(anecdotal); improves insomnia, visual disturbances, blood flow to eyes (anecdotal);

- More than doubled 3-year survival rate of patients hospitalized for atherosclerosis;

**PARA-AMINOBENZOIC ACID (PABA)**

**General** water-soluble;

- An, integral part of folic acid & procaine (Gerovital) molecule;
- Essential for some bacteria, that make folic acid from it, but not for man;

**Nutrition**

- **Sources:** liver, kidney, whole grains, bran; made by bacteria in healthy intestines;
- **Supplements:** B-complex, multi-vitamin & multi-mineral-vitamin supplements;
- **Absorption** from small intestine;
- **Metabolism:** nutritional benefit has not been confirmed;
- **Interactions:** PABA antagonizes actions of sulpha drugs;

**Functions of PABA**

- Necessary for synthesis of folic acid by bacteria in gut, that in turn stimulate synthesis of B-5;
- Co-enzyme in amino acid metabolism & in formation of red blood cells;
- Together with pantothenic acid, PABA maintains pigmentation of hair;
- Externally, PABA prevents sunburn & skin cancer from UV light;

**Quantities**

- **Measurement:** milligrams;
- **Optimum:** (SONA) average ranges not set;
- **Individual** optimum must be determined for each individual case;
- **Minimum:** (DRI) not yet established; essential nutrient for bacteria, but not for humans;
- **Deficiency** of PABA can only be achieved by oral administration of sulpha drugs;
- **Symptoms include:** hypertension, anxiety, depression, digestive disorders including constipation; fatigue, nervousness, headache;
- **Toxicity symptoms:** nausea, vomiting; long-term ingestion of high doses (more than 30 g./day) can be toxic to liver, heart & kidneys;
**Therapy with PABA**

- Constituent of folic acid;
- Helps utilization of pantothenic acid (B-5);
- Topical application protects against skin cancer;
- Topically applied sunscreen — prevents & soothes pain & damage of sunburn;
- Said to soothe pain of burns even better than vitamin E;
- Useful for treating some parasitic diseases, including Rocky Mountain spotted fever;
- Treatment of vitiligo, depigmentation of skin;
- Certain schizophrenia-like behaviours discontinued on administration of 2 g of PABA/day;
- May prevent amines from forming hallucinogens; used in schizophrenia (2,000 mg/day);
- With folic acid, B-5 & biotin, PABA restores colour to grey & greying hair (animals);
- Used to treat Peyronie’s disease, a fibrous penis condition in post-middle aged men;
- Used in lupus, apparently with some success;

**PANGAMIC ACID (DMG)**

**General:** water-soluble; dimethyl glycine (DMG)

- Need in human nutrition has not been established; dimethyl glycine is an intermediate in normal metabolism;
- Despite ambiguity of its nutritional status, pangamic acid is accepted as a valuable dietary factor; France, Japan, Germany, Spain & Russia use pangamic acid as an essential nutrient, with adult recommended allowances ranging from 25 - 50 mg/day;
- **History:** patented in 1949; introduced to natural foods trade in 1978;

**Nutrition**

- **Sources:** apricot pit; brewer’s yeast, brown rice, whole grain, pumpkin & sesame seeds; made in body by normal metabolism;
- **Supplement:** calcium pangamate;
- **Absorption** from small intestine; circulates freely in the body;
- **Storage:** minute amounts in liver & kidneys;
- **Excretion:** through kidneys, bowels, sweat;

**Functions of DMG**

- Can be converted into sarcosine & glycine by donating methyl groups;
- May have function in donating methyl groups for biological reactions;
- Poorly understood, but claimed to increase blood tissue oxygenation, improve performance & prevent insufficiency of tissue oxygen (hypoxia), that produces lactic acid build-up & fatigue;
- Reports claim that pangamic acid is involved in regulation of lipid & carbohydrate metabolism & in nervous system functions;