agMOOCs

Trace Minerals 1

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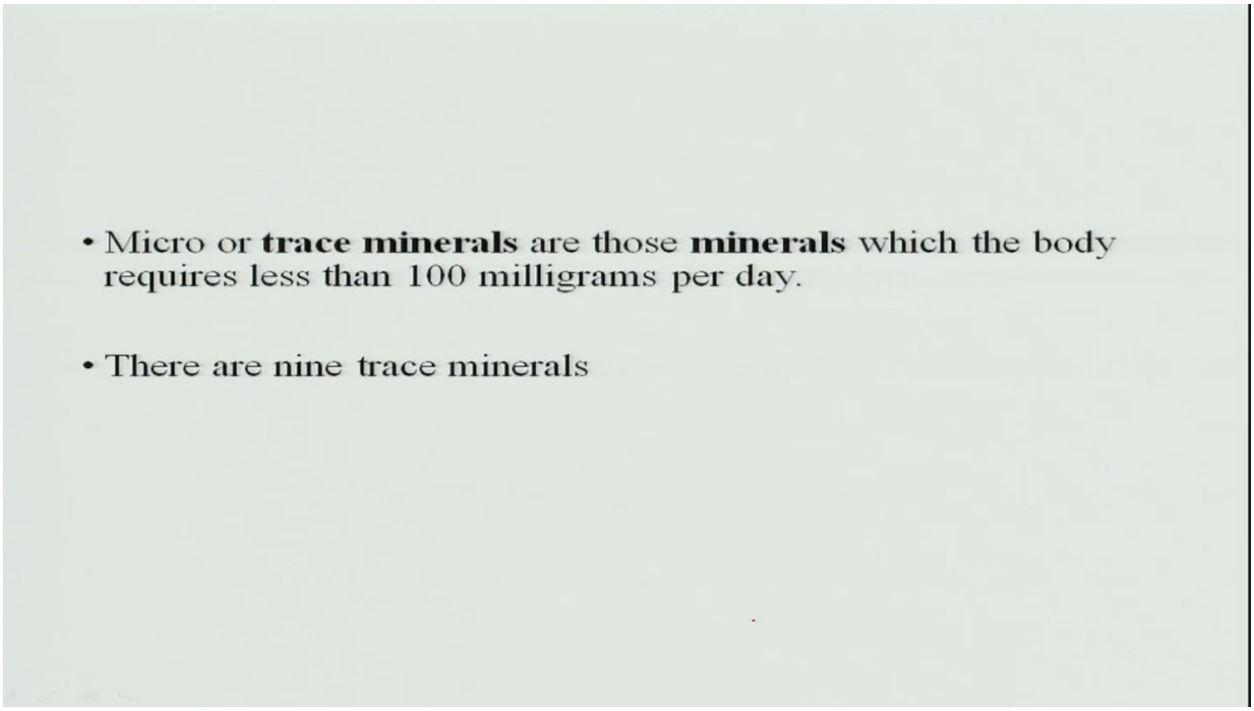
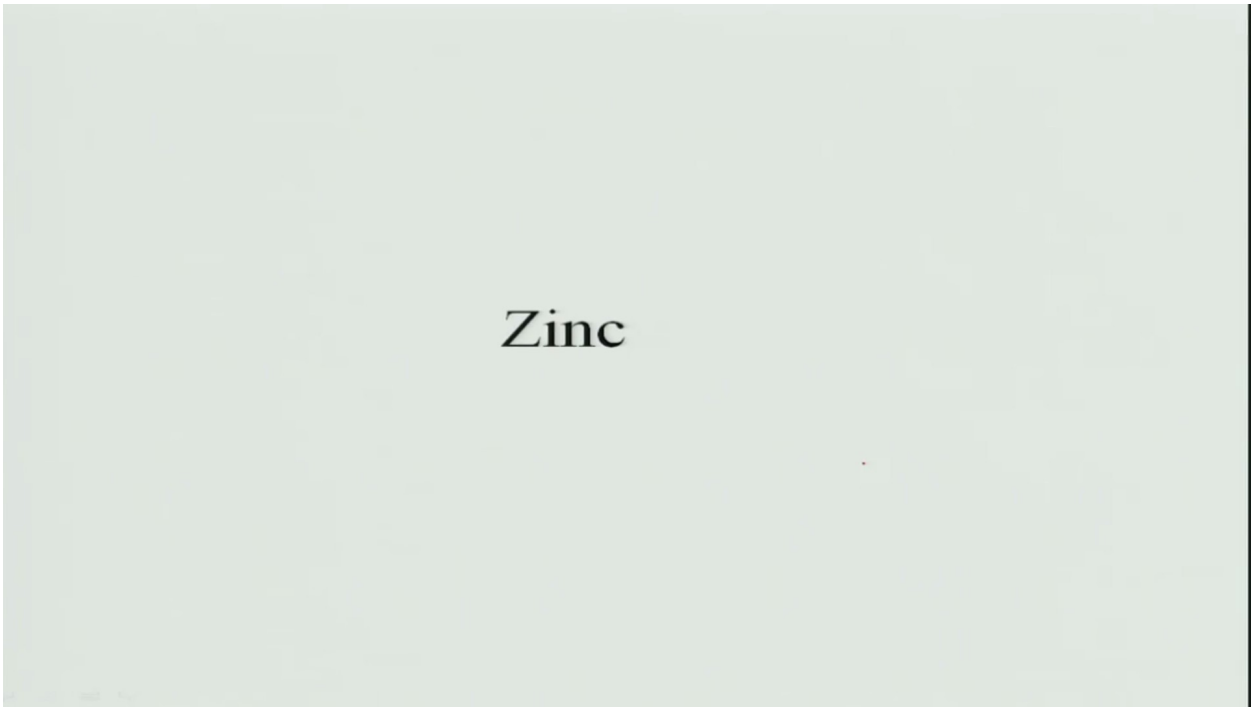
So last few classes we have seen the role of major minerals, which are to be taken above 100 milligrams, how they affect the health, and what are the sources and what are the functions of these major minerals, how they can create a havoc in the body. So the other minerals are required in minor quantities that is less than 100 milligrams, which are called as trace minerals.

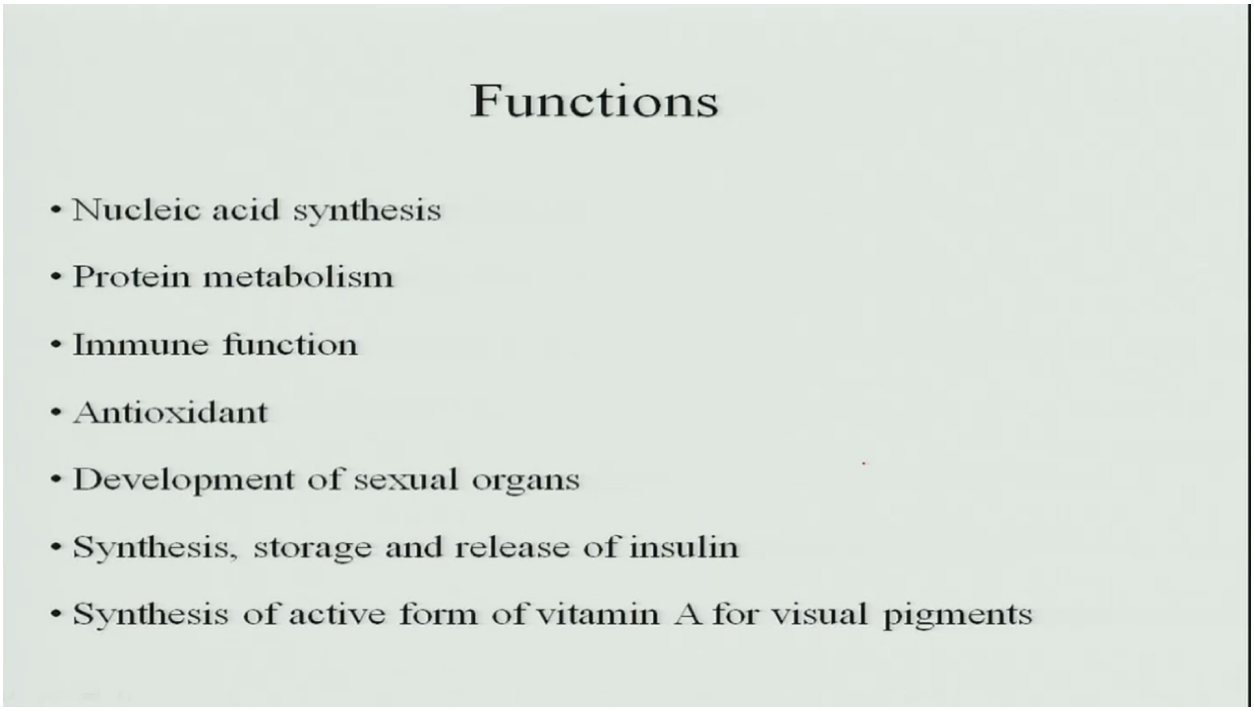


Let us see some of the trace minerals in detail. So micro or trace minerals are those minerals, which are required less than 100 milligrams per day and there are about nine trace minerals.

So out of these nine trace minerals, they are zinc, copper, selenium, chromium, molybdenum, iron, iodine, manganese and fluorine. These are all the minor or trace elements, which are required in very less quantities either milligrams, less than 100 milligrams, or also sometimes in micrograms.



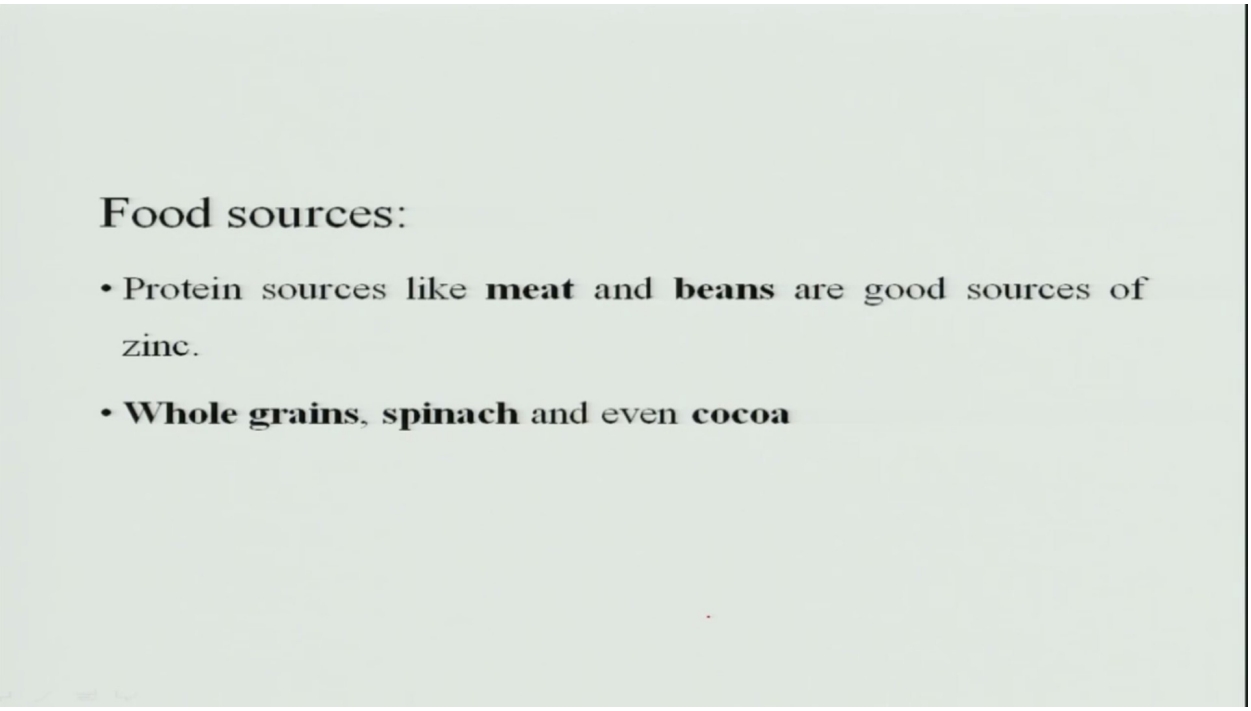
So to this the first one is zinc, which has many important functions in the body.



It is very important for the nucleic acid synthesis, so the DNA and RNA has a role with the zinc, then protein metabolism, zinc plays a very important role. It acts as a cofactor for many enzyme reactions. Then it plays a very important role in immune function. The moment we say zinc, it is very important for immunity. Then it also acts as an antioxidant. It prevents the oxidation

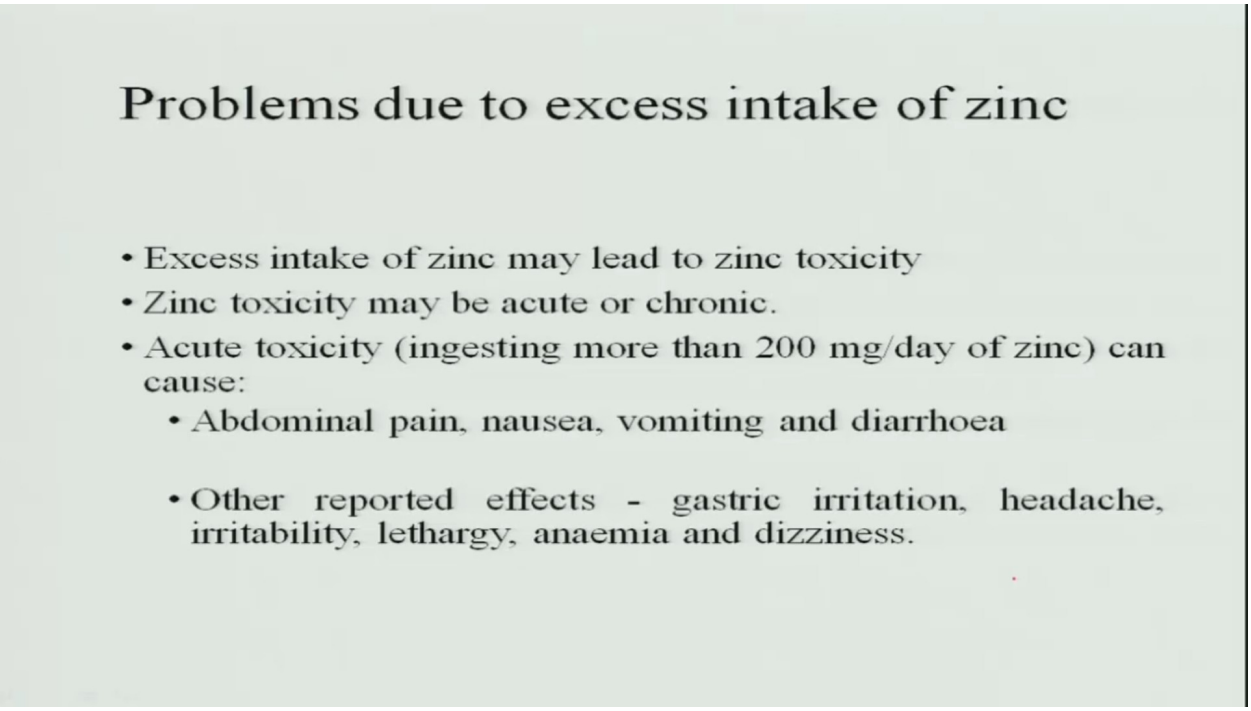
reactions in the cells thereby it helps in the prevention of uncontrolled multiplication of the cells, which may lead to cancer. Then development of sexual organs. In the pregnancy the fetal development stage the when the sex organs are developed, zinc is a very important mineral, which helps in the development of various sex organs in males and females.

Then synthesis storage and release of insulin. Zinc is a part of insulin, so zinc plays a very important role in insulin and deficiency again may cause diabetes mellitus. Then synthesis of active form of vitamin A for visual pigment. That means it is very important for eyesight also as it is involved in the visual pigments of vitamin A.



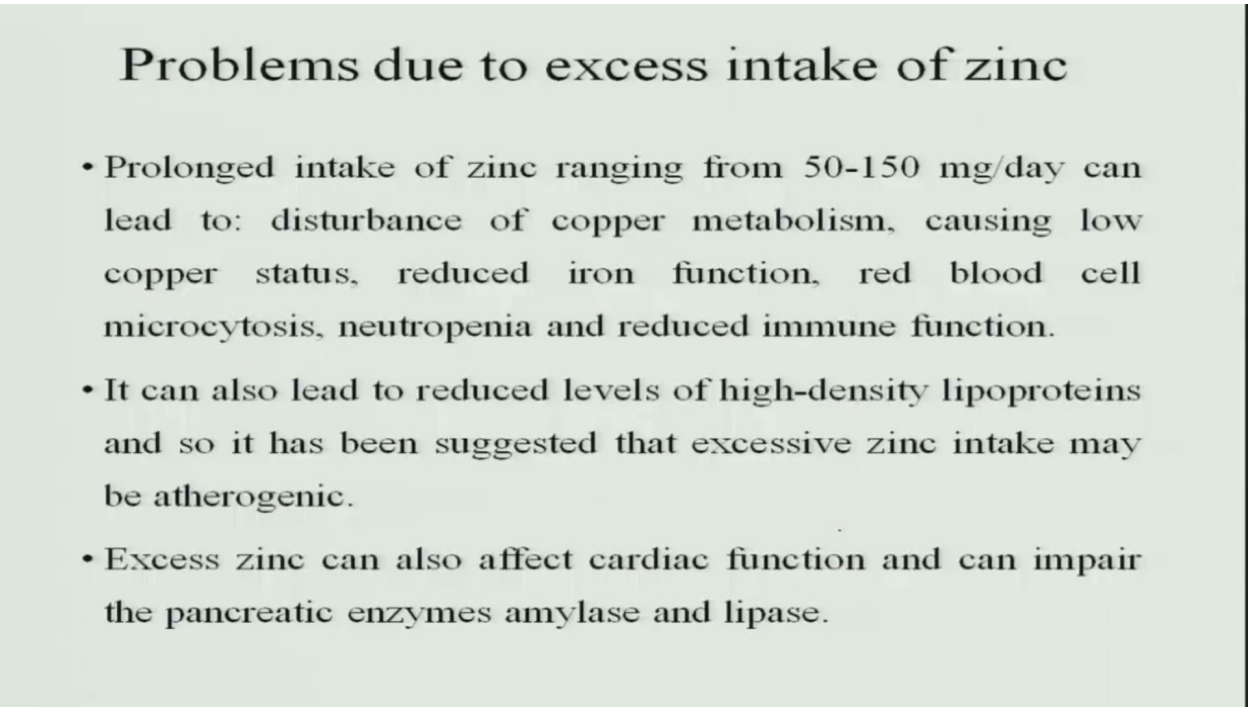
Then food sources of zinc are meat and beans, and they are good sources of zinc, and apart from that all the whole grains contain zinc, spinach and even coco is a good source of zinc.

So these are the various food sources of zinc you can see the pictures including the cashew, the eggs, yogurt, lamb, oysters, pumpkin seeds, almonds are rich sources of zinc.



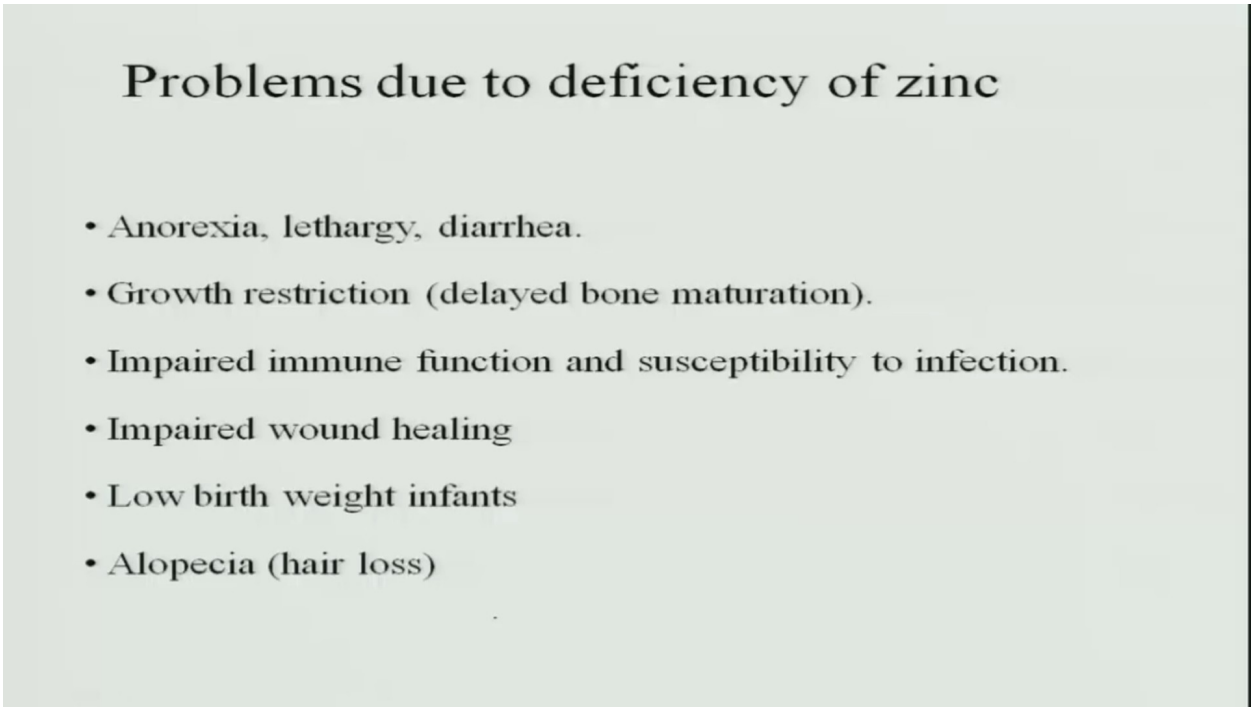
What happens if we take excess of zinc in the diet? So this may lead to again toxicity, because as we were talking that minerals are stored in the body, excess of the mineral causes toxicity. So this may be acute or chronic, so acute toxicity when you ingest more than 200 milligrams of

zinc per day. It can cause abdominal pain, nausea, vomiting and diarrhea, but acute toxicity, it can remain only for one or two days and when you reduce the zinc content, then it reduces. Then other reported effects are gastric irritation, headache, irritability, lethargy, anemia and dizziness.

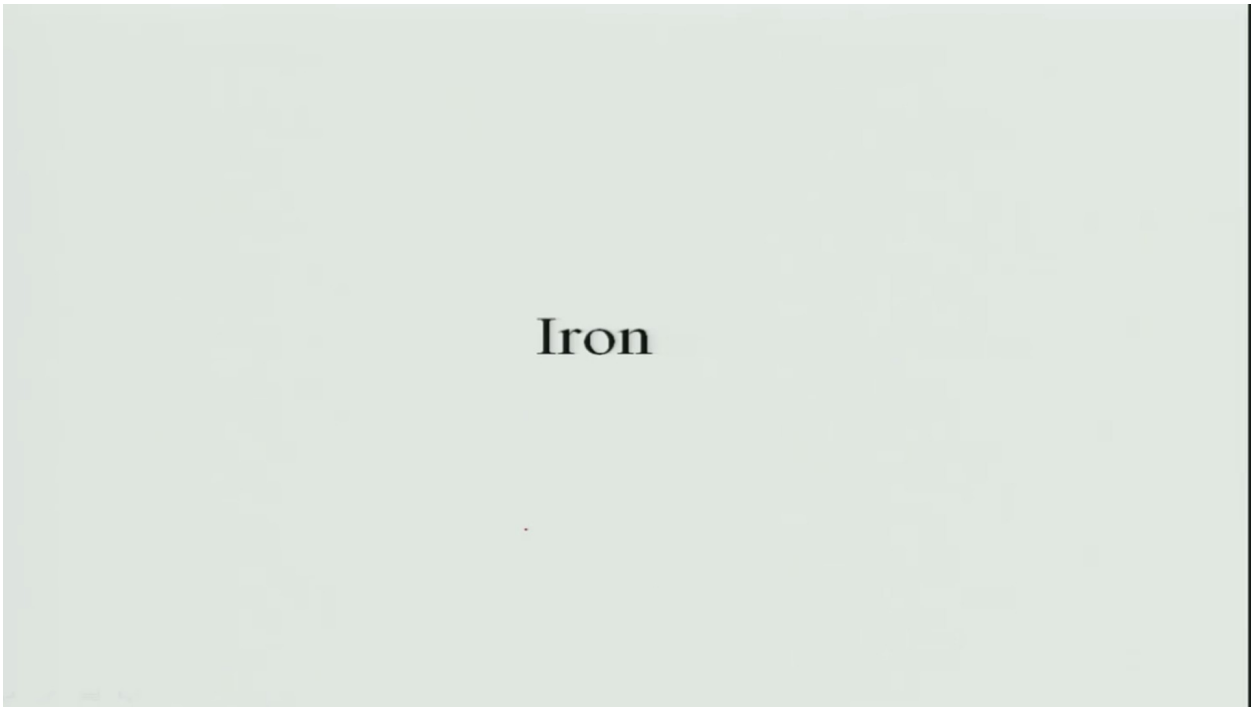


Now problems due to excess intake of zinc are some more, which are prolonged intake of zinc ranging from 50 to 150 milligrams per day. It will lead to chronic zinc deficiency or excess of zinc, so this causes disturbance in the copper metabolism, causing low copper status. Then copper is involved in the iron metabolism, therefore there is a reduced function of iron, and iron is very important for the formation of red blood cells, therefore red blood cell. The size of the red cells becomes small, it is called as microcytosis, and neutropenia. The neutrophils that are present as a part of WBCs in the blood also are reduced in number. So these are called the policemen of the blood, so wherever there is infection, they run and catch the infection like robbers and kill them, and there is a reduced immune function.

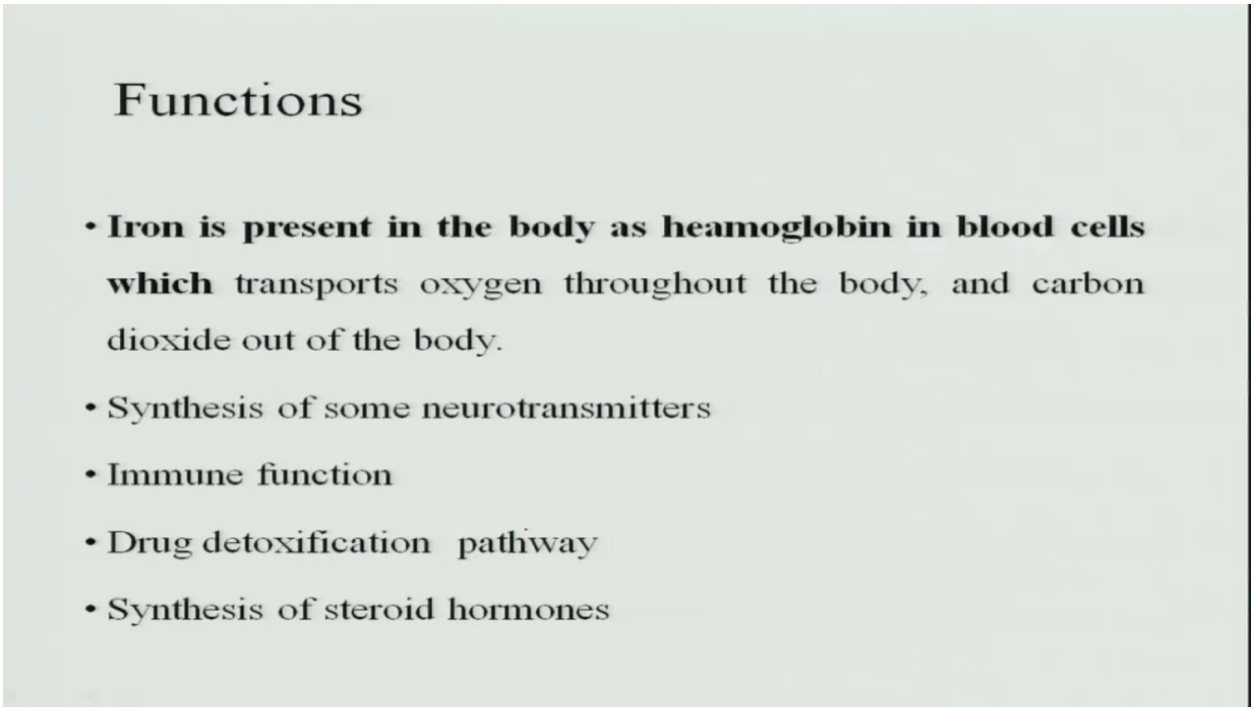
Then it can also lead to reduced level of high-density lipoproteins and these high-density lipoproteins are supposed to be the good cholesterol, which helps in keeping the heart healthy. So whenever there is excess of, zinc it reduces the high-density lipoproteins. So excessive zinc may cause atherogenic. Atherogenic means it may cause the arteries to become hard and decrease in the elasticity of the arteries. Then excess can also affect the cardiac function, and it also affects the – when the arteries are affected, naturally the cardiac function also is affected and it can impair pancreatic enzyme, that is amylase and lipase secretions are decreased. So there is a decreased digestion of the carbohydrates and fats when there is excess of zinc intake.



Now problems due to deficiency of zinc, it causes anorexia, that is there is no appetite, you do not feel like eating. Then lethargy, when there is no appetite, person does not eat, he feels very lazy. And diarrhea, so there is growth restriction because there is delayed -- born maturation decreases, therefore the growth restriction occurs. Then immune function is there, the individual is prone to many diseases, and susceptibility to infection is increased. There is impaired wound healing, the wound healing also decreases; and low birth weight infants are born when there is less of zinc. And alopecia is, well, all of us know that zinc is very important for hair growth, therefore alopecia is also a symptom of the efficiency of zinc.

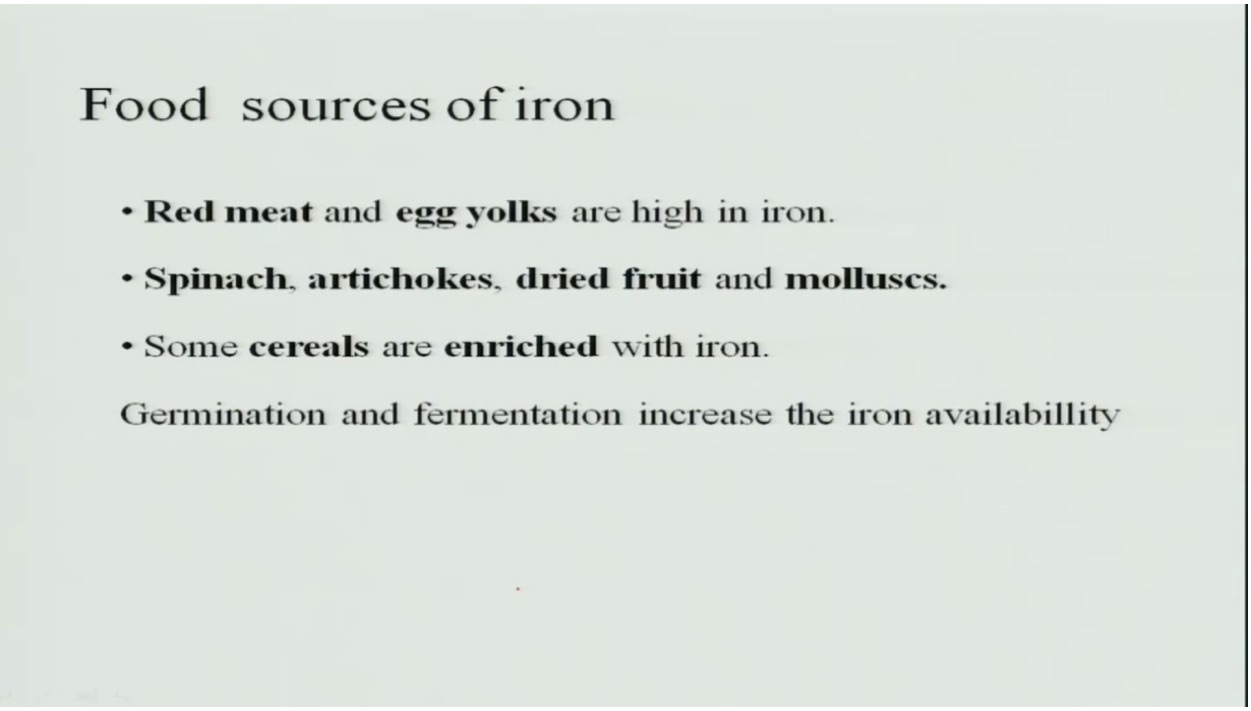


Now the next important mineral is Iron.



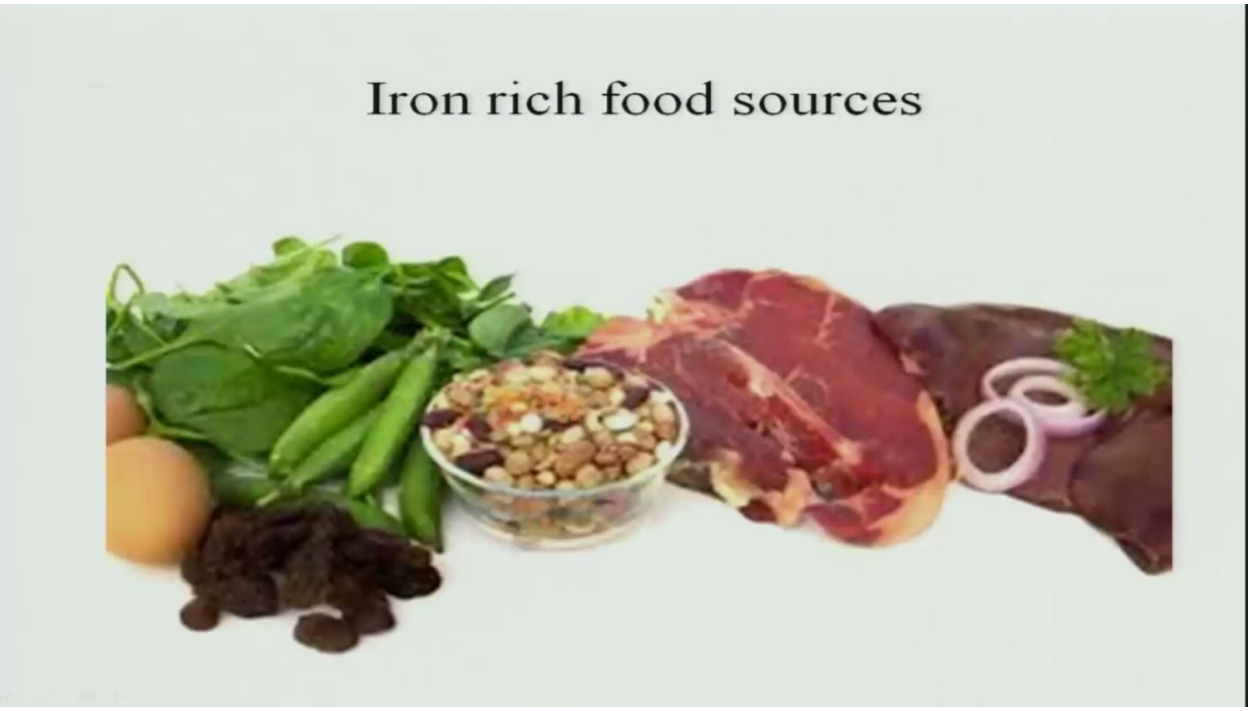
Iron plays a very important role as it is a part of hemoglobin in the blood cells. Hemoglobin is a combination of heme and globin. The heme is the iron part and the globin is a protein part. So this hemoglobin transports oxygen throughout the body and it removes the carbon dioxide out of the body. So every gram of hemoglobin will carry about 1.34 ml of oxygen and that is the

importance of hemoglobin. So a normal hemoglobin level should be about 12 to 14 grams per 100 ml for a woman and 14 to 18 for men. And synthesis of some neurotransmitters, neurotransmitters like ACH are synthesized by iron and immune function also is very important part of the iron metabolism. Then it also helps in drug detoxification pathway and synthesis of steroid hormones.

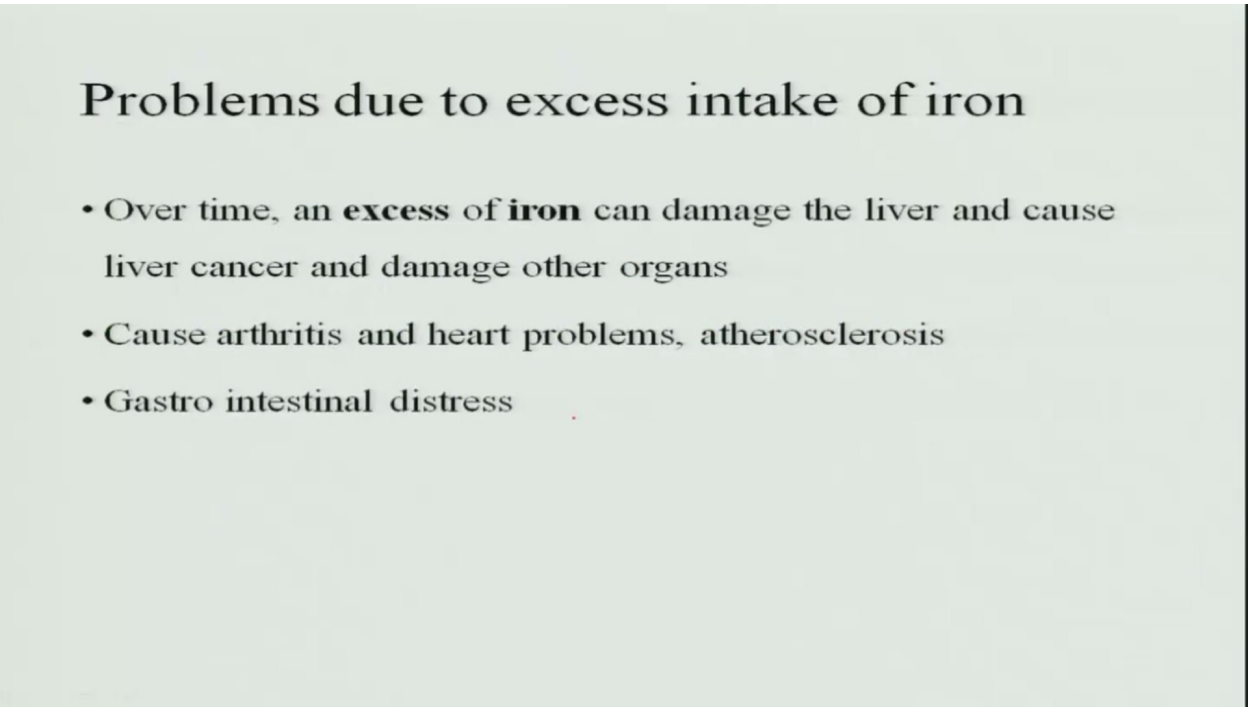


The food sources of iron, they are red meat and egg yolk, they are high in iron, the lot of -- it is a rich source of iron, and spinach, artichokes, dried fruit, and mollusks also are good sources of iron, but the iron that is present in the non-vegetarian food is in the form of heme, therefore the heme present in the body and the heme present in animal product is same, therefore bioavailability of iron is high in the animal foods, whereas in the plant foods, the bioavailability is low. So the bioavailability of iron is only 3%. So whatever we eat, suppose we eat 100 grams of iron, only about three grams of iron is available to the body. Then there are some cereals, which are enriched with iron. Now iron fortified cereals are available, then you have the conflicts which are fortified with iron. There is research going on for fortification of iron in salt.

And these are the natural processes which can be done during food processing that is germination and fermentation also increase the iron availability. It is increasing the iron availability, that means the iron that is present in the food is increased by germination and during germination vitamin C is produced. This vitamin C is very important for absorption of iron. Similarly, during fermentation also there are many B vitamins that are produced, which help in the iron availability.

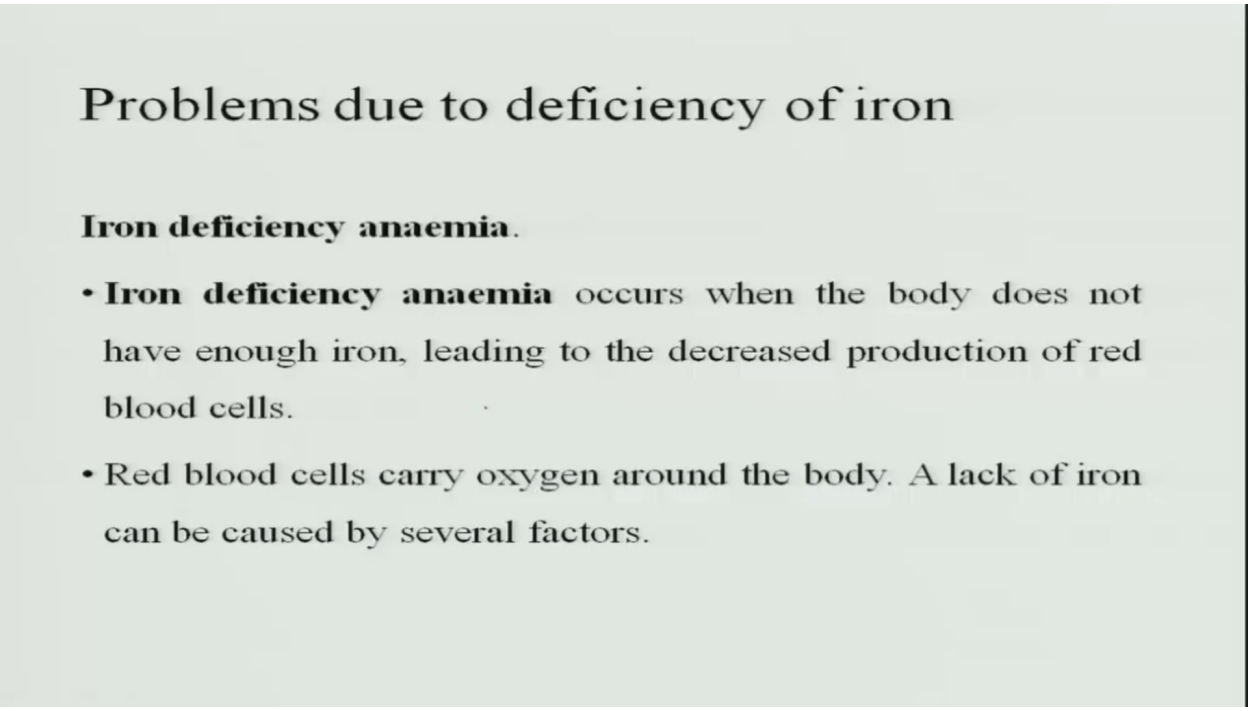


Now I on which force as we have seen the meat and meat products and nuts, cereal grains and vegetable products.



Now problems due to excess of iron, because iron is a very important part of hemoglobin, we think we can have excess of iron and protect our body, but no, overtime an excess of iron can damage the liver, because iron is stored in the liver as ferritin. So when excess of ion occurs, it

can cause liver cancer and also damage the other organs, and it can cause arthritis and heart problems, atherosclerosis and gastrointestinal distress. You must have felt the gastrointestinal distress whenever you take supplementation of iron.



And problems due to deficiency of iron, the main disorder that is caused is iron deficiency anemia. So whenever the body does not get sufficient amount of iron, leading to decreased production of red blood cells occurs, and when there are less number of red blood cells, the hemoglobin level also naturally goes down and the oxygen carrying capacity to the various cells also decreases. The person becomes weak and he starts having palpitations and loss of concentration, work capacity decreases, therefore when lot of people are suffering from iron deficiency, the work capacity of people decreases, it may affect the national productivity. Then red blood cells carry oxygen around the body, and lack of iron, it is caused by several factors.

So here we have seen the important minerals that is zinc and iron, which play a very important role in immunity, the formation of the hemoglobin, and how they affect the condition of the body, how they affect the heart, and immune system in the body. Thank you.