

Quadruple Fortification of Salt with Iodine, Iron, Vitamins B9 and B12 to Reduce Maternal and Neonatal Mortality by Reducing Anemia and Nutritional Deficiency Prevalence (P24-041-19)

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Objectives: To develop a quadruple fortified salt(QFS) formulation that provides 100 + % of RDA for iodine and vitamin B₁₂ and 30–50% of RDA for iron and folic acid in forms that are organoleptically stable, bioavailable and acceptable to consumers

Methods: Iodine was sprayed onto salt as an aqueous solution of potassium iodate. Iron was admixed as a solid premix, which was colour masked with TiO₂ and encapsulated in soy stearine to provide a water-impervious coating. The iron core was made of ferrous fumarate, which was agglomerated to an average size matching salt grain, i.e., 300–500 µm. Folic acid and vitamin B₁₂ were added either in the iodate spray solution or in the solid iron premix. The premixes and salt were stored at 25, 35 and 45°C at 65% RH for up to a year. The loss of iodine, folic acid and vitamin B₁₂ were monitored. An optimized

formulation was tested on the pilot scale at JVS Foods Pvt, Jaipur, India.

Results: Folic acid can be stabilized in the iodine spray solution, and triple fortified salt containing iodine, folic acid and encapsulated ferrous fumarate retained >90% of both the added iodine and folic acid for 6 months. Stable QFS was made by incorporating vitamin B₁₂ in the solid iron premix at a 1:200 ratio. The process was scaled up to produce some 25 kg of iron and B₁₂ premix, sufficient for 5 tons of salt, or 500,000 daily doses of salt. Organoleptic testing of Indian meals produced with quadruple fortified salt were found to be acceptable by a consumer panel at the University of Delhi.

Conclusions: Stable quadruple fortified salt that can provide up to 50% of RDA of folic acid and iron and 100 + % of RDA of vitamin B₁₂ and iodine has been developed. The product was pilot tested and had high consumer acceptability. The formulation could reduce the incidence of maternal and infant mortality at a cost of less than 20¢/annum.

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