

**General** - water-soluble; “hair” vitamin;

- First isolated from egg yolks & identified as vital growth factor for yeast;
- Raw egg white contains a glycoprotein (avidin) that inactivates biotin & prevents its absorption from the gut; 27 egg whites/day are necessary to induce deficiency;
- Biotin comes from foods & bacteria in healthy gut make unknown amounts of it;
- **History:** need for biotin in yeast identified in 1924; egg white injury in rats (dermatosis & loss of hair) reversed by liver factor in 1927; need for biotin demonstrated in human diet in 1942; biological functions identified in 1959; genetic error in biotin-dependent carboxylase described in 1971;

## Nutrition

- **Sources:** best: yeast, liver, kidney, soy bean, egg yolks; good: sardine, salmon, whole grains, nuts, cauliflower; fair: corn, legume, rice, spinach, chicken; intestinal bacteria produce some biotin (stimulated by sucrose);
- **Supplements:** B-complex, multi-vitamin & multi-vitamin-mineral formulations;
- **Absorption** of biotin occurs in upper part of small intestine; 50% of estimated daily 25 to 45 mg from foods is absorbed;
- **Antagonized by:** poor diet; raw egg white; antibiotics; excess choline; rancid fats; low stomach acid; saccharin;
- **Stability:** destroyed by alkali & oxidation; relatively heat-stable; slight cooking losses; moderate processing & refining losses;
- **Storage:** highest in liver, kidneys, brain, adrenals; blood levels high;
- **Excretion:** excess excreted in urine;
- **Metabolism:** usually bound to protein, released by enzyme action; works with zinc; increased need during pregnancy & lactation; works with lysine (biocytin);
- **Interactions:** alcohol consumption increases need for biotin; antibiotics including sulphonamides & oxytetracycline reduce biotin-producing bacteria;

## Functions of Biotin

- Main activity occurs in the liver, in carbon dioxide transfer reactions;
- Involved in synthesis of nucleic acids & energy carrier ATP;
- Part of several enzyme systems involved in normal growth & maintenance of nervous system tissue, bone marrow, sweat glands, male sex glands, skin tone, hair quality & blood cells;
- Involved in the synthesis & oxidation of fatty acids;
- Takes part in stimulating protein synthesis & deaminating several amino acids;
- Involved in oxidation of carbohydrates for energy; involved in insulin activity;
- Involved in synthesis of Vitamin B-3, digestive enzyme (pancreatic amylase), immune antibodies;
- Involved in utilization of protein, folic acid, B- 12 & pangamic acid;

- Important in metabolism of branched chain amino acids;
- Necessary for glycogen formation;
- Required for healthy hair & skin;

### Quantities

- **Measurement:** micrograms; milligrams;
- **Optimum:** (SONA) average not yet established;
- **Individual optimum** must be individually determined;
- **Minimum:** (DRI) set at 30µg/day;
- **Less than RDA:** not measured; estimated at less than 10% of the population
- **Deficiency** can result from sterilization of intestinal tract by prescription antibiotics; diet exceedingly high in raw egg white (avidin is inactivated by cooking); inborn (genetic) error; patients undergoing haemodialysis; intravenously fed patients; long-term anti-convulsive therapy; alcoholics, burn patients, people with G.I. disorders; sudden death infants; deficiency symptoms develop in 3 - 4 weeks on biotin-free diet, & worsen with time; weight loss diets, poor absorption, increased requirement;
- **Symptoms** similar to B-1 deficiency, include: dry, scaly, dry skin (dermatitis), lack of energy, loss of appetite (anorexia), & muscle tone; hair loss; nausea, vomiting, mental depression, insomnia, pale tongue, disturbances of nervous system, heightened sensitivity to touch (hyperaesthesia); greyish skin tone;
- **Prolonged deficiency:** fatigue, sleepiness, muscle pains, loss of taste buds; anaemia, elevated serum cholesterol; lowered haemoglobin;
- **Chronic, severe deficiency** can result in hair loss (alopecia) & hair discoloration;
- **Toxicity:** none known; daily injections of 10 mg in children for several months show no side effects;

### Therapy with Biotin

- 5 to 10 mg/day useful in treating seborrhoea dermatitis & Leiner's disease in children;
- 150 or more mg/day used to alleviate biotin deficiency;
- 2.5 mg/day used successfully to treat brittle nails;
- Used in management of "un-combable" hair (profusion of cowlicks);
- Increased biotin levels may slow down aging process;
- May help athletes; biotin may improve branched chain amino acid metabolism;