

# CURRENT STATUS OF ENDEMIC GOITER AND SALT IODIZATION IN COLOMBIA

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Colombia, with an area of 1,138,000 km, is bounded by two oceans and five republics (Panama, Venezuela, Peru, Ecuador, and Brazil). Physically, it is divided into two clearly defined areas: an Andean zone, located in the west of the country, which is above 1,000 meters, and the eastern plains found below 1,000 meters.

## Background

As early as the sixteenth century, chroniclers of the Colony in the New Kingdom of Granada noted the frequent presence of goiter among inhabitants of the various Colombian regions. The endemia was characterized as extending the length of the Magdalena River, as far as the confluence of the Cauca River. The eastern region of Colombia also was described as a goiter zone.

There has been heightened interest in the subject of goiter in this century. Between 1945 and 1948, a national study of goiter was conducted under the direction of Dr. Parra H. He surveyed 385 municipalities and found a general prevalence of 52.6%; his sample included 183,243 students of both sexes. The Department of Caldas was the most affected, with a prevalence of 81.1%.

The consumption of iodized salt as a means to prevent goiter was first recommended by Boussingault, a French scientist. He analyzed salt containing iodine from the region of Heliconia (Antioquia), and noted that inhabitants

who consumed it had a much lower prevalence of goiter than those who did not.

In May 1950, the manufacture of iodized salt was begun, with a monthly output of 300 tons. The iodized salt was used in a pilot experiment in seven towns of the Department of Caldas, chosen for their very high prevalence of goiter in the 1945-1948 national study. Two years later, the National Institute of Nutrition completed another study of schoolchildren from the same seven towns and determined that the general prevalence of goiter was 33.9%. This percentage, compared with the previous figure, demonstrated the effectiveness of iodization.

Decree 0591/55 officially established iodization in salt for both human and animal consumption in Colombia, at an iodide content of between 50 and 100 parts per million. In 1959 the state administrative unit, the Concesion de Salinas, acquired its refinery, which produces the greatest quantity of iodized salt consumed in the country. The National Institute of Nutrition assumed control of iodization in 1960.

A study of more than 10,000 persons, completed in 1960 by the Institute, found the prevalence of goiter in persons under 15 years of age was 41%. The content of iodine in salt was variable, but was less than the levels considered adequate to prevent goiter.

In 1965, a clinical examination was conducted of 12,166 schoolchildren from the same seven towns of Caldas. This examination uncovered a prevalence of 1.8%; 0.8% using the WHO classification.

In late 1966, 712 salt samples from 119 towns were studied. Of the samples analyzed, 599 (84.1%) were from salt that had been refined and iodinated, and 113 (15.9%) were

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from noniodinated salt. The averages of iodine in the salt varied between 42.0 and 60.4 parts per million; noniodinated salt did not exceed nine parts per million.

The role of the legislature was important in efforts to prevent the endemia. Legislative interest was demonstrated in the 1940s through establishment of iodization standards, the formulation of directives stating that salt should be iodinated, and the categorization of geographical zones as goitrous.

#### Centers for Salt Mining and Manufacturing

The sea and the land are the two natural sources of salt in Colombia. Marine salt is obtained from evaporation of seawater by the wind and sun. Salt on the land is obtained from brine springs, from treatment of rock-containing salt, or by mining. In the first two instances, the manufacturing process is carried out in an artesian manner through the evaporation of brine, using such combustibles as mineral carbon, vegetable carbon, or wood. Wood, however, involves industrial treatment of the brine.

The geographical sites of salt production and manufacture in Colombia are as follows: marine salt, Manaure and Galerazamba; land salt, Zipaquira (mine); Nemocon (water-salt, industrial process); Upin (water-salt, heated); and brine springs, Salinas (Casanare), Heliconia (Antioquia), Valle del Patria (Cauca-Narino), and Riosucio (Caldas). With the exception of the salts of Heliconia, none contain acceptable amounts of iodine in their natural state.

The industrial manufacture of salt is carried out in two plants—Mamonal on the Atlantic coast and Betania in the central zone of the country. Two state entities handle the industrial management of Colombian salt. The Concesion de Salinas administers the production centers and sells granular salt from Manaure to the firm Alcalis de Colombia, to be processed in Mamonal and brine from Zipaquira and Nemocon to be processed in Betania. From Alcalis de Colombia, the Concesion

de Salinas obtains the final product to be sold in the country.

#### Systems of Iodization

Iodine is added to salt in only two places: Betania and Mamonal. Salt iodization is carried out using potassium iodide inserted into the production process after concentration and before drying the salt. Since this system transports variable amounts of salt on the conveyor belts, the mixing of salt with iodine is not perfect. Such imperfections have been confirmed by laboratory analyses at the plant level.

#### Production, Marketing, and Laboratory Analysis of Salt

##### *Production*

The average volume of salt production between 1976 and 1981 was 1,128,000 tons. Of this amount, 15% was iodinated. The 1955 standard, which legislated that salt for human and animal consumption should be iodinated, has thus not been met.

##### *Marketing*

Two channels for salt marketing exist in the country:

- (1) The official market is supervised by the Concesion de Salinas. It uses the company's network of stores and sells directly to the Caja de Credito Agrario, industries including the cattle industry, and major distributors.

- (2) The non-official channel starts in the Salinas de Manaure where salt is harvested twice a year by natives of the region. This salt is then used for direct sale or barter. It is transported to different parts of the country, especially Bucaramanga, where it is milled, packed, and distributed for human consumption. The unrefined salt from Manaure has high grades of impurities and costs less. Its availability has altered the national market

and adversely affected the economic status of the Concesion de Salinas, the income of the Colombian Institute of Family Welfare for nutrition programs, and, above all, the health of the Colombian people.

Salt obtained from salt ponds by small producers is sold without iodization, supposedly for animal consumption. These ponds are often found in areas, such as Casanare, that are remote and difficult to reach.

#### *Laboratory Analyses*

The Colombian Institute of Family Welfare exercises control and supervision at two levels—the plant level and the consumer level. It supervises the plant in Betania, as well as oversees consumer requirements, an area added in March 1983. The latter includes urban and rural consumption and industrial markets. In April 1983, the Institute extended its control to include the plant at Mamonal, while suspending consumer sample reports and revitalizing the collection of salt samples from major distributors located in the capital cities of each one of the departments, administrative agencies, and police stations.

Between 1964 and 1982, the plant at Betania averaged the recommended 50 ppm of iodine only in the years 1964, 1965, 1966, 1968, 1977, and 1982. In 1981 the average fell below 30 ppm. Analyses of humidity levels show it to be very stable and low. Ninety-four percent of 937 samples taken by the Institute since March 1983 did not reach the recommended iodine levels for consumers. Of 439 samples received from major distributors since April 1983, only 144 met the recommended levels; 295, or 67%, did not meet the appropriate levels.

Inadequate iodization of commercial salt, along with the introduction of contraband uniodinated salt, therefore is hampering the effective provision of iodized salt prophylaxis in Colombia.

#### **Program Considerations**

##### *Difficulties*

There are a number of difficulties inherent in the salt iodization program in Colombia. They include:

(1) Programs for prevention and control of endemic illnesses, such as endemic goiter, are not carried out effectively.

(2) The state has failed to complete legislation on salt iodization as a preventive measure.

(3) Information on the magnitude of the endemic goiter problem is inadequate.

(4) The production, processing, and distribution of salt has ceased to be a monopoly of the state.

(5) Plans for surveillance of iodization do not follow a defined structure.

##### *Options*

Options under consideration to improve the program are:

(1) The magnitude of the recognized problems could be reevaluated in order to determine the prevalence of goiter.

(2) The health care, salt iodization, and salt marketing systems, including packing and distribution, could be evaluated.

##### *Actions*

The following actions could be taken:

(1) The scheme of control at the Colombian Institute of Family Welfare should be redefined.

(2) Studies for detection of congenital hypothyroidism could be conducted by the Universidad Nacional.

#### **SUMMARY**

Endemic goiter has been present in Colombia since antiquity. Efforts in the 1950s led to iodization of salt at 50 ppm, and a decline in

goiter prevalence resulted. In recent years, however, the levels of iodine have been inadequate in salt samples, and noniodinated salt has become increasingly available. Currently,

the need exists for an updated goiter survey and for reevaluation of the iodization, marketing, and surveillance of salt.

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