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Iron Fortification of Flours in Venezuela

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In Venezuela a severe economic crisis started in 1983, produced a progressive reduction on food consumption and life quality for low socioeconomic strata, representing 80% of the Venezuelan population. This deterioration resulted in a continuous increase on iron deficiency and anemia prevalences. As a result, in 1993 the Venezuelan Government nominated a special commission (CENA) for the enrichment of food. A program of iron fortification was started the same year enriching precooked corn flour with 50 mg/kg of iron as ferrous fumarate, vitamin A, thiamin, niacin and riboflavin. Eight months later, fortification of wheat flour was started including the same nutrients except vitamin A.

During the first year of iron fortification the only adverse effect observed occurred in two regions of the country where hard water is used to prepare the corn bread the night before it is consumed. They noticed that the bread turned slightly dark the day after it was baked. This inconvenience determined a change in iron fortification pattern and from February 1994, the precooked corn flour was enriched with 30 mg/kg of iron as ferrous fumarate and 20 mg of elemental iron. This pattern of iron fortification has been continued since February 1994. Fortification pattern for wheat flour was not changed.

In 1994, a survey carried out in Caracas in a population of 307 children aged 7, 11 and 15 years, showed that the prevalence of iron deficiency measured by serum ferritin concentration, dropped from 37% in 1992, to 16% in 1994, only one year after the iron fortification program was started. Prevalence of anemia, measured by hemoglobin concentration, diminished from 19% to 10% in the same period.

Results from three other surveys carried out in 1997, 1998 and 1999 on the same age and socioeconomic groups that had been evaluated in 1990, 1992 and 1994, showed that after a dramatic reduction in 1994, iron deficiency tended to stabilize. Prevalence of anemia also diminished dramatically from 1992 to 1994, but for the last three surveys it reached the same levels of prevalence that were reported before the fortification program was started. It is possible that viral infections, reduction in corn flour consumption along with an increase in wheat flour intake (with no vitamin A fortification), continuous deterioration on life quality and the change of iron compound, could be responsible for the increase in anemia prevalence to the values found in 1992 before the fortification program started. Finally, in spite of the fact that conditions in the country continue deteriorating, this fortification program has improved iron stores and maintained prevalence of anemia.