

# Parallelism in alkaloid-alkali quids

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The chewing of the Areca nut, tobacco, coca, and pituri with lime substances in discontinuous areas of the world has caused many enthusiastic diffusionists to include these customs among their world-wandering traits. Even such a cautious investigator as Wissler comments that the distribution of tobacco-lime and coca-lime chewing in Americas and betel-chewing in Melanesia and southeastern Asia is "truly puzzling."<sup>2</sup> It is not the purpose of this article to survey the whole problem of the possibility of the diffusion of traits across the Pacific, as it has been dealt with in some detail by Dixon<sup>3</sup> and others to the satisfaction of most American anthropologists. However, as the case for diffusion rests largely upon the reoccurrence of fortuitously associated traits, the association of these various alkaloids with lime in chewing quids seems to present a perplexing problem in spite of arguments against possible modes of diffusion. If the traits of the complex can be shown to be functionally, instead of fortuitously, related, the case for diffusion is markedly weakened. Such a functional relationship can be indicated in all the cases of alkaloid-alkali quids.

The distribution of these customs is indeed wide. The nut of the Areca catechu palm is chewed with the leaf of Piper betel and lime from burned coral or shells in Melanesia, Malaysia and southern India.<sup>4</sup> There are regional variations, such as the substitution of Piper methysticum leaf or fruit in Melanesia for Piper betel leaves.<sup>5</sup> Betel chewing is considered by all observers as a mild stimulant. The chew imparts a bright red color to the saliva, which is caused to flow copiously, and habitual users tend to lose their teeth through recession of the gums. In nearby Australia, pituri (Duboisia hopwoodii) is chewed, mixed with ashes, in Queensland and the southern part of the continent.<sup>6</sup>

Turning to the Americas, two types of alkaloids are found with lime in chewing quids: coca and tobacco. Of over eight species of coca plants, [618] Erythroxylum coca and Erythroxylum truxillense, the only species containing appreciable amounts of cocaine, are those which are chewed with lime by the natives of Western South America. In the adjacent Amazonia and Orinoco areas, tobacco and lime are similarly chewed.<sup>7</sup> In both cases, the quids are explicitly chewed for their stimulating effects. A similar effect is obtained by the Eskimo by chewing tobacco with the ash of a tree fungus. This is known to be recently acquired trait, but the history of the acquisition is in doubt. The plant which the nearby Tlingit and Haida chewed with lime was, in all probability, not tobacco.<sup>8</sup> Tobacco was swallowed with lime by various California groups, apparently as an emetic. The tobacco-lime chew reappears as a stimulant in the valley of Mexico, where it was used by the priests.<sup>9</sup>

The element of similarity in these diverse customs, namely the chewing for stimulation of an alkaloid with an alkali, gives the obvious clue to the functional relationship of these

factors in the trait complex. There is a definite chemical necessity for the alkali in the quid if the stimulant in the alkaloid is to become physiologically active.

The chemical factors involved in the betel chew are the most complex. The Areca, or so-called betel nut, contains from .3% to .6% of arecoline. It also abounds in tannic acid. Arecoline is the stimulant, the effect of which is desired by the natives. It is released from the compound in which it is held by the addition of an alkali. Its commercial preparation involves the same principle which the natives utilize.<sup>10</sup> Further evidence that this actually takes place in betel chewing is to be found in the increased salivation, a definite effect of arecoline stimulation. The red color imparted to the saliva proves that the mouth is really alkaline as this "Areca red" is formed in the decomposition of tannin and is only soluble in alkaline solutions.<sup>11</sup> Catechu, another substance found in Areca, dissolves in a strong alkali. The strong astringent properties of this catechu may account for the gum recession accompanying betel chewing.

Pituri and tobacco can be discussed together, as the stimulant in each is nicotine. Again, in the laboratory preparation of nicotine, it is known [619] that a strong inorganic base frees the weak organic base, so lime is used to obtain the nicotine from tobacco. The same chemical principle would apply to freeing the nicotine in pituri.

A similar situation is found in the case of coca. The cocaine is commercially extracted from the plant by digestion with lime or sodium carbonate. The alkaloid passes into the solvent from which is removed by a slight excess of hydrochloric acid.<sup>12</sup> These conditions are duplicated in the chewing of coca with lime and swallowing the saliva so that the dilute hydrochloric acid in the digestive juices can free the stimulant.

The foregoing analysis of the chemistry involved in the commercial preparation of alkaloid stimulants from the plants which the natives chew with lime shows that the aborigines have hit upon the same basic principle, the only one which makes the chewing of these alkaloids desirable at all. It follows, therefore, that the occurrence of an alkaloid stimulant and lime in the same quid is not like mint flavor and chewing gum, a fortuitous associations of traits, but is a logical and functional complex like the paddle and the canoe. The case for independent parallel development is, therefore, enhanced. Other factors, such as continuity of area and probably of contacts, must still be considered in deciding whether two instances of alkaloid-alkali chewing are the result of diffusion or independent invention. This is apparent in the contiguous area of coca- and tobacco-chewing in South America.<sup>13</sup> However, where conditions conducive to diffusion are apparently lacking, there need no longer be hesitancy in claiming independent invention.

## References

<sup>1</sup> The writer is indebted to one of his students, Mr. Donald Simmons, for assistance in this study.

<sup>2</sup> Clark Wissler, *The American Indian* (1938), p. 25.

<sup>3</sup> R.B. Dixon, *The Building of Culture* (1928).

<sup>4</sup> C.D. Forde, *Habitat, Economy, and Society* (1937), p. 191.

<sup>5</sup> A.B. Lewis, *Ethnology of Melanesia* (Field Museum of Natural History, Anthropology Guide, Part 5, 1932), p. 66.

<sup>6</sup> Dixon, *op.cit.*, and E.D. Merrill, *Tobacco in New Guinea* (*American Anthropologist*, 32), pp. 101-105. Notable is the fact that a species of tobacco native to Australia was never utilized by the aborigines. (See Merrill).

<sup>7</sup> Ralph Linton, *Use of Tobacco Among the North American Indians* (Field Museum of Natural History, Anthropology, Leaflet 15, 1924), p. 2.

<sup>8</sup> R.B. Dixon, *Tobacco Chewing on the Northwest Coast* (*American Anthropologist*, vol. 35).

<sup>9</sup> *Ibid.*

<sup>10</sup> F. Chemnitius, *Zur Herstellung des Arecolins* (*Journal für praktische Chemie* 117), pp. 147-50. The ground areca nut is put in a 10% potash solution to free the arecoline. H.C. Wood and C.H. La Wall, *U.S. Dispensatory* (1937). Here a 10% solution of sodium carbonate (an alkali) is suggested to first free the alkaloid.

<sup>11</sup> Wood and La Wall, *op.cit.*

<sup>12</sup> C. Ainsworth Mitchell, *Allens Commercial Organic Analysis* (1929), vol. VII, p. 510.

<sup>13</sup> Ralph Linton, *op.cit.*, indicates that tobacco-lime chewing was borrowed from coca-lime chewing.