International Lipid-Based Nutrient Supplements (iLiNS) Project Overview

Project goal:
To further develop the evidence base for the use of lipid-based nutrient supplements (LNS) to *prevent* under-nutrition in vulnerable populations.

Context:
Tackling under-nutrition, including micronutrient deficiencies, is increasingly recognized as a high priority and high-return development investment, closely linked to achievement of the Millennium Development Goals. While attention has often focused on one or several individual micronutrients such as iron or vitamin A, poor quality diets are known to result in multiple deficiencies. Infants, young children and women of reproductive age are most vulnerable due to the high nutrient requirements of growth, pregnancy and lactation. For these groups, innovative and affordable approaches are needed to fill gaps in essential nutrients, and policy action may be required to develop and deliver them.

Summary:
Lipid-based nutrient supplements (LNS) are a family of products designed to deliver nutrients to vulnerable people. They are considered "lipid-based" because the majority of the energy provided by these products is from lipids (fats). All LNS products provide a range of micronutrients, but unlike most other multiple micronutrient supplements LNS also provide energy, protein, and essential fatty acids (EFA). Like other essential nutrients, EFA cannot be produced within the body and must be consumed. High energy/high dose LNS products such as Plumpy'nut™ have emerged as a very effective option for treating severe acute malnutrition in children, and make it possible to do so via community-based programs. More recently, LNS products with a lower energy dose but a full complement of micronutrients have been shown to prevent child stunting and support normal motor development in several controlled trials in Malawi and Ghana. These lower dose products were developed to enrich and not replace locally available foods.

The current iLiNS Project seeks to build on the work with additional efficacy trials in Malawi, Ghana, and Burkina Faso. The new trials aim to confirm the potential of LNS for *prevention* of under-nutrition, and will identify product formulations that are optimized with respect to nutrient content and energy dose, and are cost-effective. In addition to targeting children from 6 to 18 mo of age, iLiNS will also include two trials to evaluate the impact of LNS given to women during pregnancy and the first 6 mo of lactation, as well as to their children from 6 to 18 mo. The iLiNS project also extends beyond efficacy trials to explore a range of economic issues, including cost-effectiveness, willingness to pay for the LNS products, and a range of possible product delivery systems.

Objectives:
iLiNS Project activities are structured around the following six objectives (study sites in parentheses):

1. Develop and test the acceptability of alternative LNS formulations for various target groups (all sites)
2. Evaluate the efficacy of reduced-cost formulations of LNS for infants and young children (Malawi)
3. Determine the optimal amount of zinc to include in LNS (Burkina Faso)
4. Evaluate the efficacy of LNS products for pregnant & lactating women (Malawi, Ghana)
5. Conduct socio-economic studies of LNS (demand, delivery systems, cost-effectiveness) (all sites)
6. Coordinate efforts, build capacity and use results to inform policies and programs

Efficacy study designs and outcomes:

Objectives 2-4 will be met by conducting controlled intervention trials in which participants are randomly assigned to different study groups (see below). Objectives 2-4 will use products developed and tested under Objective 1.

Objective 2: Malawi	Objective 3: Burkina Faso	Objective 4: Malawi and Ghana
1920 children	3200 children	864 women and their infants
LNS from 6 to 18 mo of age	LNS from 8 to 18 mo of age	LNS, multiple micronutrients or iron-folic acid tablets
6 study arms, varying dose & cost: • LNS with milk, 40 g/day • LNS no milk, 40 g/day • LNS with milk, 20 g/day • LNS no milk, 20 g/day • LNS with milk, 10 g/day • Delayed intervention	5 study arms, 20 g LNS/day, varying zinc: • LNS no zinc & placebo tablet* • LNS 5 mg zinc & placebo tablet* • LNS 10 mg zinc & placebo tablet* • LNZ no zinc & 5 mg zinc tablet* • Delayed intervention *tablets given between meals	3 study arms, varying product and duration: • LNS 20 g/day, pregnancy, lactation to 6 mo & for child from 6 to 18 mo of age (comprehensive) • Multiple micronutrient tablet, pregnancy & lactation • Iron-folic acid tablet during pregnancy and placebo (low dose calcium) during first 6 mo lactation (standard care control)

Outcomes:

Infants/children: Anthropometry, body composition, morbidity, anemia and micronutrient status, erythrocyte essential fatty acids, immune response, neuro-behavioral development, appetite, energy intake from complementary foods, adverse events (continual monitoring).

Mothers: Pregnancy weight gain and birth outcomes, anemia and micronutrient status, erythrocyte essential fatty acids, breast milk composition (micronutrients and essential fatty acids), depressive symptoms.

Socioeconomic studies and outcomes:

The following issues (column headings) will be addressed in Objective 5 using an array of research tools and data.

Demand for LNS products	Factors affecting demand for & efficacy of LNS products	Cost-effectiveness of LNS products

• Assessments of food beliefs & food habits
• Willingness-to-pay (WTP) assessments
  • Survey-based questionnaires
  • Economic experiments with LNS auctions
  • Market tests of LNS products
	• Statistical analysis of effects of characteristics
	  • Individual
	  • Caregiver
	  • Household
	  • Village
	  • Meso
		• Assessment of costs of delivering LNS under different mechanisms
		  • Product development costs
		  • Production costs
		  • Distribution costs
		  • Household Consumption costs (cash and time)

Outcomes:

Willingness-to-Pay: Estimates of WTP for LNS products, and the identification of factors that influence WTP.

Cost-Effectiveness: Estimates of the cost-effectiveness of alternative formulations and dosages of LNS, for alternative LNS product delivery mechanisms (e.g., community-based health programs versus retail food outlets).

Policy Guidance: Identification of the potential roles of public policy in developing and delivering LNS products, with special attention paid to resource-poor households.

For more information: Visit www.iLiNS.org, or contact the iLiNS Project Manager, Mary Arimond (marimond@ucdavis.edu) or Project Director, Dr. Kathryn Dewey (kgdewey@ucdavis.edu).

Project Partners

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