

Trace element	Function	Dietary sources	Causes of deficiency	Risk groups	Clinical findings	Screening and management
Chromium	Metabolism of fats and carbohydrates	Muscle meat, grain, legumes, nuts	Restricted food access	Extremely rare, PN	Impaired glucose tolerance, weight loss, confusion, peripheral neuropathy	Levels more commonly checked for excess (e.g. in PN dependent patients), ubiquitous in food, no dosing needed
Copper	Mineral cofactor superoxide dismutase, enzymes related to electron transfer, iron oxidation, melanin formation and connective tissue synthesis	Organ and muscle meat, nuts, cereals,	Long term PN without Cu added	Extremely rare, PN	Impaired glucose tolerance, weight loss, confusion, peripheral neuropathy, anaemia, neutropenia	Malnutrition, PN dependent patients
Iodine	Component of thyroid hormones required for normal growth and development	Sea fish, seaweed, iodised salt, dairy (through cattle supplementation)	Environmental deficiency in inland Africa and Asia, SthAmerica, mountainous areas WHO map iodine Absorbed stomach and upper SI	Environmental deficiency in inland Africa and Asia Goitrogens can impair binding of I to thyroglobulin (brassicas, sweet potato, maize)	Hypothyroidism (lethargy, poor cold tolerance, bradycardia, goitre), cretinism (intellectual disability (reduced language and memory skills), deaf-mutism, +/- hypothyroidism, short stature), miscarriage, stillbirth, increased perinatal mortality.	24 hr urine iodine excretion (90% excreted via kidneys) or random urine iodine:creatinine Iodised salt Mx thyroid disease
Iron	Component in heme and cytochrome proteins	Organ and muscle meat, pulses, dried apricots, green leafy vegetables	Restricted food access, increased losses, including parasite infection (inc. hookworm), malaria	Young children, esp those born to deficient mothers, high milk intake, vegetarians, chronic disease, PN dependent	Microcytic anaemia, pallor, weakness, shortness of breath	See anaemia and iron deficiency guideline
Manganese	Component metalloenzymes, bone formation, metabolism protein, carbohydrate, cholesterol	Cereals, tea, vegetables, low ferritin levels increase absorption, low bile excretion reduces excretion	Clinical deficiency not usually seen, even with low dietary intake if otherwise healthy.	Extremely rare	Impaired growth, reproductive function and glucose tolerance	Levels more commonly checked for excess (e.g. in PN dependent patients) See NRV
Molybdenum	Enzyme cofactor, including for purines/pyridines	Legumes, grains, nuts	Clinical deficiency not usually seen, reported in long term PN without Mb added.	Extremely rare PN	Neurological impairment in genetic abnormality sulphite oxidase	Levels not usually checked See NRV
Selenium	Antioxidant, redox reactions, thyroid metabolism (conversion T4 to T3), glutathione peroxidase	Seafood, chicken, muscle meat, fish, brazil nuts, eggs. Cereals and plant food content reflect soil content	Areas where soil levels low, gut disease	Seen in parts of China, Finland (soil content low)	Cardiomyopathy (Keshandisease, affects mostly children and women), myositis and nail dystrophy	Screen if malnutrition, PN dependent, See NRV
Zinc	Cofactor for many enzymes, inc ALP, RNA/DNA polymerase and superoxide dismutase	Seafood, organ and muscle meat, grains, milk, eggs. Higher bioavailability from animal sources than plant foods	Restricted food access, increased losses	Restricted food access, any cause of chronic diarrhoea, chronic illness	Acrodermatitis enteropathica, delayed wound healing, impaired taste, growth failure, delayed puberty and diarrhoea	Screen if malnutrition, diarrhoea, PN dependent, features deficiency Zinc dosing