



Ready to Use Food for Children

World Food Programme

New Delhi, India

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Goal in Developing Indian RUFC

- Develop an appropriate product for infants and young children aged 6-23 months
 - Blanket feeding
 - Supplementary feeding: Address Moderate Malnutrition
- Utilize locally available raw ingredients
- Make a product that is safe and ready to use
 - Packaged in either a single serving ration or jar (1-2 week ration)
 - Special packaging for long shelf-life
 - Low water activity - less prone to bacterial contamination
 - No cooking requirement



India RUFC - Macronutrients

	Requirement From Food	India RUFC
	6-8 / 9-11 months	/50 g
Energy	202 / 307*	260-270
Protein	3.9 / 4.5**	5.0-6.5
Fat	12.5***	15.5

- Energy dense
 - Soybean oil
- High quality protein
 - Essential amino acids from milk solids, pulses
- Fortified to provide important micronutrients for cognitive development and physical growth

*Uauy R, Castillo C. J. 2003 ** Reeds P J, Garlick P J. 2003 ***GAIN Consultation in India, Sept. 2007



Formulations

	Formulation #1
Ingredients	g/100 g
Fried Gram (Chick Pea)	34
Soybean Oil	31
Sugar	12
Extruded Rice Flour	12
Skimmed Milk Powder	10
Soya Lecithin	1
Micronutrients	

India RUFC - Vitamins



	RUFC	Plumpy Doz™	Supplementary Plumpy™
Vitamin A, ug	100	400	840
Beta Carotene, ug	400		
Vitamin E, mg	3.0	6.0	18.4
Vitamin D, ug	2.5		15.0
Vitamin K, ug	15		19.3
Vitamin B1, mg	0.25	0.50	0.55
Vitamin B2, mg	0.25	0.50	1.66
Niacin, mg	3.7	6.0	4.9
Pantothenic Acid, mg	0.5	2.0	2.9
Folic Acid, ug	75	160	193
Vitamin C	30	30	49
Vitamin B6	0.25	0.50	0.55
Vitamin B12	1.0	0.9	1.7
Biotin			60



India RUFC - Minerals

	RUFC India	Plumpy Doz TM	Supplementary Plumpy TM
Calcium, mg	200	387	276
Copper, mg	0.3	0.3	1.6
Iron, mg	10.0	9.0	10.6
Iodine		90	92
Magnesium, mg	40	60	85
Manganese, mg	0.8	0.17	
Phosphorus, mg	75	275	276
Potassium	305	310	511
Selenium, ug	10	17	28
Zinc, mg	4.1	9.0	12.9



Steps Taken to Develop RUFC

- Identified capable producers
 - Necessary equipment (planetary blender, packaging machine, etc)
 - Follow internationally recognized standards i.e. ISO 22000, HACCP, GMP
- Produced pilot batches
- Conducted extensive laboratory testing on the RUFC
 - Nutritive Value, Physical Properties, and Safety (i.e. pesticide residues, mycotoxins, microbiology)
- Conducted preliminary acceptability trials and adapted product taste to the local preference



Issues encountered

- Oil separation
 - Evaluate different thickening agents/emulsifiers, i.e. alginates and/or mono-/di-glycerides
 - Try different blending techniques
 - Pass some of the ingredients through a homogenizer or colloid mill
- Oil Stability
 - Evaluate various antioxidants
- Viscosity/Stickiness
- Primary Packaging
 - Automatic Packaging versus Semi-automatic process
 - 3 layer material versus 4 layer material
 - Sealing through contamination
- Secondary packaging
 - 3 ply cartons versus 5 ply cartons
 - 10 kg (max. net. wt.)



Way Forward

- Finalize product formulations and packaging
- Formal acceptability trial with mothers and infants
- Efficacy studies
 - Blanket feeding (preventative)
 - Supplementary feeding (treatment of moderate malnutrition)
- Effectiveness studies



Thank You

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Trends in Malnutrition in India: 6-24 months

NFHS-3



Age (months)	Stunting < -2 SD HAZ	Underweight < -2 SD WAZ
6-8	25.9	34.7
9-11	32.0	36.7
12-17	46.9	40.2
18-23	57.8	45.9

- Prevalence of stunting and underweight continually increases from 6 months of age to 23 months of age



RUTF compared to RUSF

	RUSF	RUTF
Target Population	Moderately Malnourished	Severely Malnourished
Role of Food	Preventative	Therapeutic
Cost (ex-factory)	\$2500/MT	\$4500/MT
Factory Location	India	France



Infant/Young Child Malnutrition in India

		NFHS-3 (2005-06)
Wasting	Moderate	22.9%
	Severe	7.9%
Stunting	Moderate	44.9%
	Severe	22.0%
Underweight	Moderate	40.4%
	Severe	15.8%

- Prevalence of malnutrition is almost double that of Sub-Saharan Africa
- 40% of undernourished children in the world are Indian
- India is not on pace to achieve MDG 1 of halving the number of underweight children
- More children die from moderate malnutrition than severe malnutrition

Integrated Child Development Services



	India	Orissa
6-36 months	30,755,232	1,924,030
36 -72 months	29,894,421	1,907,239
6-72 months	60,634,506	3,831,269
Pregnant and Lactating Women	13,046,087	734,630
Total Beneficiaries	73,680,593	4,565,899



Micronutrients: RUSF compared to Indiamix

- RUSF
 - Vitamin A (300µg RE); Folic acid (75µg); Niacin (3.7mg); Pantothenic acid (0.5mg); Riboflavin (0.25mg); Thiamin (0.25mg); Vitamin B6 (0.25mg); Vitamin B12 (0.5µg); Vitamin C (20mg); Vitamin D (1µg); Vitamin E (3mg); Vitamin K (5µg); Calcium (100mg); Copper (0.3mg); Iron (10mg); Magnesium (40mg); Manganese (0.8mg); Phosphorus (75mg); Selenium (10µg); Zinc (2mg)
- Indiamix
 - Vitamin A (194.3µg); Folic acid (26.4µg); Niacin (4mg); Riboflavin (0.63mg); Thiamin (0.62mg); Vitamin B6 (0.28mg); Vitamin B12 (0.25µg); Vitamin C (15mg); Calcium (95.4mg); Iron (7.3mg); Zinc (2.5mg)



Under 5 Malnutrition

		NFHS-3 (2005-06)	Change from NFHS-2
Wasting	Moderate	22.9%	3.2%
	Severe	7.9%	1.2%
Stunting	Moderate	44.9%	-6.1%
	Severe	22.0%	-5.0%
Underweight	Moderate	40.4%	-6.1%
	Severe	15.8%	-1.8%



Small-scale atta fortification

- Developed appropriate premix composition (diluted) for small-scale fortification, Village Chakkis and Home Chakkis
- Increased nutrition awareness on the importance of fortification with an intensive IEC campaign in 400 villages
- Enhanced the local capacity to produce fortified flour (bajra or wheat) by training 446 Chakki Wallahs on fortification
- Improved access to fortified food for 90% of Gujaratis
- Demonstrated how to maintain the premix pipeline
- Devised a monitoring system for premix and fortified atta
- Provided a replicable model for small-scale atta fortification in Gujarat and India

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