# CONTRIBUTED PAPERS

## The Role of Hydrolyzed Vegetable Proteins in Iron Fortification Food Programs

**A.J. PONTECORVO**, Food Ingredients Specialities Department, The Nestle Co., Mexico

Efforts have focused the attention of food programs on increasing the amount of available iron in the diet through fortification of selected foods. In developed countries, wheat flour traditionally has been considered a common vehicle for iron fortification. Nevertheless, in less developed countries, other vehicles that may not be staple foodstuff should be considered (1). These vehicles may have an advantage over staple vehicles if they are more widely or more uniformly consumed by the target population. Specifically, salt, sugar, coffee, tea, oils and monosodium glutamate (MSG) have been considered as possible vehicles for iron fortification food programs (2).

Nonstaple foods show promise as vehicles for fortification because they are usually consumed by even the poorest individuals in society, or those who are in the greatest need of the nutrient (2). These foods can be fortified on a large scale at relatively few centralized private or governmental plants so that quality can be controlled and distribution can be supervised (3–7). They include salt, sugar, coffee, tea, oils and MSG.

The development of vitamin A-fortified MSG has led, in recent years, to the examination of use of the flavor enhancer MSG as a vehicle for iron fortification (3). MSG is consumed daily as a flavor enhancer or as a seasoning, sometimes replacing salt, in Southeast Asian countries, and in most countries of Latin America as hydrolyzed vegetable proteins from soybean origin, the basic ingredient of most industrial or semi-industrial, commercialized instant soups, bouillons, porridges, broths and seasonings. An example is that the Mexican market for industrial-type commercialized, instant soups, bouillons and broths is 15% of total population. This represents, in a country of 71 million inhabitants, a total of 10.7 million people that could be the target population for iron fortification food programs using hydrolyzed vegetable proteins as the appropriate vehicle. If the market for industrial-type commercialized soups, bouillons and broths would remain at 15%, that would represent 14.3 million people as the target for iron fortification food programs using hydrolyzed vegetable proteins as the appropriate vehicle by 1990.

Two iron sources already have been selected as possible fortificants to natural MSG contained in hydrolyzed vegetable proteins. The first source is ferrous sulfate encapsulated with zinc stearate, which has proven to have good color stability, a relative biological value of 70% as determined by rat tests (2) and an overall technical feasibility that has been demonstrated in the laboratory (3). The second source is ferric phosphate. This odorless, tasteless, off-white powder has an estimated relative biological value of 50% based on published data correlating particle size and relative biological value (3). Nevertheless, further testing is required to determine the efficacy of these two systems because actual iron absorption has not been determined in humans or test animals.

Our studies indicate that the 7% average naturally occurring MSG in hydrolyzed vegetable proteins may be a suitable vehicle for iron fortification. Because MSG is present in hydrolyzed vegetable proteins and consumed with meals, absorption studies in humans should consider the great variety of foods in which hydrolyzed vegetable proteins are used, especially in traditional dishes of Latin American countries. Table I shows a list of different, traditional Mexican food dishes in which hydrolyzed vegetable proteins are used or can be used on a daily basis.

Broths, soups, bouillons and seasonings have a very important role in the average Mexican daily diet. Four out of every five people consume some type of these products daily. It should also be emphasized that soups and bouillons are the nonstaple food items of higher consumption in Mexico, after the traditional staple food called "tortilla." On the other hand, it has been estimated that 85% of the Mexican population eats away from home daily at least once for breakfast, lunch, dinner or at a break during working hours at restaurants, snack bars, cafeterias, deli shops or simple nearby local places.

These facts lead us to the conclusion that, at present, there is a well developed and definite market for soups and bouillons in Mexico. Such market for soups and bouillons reached 12,000 tons in 1979, and the market for seasonings reached 1,000 tons the same year (nonextrapolated Nielsen data). The results from a mid-1979 study held in 5 of the most important cities in Mexico and with a universal sample of 5,000 are shown in Table II.

Flavor preferences were chicken, chicken and tomato, beef, shrimp, and pork.

Comparative analysis was made of 8 competitive international and local brands of dehydrated instant soups in

TABLE I

**Different Mexican Traditional Food Dishes in Which Hydrolyzed Vegetable Proteins Are Used or Can Be Used on a Daily Basis**

| |
|---|
| Beef meat stew |
| Broths, soups and bouillons |
| Chicken (fried) |
| Chicken stew |
| "Chilaquiles" |
| Egg stew |
| "Empanadas" |
| "Enchiladas" |
| Fish stew |
| Flavored and seasoned rice |
| Fried beans |
| "Moles" |
| Noodle soup with chicken |
| Pasta |
| Rice soup with chicken |
| Salads |
| Sauces |
| Seafood |
| Seasonings (soya sauce, meat juice, seafood seasonings) |
| Pork meat stew |
| Vegetable soups |
| White rice and fried eggs |

TABLE II

Social and Economical Levels

| Level | Considered as: | Population (%) | Acceptance (%) |
|---|---|---|---|
| A/B | High | 5 | 72 |
| C | Intermediate | 38 | 64 |
| D/E | Low | 57 | 57 |

TABLE III

Comparative Analysis of Eight Competitive International and Local Brands of Dehydrated Instant Soups in Mexico

(1) Knorr-Suiza (Knorr–Switzerland)
(2) Maggi (Nestle–Switzerland)
(3) Rosa Blanca (General Foods–U.S.A.)
(4) Rico (Anderson Clayton–U.S.A.)
(5) Instant Ramen (Suntory–Japan)
(6) Mexican Local Brand
(7) Mexican Local Brand
(8) Mexican Local Brand

TABLE IV

Industrial-Type Soup Market Share (%)

| | |
|---|---|
| Home-made | 58 |
| Dehydrated | 35 |
| Canned | 12 |

TABLE V

Aspects Considered in Soup Analysis

(1) General soup consumption
(2) Traditional food habits
(3) Sales habits and shopping habits
(4) Specific brand preferences
(5) Specific needs of key consumers
(6) Marketing positioning of brands
(7) Product brand image
(8) Acceptance level
(9) Frequency of consumption

Mexico and results are shown in Table III. In most cases, only natural ingredients, hydrolyzed vegetable proteins, and/or natural or artificial MSG are used in their production.

Mexican consumers make a difference in the commercial food market between home-made soups and industrial-type soups. According to our estimates, home-made soups represent 85% of the consumption in the entire country. Nevertheless, the first type of food considered includes all type of soups prepared, not only starting from fresh, natural, raw ingredients (e.g., chicken, beef, vegetables, and others), but also those prepared starting from cubes, tablets, powder or granulated bouillon presentations, because in most cases, these are taken as the base for the soup, and consumers add fresh meat, chicken or fresh vegetables to obtain the final product.

The general results for the industrial-type soup market share are given in Table IV. Aspects considered in the analysis are listed in Table V.

This analysis of the situation in the industrial-type commercialized soup market has led us to conclude that there is a potentially very large volume for hydrolyzed vegetable proteins to be used in iron fortification food programs of nonstaple food items that contributes to alleviate, in some proportion, the nutritional problems caused by iron deficiency.

REFERENCES

1. Paden, C.A., L. Wolinsky, J.C. Hoskin, K.C. Lewis, D.R. Lineback, and R.D. McCarthy, Lebens. Wissen. Tech. 12: 183 (1979).
2. Zoller, J.M., I. Wolinsky, C.A. Paden, J.C. Hoskin, K.C. Lewis, D.R. Lineback, and R.D. McCarthy, Food Technol. p. 38 (Jan. 1980).
3. Bauerfeind, J.C., and A. Timreck, Presentation at IVACG meeting, Rio de Janeiro, Brazil, and INAGC meeting, Campinas, Brazil, 1978.
4. Guranath and Sons, "Fortification of Salt with Iron," Report to U.S. AID, New Delhi, India, 1973.
5. Guranath, M.M., H.W. Diamond, and M.G.V. Mannar, Presented at 4th Symposium on Salt, Houston, Texas, 1973.
6. Institute of Nutrition of Central America and Panama (INCAP), "Fortificación del azúcar con hierro," INCAP Annual Report, 1976, pp. 99–103.
7. Klug, S.L., F.J. Patrizio, and W.J. Einstman, U.S. Patent 4,006,263 (1973).

# Continuous Deodorization

ANGEL ABREGO LOPEZ and MARIO FLORES MARTÍNEZ, Dessarrollo Industrial
Ingenieros Morelia, Michoacan, Mexico

## INTRODUCTION

The fundamental types of continuous deodorization are countercurrent, parallel countercurrent, horizontal flow with Mamuth pump steam–oil contact and horizontal trays, using a labyrinth based on Wecker invention.

Each of these designs is described with what we believe are main advantages according to several researchers (1–5, and S. Sourelis, personal communication).

## COUNTERCURRENT DEODORIZATION

This equipment, by its natural simplicity, has a tendency to be more attractive in cost at first. Normally, it is designed to operate at a maximum 6 mm Hg, which we believe is more economical than 1 mm Hg since both oils give a product of equivalent odor and flavor when judged by a test panel evaluating oils deodorized at 6 mm Hg and 1 mm Hg. However, less blowing steam is used at 1 mm Hg, but a higher steam usage is required in steam operated ejectors. It is possible to lower temperature at 1 mm Hg, but this would affect flavor, odor and shelf-life of the product.

The contacting device is the bubble cap, which is readily available as it is standard equipment in the chemical and petroleum industries (6). The theoretical pressure drop is 1.8 mm Hg and acceptable hydraulic gradient is a diameter of 3.00 m in deodorization towers. We measured the pressure decrease per plate at the IGSA deodorizer, which is