

## Uses, effects and consequences of fluoride present in the consumption of drinking water. La Noria community, Pinos Zacatecas

## Usos, efectos y consecuencias del Flúor presente en el consumo de agua potable. Comunidad La Noria, Pinos Zacatecas

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### Abstract

Fluorine is essential for human beings, since it has an essential function in the formation of bones and tooth enamel. Although it is also present in medicines, anesthetics, pesticides, industrial waste. Also in fertilizers and iron minerals, in drinking water and in high concentrations it is harmful. This research presents the case of the La Noria Community, Pinos Zacatecas in which drinking water containing fluoride is consumed, which produces effects on its inhabitants, the consequences above all are on the enamel and dentin.

**Objectives:** To investigate the use, effects and consequences of fluoride present in the intake of drinking water by the human being.

**Methodology:** Retrospective research, a questionnaire was applied through a directed interview. Qualitative and quantitative analysis was carried out. Random sample for 80 people with an age range between 3 to 70 years of both genders.

**Contribution:** Know the uses, effects and consequences of fluoride present in the consumption of drinking water. The Noria, Pinos Zacatecas.

### Fluorine, Effects, Consequences

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### Resumen

El flúor es indispensable para el ser humano, ya que tiene una función esencial en la formación de los huesos y esmalte dental. A pesar de que también se encuentra presente en medicamentos, anestesia, plaguicidas, desechos industriales. También en fertilizantes y minerales de hierro, en el agua potable y en concentraciones elevadas resulta perjudicial. En esta investigación se presenta el caso de la Comunidad La Noria, Pinos, Zacatecas en la cual se consume agua potable que contiene flúor, misma que produce efectos en sus habitantes, las consecuencias sobre todo son en el esmalte y la dentina.

**Objetivos:** Indagar en el uso, efectos y consecuencias del flúor presente en la ingesta por consumo de agua potable el ser humano.

**Metodología:** Investigación retrospectiva, se aplicó un cuestionario mediante una entrevista dirigida. Se procedió al análisis cualitativo y cuantitativo. Muestra aleatoria para 80 personas con un rango de edad de entre 3 a 70 años de ambos géneros.

**Contribución:** Conocer los usos, efectos y consecuencias del Flúor presente en el consumo de agua potable. La Noria, Pinos, Zacatecas.

### Flúor, Efectos, Consecuencias

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## Introduction

Nowadays, water is indispensable for human beings; it is considered a universal and irreplaceable solvent in the correct functioning of their biochemical processes. Fluoride is indispensable for the human being, since it has an essential function in the formation of bones and dental enamel. It is also present in medicines, anesthetics, pesticides, industrial wastes, as well as fertilizers and iron ores. Fluorides are the most abundant halogenated compounds in the earth's crust. Fluorine is known as the most electronegative chemical element. We know that the fluoride ion forms compounds and reacts with most organic and inorganic molecules. Thus, it maintains a close relationship with enamel and dentin as they are bound by hydroxyapatite (*calcium phosphate*) which is dissolved by acids from bacterial decomposition, due to the consumption of drinking water. Fluoride ions form fluorapatite with dental enamel, which is less soluble in acids than hydroxyapatite, giving greater resistance to enamel. However, in high concentrations it causes dental fluorosis or skeletal fluorosis, which results from the excessive accumulation of this substance and makes bones fragile and brittle. Fluoride has both beneficial and detrimental effects on human health, with a narrow range between intakes associated with its beneficial health effects and adverse effects. Effects on bone are considered the most relevant for the assessment of adverse effects of long-term exposure of humans to fluoride. Skeletal fluorosis affects millions of people in several regions of Mexico and other countries.

At present, there are places where people ingest water whose fluoride concentration is not optimal for human consumption. In this work we present a study for the community of "La Noria, Pinos Zacatecas", which presents adverse and harmful effects and consequences due to the ingestion of water from the sources that supply this population. Fluorides have been present for decades; however, one of the most frequent consequences is the staining of enamel due to the consumption of drinking water in the aforementioned community.

The WHO and Environmental Protection Agency's recommendation for fluoride in drinking water is 1.5 mg/L. WHO recommends the reference value for fluoride in drinking water of 1.5 mg/L (WHO, 1993, 1996) Norma Oficial Mexicana NOM-179-SSA1-2020, agua para uso y consumo humano frecuente (Official Mexican Standard NOM-179-SSA1-2020, water for frequent human use and consumption). It is known that worldwide the fluoridation of drinking water, artificially, affects only 5.7% of the population, according to the study by Cheng et al.

## Methodology

A retrospective research method was carried out, with the purpose of finding out the risks of direct water consumption from the aquifers in "La Noria, Pinos Zacatecas". Also, cross-sectional. A questionnaire was applied to obtain information on the current situation of the community regarding water consumption and its effects.

The sample was randomly selected for 80 people, with an age range of 3 to 70 years, both sexes. A questionnaire was applied by means of a guided interview. Then we proceeded to the qualitative and quantitative analysis.

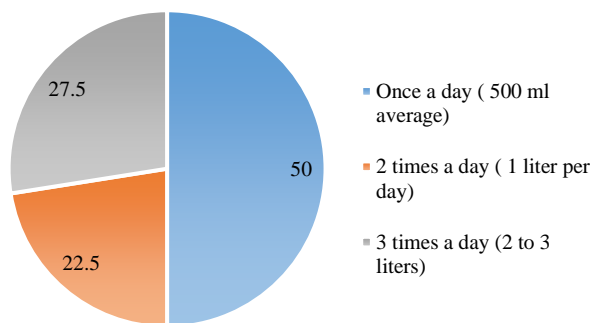
## Results and discussion

The results obtained in the present work, considering that a total of 80 people were interviewed, the following was found:

Responses	Total number of respondents	% it represents
Once a day (500 ml average)	40	50
2 times a day (1 liter per day)	18	22.5
3 times a day (2 to 3 liters)	22	27.5

**Table 1** Number of times drinking water is consumed in the community of La Noria

**Number of times drinking water is consumed per day (%)**



**Figure 1** Graph of results corresponding to Table 1

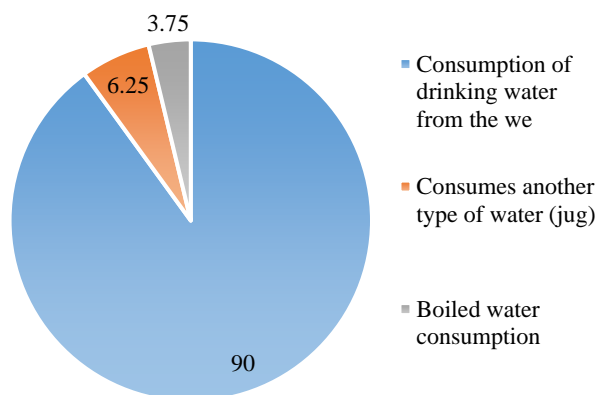
In this graph it can be observed that the majority of people in the community at least do it 1 time a day. The percentage between 2 and 3 times a day is different, but in a minimal proportion.

The analysis corresponding to question 2 shows the following result.

Responses	Total number of respondents	% it represents
Consumption of potable water from well	72	90
Consumes another type of water (jug water)	5	6.25
Consumption of boiled water	3	3.75

**Table 2** Type of water consumed.

**Type of water consumed (%)**



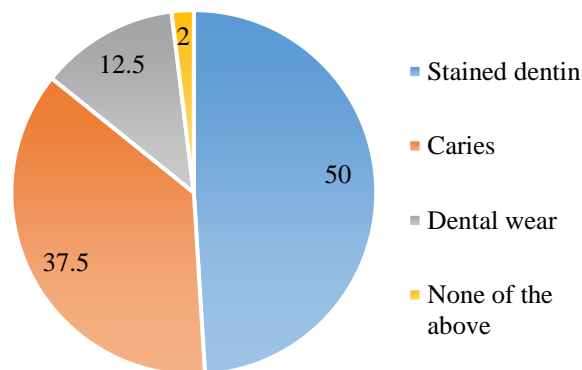
**Figure 2** Graph of results corresponding to Table 2

In this analysis it can be observed that the majority of the population consumes drinking water from the community well. A minimal percentage boils it or consumes it from a jug. This may indicate that the socioeconomic issues within the community may be complicated, which prevents them from acquiring and/or consuming previously treated water (jug water) or due to customs and traditions.

Responses	Total number of respondents	% it represents
Stained dentin	40	50
Caries	30	37.5
Tooth wear	10	12.5
None of the above	0	0

**Table 3** Effects you have observed when consuming water from the well

**Effects you have observed when using well water (%)**



**Figure 3** Graph of results corresponding to table 3

From this last graph we find that of the people who answered, only 2 do not present any type of problem. It could be inferred that they perhaps correspond to people who began to drink jug water at an early age. For the rest there is a concordance with the results found in Table 2, of which the majority consumes water from wells and a very low percentage from jugs. This implies that there is some type of effect on their teeth due to its use. Most of the people in the community have pigmented enamel, and caries also represents a considerably high percentage. It is important to mention that we only focused on this aspect and not on the bones.

## Conclusions

The effects and consequences of the ingestion of drinking water containing fluorides present risks of various diseases in the aseo-skeletal system. Also bone wear, and stained dentin. Dental and skeletal fluorosis are manifested as chronic ingestion. In children, adolescents and adults, the consequences of water consumption in the community of La Noria, entails ailments and certain effects of diseases due to over-ingestion of fluorides, through fluoridated drinking water, since the deterioration of health is proportional to the dose and the time of intake of the consumption of the same. Drinking water fluoridation does not have a significant impact when it is used for sporadic consumption. However, it does have an impact on its efficacy, or rather, on the effect of dentin stained by caries due to the consumption of water intake for prolonged periods of time.

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