. It was only after the advent of the white man that these nutritious drinks were distilled to form the mescal, tequila, and sotol aquarente, that have largely replaced the former.

Besides eating food from nearly every phylum of the animal and plant kingdoms, the Indians imbibed a large number of drinks made by extracting plants with hot or cold water and hence containing water-soluble vitamins. Since the North American Indians seem to be the best known in this regard, a (partial) list of the plants they used is given below, followed by a list of tropical American plants that have found their way into the United States and may have done so occasionally in pre-Columbian days. Some of these plants were cultivated by North American Indians, especially corn, beans, pumpkins and squashes. Since it is immaterial from a nutritional standpoint whether vitamins are taken as food or medicine, these two groups of plants are not separated in the appended lists (1 and 2).

## II. LISTS OF AMERICAN PLANTS

*List No. 1. Some North American plants that were used as food, or taken internally as medicine, by North American Indians; including some materials that were "chewed" and their vitamins swallowed*

Abronia fragrans (sand puff)  
 Acanthocheton wrightii (herb, ancient Hopi food)  
 Acer negundo, saccharum, saccharinum and rubrum [maple (sugar)]  
 Achillea millefolium (yarrow)  
 Acornus calamus (sweet flag)  
 Actinella odorata (herb)  
 Adenostegia (yumayut)  
 Agaricus campester and arvensis (mushroom)  
 Agastache anethodora (anise)  
 Agave americana, parryi, palmeri, wislizeni, and deserti (maguey, pulque plant)  
 Agrostis perennans (grass)  
 Alecortia jubata and fremontii (lichen)  
 Allionia nyctaginea (four-o'clock)  
 Allium bisceptrum, acuminatum, mutabile, recurvatum, and cernuum (wild onion)  
 Amanita rubescens (mushroom)  
 Amaranthus blitoides, torreyi and retroflexus (tumbleweed)  
 Ambrosia elatior and artemisiaefolia (ragweed)  
 Amelanchia alnifolia (June berry, service berry)  
 Ammobroma sonora (sand food)  
 Amoreuxia wrightii, and palmatifida (sayas, indian parsnip)  
 Amorpha canescens (shoestring)  
 Amsinckia tessellata (herb)  
 Andropogon furcatus (red hay)  
 Anemone canadensis and cylindrica (wind flower)  
 Angelica (angelica)  
 Anhalonium engelmanni, fissuratum and lewini (cactus, peyote)  
 Aphlopappus (herb)  
 Aphyllon fasciculatum (cancer root)  
 Apios apios, and tuberosa (ground nut)  
 Aquilegia coerulea, and canadensis (wild columbine)  
 Arctostaphylos manzanita, patula, glauca and tomentosa (manzanita)  
 Arisaema triphyllum (indian turnip)  
 Armillaria mellea (honey mushroom)

*Artemisia biennis*, *discolor*, *trífida*, *dracunculoides*, *tridentata*, *frigida*,  
    *gnaphalodes*, *forwoodii*, *filifolia*, *wrightii*, and *heterophylla* (wild sage,  
    fuzzy weed, wormwood)  
*Asclepias tuberosa*, *exaltata*, *syriaca*, *verticillata*, *erosa*, *speciosa*, *eriocarpa*,  
    *galioides*, and *involucrata* (butterfly weed, milkweed)  
*Asclepiodora decumbens* (milkweed)  
*Asimina triloba* (North American pawpaw)  
*Aster hesperius* (wild aster)  
*Astragalus caroliniana*, *pictus filifolius* and *diphysus* (rattle pod, milk  
    vetch)  
*Atriplex canescens*, *confertifolia*, *argenteum* and *powellii* (arache)  
*Avena fatua* (wild oats)  
*Bahia woodhousei* [(purgative) thistle]  
*Balsamorhiza sagittata* (arrow root)  
*Barbarea barbarea*, *stricta* and *præcox* (scurvy grass)  
*Bechmannia erucaeformis* (slew grass)  
*Berberis canadensis*, *repens*, *aquilifolium* and *trifoliata* (barberry, Oregon  
    grape)  
*Betula lenta*, and *fontinalis* (birch)  
*Bidens bigelovii* (bur marigold)  
*Bigelovia douglasii* and *parishii* (rabbit bush)  
*Blennosperma californicum* (weed)  
*Bloomeria aurea* (lilly)  
*Boletus versipellis* and *edulis* (mushroom, cepe)  
*Bovista plumbea* (puff ball)  
*Brickellia grandiflora* and *wrightii* (herb)  
*Brodiaea congesta*, *capitata* and *volubilis* (purple-flowered grass-nut,  
    climbing grass-nut, wild hyacinth)  
*Bromus breviaristatus* and *maximus* (brome grass)  
*Cactus viviparus*, *heyderi* and *goodrichii* (cactus)  
*Calandrinia cawlescens* (red maids)  
*Calla palustris* (water arum)  
*Calliproa lutea* (yellow-blossom grass-nut)  
*Callirrhoe involucrata*, *digitata* and *pedata* (mallow)  
*Calochortus nutallii*, *macrocarpus* and *aureus* (mariposa lilly, sego)  
*Calvatia cyathiformis*, and *gigantea* (puff ball)  
*Camassia esculenta* (camos)  
*Cantharellus cibarius* (mushroom)  
*Carduus ochrocentris* (thistle)  
*Carex utriculata* (sedge)

- Carcum gairdnerii*, *kelloggii* and *oregonum* (yamp, wild anise)  
*Castanea dentata* and *pumila* (chestnut)  
*Castanopsis chrysophylla* (Oregon chinquapin)  
*Castilleja parviflora* (painted cup)  
*Caulophyllum thalictroides* (blue cohosh)  
*Ceanothus americanus* (red root, New Jersey tea)  
*Celtis occidentalis* and *reticulata* (hackberry)  
*Cercocarpus montanus* (mountain mahogany)  
*Cereus giganteus*, *thurberi*, *stramineus* and *triangularis* (giant cactus)  
*Chamaesaracha coronopus* (benedictine berry)  
*Chamaesyce serpylliflora* (milkweed)  
*Chenopodium capitatum*, *leptophyllum*, *rubrum*, *cornutum*, *fremontii*,  
*californicum* and *album* (lambsquarters, pigweed)  
*Chlorogalum pomeridianum*, *parviflorum* and *divaricatum* (little soap-  
root, wild potato)  
*Chrysopsis villosus* (golden aster)  
*Cinna arundinacea* (wood reed-grass)  
*Citrullus citrullus* (watermelon)  
*Clavaria flava* and *fusiformis* (coral mushroom)  
*Claytonia caroliniana*, *virginica*, *megarrhiza*, and *perfoliata* (wild lettuce,  
spring beauty)  
*Clematis lingusticifolia* (virgin's bower)  
*Cleome integrifolia* (stinking clover)  
*Clitopilus aboritivus* (mushroom)  
*Cnicus drummondii*, *undulatus* and *edulis* (thistle)  
*Collybia velutipes* and *radicata* (mushroom)  
*Coprinus comatus*, *micaceus* and *a tramentarius* (shaggy-mane mushroom,  
glistening coprinus, inky coprinus)  
*Coreopsis cardaminefolia* (coreopsis)  
*Coriandrum sativum* (coriander)  
*Corylus americana* and *californica* (hazelnut)  
*Cowania mexicana* (cliff rose)  
*Crataegus chrysocarpa* (red haw)  
*Crepis glauca* (hawk's beard)  
*Croton texensis*, *corymbulosus* (croton, chapparal tea)  
*Cucurbita ficifolia*, and *foetidissima* (gourd)  
*Cyclobothra* (beaver-tail grass-nut)  
*Cycloloma atriplicifolium* (winged pigweed)  
*Cymoterus longipes*, *montanus*, *globosus*, *glomeratus*, *fendleri* and *pur-  
pureus* (chimaja)

*Cyperus esculentus* and *rotundus* (chufa, nut grass)  
*Dalea lanata* (herb)  
*Dasylerion texanum* (sotol)  
*Dasystephana puberula* (gentian)  
*Datura meteloides* and *quercifolia* (jimson weed)  
*Deschampsia caespitosa* (hair grass)  
*Dichoria brandegii* (katokia)  
*Diospyros virginiana* and *texana* (persimmon)  
*Dithyrea wislizeni* (spectacle pod)  
*Dracocephalum parviflorum* (mint)  
*Echeveris lanceolata* (rock lettuce)  
*Echinocactus visnaga* and *wislizeni* (cactus)  
*Echinocystis macrocarpa* (chillicothe)  
*Elaeagnus argentea* (silver berry)  
*Elymus canadensis* and *condensatus* (wild rye)  
*Ephedra nevadensis* and *antisyphilitica* (teamster's tea, joint fir)  
*Epilobium coloratum* (willow herb, fireweed)  
*Equisetum laevigatum* (horsetail)  
*Eriocoma membranacea* and *cuspidata* (grass)  
*Eriodictyon tomentosum* and *parryi* (yerba santa)  
*Eriogonum ovalifolium*, *corymbosum*, *alatum*, *fasciculatum* and *jamesii*  
(medicine root)  
*Eryngium aquaticum* (button snakeroot)  
*Erythraea venusta* (canchalagua)  
*Erythronium albidum* and *mesochoreum* (spring lilly)  
*Escholtzia californica* (California poppy)  
*Euonymus atropurpurea* (burning bush)  
*Euphorbia serphyllifolia* and *polycarpa* (spurge)  
*Euretia lanata* (white sage)  
*Falcata comosa* (ground bean, hog peanut)  
*Ferula multifida* (totuv)  
*Festuca ovina* (sheep's fescue-grass)  
*Fistulina hepatica* (beef-tongue mushroom)  
*Fragaria vesca*, *americana* and *virginiana* (strawberry)  
*Fritillaria atropurpurea* and *pudica* (lilly)  
*Gaertneria acanthicarpa* (ragweed)  
*Galium* (bedstraw)  
*Gaultheria procumbens* (wintergreen)  
*Gaura parviflora* (herb)  
*Gaylussacia* (huckleberry)

*Geranium fremontii* (cranesbill)  
*Geum macrophyllum* (herb)  
*Gilia aggregata* and *staminea* (standing cypress)  
*Glyceria distans* (manna grass)  
*Glycine apios* (indian potato)  
*Glycyrrhiza lepidota* (licorice)  
*Grindelia squarrosa* (sticky head)  
*Grossularia missouriensis* (gooseberry)  
*Gutierrezia euthamniae*, *filifolia* and *longifolia* (broom weed, snake weed)  
*Gymnolemia multiflora* (herb)  
*Hedeoma hispida* and *drummondii* (pennyroyal)  
*Hedysarum mackenzii* (legume)  
*Helianthus annuus*, *tuberosus*, *doronicoides*, and *giganteus* (sunflower,  
Jerusalem artichoke)  
*Heracleum lanatum* (cow parsnip)  
*Hesperocallis undulata* (desert day-lilly)  
*Hesperoscordium lacteum* (white-flowered grass nut)  
*Heteromeles arbutifolia* (christmas-berry)  
*Heuchera pubescens* (alum root, rock geranium)  
*Hicoria ovata* (hickory nut)  
*Houttuynia californica* (yerba mansa)  
*Humulus americana* (hops)  
*Hydnum coralloides*, *laciniatum* and *erinaceus* (coral mushroom)  
*Hymenopappus filifolius* (thistle)  
*Hymenoxys floribunda* (Colorado rubber-plant)  
*Ilex vomitoria* (cassine)  
*Ionoxalis violacea* (sheep sorrel)  
*Iva axillaris* (marsh elder)  
*Juglans nigra* and *cinerea* (black walnut, butternut)  
*Juniperus californica*, *virginiana*, *occidentalis*, *pachyphloea*, *mexicana*  
and *monosperma* (cedar, juniper)  
*Kalmia glauca* (pale laurel)  
*Kryntzkia sericea* (herb)  
*Kunzia tridentata* (shrub)  
*Laciniaria scariosa* and *punctata* (blazing star)  
*Lactarius deliciosus* (orange milk-mushroom)  
*Lactuca pulchella* (blue-lettuce)  
*Lathyrus* (pea)  
*Layia glandulosa* (tidy-tips)  
*Ledum palustre* and *groenlandicum* (marsh-tea, labrador-tea)



*Lepargyrea argentea* (buffalo-berry)  
*Lepidium nitidum* (peppergrass)  
*Lepiota procera* (parasol mushroom)  
*Leucelene ericoides* (thistle)  
*Lewisia rediviva* and *brachycalyx* (bitter-root)  
*Lilium umbellatum* (lilly)  
*Lindera benzoin* (spice-bush)  
*Linum lewisii*, *rigidum* and *puberulum* (flax)  
*Lithospermum pilosum*, *multiflorum* and *canencens* (puccoon)  
*Lonicera conjugialis* (Oregon cranberry)  
*Lophanthus urticifolius* (mint)  
*Lophophora williamsii* (cactus)  
*Lotus strigosus* (tovinal)  
*Lupinus littoralis* (lupine)  
*Lycium pallidum* (tomatillo)  
*Lycoperdon gemmatum*, *piriforme*, and *solidum* (puff ball, indian bread)  
*Lygodesmia juncea* and *grandiflora* (skeleton weed)  
*Madaria* (tar weed)  
*Madia glomerata* (tar weed)  
*Malacothrix californica* (makiyal)  
*Malus ioensis* (crabapple)  
*Malvastrum coccineum* (red false-mallow)  
*Mammillaria* (ball cactus)  
*Marasmius oreades*, *scorodoni* and *rotula* (fairy-ring mushroom, garlic mushroom, little-wheel mushroom)  
*Martynia louisiana* (unicorn plant)  
*Medeola virginiana* (indian cucumber-root)  
*Melica* (melic grass)  
*Mentha canadensis* (mint)  
*Mentzelia albicaulis* (herb, stick leaf)  
*Mesembryanthemum aequilaterale* (fig marigold)  
*Micromeria douglassii* (yerba buena)  
*Microseris nutans* (succulent root)  
*Mimulus luteus* (mask flower)  
*Mirabilis californica* (herb)  
*Mitchella repens* (partridge berry)  
*Mitella trifida* (bishop's cap)  
*Monarda fistulosa* and *citriodora* (horsemint)  
*Monardella lanceolata* (indian tea)  
*Montia perfoliata* (indian lettuce)

- Morchella esculenta*, *deliciosa*, *conica* and *semi-libera* (morel)  
*Muscadinia munsoniana* and *rotundifolia* (bullace grape, muscadine, scuppernong)  
*Myrica asplenifolia* (sweet fern)  
*Nelumbo lutea* (yellow lotus, water chinquapin)  
*Nymphaea polysepala* and *advena* (yellow pond-lilly)  
*Oenothera biennis* and *caespitosa* (evening primrose)  
*Opuntia rutila*, *polyacantha*, *humifusa*, *tuna*, *ficus-indica*, *engelmannii*, *vulgaris*, *arborescens*, *camanchica* and *whipplei* (prickly-pear, cane cactus)  
*Orobanche tuberosa* (cancer root)  
*Orogenia linearifolia* (wild parsnip)  
*Orontium aquaticum* (golden club)  
*Oxycoccus macrocarpus* (cranberry)  
*Padus nana* and *melanocarpa* (chokecherry)  
*Panicularia fluitans* (sugar grass)  
*Panicum obtusum* and *capillare* (old-witch grass)  
*Parmelia saxicola* (lichen)  
*Parosela aurea* and *lasianthera* (bitter medicine)  
*Passiflora incarnata* (maypop)  
*Pectis angustifolia* and *papposa* [thistle family]  
*Pellaea omithopus* (tea fern)  
*Peltandra virginica* and *sagittaeifolia* (arrow arum)  
*Pentstemon grandiflorus* (fox glove)  
*Peritoma serrulatum* (rocky-mountain bee-plant)  
*Petalostemon purpureum* (purple clover)  
*Peucedanum graveolens*, *canbyi*, *eurycarpum*, *farinosum*, *geyeri*, and *ambiguum* (biscuit root)  
*Phacelia ramosissima* (sikimona)  
*Philibertia heterophylla* (milkweed)  
*Pholiota praecox* and *caperata* (mushroom)  
*Phoradendron juniperium* (mistletoe)  
*Photinea arbutifolia* (California holly)  
*Phragmites phragmites* (cane grass)  
*Physalis neomexicana*, *fendlerii*, *longifolia*, *heterophylla* and *lanceolata* (ground cherry)  
*Physaria newberryi* (hohoyana)  
*Pinus edulis*, *monophylla*, *cembroides*, *ponderosa*, *lambertiana*, *sabiniana* and *murrayana* (pine nut, piñon, sugar pine)  
*Pleurotus ulmarius*, *ostreatus* (mushroom, oyster mushroom)

- Poa californica* (meadow grass)  
*Podophyllum peltatum* (may apple)  
*Polygonum ramosissimum*, *douglasii* and *lapathifolium* (smartweed)  
*Polyporus applanatus* and *frondosus* (tree fungus)  
*Polystictus versicolor* and *perennis* (bracket fungus, mushroom)  
*Populus sargentii* and *tremuloides* (cottonwood, aspen)  
*Portulaca retusa* and *oleracea* (purslane)  
*Promus virens* (grass)  
*Prosopis juliflora* and *pubescens* (mesquite, screw bean)  
*Prunus demissa*, *americana*, *besseyi*, *nigra*, *angustifolia*, *subcorticata*,  
*ilicifolia* and *hortulana* (plum)  
*Pseudotsuga douglassii* (douglass spruce)  
*Psoralea esculenta*, *tenuiflora*, *hypogaea*, *californica*, *castorea*, *canescens*,  
*orbicularis* and *subacaulis* (tipsin, indian potato)  
*Pteris aquilina* (brake)  
*Quamasia quamash* (camos)  
*Quamoclidion multiflorum* (wild four-o'clock)  
*Quercus undulata*, *macrocarpa*, *rubra*, *garryana*, *lobata*, *virginiana*, *pungens*, *oblongifolia*, *engelmannii*, *michauxii*, *prinoides*, *agrifolia*, *gambelii*,  
*douglasii*, *californica*, *chrysolepsis*, *wislizeni*, *dumosa* (oak)  
*Ramona stachyoides* and *polystachya* (black sage and white sage)  
*Ramunculus aquatilis*, *cymbalaria* and *californicus* (crow foot)  
*Ratibida columaris* (cone flower)  
*Reverchonia arenaria* (patanwuba)  
*Rhamnus purshiana* (cascara sagrada)  
*Rhus trilobata*, *aromatica*, *glabra*, *toxicodendron*, *hirta*, *copallina*, *integrifolia* and *ovata* (sumac and poison ivy)  
*Ribes aureum*, *divaricatum*, *lacustre*, *leptanthum*, *oxyacanthoides*, *americanum*, *cereum* and *inebrians* (currant)  
*Rosa californica*, *fedlerii*, *pratincta* and *nuttana* (wild rose)  
*Rubus leucodermis*, *nuttanus*, *occidentalis*, *strigosus parviflorus* and *vitifolius* (raspberry, blackberry)  
*Rumex hymenosepalus*, *geyeri*, *salicifolius* and *mexicanus* (dock)  
*Russula virescens* (mushroom)  
*Sabal palmetto* (palmetto)  
*Saccharomyces* (yeast)  
*Sagittaria latifolia* and *arifolia* (arrowleaf)  
*Salicornia herbacea* (brittlewort)  
*Salvia polystachya*, *columbariae*, *carduacea*, *tiliaefolia*, *ballataeflora* (sage, chia)

*Sambucus racemosa*, *glauca* and *canadensis* (elderberry)  
*Sanicula tuberosa* (turkey pea, snakeroot)  
*Sassafras officinale* (sassafras)  
*Sidalcea malvaeflora* (wild hollyhock)  
*Scirpus lacustris* and *validus* (bulrush)  
*Scutellaria* (skullcap)  
*Senecio* (squaw weed)  
*Sericotheca dumosa* (a small, round fruit)  
*Shepherdia argentea* and *canadensis* (bullberry, soapberry)  
*Silene acaulis*, *multicaulis* and *scouleri* (catchfly)  
*Silphium perfoliatum*, *laciniatum* (cup plant, pilot weed)  
*Sisymbrium canescens* and *incisum* (hedge mustard)  
*Sisyrinchium bellum* (blue-eyed grass)  
*Sium cicutaefolium* (herb)  
*Smilax herbacea*, *pseudo-china*, *bona nox*, *glauca*, *rotundifolia* and *auriculatum* (Jacob's ladder)  
*Solanum jamesii*, *elaegnifolium*, *fendlerii*, *triflorum*, *douglasii* and *rostratum* (nettle, buffalo bur, native potato, nightshade)  
*Solidago canadensis*, *nemoralis*, *spectabilis*, *missouriensis* and *odora* (golden-rod)  
*Sonchus asper* (saw thistle)  
*Sophia* (tansy mustard)  
*Sophora secundifolia* (frijolillo)  
*Sparassis herbstii* (mushroom)  
*Sparganium eurycarpum* (bur reed)  
*Spathyema foetida* (polecat weed)  
*Sphaeralcea angustifolia*, and *incana* (mallow)  
*Spiraea caespitosa* (*spiraea*)  
*Sporobolus cryptandrus* (rush grass)  
*Stachys palustris* (wound wort)  
*Stanleya albescens* (wild mustard)  
*Stanleyella wrightii* (wild mustard)  
*Suaeda depressa* (sea blite)  
*Talinum aurantiacum* (herb)  
*Thelesperma gracile* and *trifidum* (indian tea)  
*Townsendia arizonica* (herb)  
*Tricholoma equestre* (mushroom)  
*Trifolium ciliolatum*, *gracilentum*, *microcephalum*, *tridentatum*, *obtusiflorum* and other species (clover)  
*Triglochin maritimum* (arrow-grass)

Tripterocalyx wootonii [four-o'clock family]  
 Trisetum subspicatum (grass)  
 Triticum vulvage (plant)  
 Troximom aurantiacum (indian water-cress)  
 Typha latifolia (cattail)  
 Ulmus fulva (slippery elm)  
 Ustilago maydis or zeae (corn smut)  
 Vaccinium caespitosum, membranaceum, scoparium and many other species  
 (blue-berry, bilberry)  
 Vagnera amplexicaulis (false solomon's-seal)  
 Valeriana adulis (kooyah)  
 Verbena hastata (verbena)  
 Viburnum lentago (black-haw)  
 Viola cucullata and pedunculata (violet)  
 Vitis arizonica, labrusca, rupestris, girdiana, monticola, cordifolai,  
 bicolor, candicans and other species (wild grape, fox grape, sugar grape,  
 mustang grape)  
 Washingtonia longistaylis (sweet cicely)  
 Woodwardia radicans (brake fern)  
 Wyethia amplexicaulis (succulent root)  
 Xanthium commune (cocklebur)  
 Xanthoxalis stricta (sourgrass)  
 Ximenesia exauriculata (crownbeard)  
 Yucca baccata, macrocarpa, treculeans, schottii, whipplei, mohavensis  
 and glauca (yucca, soapweed, spanish bayonet)  
 Zizania aquatica (wild rice)  
 Zygadenus nuttalli (lilly)

*List No. 2. Some tropical American plants that were cultivated by North  
 American Indians, or are suitable articles of commerce from  
 the standpoint of content of vitamins*

Achras sapota (chewing-gum tree, sapodilla)  
 Ananas ananas (pineapple)  
 Anona cherimolia, reticulata, muricata, and squamosa (cherimoya, custard  
 apple, sour sop and sweet sop)  
 Arachis hypognea (peanut)  
 Batatas batatas (sweet potato)  
 Bertholletia excelsa (brazil nut)  
 Brosimum alicastrum (bread nut)

*Capsicum annuum* (red pepper)  
*Casimiroa edulis* (white sapota)  
*Cerica papaya* (papaya)  
*Chenopodium quinoi* (quinoa)  
*Chrysophyllum cainito* (star apple)  
*Coccoloba uvifera* (sea grape)  
*Cocus nucifera* (coconut)  
*Coumarouna odorata* (tonka bean)  
*Cucumis angurica* (gherkin)  
*Cucurbita pepo* and *maxima* (pumpkin, squash)  
*Cryptocarya moschata* (Brazilian nutmeg)  
*Erythroxylon coca* (coca plant)  
*Eugenia pimenta* (Jamaica pepper)  
*Ilex paraguayensis* (mote)  
*Lecythis zambucayo* and *amoxonum* (monkey pot, paradise nut)  
*Lucuma mammosa* (lucuma)  
*Lycopersicon lycopersicum* (tomato)  
*Mammea americana* (mammee apple)  
*Manihot manihot*, and *palmata aipi* (cassava)  
*Maranta arundinacea* (arrowroot)  
*Paullinia cupana* (guarana)  
*Pereskia aculeata* (barbados gooseberry)  
*Persea persea* (alligator pear, avocado)  
*Phaseolus vulgaris* and *lunatus* (bean and lima bean)  
*Psidium guayaba*, *montanum* and *cattleyana* (guava)  
*Sapota zapotilla* (sapodilla)  
*Smilax officinalis*, *papyracea* and *medica* (sarsaparilla)  
*Solanum tuberosum*, *muricatum* and *melongena* (potato, melon-pear and eggplant)  
*Theobroma cacao* (chocolate tree)  
*Tropaeolum*, *majus* and *minus* (nasturtium)  
*Vanilla planifolia*, *grandiflora* and *aromatica* (vanilla)  
*Zamia integrifolia* and *furfuracea* (Florida arrowroot, sago)  
*Zea mays* (indian corn)

The foregoing lists contain some plants, such as *Datura* and poison ivy, that are poisonous, but were nevertheless taken internally and may have functioned as a source of vitamins. The Indians used *Datura* as an anesthetic in surgical operations and ate poison ivy in order to de-sensitize themselves. One might suppose that plants

that were considered to be medicines were taken in such small quantities, and so infrequently, that they could not have been important sources of vitamine. The quantities varied of course, but were sometimes considerable, three pints of a decoction often having been given in two days. Diarrhea was very prevalent among the Indians and hence medication was frequent.

The supply of wild plants was by no means unlimited and the Indians are supposed to have cultivated many species. Besides the corn, beans, squashes, pumpkins and potatoes that we have obtained from the Indians, they planted other species. The watermelon is generally supposed to have come from Africa but, according to Gilmore, the Indians of the Missouri River region cultivated a small spherical variety before the introduction of the modern varieties. Indians planted Jerusalem artichokes and sunflowers, and aided in the distribution of many wild fruits and land and water plants. Whether the Indians tilled the soil in the case of the latter seems doubtful, but they are said to have protected them. The Indians of the Pacific Coast did not cultivate the soil, but they lived largely on plant food. Their habit of gathering roots resulted in the name "Digger Indian."

From the standpoint of vitamins, the mode of preparation of food is of importance. The Indian method of boiling corn in potash or lime-water may have lessened the vitamine content in the corn but, since the boiling was applied to the whole grain, probably considerable water-soluble vitamine was left in it. Corn was eaten whole after this treatment or ground while wet. Mexicans grind wet corn on the metate, but some of them take the wet corn each day to an ixtamal mill and have it ground by power. Some Indians ground the corn in the dry state. Acorns were soaked in water after grinding, a process that probably removed much of the water-soluble vitamine. The great superiority of the Indian method of milling was due to the fact that the germ was not removed. The germ that contains the vitamine is removed from nearly all the cereals we eat, and fed to stock. This is good for the stock, but no one has been able to prove that it is good for us.

The antiscorbutic vitamine is the most perishable and difficult to store for winter. Drying of most vegetables destroys this vita-

mine. Only very acid foods, such as tomatoes or some fruits, have been shown to be antiscorbutic in the dry state. The Indian kept antiscorbutics for winter in the form of dried fruits and fresh foods. Not only were roots and tubers stored for winter, but such perishable things as watermelons were stored by wrapping in yucca leaves and suspending from the rafters.

The fact that Indians were well supplied with vitamines does not prove that vitamins are responsible for good teeth but suggests at least that the subject is worthy of further study. Many of the foods eaten by Indians required more mastication than ours. "Chewing" is considered bad manners by us and is discouraged in many ways. We have developed such a fear of germs that we discourage our children from "chewing" many raw plants that were "chewed" by Indians.

From consideration of the data compiled by Pickerill one might suppose that a good definition of a civilized man is a man with carious teeth. From this standpoint the Mexican is not completely civilized and we may have the opportunity of studying the process of his civilization. The difficulty in studying the question experimentally on animals is due to the fact that few animals are sufficiently civilized to develop caries, although old dogs frequently have pyorrhea.

### III. SUMMARY

North American Indians had good teeth. This condition was probably due to complete adequacy of diet. The Indians ate a greater variety of foods than is generally supposed. Their vegetable foods were of such nature, and so preserved and prepared, as to furnish all three classes of vitamins. Since lack of vitamins causes changes in the teeth (scurvy) or improper development of the teeth (rickets), the abundance of vitamins in the diet of Indians probably had much to do with the state of their teeth. These are merely suggestions intended to stimulate research along this line.



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