

*Division of Health Systems and Services Development  
Organization and Management of Health Systems and Services Program  
Regional Program on Oral Health*

## **Progress Report on the Assessment of the Guatemalan Salt Fluoridation Program**

*Prepared by:*

*Mr. Trevor Milner  
Fluoridation Engineering Consultant for PAHO*

*Dr. Saskia Estupiñán-Day  
Regional Advisor in Oral Health, PAHO*

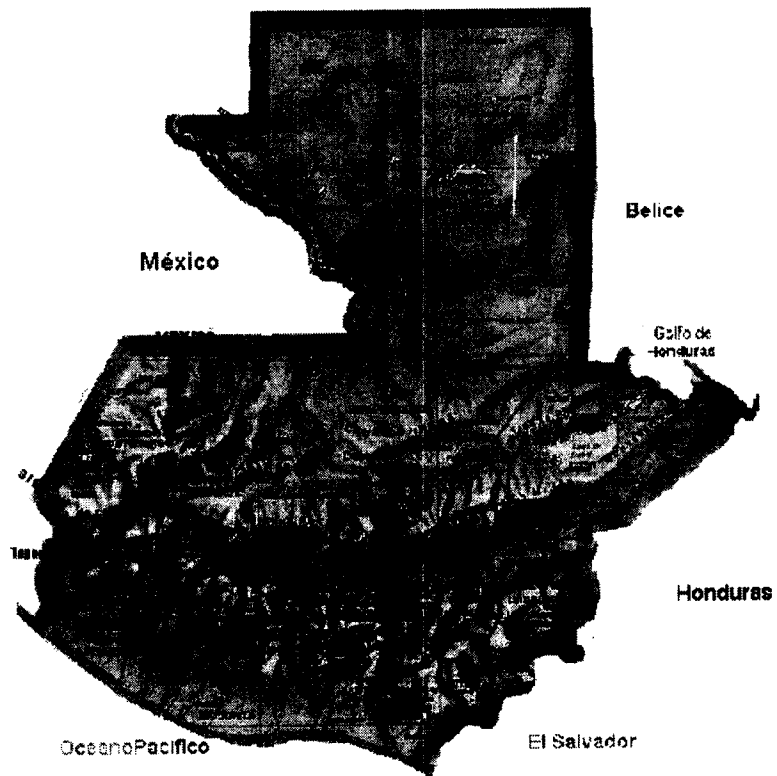
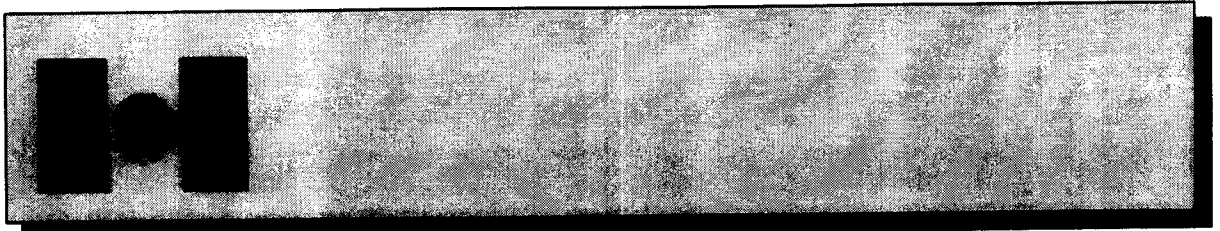


**Pan American Health Organization (PAHO)  
World Health Organization (WHO)**

**January 1999**



Pan American Health Organization  
Division of Health Systems and Services Development  
Regional Program of Oral Health



Prepared by: Trevor Milner, PAHO  
Mary Tere Salas, PAHO \* -INCIENSA  
Ivania Solórzano, PAHO\* - INCIENSA  
September, 1998





# CONTENTS

CONTENTS	PAGE
GENERAL INFORMATION.....	4
1. INTRODUCTION.....	6
BACKGROUND .....	6
TERMS OF REFERENCE.....	6
2. NATIONAL ORAL HEALTH SITUATION.....	8
ORAL HEALTH STATUS .....	8
ORAL HEALTH INFRASTRUCTURE .....	10
3. DESCRIPTION OF PRESENT SALT FLUORIDATION PROGRAM.....	12
NATIONAL ORAL HEALTH COMMITTEE.....	12
BASELINE STUDIES .....	12
FLOURIDE CONCENTRATION IN WATER .....	12
PREVALENCE OF DENTAL CARIES.....	13
PREVALENCE OF DENTAL FLUOROSIS .....	13
URINARY FLUORIDE EXCRETION.....	13
SALT CONSUMPTION.....	14
OTHER SOURCES OF FLUORIDE.....	14
4. STATE OF SALT INDUSTRY .....	15
5. LEGAL SITUATION.....	20
6. NATIONAL SURVIELLANCE PROGRAM .....	21
7. CONCLUSIONS.....	22
8. RECOMENDATIONS.....	24
9. APPENDICES .....	25
10. BIBLIOGRAPHY .....	35



**REPORT on the ASSESSMENT OF the GUATEMALAN SALT FLUORIDATION PROGRAM.**

This report assesses the progress attained by Guatemala in the planning and implementation of a Salt Fluoridation Program.

PAHO's current Oral Health Strategy proposes to help countries reach a level where improvements in the indicators of oral health are made and preventive policies predominate. The strategy is based on an oral health development typology that classifies countries in the Latin America and Caribbean Region using the most current epidemiological surveillance and the existence of national policies to promote fluoridated salt as a preventive intervention.

This report summarizes the different aspects of a visit made by consultants to the Pan American Health Organization to assess the progress towards salt fluoridation in Guatemala. It focuses on the most important findings and provides recommendations for the consideration of the Ministry of Public Health and Social Assistance, the Ministry of Social Security of Guatemala, the National Committee for Food Fortification, (CONAFOR), the National Salt Producers Association, (ANSAL) as well as the joint National Committee of Oral Health, (CONASABU), which is responsible for the program of Salt Fluoridation.

This evaluation could serve as a framework to develop appropriate, effective and efficient policies to implement a program of salt fluoridation for the Guatemalan people.

## **GENERAL INFORMATION**

### **Guatemala Fact Sheet**

#### **Demographic Indicators:**

Land Area:	108,000 sq. km (42042 sq. mi.).
Population:	11.56 million (1998 estimate)
Population Growth:	2.6% per annum 1987-1996
Cities:	Guatemala City, 2.0 millions
Urbanization:	39.8% of population live in towns or urban centers.
Ethnicity:	Indigenous 41.7% Mestizos & Other 55.7%
Crude Birth Rate	36.1 per 1,000 inhabitants (1998)
Crude Death Rate	6.6 per 1,000 inhabitants (1998)
Fertility	4.9 live births per woman
Life Expectancy at Birth	64.9 male, 70.0 female (1998)

#### **Socio-Economic Indicators:**

##### **(a) Economy**

Labor Force	Total 3.1 million; agriculture 60%, services 14%, manufacturing, mining & construction 18%, Other 6%, (1995).
GNP Per Capita:	US\$1470 per year (1996)
Annual Growth Rate:	3%
External debt:	US\$ 3.9 billion (1997)
Exchange Rate:	6.3 Quetzal per US\$ (Sept 1998)
UNDP-HDI:	0.615, rank 111 <sup>th</sup> of 174 countries



(b) Health Indicators:

Maternal Mortality: 190 per 100,000 live births, (1992 to 1997)

Infant Mortality: 37.7 per 1,000 live births (1997)

Morbidity of Selected Diseases:

<u>Diseases</u>	<u># of Cases</u>
Tuberculosis	39.1 (incidence per 100,000 population)
Measles	8 (cases)
Malaria	32099 (reported)
Cholera	1263 (reported)
Dengue	5385 (confirmed)
AIDS	14.1 (incidence per 1million population)

Resources

Physicians per 10,000 pop.....	9.3
Nurses per 10,000 pop.....	2.7
Dentists per 10,000 pop.....	1.3
Hospital beds per 1,000 pop.....	1.1
Medical Schools.....	2
Dental Schools.....	3

Immunization Coverage: DPT3 78%; OPV3 78%; BCG 94%; measles 74%

Expenditure on Health: \$56 per capita, 4.2 % of GDP (1995)

DMFT 10.1, 5 -17 year olds, (1985)  
7 3 -17 year olds, (1991)

# 1. INTRODUCTION

## **1.1 BACKGROUND**

A conference entitled “Taller Regional de Vigilancia Epidemiología y Control de Calidad de los Programas de Fluoruración de la Sal” was held in Quito, Ecuador from the 27<sup>th</sup> to 30<sup>th</sup> July 1998. Attendees who in the main were functionaries of their countries oral health departments were updated on the progress of salt fluoridation programs in the region. In addition the protocols and procedures which have been developed and modified based on the experience of the existing programs were presented in detail to those in attendance. Therefore a number of countries that are in the decision or beginning stages of a salt fluoridation program were exposed to the details of developing one.

Guatemala has been for several years contemplating a salt fluoridation program. As a matter of fact, they were among those countries taking the lead to push for programs of salt fluoridation in the early eighties. This culminated with a conference in 1986 on salt fluoridation in Antigua, Guatemala. Unfortunately since then the goals of fluoridation that were set have not been achieved.

Since recently, the proposal to begin a program of salt fluoridation has been revived in Guatemala. Persons there have begun to put the organizational structures in place and progress has occurred in defining the program for implementation in Guatemala. The Quito conference was therefore very useful for those attendees from Guatemala to concretize the steps that have to be taken, and to compare their own plans and progress.

Based on the exposure received in Quito, the members of the Guatemalan salt fluoridation committee felt that it would be important for an assessment of their plans and progress for salt fluoridation to be made. They therefore made such a request to PAHO.

Based on this request a team of consultants from the Regional Oral Health Program of PAHO was assembled and sent to Guatemala.

## **1.2 TERMS OF REFERENCE**

This assessment was made at the request of the Ministry of Public Health and Social Assistance of Guatemala, with the objective of advising on the present direction and progress of the salt fluoridation program and making recommendations for the program’s improvement. The detailed terms of reference were as follows:

- ◆ To provide technical co-operation to the Oral Health Committee of the Ministry of Public Health and Social Assistance.
- ◆ To disseminate the present PAHO developed protocol for baseline studies and to advise on how to operationalize these guidelines in the Guatemalan context. These are the baseline studies of DMFT and fluorosis prevalence, urinary fluoride excretion, and fluoride content of water.
- ◆ To disseminate the present PAHO guidelines on epidemiological surveillance, quality control monitoring and evaluation, and to operationalize these guidelines in the Guatemalan context.
- ◆ To provide technical assistance in the development of quality assurance systems for the manufacture of fluoridated salt.
- ◆ To discuss and advise on the possible strategies in order to complete the implementation of fluoridated salt in as short a period of time as possible.

The assessment was to take place via visits and discussions with various institutions and individuals, such as the Ministry of Public Health and Social Assistance, the Ministry of Social Security (IGSS), the office of the Vice-President of the Republic of Guatemala, UNICEF, INCAP and the Salt Producers. In addition attendance and discussion was to take place at the previously scheduled workshop on Salt Fluoridation.



## 2. NATIONAL ORAL HEALTH SITUATION

### 2.1 ORAL HEALTH STATUS

The last oral health survey was done in 1985. This was carried out in conjunction with INCAP, Universidad de San Carlos de Guatemala, Faculty of Dentistry. The survey was national in scope, among school aged children, ages 5 – 17. The sample size was 482 selected randomly by clusters. The survey studied the following:

- i. Periodontal disease
- ii. Dental caries
- iii. Dental fluorosis
- iv. Craniofacial anomalies
- v. Soft tissue anomalies

The main findings of the survey are summarized in Table (i) below.

**Table 1: Table Summarizing the Main Results of a 1985 Study “Informe Final de la Encuesta Nacional Sobre Salud Bucal en los Escolares 5 a 17 años de Guatemala “**

Periodontal disease Indicators %			Dental caries 97% prevalence			Fluorosis
Debris in soft tissue	Calculus	Gingivitis	DMFT	C	M+ F	Mild, moderate and severe observed in 3 communities. Mainly mild.
96	38	59	10.1 s.d. 4.7	9.23		

The data collected in 1985, and summarized above, although far from complete reveals a picture of high prevalence of dental caries and periodontal diseases. This could be attributed to the high level of sugar consumption and poor dental hygiene practices at that time. In addition the situation is made worse by deficiencies in the oral health delivery services and a weak public health infrastructure.

Fluorosis was detected in the communities of El Progreso, Zacapa and Izabal. The levels detected ranged from low, moderate and severe, with most being low levels. It was concluded at the time that this condition was endemic due to high levels of naturally occurring fluoride in drinking water. Fluoride levels in water ranged from 2.85 mg F/L to 5.63 mg F/L. It was estimated at the time that

approximately 40,000 persons were exposed to high levels of fluoride in drinking water in 8 communities.

The study made the recommendations that are stated below:

- ◆ The implementation of a large-scale preventative measure such as salt fluoridation.
- ◆ The provision of a national school mouth rinse program.

Arising from these recommendations, a number of measures were implemented in an attempt to reduce the prevalence and severity of dental caries. Chief amongst these were the implementation of water fluoridation in Guatemala City in April 1989, and a national mouth rinse program in each of the capital towns of the country's 22 departments.

A subsequent study in 1991, summarized in Table (ii) below showed that the consistency, effectiveness and efficacy of these measures were mixed. One weakness of this study however was that it was confined to the urban areas only.

**Table (ii): Table Summarizing the Main Results of a 1991 Study "Encuesta Epidemiológica de Caries Dental e Higiene Oral en Escolares de Establecimientos e Educativos del Sector Oficial Ubicados en las Cabeceras Departamentales de la República de Guatemala, 1991"**

Periodontal disease Indicators %			Dental caries 97% prevalence			Fluorosis
Debris in soft tissue	Calculus	Gingivitis	DMFT	D	M+ F	No data
50	20	No data	7			

Some conclusions from this survey were as follows.

- The range of DMFT in urban areas was 3 to 17, with the lower values in the less developed departments.
- The coverage of mouth rinse programs almost doubled since 1989
- The majority of students, 84%, have tooth brushes or substitutes
- 63% of students had dental caries

The major recommendations arising from this study were as follows:

- To take preventative actions in departments having DMFT greater than 5.
- To ensure consistency in the implementation of mouth-rinse programs.
- To ask Congress to pass legislation and to make funds available to alleviate the oral health problems of the nation.



## **2.2 ORAL HEALTH INFRASTRUCTURE**

### **2.2a Ministry of Public Health and Social Assistance**

The Ministry of Health has 110 dentists in public oral health. In addition there are a cadre of auxiliary nurses who are present in 60% of the country's departments. These auxiliaries assist in only a few of the procedures such as fluoride applications. There are no dental assistants.

The government oral health services is only able to service about 46% of the population, Forty percent directly from the Ministry of Health and the IGSS, and the remaining via NGOs who give philanthropic service.

Of the 1208 health centers operated by the Ministry of Health 348 offer limited dental services, and the remaining 860 provide no dental services. There are Health Centers in the urban area with, 60 hospitals, 35 health consultancies and 21 primary care centers.

Budgetary constraints weigh heavily against the activities of the oral health services. Information on the actual budget and expenditures of the Ministry of Public Health is difficult to obtain. However it is estimated that expenditures on equipment and supplies in oral health are around 8,000 to 10,000 Quetzals per annum, or about U\$1200 to U\$ 1,500 per annum. During 1997 it is estimated that a sum of 300,000 Quetzals or U\$ 47,000 was budgeted, due to higher expenditure on vehicles for the oral health services program. In addition oral health prevention and services suffers the general malaise found in our region where the priorities for oral health in terms of expending human and material resources is normally at the lowest level.

### **2.2b Guatemalan Institute of Social Security: (IGSS)**

The IGSS has 86 dentists (78 general dentists, 6 maxillofacial surgeons, 2 administrators and 2 surgeon residents). The clinical services are located in 12 hospitals and 14 dental clinics. The menu of services offered are: extractions, periodontal treatments, root canal treatments, restorative treatment, surgeries, prostheses, orthodontic pediatrics and x-rays.

The IGSS participates in the water fluoridation program that is carried out in the capital, Guatemala City (metropolitan area). It started in 1989 at the water treatment facility at Lo de Coy, a few miles outside of Guatemala City. This treatment plant provides potable water to about 45% of the population of Guatemala City. Sodium Fluoro-silicate is used as the fluoride additive at a concentration of between 0.8 to 0.9-ppm fluoride. The analytical laboratory of the Department of Chemistry of the San Carlos University is responsible for the fluoride analysis of the product water.

The City of Guatemala owned EMPAGUA, (*Empresa de Agua*), operates the program. The cost of the program, mainly the purchase of the fluoride chemical, is financed by the IGGS. The approximate cost is \$25 000 per year.

Since 1989, apart for a period of about 2 years when financial constraints did not allow the purchase of the additive, there has been reasonably addition. It is felt that the down stream dilution by additional water sources does not in fact allow the delivery of water at the required concentration of 0.8 to 0.9 ppm to the end consumer. It has been agreed by the IGGS to transfer the program funds to the salt fluoridation program, once this becomes a reality.

### **2.2c School Of Dentistry of the University of San Carlos**

The schools dental curriculum contains a supervised professional program (EPS). The 1998 program has 93 students involved in developing preventive oral health activities. This takes the form of a weekly mouth rinse program involving 100,000 school children of ages 6 to 15 years old. The mouth rinse is a sodium fluoride solution of 0.2% concentration.

In addition there is a program where comprehensive attention to preschool, school children and pregnant women is given. This program includes the training of dental assistants. The theme of this year's student's research project is "*The prevention of dental caries in school children 12 years old*".

### **2.2d Private Sector Dentists**

It is estimated that currently there have been about 1760 graduate dentists in Guatemala. This is expected to increase to 1800 by 1999. In the private sector there are 500 to 600 presently working in Guatemala. Most of them have their practices located in the urban areas.

There are 6 dental associations. Four of these are departmental associations, which are active in performing some dental education to the communities. The other associations, the Guatemalan Dental Society, and the Women Dentists Association although national, have not been active in providing services to the community at large.



### 3.

## DESCRIPTION OF PRESENT SALT FLUORIDATION PROGRAM

### 3.1 NATIONAL ORAL HEALTH COMMITTEE

The body that is charged with the responsibility of the national salt fluoridation program is CONASABU or the Comisión Nacional de Salud Bucal. CONASABU was initiated by Governmental Decree # 755-88m, and is made up of 2 members each from the following institutions:

- ◆ Ministry of Public Health and Social Assistance, Oral health department, preventative program.
- ◆ Ministry of Education, Student Welfare program.
- ◆ University of San Carlos of Guatemala, Faculty of Orthodontology,
- ◆ Ministry of Social Security.
- ◆ Guatemalan College of Estomology.
- ◆ City of Guatemala.

The external agencies providing technical co-operation are UNICEF, INCAP and PAHO. UNICEF has been especially active in assisting the program of salt iodization since 1991.

By the exercise of executive decree, Guatemala in 1952 started a program to iodize salt. This program reached coverage of about 90% of salt for human consumption. Unfortunately during 1978-1990 the program was discontinued.

In 1992 UNICEF established an inter-sectorial committee, consisting of government officials, representatives from the private industry and the National Institution of Technical Assistance. This committee was legally established by legislative decree 44-92 of 1992, under the Food Fortification Law, as an organization called the National Committee for Fortified Foods (CONAFOR).

The present committee therefore has the experience of a fairly successful program of salt iodization that had good participation of the salt producers. The participation of the producers will be critical for the success of the fluoridation program. Steps should be taken from now for them have formal and permanent representation on CONASABU.

### 3.2 BASELINE STUDIES

#### **3.2a Fluoride Concentration In Water**

From 1984 to 1986 a study in fluoride concentration in water was done, in the main departments of Guatemala, municipalities and small communities. The results showed the concentration in water varies from region to region and at different times a year. The variation observed was 0.00 to 0.30. Although the

concentration in most of the country is low, there were three towns that had high concentration of fluoride in the water. These towns are El Progreso, Izabal and Amates.

### **3.2b Prevalence Of Dental Caries**

In 1985, a national survey of dental caries was carried out in Guatemala. See **Table 1**, page 8. The results showed that 97.1% of school children had dental caries. The DMFT was 10.08, with the caries component of 7 being by far the largest component. This result clearly shows the scarcity of preventative and treatment interventions available to the population.

Unfortunately the analysis of the data did not include disaggregation by age, as is the norm in the presentation of the results of oral health surveys by other countries.

In 1991 the Ministry of Public Health and Social Assistance, the Guatemalan Social Security Institute and the University of San Carlos carried out a national study of dental caries in the capital, Guatemala City and the main cities of each Department. This study found a DMFT result of 7 in 3 to 17yr olds.

Although these studies confirm generally the less than satisfactory state of oral health in Guatemala, they do not meet all the requirements of a standard national DMFT baseline study.

### **3.2c Prevalence of Dental Fluorosis**

In 1986 a study was carried out in 11 areas with different fluoride concentration in water. Children and adolescents (12-17yrs) were analyzed (n=749) based on the Dean Index. The results showed a clear presence of fluorosis in the populations with 2.85 mgF/L. in water. The National Survey carried out in 1985 by the University of San Carlos among 482 students from urban areas showed no fluorosis except in the townships where the water had high concentrations of natural fluoride, namely Morales, Izabal and Amates. These communities have fluoride level 5 times higher than the optimal (0.8 – 1.2 ppm)

### **3.2d Urinary Fluoride Excretion**

Two surveys on fluoride excretion were carried out by the faculty of dentistry of the University of San Carlos of Guatemala. The first survey was done in 1993 and the second was a study entitled "Concentración y excreción urinaria de fluoruro en cuatro grupos de población de la república de Guatemala. Estudio por regiones de salud. ", carried out in 1996.

In both studies the sample was selected by clusters, and included urban and rural areas. The total population (n=360), was made up of school children under 17 years of age, adolescents and adults, greater than 18.60 years old. The results showed that fluoride concentration levels ranged between 0.2 and 0.4 mg F/L. These results show that there is no significant source of dietary fluoride in the populations under consideration.



The other survey took place during 1993-1996, only in school children from 13 to 17 years of age, covering 7 health regions of the country. The average value of fluoride in urine was 0,40 mg F/L. This study therefore confirmed the findings of the previous one. The preliminary conclusion that could therefore be drawn is that there would be unlikely to be any complications of fluorosis if salt fluoridation was implemented in Guatemala.

### **3.2e Salt Consumption**

The University of San Carlos of Guatemala carried out a salt consumption survey in 1986. A total of 612 families were interviewed. Of the total 309 was from the rural areas, and 306 from the urban areas. There was high variability in the salt consumption. The consumption observed ranged from 1 to 51 gm/ person /day. The average was 10.22 gm/ person/day, with the standard deviation being 5.85 gm/person/day and the median 8.90 gm / person /day.

### **3.2f Other Sources of Fluoride**

**i Fluoride mouth rinse program** In 1984, the Ministry of Health began to implement a fluoride mouth rinse program, using 0.02% NaF solution.

#### **ii Fluoride tablets program**

The IGSS has implemented a program with fluoride tablets for preschool children that are attending the social security dental clinics. The coverage of this program is about 80,000 children.

In addition there is a tablet program for school children ages 5-14 years, administered by teachers. The tablets are donated by the Colgate Company and have a fluoride content 500 mg. About 70% of children in the urban areas are covered. In total about 800,000 children benefit.

## 4. STATE OF SALT INDUSTRY

### 4.1 PROCESSADORA Y DISTRIBUIDORA DE SAL (PRODISAL)

PRODISAL is a joint venture of 10 crude salt producers and distributors who have united with the objective of establishing a single receipt, processing and distribution center for salt. **Appendix 4** lists the names and other information concerning the members of this joint venture. They were formed in 1993 and have since established a single receipt station for salt from their salinas which was opened in Dec 1997. This station consists of a warehouse for salt storage and facilities for the iodization and packaging of salt. **Figure 1** below shows the front view and warehouse entrance of the existing receipt station.

**Figure1: Front of PRODISALS central receiving warehouse.**



To date this group has been very active in the search for financing for the development of their project. So far they have received over \$350,000 of development financing, mainly in the form of grants from a variety of organizations. **Table 3** below summarizes the funding received or promised, and the corresponding expenditure that it is earmarked for.

**Table 3. Funds Raised by PRODISAL**

Organization	Funds	Purpose
UNICEF	\$120,000	Central receiving station & warehouse
Government of Guatemala	\$220,000	Centrifuge
Various	\$30,000	Laboratory Equipment
<b>TOTAL</b>	<b>\$370,000</b>	





Overall an additional \$1 million in financing is being sought in order to complete the project of designing and installing a modern salt processing and packaging facility. This facility will be expected to produce at the rate of 10 ton per hour, or at an annual production of up to 70,000 ton per year.

At present it is estimated that the consumption of domestic salt for human consumption is close to 40,000 ton per year in Guatemala.

Approximately 350 salt producers produce the crude salt and do some processing, packaging and distribution of salt. The breakdown is as follows.

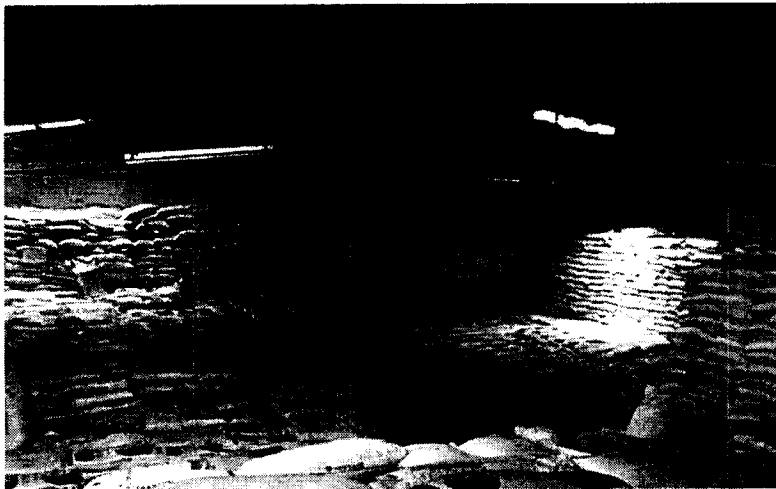
**Table 4. Salt producer profile, Guatemala**

Number of Producers	Production ton per year	% producers	% Production
200	< 100 t	57	15
50	100 to 500	15	15
50	500 to 1500	15	30
40	1500 to 2000	15	40
340	100,000	100	100

The present recieval station is located in Cipacate, not far from the main salt producing areas on the Pacific ocean coast.

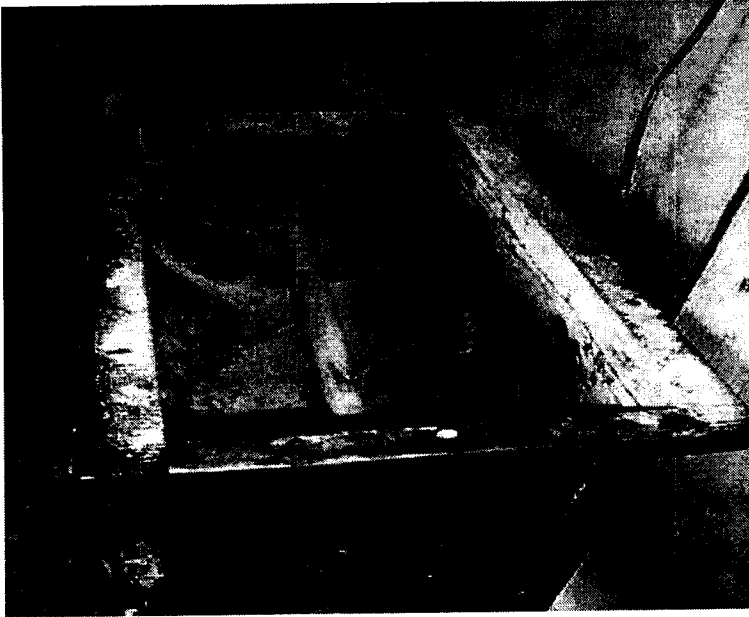
The bagged washed salt (primary washing) is transported by truck to the recieval station and stored in the warehouse. The salt is sorted and stored according to the grade and the supplier. **Figure 2** below shows an inside view of the warehouse and the manner in which salt is stored.

**Figure 2: Inside view of PRODISAL's warehouse**



The processing of the salt begins with the addition of potassium iodide. The sacs of salt are emptied in the salt mixer and potassium iodide added. The mixer used is shown in **Figure 3**, below.

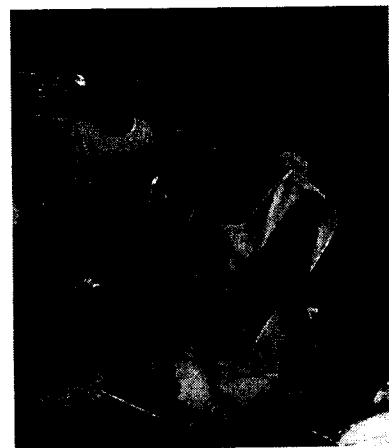
**Figure 3: Mixer used for iodization of salt.**



The salt does not undergo further processing such as washing, drying, or milling. The humidity or moisture associated with the salt is approximately 3 to 4%. The reaping process employed in the Salinas results in small grain salt. As already mentioned, the first stage of washing is done at the Salinas.

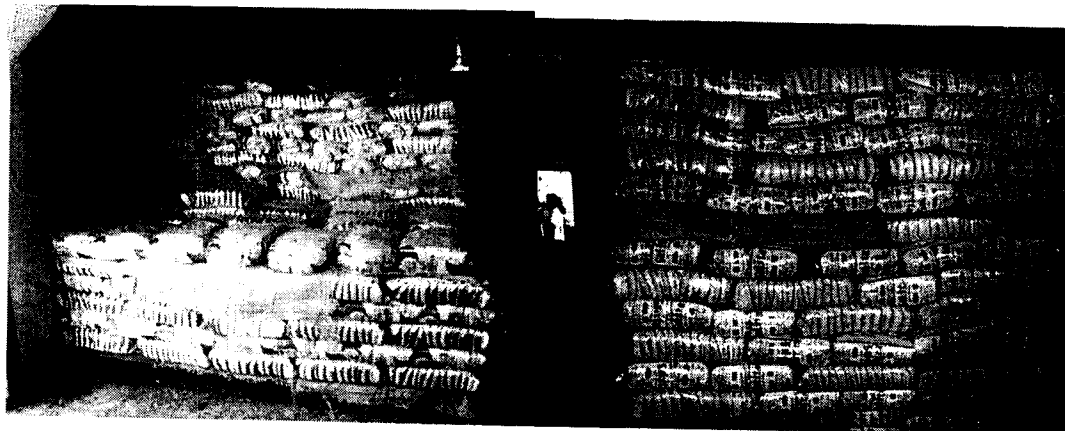
The next stage is therefore the packaging of the salt, which is done manually as shown below.

**Figure 4: Packaging operations at PRODISAL.**



Finally the finished salt is stored prior to shipment to the market.

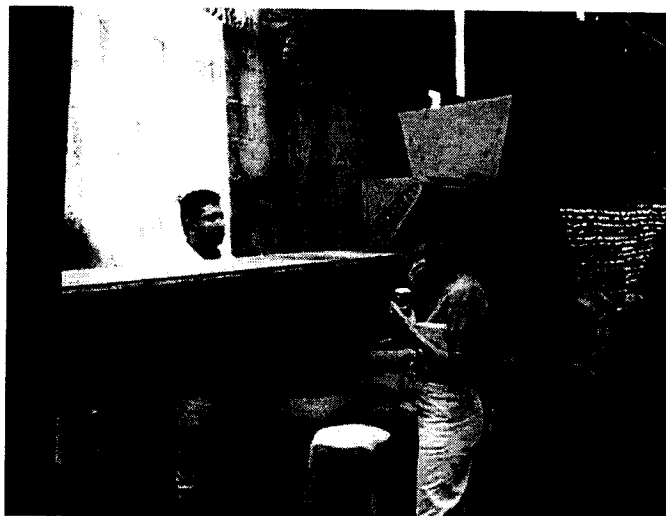
**Figure 5: Finished salt storage.**



Some equipment has already been bought for the addition of other additives such as fluoride.

This equipment consists of two proportional screw feeders that can be calibrated to feed consistent amount of additive to salt and mix the ingredients together. The screw feeder is shown below.

**Figure 6: Additive feeder/mixer for salt.**



In addition the principals of PRODISAL are in the process of developing a new location for receipt and processing of salt. A new location has already been identified. The location is much larger and will be able to have equipment for the processing of salt. This will include storage areas, washing equipment, milling equipment, drying equipment and packaging.

A view of the new area is shown below.

**Figure 7: View of proposed PRODISAL salt processing facility.**



The activities and plans of the PRODISAL group were very impressive. They obviously are a keen and dedicated group of entrepreneurs who have accomplished much with very little resources. They realize that their individual operations cannot realize the economies of scale that are required in this modern world. Hence the reason to unite and form a larger entity. Certainly this is not without its problems but the functioning that was observed is as smooth as can be expected. Their success in this regard could be a model for other small salt producers such as in Nicaragua and Honduras who need to form production alliances at this stage.

The principals of PRODISAL recognize the need to be efficient and to improve their processes and quality of finished product. They are interested and enthusiastic about a salt fluoridation program. They need therefore any and all assistance possible with their financing for process and equipment improvement and for technical exposure to other salt producers' methods and techniques.

The salt producers representation on CONASABU should take place so that their concerns may be incorporated from the beginning of the program. This will ensure that the responsibility for the success of the program is shared with the sector that will have most of the burden of implementation.

## **5.** **LEGAL SITUATION**

At present, the National Oral Health Committee, CONASABU, has proposed regulations to govern the production, sale and distribution of fluoridated salt in Guatemala. This proposed regulations are based on proposals submitted by INCAP, and are similar to the regulations existing for iodized salt.

The regulations will be monitored and enforced by the Food Registration and Control Department.

The regulations which will be passed as soon as fluoridation of the salt begins is based on the Republics Congress Decree Number 44-92, which establishes that the fortification of foods is obligatory in order to supply deficiencies of nutrients which are essential in the diets of the Guatemalan people.

The issue of these regulations and there subsequent monitoring and enforcement will require the continued co-ordination of the Ministry of Public Health and Social Assistance and the Ministry of Social Security.



## **6. NATIONAL SURVEILLANCE PROGRAM**

The required surveillance programs will be the responsibility of the National Oral Health Committee, or CONASABU, co-ordinated by the Dental Department in the Ministry of Public Health and Social Assistance. Epidemiological studies and monitoring will be coordinated by the Faculty of Dentistry at the University of San Carlos of Guatemala.

The monitoring of salt quality and the analysis of additive levels will be done by the INCAP, central laboratory.

## 7. CONCLUSIONS

1. Although the National Oral Health Committee was created some years ago, with the overall responsibility to carry out a program of salt fluoridation, the integration of some of the members is recent. Great attention will therefore have to be placed to weld the committee into a cohesive unit to carry out its responsibilities.
2. The successful salt iodization program saw the salt producers working closely with UNICEF. UNICEF has sponsored and supported the producers in a host of activities, including improvement of their production efficiency and salt quality, equipment selection and plant upgrading, and analytical techniques training. It will be necessary to follow this methodology of UNICEF, which has been successful, by integrating the salt producers into the National Oral Health Committee.
3. The studies previously carried out for the prevalence of DMFT and fluorosis are outdated and were not carried out or reported in conformity to the standard protocols developed by PAHO. For example the survey in 1991 was not a national one but carried out only in the urban areas. In addition the prevalence of dental caries in permanent teeth (DMFT) and deciduous teeth (DMF) was not reported according to age and by components which is necessary in order to identify the severity of dental caries. Accordingly it will be necessary have these studies done as quickly as possible to form a baseline prior to the start of production and distribution of fluoridated salt.
4. It is important to have a new study supported by PAHO, and ensuring that the protocols used are in conformity with international standards and existing PAHO/WHO protocols. This is necessary in order to compare the epidemiological information especially with others countries, so that correct decisions may be taken as needs be.
5. Mapping of the fluoride content in water has been accomplished satisfactorily during 1994-1996. It will now be necessary to implement a surveillance and monitoring program designed specifically for the communities with higher levels of concentrations of fluoride, ie 0.5-0.7 ppm.
6. The salt consumption survey performed in 1995 can be considered adequate. It will not be necessary to do another.
7. The urinary fluoride excretion studies in Guatemalan children were not carried out in 24 hours and neither in the target group. The study as performed however can give a general idea of the fluoride balance in the organism. It

must be borne in mind that a urine study, whilst it would be a good thing to do, it is not considered essential to the salt fluoridation program.

8. The state of the salt industry is such that the quality problems inherent in the introduction and production of fluoridated salt can be addressed. The bulk of production, packaging and distribution of salt is done by the PRODISAL group who are in a position to make improvements to their process so that good quality fluoridated salt may be produced. It is anticipated that smaller producers will also follow suite.





## 8. RECOMENDATIONS

1. It is recommended to perform a dental caries and fluorosis survey, DMFT and esthetic observations, in children 6 - 8, 12 and 15, in accordance with the PAHO developed guidelines for these studies. The evaluation has to be supported by the PAHO/WHO expert group in oral health every 7 years. (PAHO guidelines).
2. Fluoride excretion monitoring can be carried out if the funds are available. Again it is stated that this is not an essential component to the program. If the decision is taken to do a urine study, it should be done close to the beginning of the program, preferably using the 24 hours collection method.
3. Is necessary to determine the other sources of fluoride in the population such as gels, fluoride rinses, and vitamin and fluoride supplements. A comprehensive study to determine this is therefore recommended.
4. Regulation of fluoride supplements should be introduced in order to control the intake of fluoride to just one source of systemic fluorides.
5. The introduction and use of a children's dental toothpaste having fluoride concentration less than 500 ppm for children under 6 years old, is highly recommended.
6. The fluoridation of water at the Lo de Coy treatment plant should be discontinued as soon as salt fluoridation begins. This is in keeping with the principle of one only systemic source of fluoride.
7. It is recommended that the salt producers be represented formally on the National Oral Health Committee.
8. The fluoride level in salt is recommended to be " in the range 200 to 250 ppm" in accordance with PAHO guidelines.
9. It is important to understand the need for, and to build in a transition period of 6 to 12 months so that the salt producers are able to work out all the kinks in their systems. To that end it is best to use a flexible fluoride concentration range in the first year.
10. It is necessary to improve the quality of salt especially with respect to humidity in order to successfully fluoridate the salt.
11. Sufficient attention needs to be placed to the needs of the salt industry to improve quality. To do so the industry will have to modernize. PRODISAL and

producers like them have taken the first steps. However it is our experience that in order to be completely successful the producers must be assisted with sources of financing.

12. In the case of PRODISAL it is recommended that they be afforded every assistance and opportunity to view the operations of other similar sized salt producers in Latin America such as Alimentos La Esmeralda, (ALESCA) and Molinos Los Socios, (MOLISOCA) of Venezuela, Panasal in Panama and Sal Saru in Costa Rico. This form of training will assist the Guatemalan producers to design and fabricate processes and equipment to meet their needs in as efficient and economical a fashion. This should be implemented as soon as possible as they are already involved at the stage of committing resources to equipment selection.



## APPENDICES

**APPENDIX 1**

**MEMBERS OF NATIONAL SALT FLUORIDATION COMMITTEE:**

**List of persons of the National salt fluoridation Committee**

Name	Telephone	Institution
Sandra Judith Chew	4723762-7, Ext 528	INCAP
Manuel González Avila	4769745	Fac. Odontología USAC
Edgar Sánchez R.	4769721	Fac. Odontología USAC
Ernesto Villagrán Colón	4769721	Fac. Odontología USAC e-mail socpreva usac.educgt
Miriam Somayoa	4769745	Fac. Odontología USAC
Carlos R. Roca	3328931	13 calle 2-60 zona 10 Topacio Azul. Of. 804
Danilo Arroyave R.	4762936	Fac. Odontología USAC Ciudad Universitaria z.1
Omar Dary	4719912	INCAP
Rudy Alvarado Bech	253-3377, 2535576	IGSS
Albina Gueera de Villagrán	3336373	UNICEF 13 calle 8, zona 10, Edificio Plaza II Nivel
Amilcar García	3352172	ANSAL
Henry García	3351688	PRODISAL
Juan Manuel Abascal	3352172	ANSAL
Ivan Rivera	3351688	PRODISAL
Lily Caravantes	3322032	OPS/OMS
Roger Cifuentes	2301793	D.G.S.S. SALUD BUCAL
Lissette Vanegas	2301793	D.G.S.S. SALUD BUCAL
Axel Maldonado Guillén	2533377/3322283	I.G.S.S.
Francisco Fuentes Escobar	2301793	D.G.S.S. SALUD BUCAL
Rebeca Dardón	2327934	Ministerio de Educación, Bienestar Estudiantil
Leticia Meza	2301793 Telefax	

**APPENDIX 2**

**ORAL HEALTH PLAN & PROGRAM OF ACTIVITIES,**  
according to priorities for 1998-99 (Ministry of Health)

Health priority	Activity (work Plan)	Actions	Unidad de measure Unit	Ident.ification according to budget .
Oral health	1. Health promotion and education	1.1. Social		II
		1.2. Health education		II
	2. Epidemiological surveillance and information	2.1. Especific epidemiological studies (dmft in the population)		III
		2.2. collection and processing of data		III
	3. Diagnosis and treatment		3.1. Oral Examination	
3.2 Oral cleaning				V
3.3. fillings				V
3.4. Extraction				V
3.5. Preventive treatment				V
3.5.1. Fluoride application				V
4. Support Program		3.6. Reference to III Level		V
		4.1 Visits		V
		4.2. Purchase and t of surgical material		V
		4.3. Distribution of Fluoride		V
		4.4. Coordination with other institutions		I
		4.5. Supervision, Evaluation monitoring		V
		4.6 Personnel training		VIII

**ATTENTION LEVELS FOR ORAL HEALTH 1998-1999**

ACTIVITIES	ADVANCES
<b>FIRST ATTENTION LEVEL</b>	
1. Risk groups covered with topical fluoride	a. Information to dentists for preventive activities
2. 25 Oral health promoters in Alta Verapaz	a. Training personnel b. Workshop for dentist to help oral health promoters
3. Oral health practices improving nutrition and hygiene in families	a. Media education program
<b>II ATTENTION LEVEL</b>	
1. The health centers used to improve quality of attention and care	a. Dental equipment to health center b. Dentists incorporated in the process that working public centers c. Plan to obtain materials
<b>III ATTENTION LEVEL</b>	
1. Reference Hospitals improved, attention to quality of dental work	a. Dental equipment and infrastructure improved in 4 hospitals

<b>SUSTAINIBILITY OF THE PLAN</b>	
1. Elaboration of attention norms for three levels	a. In press
2. Estimation of the cost of attention/subactivities/10.000 inhabitantes, for the program	En disseminated and discussed with dentists
3. Procurement of materials and orthodontological equipment at best prices	a. Writing of equipment specificaton
4. Establishing Oral Health as one of the 16 Health Priorities of the country	a. Establishing 3 specific targets and 12 concrete activities b. Developing the areas of oral health promotion

**APPENDIX 3**  
**LAW**

**APPENDIX 4****Members of PRODISAL**

	NAME	POSITION	CONTACT DETAILS	BUSINESS ACTIVITIES
1	Ivan Rivera	President	4743271	Construction contractor
2	Juan Manuel Abascal	Vicepresident	3680396	Cattle farmer ONG in developing agricultural programs in rural areas.
3	Juan Córdoba	Secretary	33518666	Director ONG
4	Amilcar García	Treasure	5946215	Farmer
5	Arnoldo Díaz	Vocal	3352172	Owner of Ice Factory
6	Hervie Garcia	Director	2887920	Distributor
7	Eduardo Siguere	Director	8303294	Farmer
9	Eduardo Bustamante	Director	3351866	Food processor
8	Jorge Luis Sierra	Director	5946132	Owner of Service Station
10	Miguel Angel Arriaza	Director	3361779	Farmer



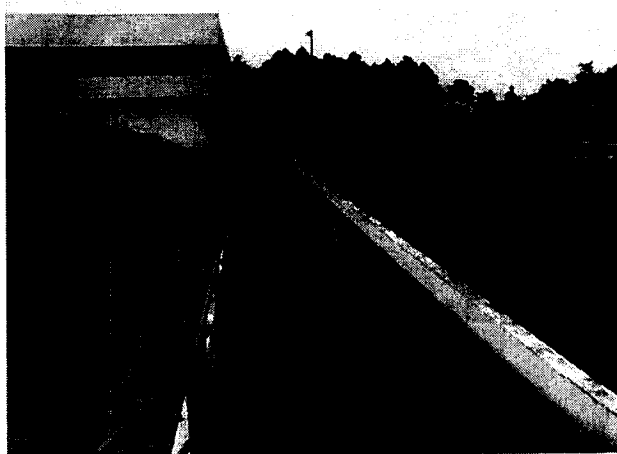
## APPENDIX 5

### VISIT TO LOY DE COY WATER TREATMENT PLANT:

As one of the recommendations from the 1985 Oral Health Survey a program of water fluoridation was started at the Empagua owned Loy de Coy water treatment plant, since 1989. Since that time apart from a period of about 2 years when there were no funds available for the purchase of fluoride treatment chemicals, addition of fluoride and its concentration has been fairly consistent according to the reports of the plant operators.

The Loy de Coy water treatment plant is situated approximately 15 kilometers from Guatemala City. It is the largest water treatment plant in Guatemala, producing 110 million Liters per day, or about 45% of the potable water needs of Guatemala City. It is the only water plant that fluoridates water produced for human consumption.

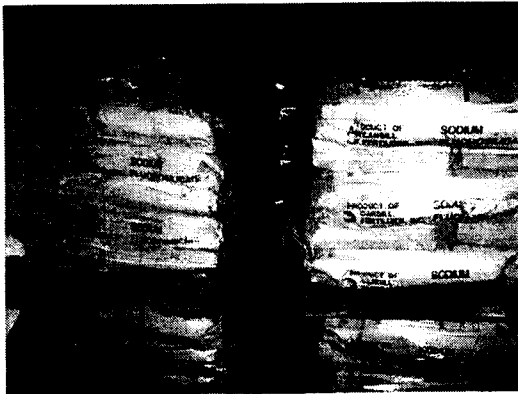
The water treated is surface water that is conveyed to the treatment plant, via a series of aqueducts, channels and tunnels, from a distance of over 15 kilometers. **Figure 8** below shows the inlet water flowing to the treatment plant



**Figure 8 Raw water inlet to treatment plant**

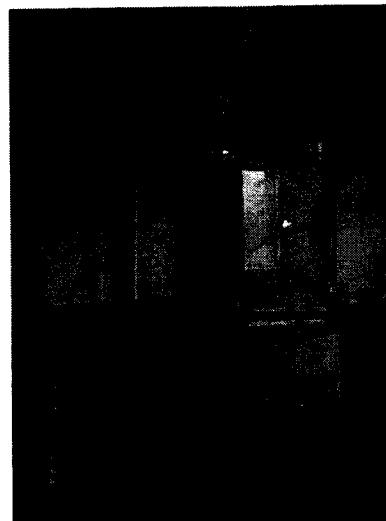
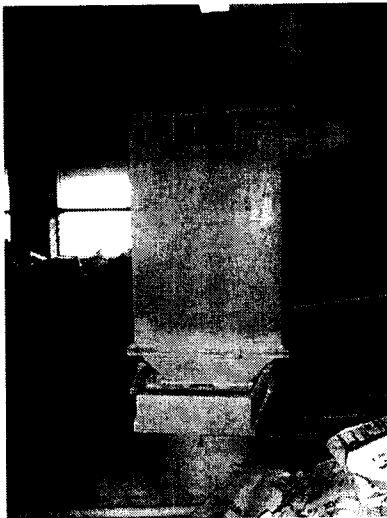
The Plant is modern and well maintained. It employs the normal methods of flocculation, filtration and chemical addition for its treatment process. Slow sand filters, which were originally used, are now longer in service.

For flocculation alum is added and settling of mud and other debris allowed to take place. The **Figures 9 & 10** overleaf shows some of this process. Chemicals including sodium silico-fluoride are stored in a warehouse adjoining the treatment plant.



**Figure 9 Palettes of Sodium Silico-Fluoride**

The fluoride Additive Chemical is stored in bins prior to usage. Weigh Scales accurately add the amount of fluoride to the water.



**Figure 10 Fluoride weigh and addition system**

Finally, pure fluoridated potable water is pumped to the consumer.



**Figure 11 Distribution pumps**



## APPENDIX 6

### MAP OF GUATEMALA



## 10. BIBLIOGRAPHY

INCAP, OPS, USAID, OMNI, Informe del Seminario - Taller de los sectores públicos y productos, sobre requerimientos técnicos y garantía de calidad de alimentos fortificados en Centroamérica. Guatemala 20-23 de enero, 1998.

González, A. M, Sánchez, R. y otros. Resumen del Informe parcial de investigación: Determinación de la concentración natural de fluoruro en las principales fuentes de agua de bebida de las cabeceras municipales y poblados principales de la república de Guatemala, USAC, Guatemala, 1987.

Sánchez R., González, M. y otros. Concentración y excreción urinaria de fluoruro en cuatro grupos de población de la república de Guatemala. Estudios por regiones de salud. Guatemala, 1996.

González, M.; Sánchez, R. y otros. Resumen Informe final de investigación: Prevalencia de fluorosis dental en los municipios de Morales, Amarettes, Izabob, Guatemala, 1986.

Comisión Nacional de Salud Bucal. Prototipo de Reglamento Fortificación de sal con Yodo y Flúor. Sexta versión, Guatemala, 1998.

González, A. M, Noguera, A, Sánchez, R. ; *Informe Final de la Encuesta Nacional Sobre Salud Bucal en los Escolares de Guatemala*; Instituto de Nutrición de Centro América y Panamá, (INCAP) y Facultad de Odontología de la San Carlos de Guatemala; 1989

Ministerio de Salud Pública y Asistencia Social. Encuesta Epidemiológica de Caries dental e higiene oral en escolares de establecimientos educativos del sector oficial ubicados en las cabeceras departamentales de la República de Guatemala. Resumen.,1991.