The Chewing of Coca Leaves in Peru

Dr. Vicente Zapata-Ortiz

PROFESSOR OF PHARMACOLOGY
UNIVERSIDAD PERUANE CAYETANO HEREDIA
P.O. BOX 5045, LIMA, PERU

The chewing of coca leaves was practiced in Peru in remote times, possibly before the Incas. Nevertheless, in the opinion of chroniclers of the conquest of Peru by the Spaniards, the cultivation and use of coca was very restricted at that time, so that chewing was a privilege of the Inca aristocracy, who consumed coca during official and religious ceremonies. According to the chronicler Santillán and also the Viceroy Francisco de Toledo, after the Spanish conquest limitations on coca use and cultivation were removed, and coca became a lucrative business. An idea of the extent of coca use following the conquest can be gotten from the fact that in the mines of Potosí alone 100,000 baskets of leaves were consumed in 1583.

The spread of coca addiction during the first year of the conquest was not unnoticed by the Spaniards, and some of them tried to control it. Thus, the Marqués de Cañata issued ordinances to restrict its cultivation and during the Council of Lima (1567–1569) the use of coca for religious purposes was disapproved. Santillán and Falcón regretted its propagation, especially Falcón who proposed measures to eradicate the habit, etc. On the other hand, several ordinances from the Vicerroys (1570, 1571, 1574) authorized coca cultivation.

The widespread use of coca can be attributed to several factors: (1)
the considerably diminished food supply, (2) the obligation to do forced labor, particularly in mines, (3) the feeling of conformity and artificial well-being experienced by those who used coca, which allowed them to block out feelings of inferiority to the conquering Spaniards, and (4) the incentive provided to the producers of coca because of the income derived from the trading of coca leaves.

The exact number of people addicted to coca is unknown, but at the present time in Peru and Bolivia it is probably 6,000,000. Its use occurs principally in these two nations, but it also extends to some neighboring countries. The habit is common among male adults in the Andean countryside, and is also observed among women.

**THE CONSUMPTION OF COCA LEAVES**

The majority of users consume 30–50 g of coca a day, distributed into three of four treats. There are a few users who consume as much as 200 or more grams a day. In general, users are initiated in the chewing of coca between 12 and 14 years of age, that is to say, when they begin to work in the fields. The habit usually continues for the rest of their lives. They start with small amounts, but soon reach the daily level of 30–50 g. That amount is generally not exceeded as happens with opiate addition or other toxic drugs.

It has been estimated that in Peru about 8,500,000 kg of coca leaves are consumed per annum, but taking into consideration that the control of this plant is very difficult due to the fact that it grows in inter-Andes valleys, and that the means of communication are difficult, the real consumption of leaves probably exceeds the indicated amount.

If the amount of cocaine contained in the coca leaves of Peru varies between 0.4 and 0.9%, then taking 0.5% as an average the consumption of cocaine through the mastication of coca leaves in Peru reaches 40,000 kg per annum, a figure which is 25 times larger than the amount of cocaine needed for medical purposes in the whole world [according to the International Narcotics Control Board (U.N., 1969) this amount in 1969 was only 1,702 kg].

**ABSORPTION AND ELIMINATION OF THE ALKALOIDS OF COCA**

During chewing, an average of 86% of the alkaloids contained in the coca leaves are ingested while the remaining 14% are put aside in the residue.
In general, coca chewers ingest between 150 to 250 kg of cocaine in 24 hr (Ciuffardi, 1948, 1951; Zapata-Ortiz, 1944). During the chewing, they add alkaloid substances to the leaves—sometimes lime, sometimes vegetables prepared in shape of bowls or rolls, very rich in potash, calcium, sodium, magnesium, etc., whose solutions are rich in alkaloids (Cruz-Sanchez and Guillen, 1949). The reason for using these alkaloid substances is to facilitate the liberation of cocaine and other alkaloids for absorption through the intestinal tract. The desired effects occur when chewing is done with the added alkaloid substances, but delayed, weak, or no reactions occur when no alkaloid, or acid substance, is employed (Ciuffardi, 1949; Chamochumbi, 1949; Salomon, 1949).

It is not positively known what happens to cocaine during chewing. It is believed that a large portion is hydrolyzed and transformed in the liver. According to Ciuffardi (1951) cocaine metabolism could be investigated through urinalysis. The alkaloid substances that are concurrently ingested seem to have an important influence on urine elimination of cocaine. It has been shown that elimination in people who are not addicted is 10 to 20% during the first 6 hr following ingestion for those who do not use alkaloid substances, but this increases to 21 to 24% when the chewing of coca leaves is done concurrently with alkaloid substances (Cruz-Sanchez, 1949).

On the other hand, Montesinos (1965) concluded that cocaine ingested in this manner undergoes hydrolysis by the alkaline substances that are used during chewing and by the different gastro-intestinal substances; it is first transformed into benzyl-ecgonine and finally into ecgonine. According to these authors, the amount of cocaine is considerably reduced before being absorbed by the intestine, and the little that it is absorbed is totally transformed in the metabolites indicated; finally, ecgonine is the only metabolite that is eliminated in the urine.

Though these studies are very interesting, they do not constitute a clear demonstration of the fate of cocaine ingested during chewing, because Montesinos' studies were done in vitro, submitting cocaine to the action of artificial gastric, pancreatic, and intestinal juices and extracts of the intestinal mucus of dogs. We believe that these in vitro studies cannot be equated with what normally occurs in the human organism because (a) the canine digestive substances are much more active than those in humans, (b) in the human digestive tract, although cocaine comes in contact with intestinal juices and enzymes, at least part of it is undoubtedly absorbed before digestion is complete and passes unmodified into the blood, and (c) likewise, some cocaine must also escape.
the action of the liver. In any case, cocaine and other alkaloids of coca are eliminated in the urine, which makes clear that cocaine contained in coca leaves is absorbed in the gastro-intestinal tract and distribution in the blood to other organs and tissues. But it must be borne in mind that considerable differences exist between those who chew coca leaves and those who take cocaine directly. In both cases cocaine is responsible for the effects, but the intensity of the addiction depends in great part upon how the drug is taken: cocaine is most effective when taken parenterally, less so when taken orally. In users of coca leaves, symptoms are more attenuated, and in general they do not lead to the acute toxic accidents that are frequent among those addicted to cocaine. That is to say, the symptoms of addiction to coca leaves, although chronic, are weak, and the individual can disregard the habit at ease. However, individuals who consume more than 100–200 gm a day present an observable abstinence syndrome when deprived of the drug.

EFFECTS OF THE MASTICATION OF COCA LEAVES

The acute physiological effects of coca include acceleration of the pulse, a mild rise in blood pressure, blood sugar, body temperature, and basal metabolism; a mild increase in respiratory rate and muscle reflexes; prolongation of reaction time (Chamochumbi, 1949; Gutierrez-Noriega and Zapata-Ortiz, 1948, 1950; Zapata-Ortiz, 1944) and increased resistance to fatigue, hunger, sleep, cold, etc. These last effects are exactly the ones that coca users value in facing the difficult conditions to which they are exposed. The acute effects of coca on mental activity are more subtle, but large doses alter thoughts and affect perception.

With respect to chronic physiological changes, it is difficult to assess the consequences of coca chewing in a population also suffering from alcoholism, malnutrition, and bad sanitary conditions. It is clear that the health of those who chew coca is deficient (Gutierrez-Noriega, 1948). Coca users commonly exist in miserable living conditions; and coca use is related to this.

Chronic psychological alterations associated with coca use are marked. In 1950, we (Gutierrez-Noriega and Zapata-Ortiz, 1950) studied the intelligence, culture, and personality of some coca users. In order to measure intelligence, we used the Binet-Simon test. We obtained very low percentile scores—never exceeding 90% and for the most part between 50% and 70%. To reduce errors derived from the misunderstanding of questions, since the majority of the people chewing coca lack
knowledge of the Spanish language, we had to rely on interpreters; results were always lower than normal. To avoid the possibility that low results were caused by a lack of communication, we repeated the study using the Terman, McCall, and Lorge "No Language Multimental Test," as well as the "Porteus Labyrinth," since these are tests in which no words are involved. The Terman test results were even lower than those obtained on the Binet-Simon. The former is a figure test which demands more abstract reasoning than the other test; unfortunately in coca addicts there is a noticeable deficiency in this type of ability. The Porteus Labyrinth test results were somewhat better, but always within the subnormal range.

There is a relationship between measured intelligence and the length of coca use: the longer the time of the addiction, the lower the mental age. Teachers from the mountain regions where coca is most consumed feel that children who have this habit suffer from intellectual impairment, but they can almost always recover if the chewing of coca leaves is stopped. It should be noted that a high percentage of coca users are almost illiterate, with little knowledge of the Spanish language. For example, in the southern mountains of Peru, there is a high proportion of Spanish illiteracy, Quactus and Simare being the languages most frequently used. In addition, the Hamburg Test of attention shows a correlation between the diminishing of attention and the duration of coca addiction. In a study of the personality of coca users Gutiérrez-Noriega (1950b) found that most were apathetic, maladjusted, hypo-affective, indifferent, and showed lessened intellectual capacity. Some others were egocentric, and a small minority were introverted. The latter seemed to show a higher intelligence and a less serious addiction to coca.

Undoubtedly additional factors exist that act unfavorably upon intellectual development. Alcoholism, a lack of education, geographical and social isolation, poor nutrition, etc., are all important factors, but coca use seems to be the most important. Confirming this is the recent work of Negréte and Murphy (1967) who performed a detailed study in the North of Argentina using a group of men who did agricultural work. These men had an age range of 25 to 49; one group was composed of coca chewers, while another group did not chew coca. Both groups were similar regarding social environments, etc. To eliminate the psychological deficiencies not attributable to coca use, subjects were rejected who showed any history of mental disorders, or any head lesions, epilepsy, diabetes, or other physical illness that could influence the functioning of the brain. People who consumed alcoholic beverages frequently or in
excess were also eliminated. Both groups were given the following tests: (1) brief scale of oral intelligence, adapted from the one of Kent, (2) auditory memory tests consisting of two short narratives, modeled on the Machsler scale, (3) visual test, after Munn, (4) two figure-completion tests, (5) two tests on similarities of objects, (6) the Knox cubes test, used to determine the degree of attention, (7) the Seguin joining test, and (8) a designing test with blocks. Performance on these tests was very low in the coca users in comparison with those who did not chew coca leaves. Negréte reported that “the coca consumers have certain psychological disadvantages, which cannot be attributed to anything but to the coca . . . it is unquestionable that the use of coca is connected to a diminishing in mental activity.”

**COCAISM AND NUTRITION**

Mention should be made of the connection between coca use and malnutrition. Suppression of the sensation of hunger, one of coca’s characteristic effects, is the most common reason for which most coca chewers begin its use. It must be made clear that although some vitamins exist in coca leaves as in other green leaves, coca is not a nourishing food. In a study done by Gutiérrez-Noriega (1948) it was shown that in some regions of Peru where food is less plentiful, the rate of addiction is higher. On the average coca users consume fewer calories than non-users. This deficit is often observed in addicts who live in the mountain ridges of the south and who consume large amounts of coca. Their diets lack meat, milk, fruits, etc., and consist mostly of farinaceous products.

The relation between cocaism and the shortage of food is significant because it indicates that the lack of food is the principal cause of cocaism. Thus any effort to eradicate coca use must be accompanied by improved nutrition. Years ago we did some brief experiments along these lines. In Huancayo, a town in the Peruvian Andes where coca is used, we put a group of coca users under strict surveillance, and provided them with proper food, adequate sanitary conditions, and shelter. We were able to verify that they began giving up coca use as their nutrition improved. Another example is the Peruvian army, which includes a high percentage of natives of the Andes. These people tend to quit cocaism as soon as they join the army; this not only happens among the soldiers that are stationed in the coastal district, but also among those who remain in the mountains. The reason is obvious: in the army they have proper food and better living conditions. But two
or three years later, when they are discharged from the army and return to their shacks where they meet malnutrition and poor living conditions, they begin to chew coca leaves again.

CONCLUSION

The chewing of coca leaves is a habit that should be eradicated. Toward this end, actions are being taken in Peru, such as the progressive reduction of the seeding of coca; we hope to accomplish the total extermination of the coca plantations. The alkaloids, including cocaine, are no longer therapeutically needed (W.H.O., 1969), because the anesthetic effect can be obtained with other synthetic local anesthetics. Simultaneously, it is necessary to intensify an educational campaign among coca consumers, particularly in the schools, about the dangers of coca use. It is also essential to improve housing and working conditions, roads, etc., and while this is being done, to improve nutrition by substituting nourishing crops for coca on the plantations. This conclusion was reached by the Expert Committee sent by the United Nations to Peru and Bolivia in 1949 (United Nations, 1950). In their report they pointed out that with some variation from one region to another it is possible to harvest economically, on the lands now being used for coca, coffee, tea, sugar cane, yuca, rice, limes, grapefruit, peaches, grapes, etc.

We hope that these measures, many of which are already being put into practice, will liberate the large section of our population made up of coca users from the obstacle that this habit presents to their economic, cultural, and social development.

REFERENCES


