agMOOCs

Trace Minerals 2

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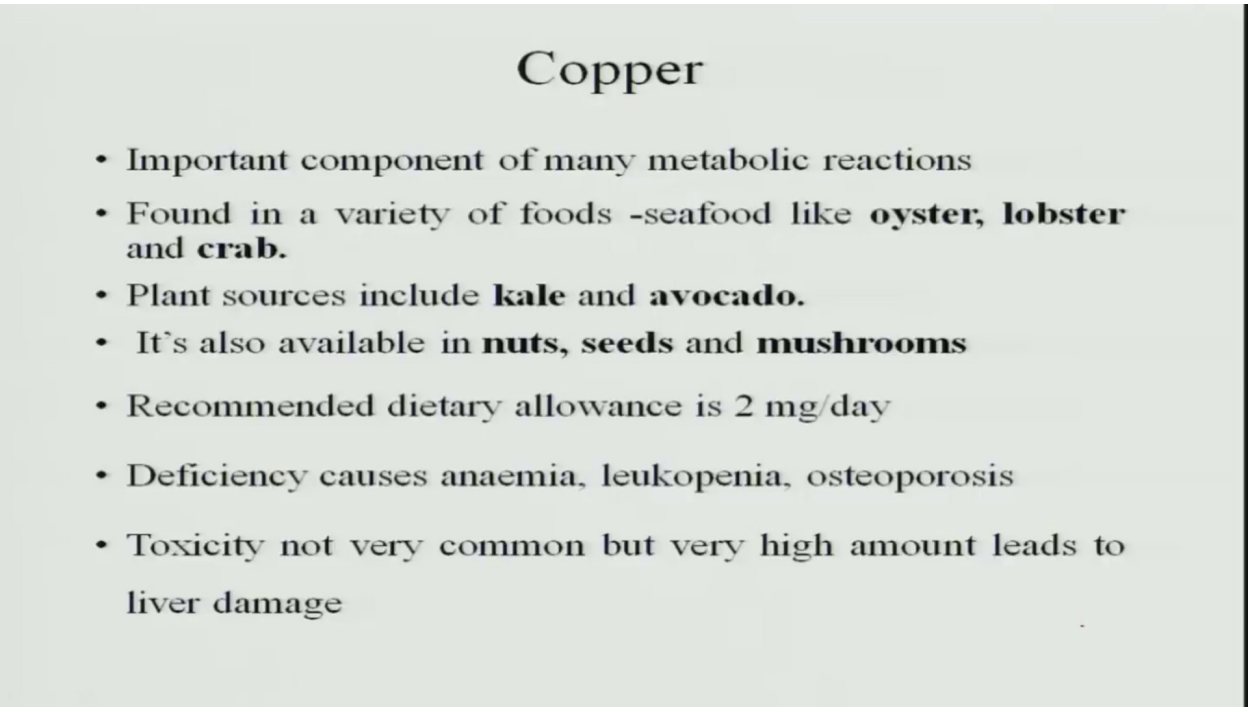
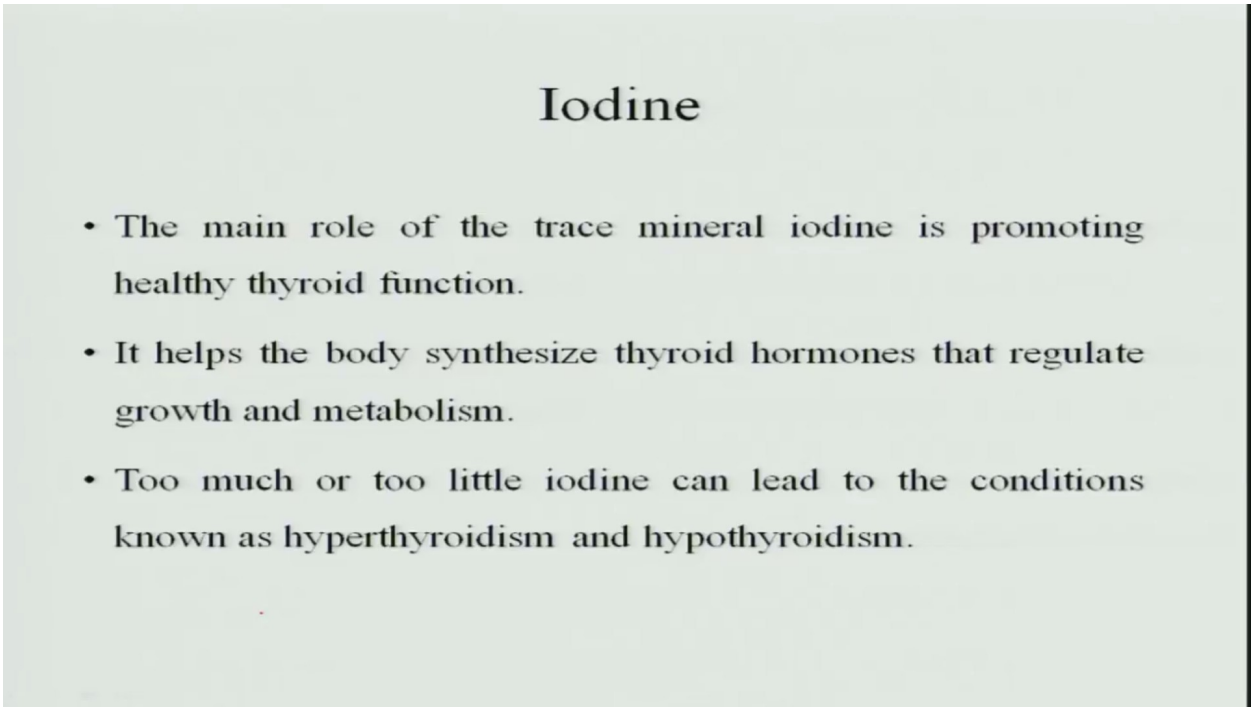
Last class we have seen about the trace elements which are required less than 100 milligrams per day and we have seen what are the sources of trace elements and what are the symptoms that occur when you take access of these trace elements and what occurs when they are deficient in our diet. So last class, we have seen about zinc and iron. Let us continue with the next trace elements.

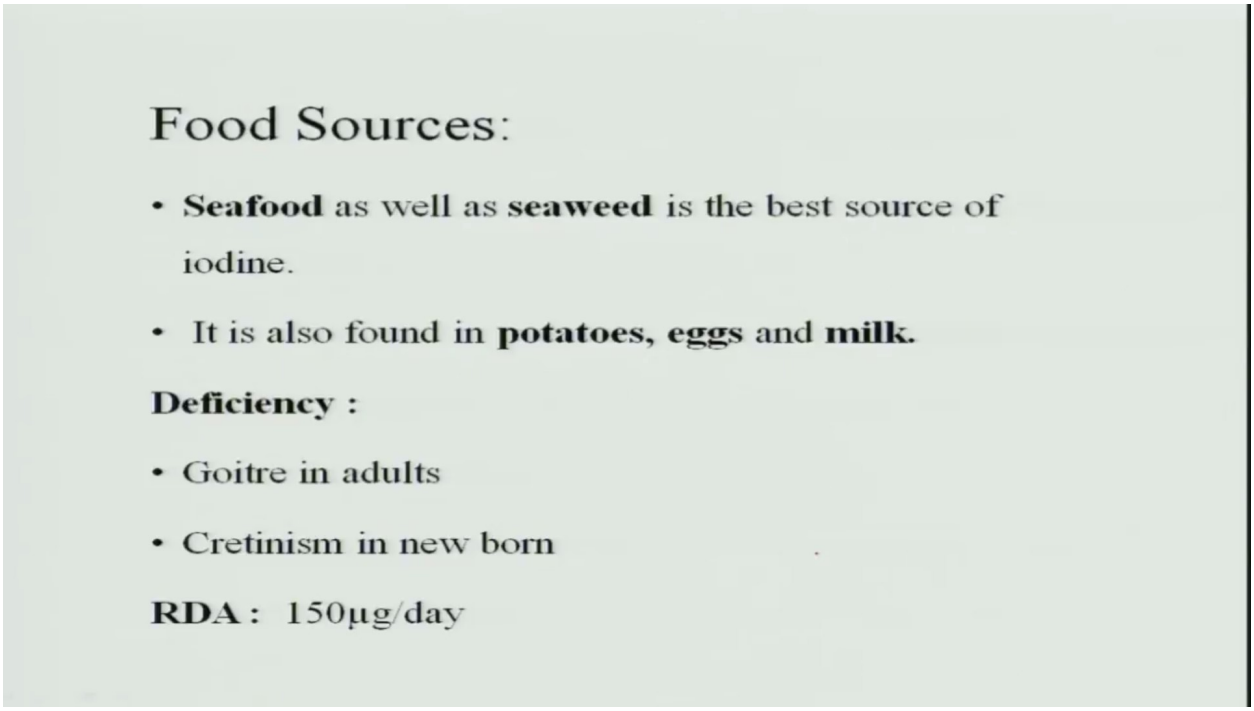


Copper is another minor element or minor mineral, which is required in the body, but still it has a very important role in the body. So this has a very important role in all the metabolic reactions and found in a variety of foods like oyster, lobster and crab. Then plant sources are kale and avocado, and it is available also in nuts, seeds and mushrooms, and the recommended dietary allowance for this is only 2 milligrams per day. But still when this 2 milligrams is not available to the body the deficiency causes anemia, leukopenia, that is the less number of leukocytes or WBC in the blood, and osteoporosis that is the bones become porous and tend to be fractured, because the calcium absorption also require copper for its absorption. Toxicity is not very common, but high amount leads to liver damage.

So these are the food sources you can see.



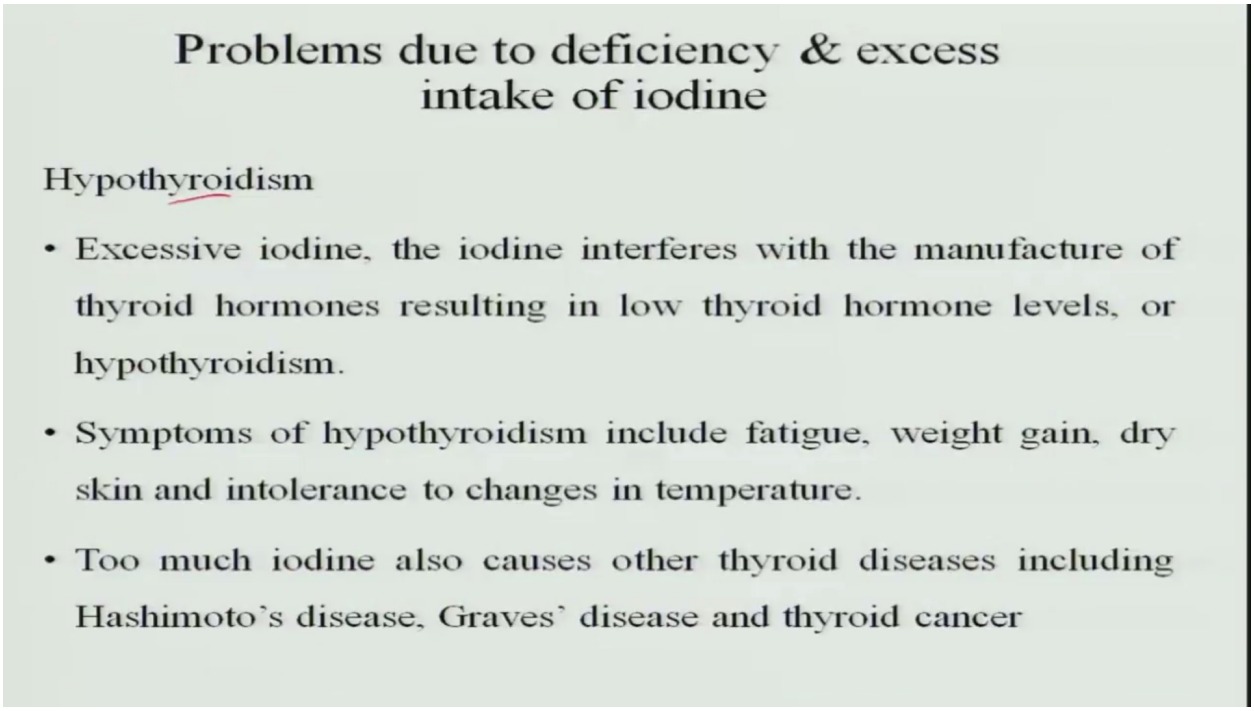
The next, another important, very important mineral which affects our energy metabolism is iodine. So the main role of the iodine is promoting the healthy thyroid function. So it helps the body to synthesize thyroid hormones that regulate the growth and metabolism in the body. So too much or too little of iodine can lead to conditions like if it is too much, it is hyperthyroidism and if it is too less, it leads to hypothyroidism.



Now food sources, where do we get this iodine from? We get from seafood. Seafood the main source of iodine as well as seaweed, and it is also found in little amounts in potatoes, eggs, and milk.

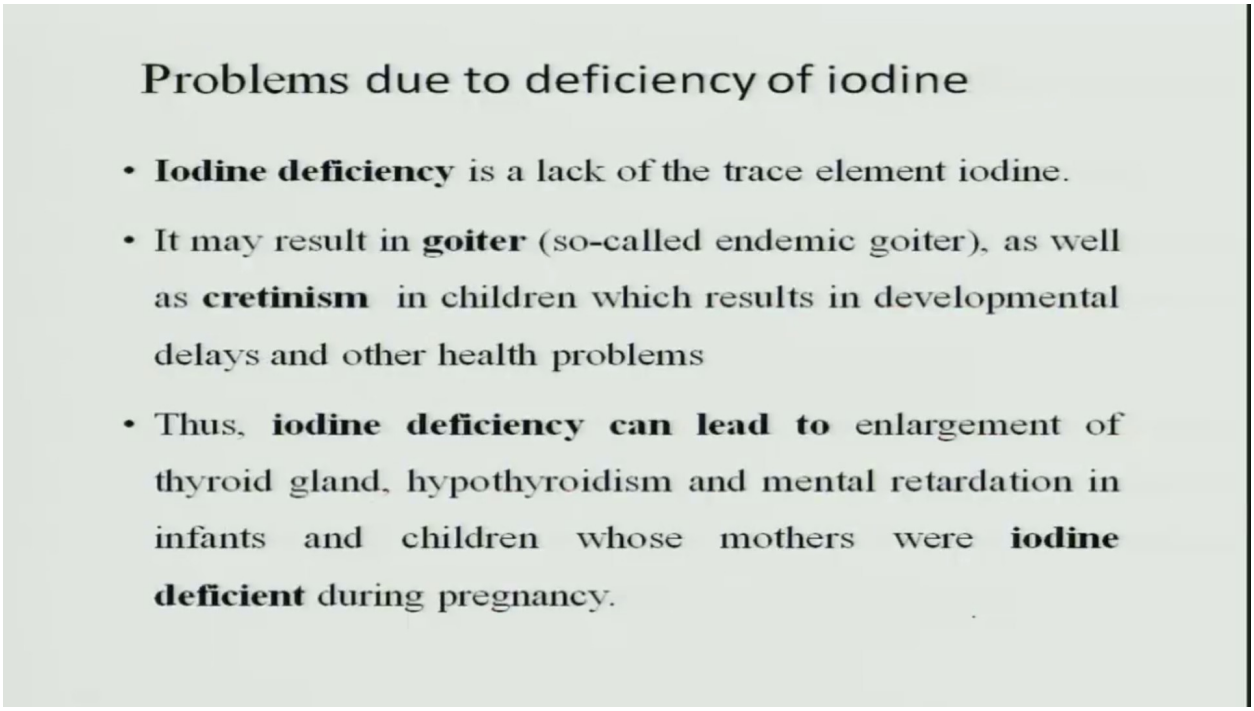
So the deficiency of iodine causes goiter in adults, cretinism in newborn. So the requirement you see, it is such a small amount, but causing such a distress. It is 150 micrograms per day.

And you can see the different sources of food that are rich in iodine.



Now the problems due to deficiency and excess of iodine intake. So when you take less amount of iodine in your diet or the diet is deficient, you are prone to hypothyroidism. So excessive iodine and the iodine interferes with the manufacture of thyroid hormones, it results in low thyroid hormone levels or hypothyroidism. Similarly, the symptoms of hypothyroidism include fatigue, there is lot of weight gain because iodine is required for energy metabolism and the energy metabolism is decreased by 50%, therefore whatever little energy is taken in is stored as fat, therefore there is weight gain and there is dry skin and intolerance to changes in temperature.

And too much of iodine also causes the thyroid diseases including Hashimoto's disease. This Hashimoto's disease is an autoimmune disease, which attacks the thyroid gland. And Grave's disease again is the cells of the thyroid gland itself have an autoimmune action against the thyroid gland and it also causes thyroid cancer.



Now deficiency of iodine, when there is lack of iodine, the trace element that is iodine, it may result in goiter. So this has been an endemic disease in the lower regions of the hilly regions, but now goiter can be seen in a large population in our country, as well as cretinism in children which results in the developmental delays and other health problems. So iodine deficiency can lead to enlargement of thyroid gland and hypothyroidism and mental retardation in infants and children whose mothers were iodine deficient during pregnancy. So whenever the mother during her pregnancy has deficient iodine intake, it affects the newborn and the child.

You can see how the goiter the thyroid gland has enlarged in an adult.

And the cretinized – the child with cretinism, you see how weak the child is. So there is no growth and there is mental retardation and the developmental delays are very slow.

Selenium

- Plays an important role in the protection of body tissues against oxidative stress and also growth & development

Food Sources:

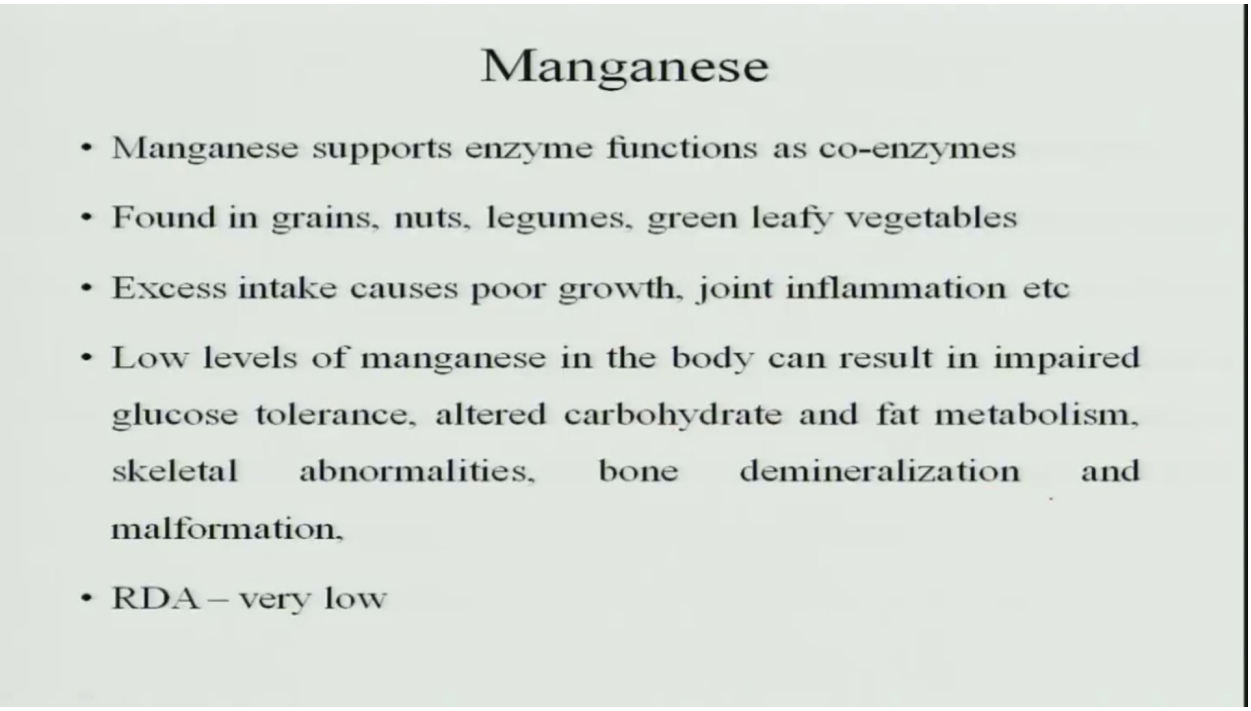
- Found in most **cereals, meats, fish** and **dairy,** legumes and Brazil nuts, as well as fruits and vegetables
- RDA : 40 µg/day

The next mineral is selenium. Selenium is again a very important mineral which acts as an antioxidant. So it plays an important role in protection of body tissues against the oxidative stress and therefore on growth and development. The food sources of selenium are cereals, meat, fish and dairy products, and you have in the other nuts like Brazil nuts, legumes, and fruits and vegetables, and the amount is very less that is 40 micrograms per day.

Problems due to deficiency of selenium

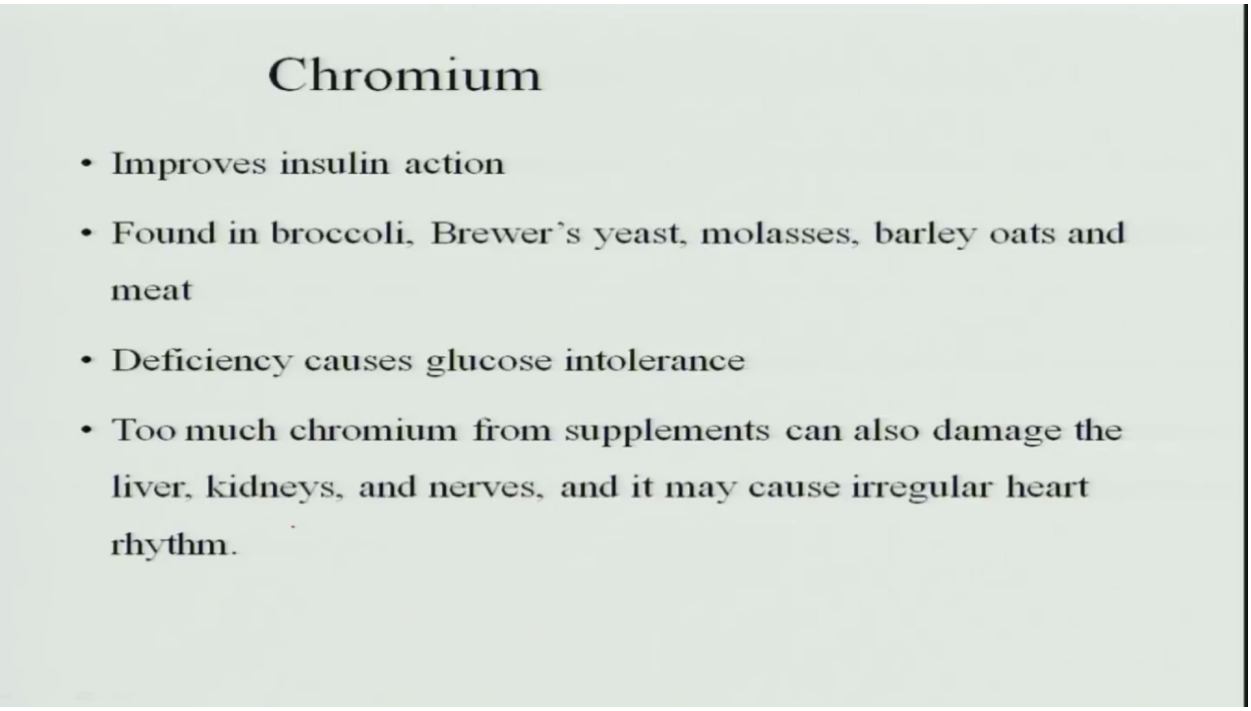
- Selenium deficiency is very rare
- Selenium deficiency can cause Keshan disease (a type of heart disease) and male infertility.
- It might also cause Kashin-Beck disease, a type of arthritis that produces pain, swelling, and loss of motion in the joints.

Now deficiency of selenium causes so the infertility in men, but the deficiency is very rare because this selenium deficiency occurs so very rarely, because it is available in most of the foods and it can also Keshan's disease where it is a type of heart disease where the muscles of the heart are affected. It is called as cardiomyopathy, and it might also cause the Kashin-Beck disease, which is a type of arthritis where all the bones and joints have a lot of pain, swelling and loss of motion of joints.



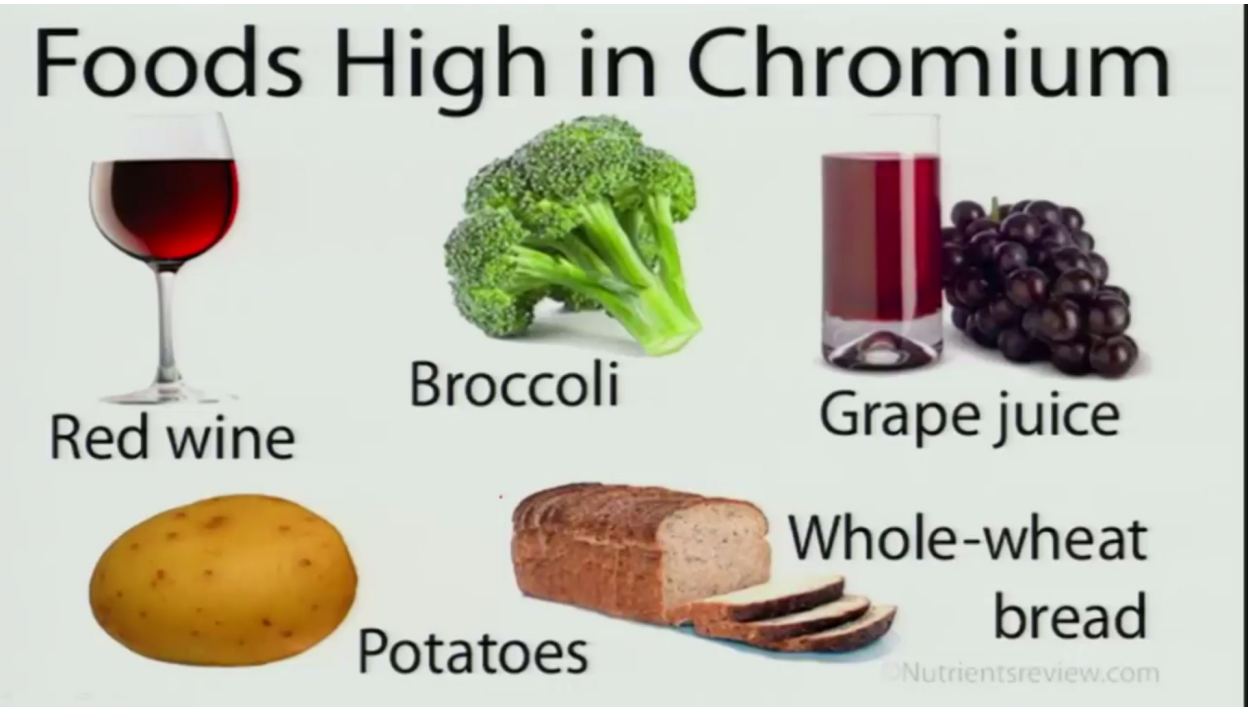
Another trace mineral is manganese. So this supports the enzyme function. It is again a co-enzyme in the reactions in the metabolism of carbohydrates, proteins and fats. So it is found widely in grains, nuts, legumes, green leafy vegetables. And excess intake, it causes poor growth, joint inflammation; and low levels of manganese in the body can impair the glucose tolerance, because it is involved in the carbohydrate metabolism, altered carbohydrate and fat metabolism. Then there are some skeletal abnormalities, because it is involved in the bone growth and bone demineralization and malformation. The RDA is very low.

And the food sources are, you find in green vegetables, fruits, whole grains, legumes, spices almost all the force are here which are rich in manganese. So again, the deficiency is very rare.

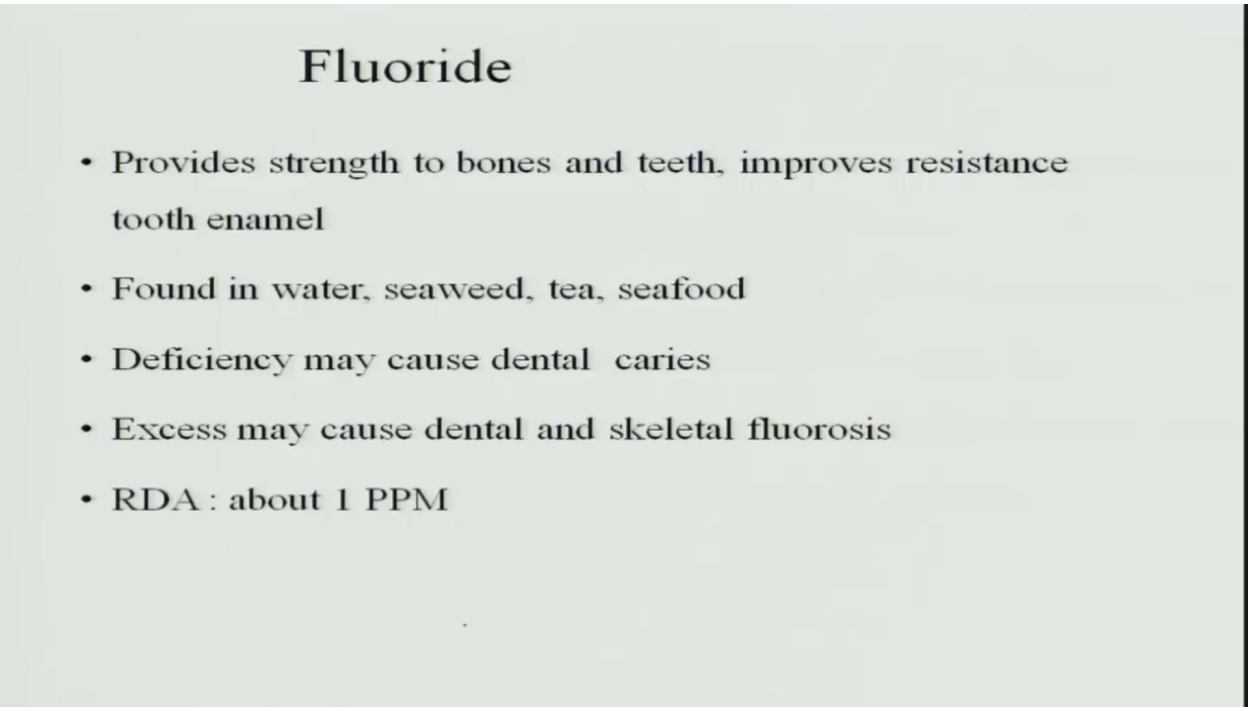


The next mineral is chromium. It improves the insulin action, found in broccoli, Brewer's yeast, molasses, barley oats and meat. So since it is involved in the insulin action, the deficiency

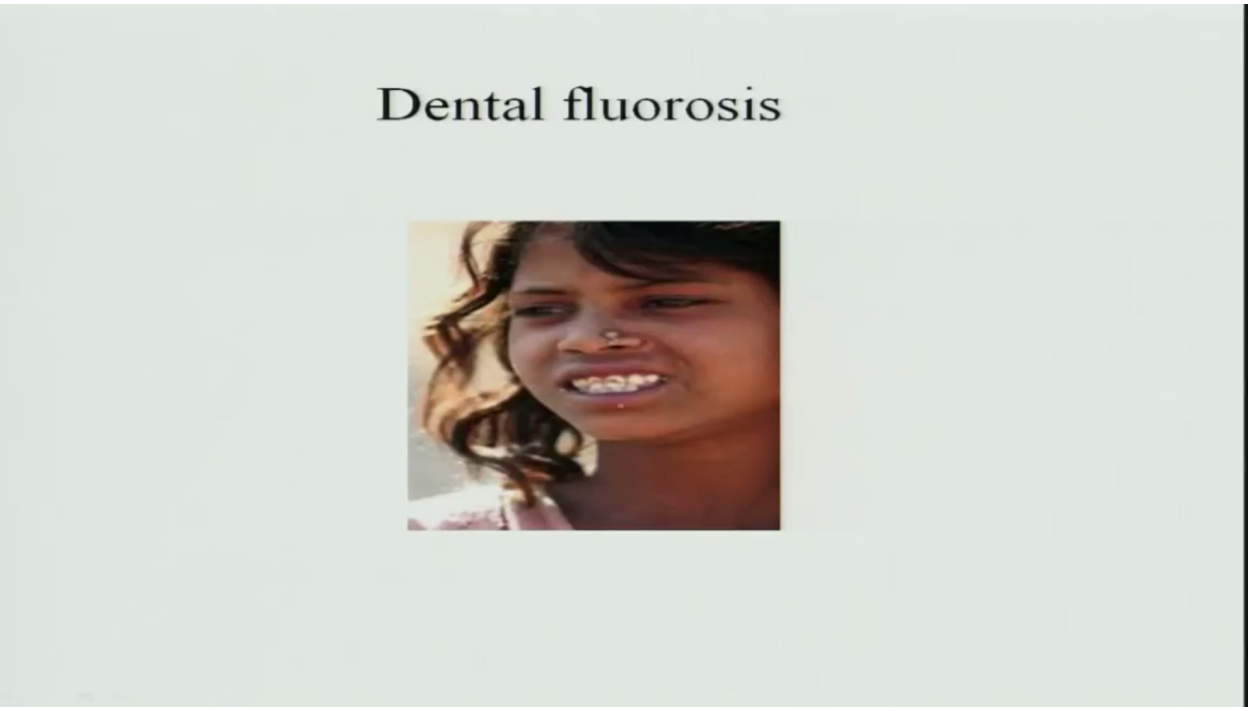
causes glucose intolerance and too much of chromium when it can also damage the liver kidneys and nerves, and it can also cause an irregularity in the rhythm of heartbeat.



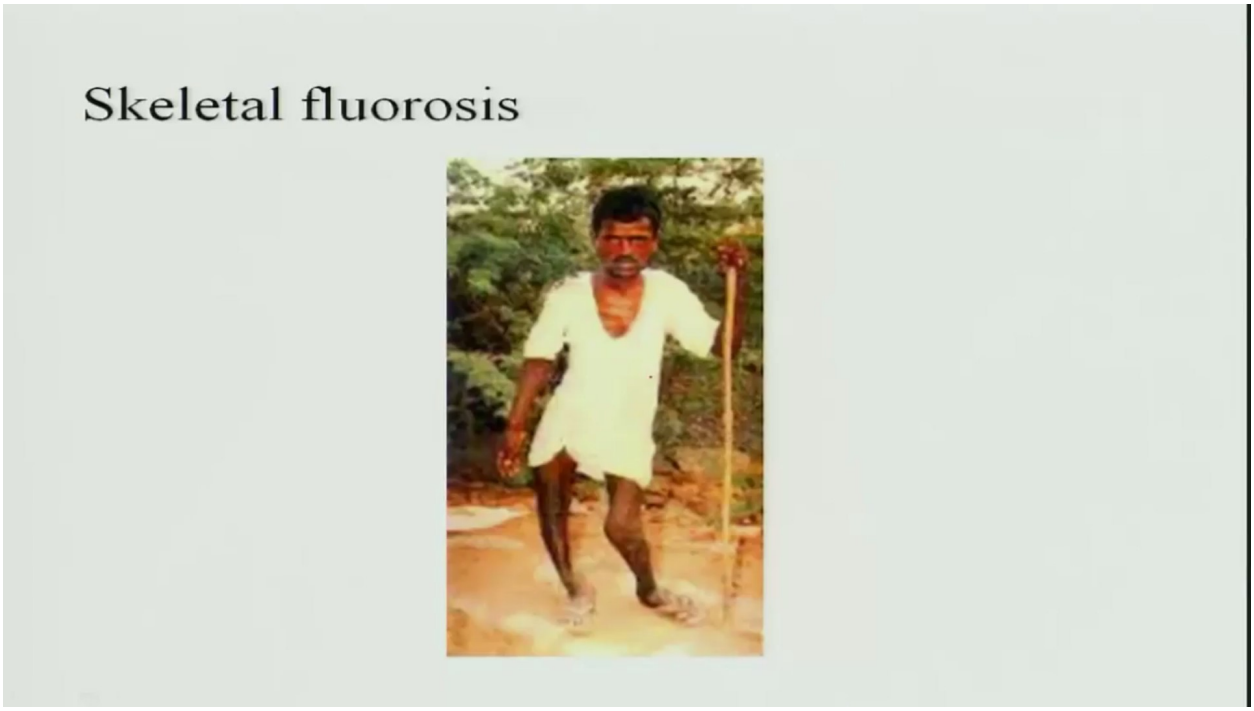
The foods high in chromium are red white broccoli grape juice whole wheat that is whole grains are important and potatoes, always potatoes when they are rich in the minerals and vitamins they are along with the peel.



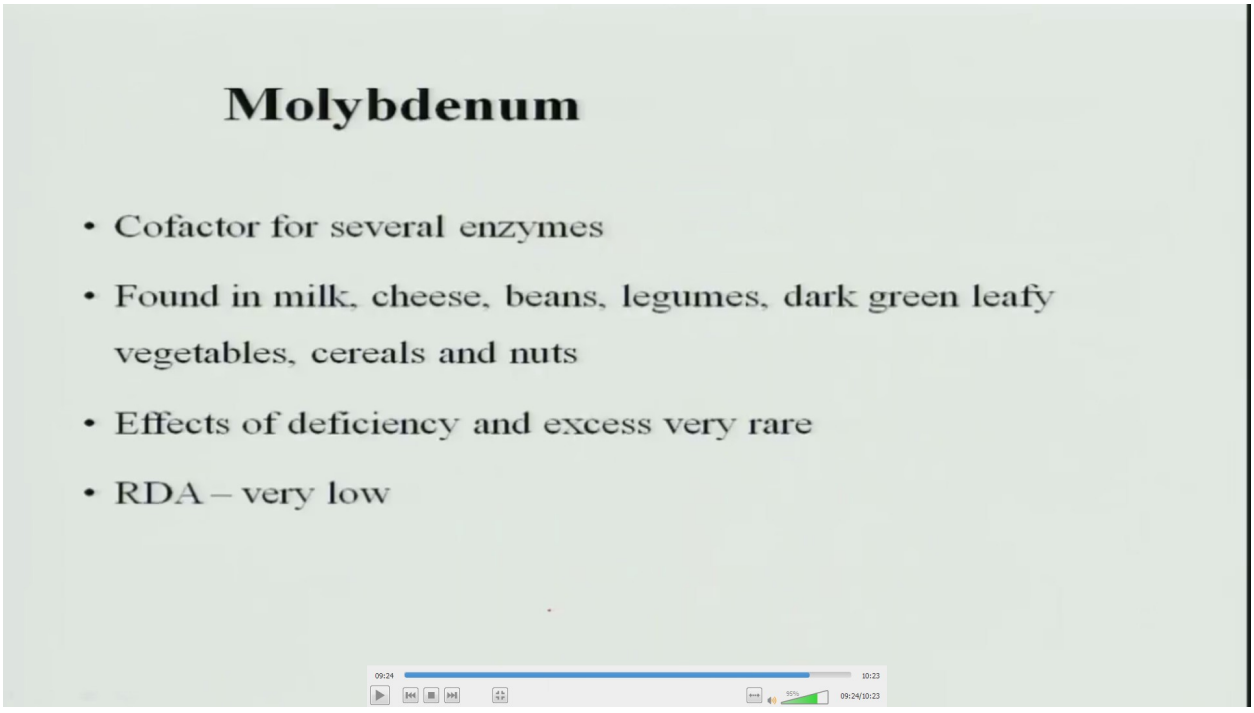
One more important fluoride in our life is it affects the skeleton and the teeth. So it provides strength to the bones and teeth improves resistance to the tooth enamel so this is fluorine is found in water, seaweed, tea and seafood, so deficiency may cause dental caries and excess may cause dental and skeletal fluorosis and the recommended dietary allowance is one parts per million.



So dental fluorosis you can see the discoloration of teeth and there is also pitting of and mottling of the teeth, which is a permanent damage of teeth, because of deficiency of fluoride.



And skeletal fluorosis whenever the fluorine is excess, you just see how the bone deformation occurs and the individual cannot walk on his own as to take a help of a stick.



Molybdenum is again a cofactor for several enzymes found in milk, cheese, legumes, dark green leafy vegetables, cereals and nuts. And effects of deficiency and excess are very rare, because

all these foods are available in large quantity and available everywhere and RDA idea is very low.

And these are the foods for rich and you can see all the fruits and vegetables and cereals, grains, nuts and beans everything has molybdenum in them. So therefore, we have seen the trace elements, all the nine trace elements, though they are required in small quantities what is the havoc they create in our own body system and how they affect the health, therefore, when we have a balanced diet, we can meet the requirements, because the requirement is very low for all these minerals. Thank you.