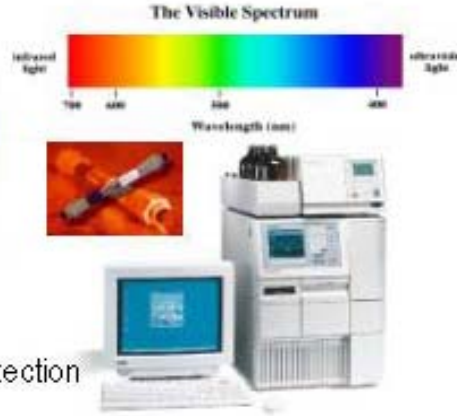
Fat-Soluble Micronutrients in Serum

Public Health Problem

- Fat-soluble vitamins (A, E, D) are essential for maintaining vision, fertility, and blood clotting and for regulating bone-mineral turnover. Some fat-soluble, plant-derived pigments, such as the carotenes, lycopene, cryptoxanthin, lutein, and zeaxanthin, also are important - either as precursors to vitamin A or as antioxidants
- The cooperation of vitamins E and C is probably the most important antioxidant mechanism protecting low density lipoproteins against lipid peroxidation
- The richest dietary sources of the fat-soluble micronutrients are fish-liver oils (A), milk (supplemented with D), vegetables oils (E), carrots (carotenes), tomatoes (lycopene), papaya (cryptoxanthin), collards (lutein), and corn (zeaxanthin)

Sources: food & supplements



HPLC & UV/vis detection

CDC's Laboratory Response

The CDC Nutrition Laboratory measures the following fat-soluble micronutrients in serum: retinol (vitamin A), retinyl palmitate, retinyl stearate, α-tocopherol (vitamin E), γ-tocopherol, lutein, zeaxanthin, β-cryptoxanthin, lycopene (*trans* and total), carotenes (α-, trans-β-, 13-*cis*-β-), and 25-hydroxy-cholecalciferol (vitamin D). The laboratory provides important biologic information for population surveys and intervention trials, including

- The National Health and Nutrition Examination Survey (NHANES) - a population survey to establish reference ranges for fat-soluble vitamins among the civilian, noninstitutionalized US population

- Various nutrition surveys abroad, such as the Mongolia Anemia Study and the Micronesian Women and Children Study
- Age-Related Eye Disease Study (AREDS) - a 10-year clinical trial to test the ability of antioxidants (vitamins C and E, beta-carotene) or zinc, either alone or in combination, to delay or prevent the progression of macular degeneration and cataracts
- Isotretinoin Basal Cell Carcinoma Prevention Trial (ISO-BCC) - a double-blind, randomized, placebo-controlled, multicenter clinical trial designed to evaluate the effectiveness of a synthetic retinoid to reduce the incidence of basal cell carcinoma in a high-risk population
- Premier Study - a randomized, multicenter study designed to compare different interventions to lower blood pressure in hypertensive adults. One of the interventions included increasing the consumption of fruits and vegetables

Public Health Impact

To study the relation among diet, nutrition, and health, scientists and nutritionists rely on NHANES data about what Americans eat and what kinds of supplement they use. The Nutrition Laboratory provides important biologic information about nutritional status by analyzing serum samples to complement dietary survey and supplement survey information. In addition to supporting population-based surveys, the laboratory supports large and small intervention trials to assess participant compliance and to measure serum levels achieved with various types of interventions (dietary or supplements).

The laboratory also provides international support to help countries address acute and chronic nutritional deficiencies in their populations. Nutritional deficiency disorders, devastating in the United States in the 19th century, are still common in the developing world and are reemerging in parts of the developed world. Worldwide, vitamin A deficiency is the leading cause of blindness among children. Vitamin E deficiency targets the neuromuscular, vascular, and reproductive systems. Vitamin D malnutrition remains the most common cause of rickets.

For More Information

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The Centers for Disease Control and Prevention (CDC) protects people's health and safety by preventing and controlling diseases and injuries; enhances health decisions by providing credible information on critical health issues; and promotes healthy living through strong partnerships with local, national, and international organizations.

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