agMOOCs

Fat Soluble Vitamins 1

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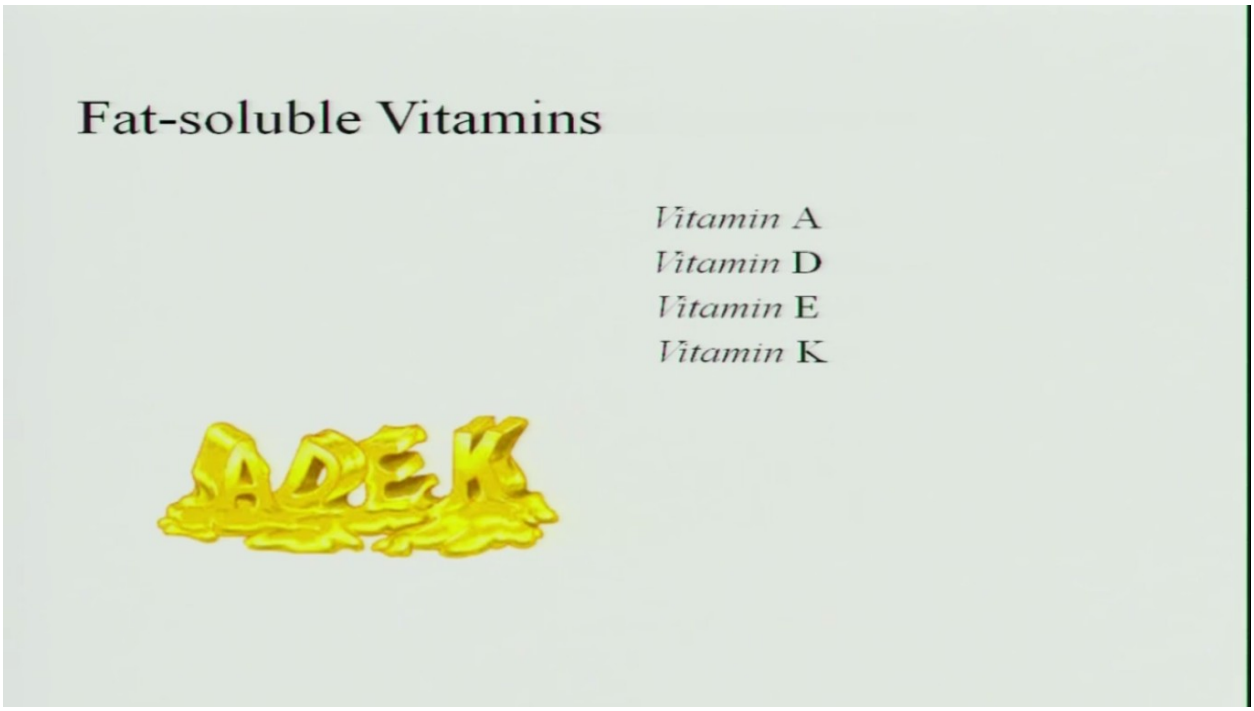
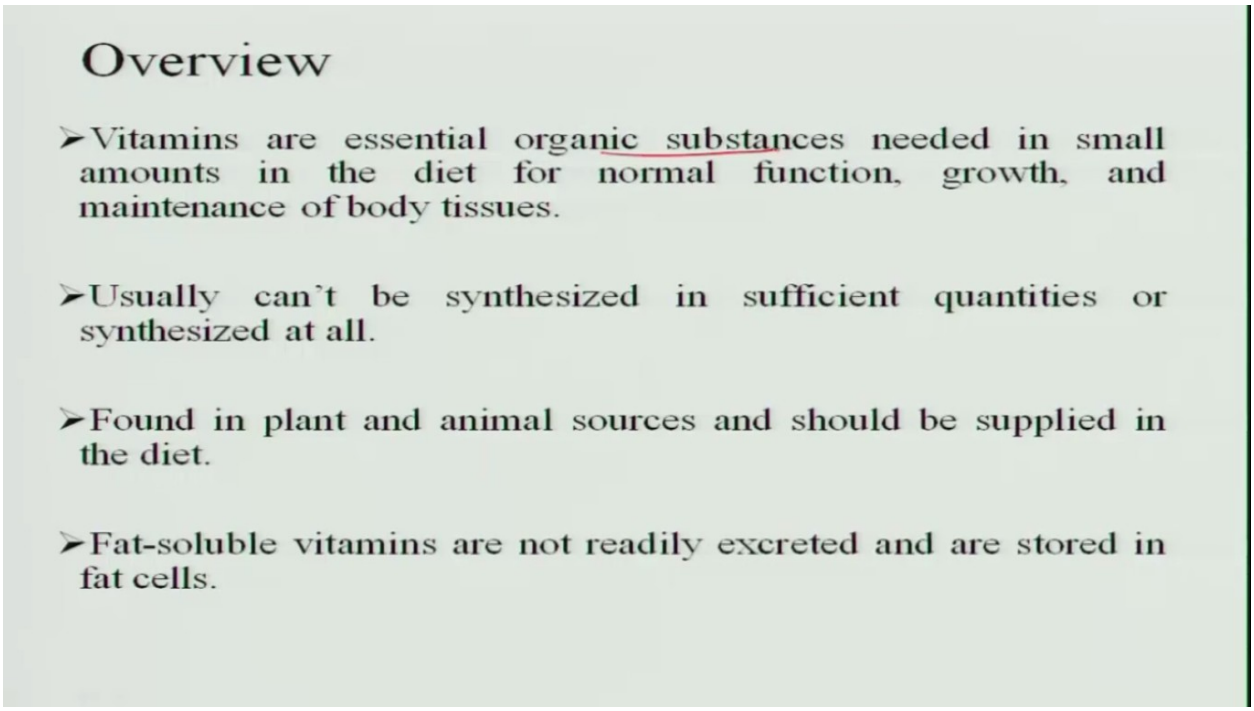
In the last few classes we have seen the importance of the major nutrients like carbohydrates, proteins, fats, and the energy that is supplied through the food in the body, the ways they are measured, and how the recommended dietary allowance is given and what are the food sources, etc. Now let us move on to the minor nutrients that is the vitamins. And these vitamins are divided into two that is the fat soluble vitamins and water soluble vitamins.

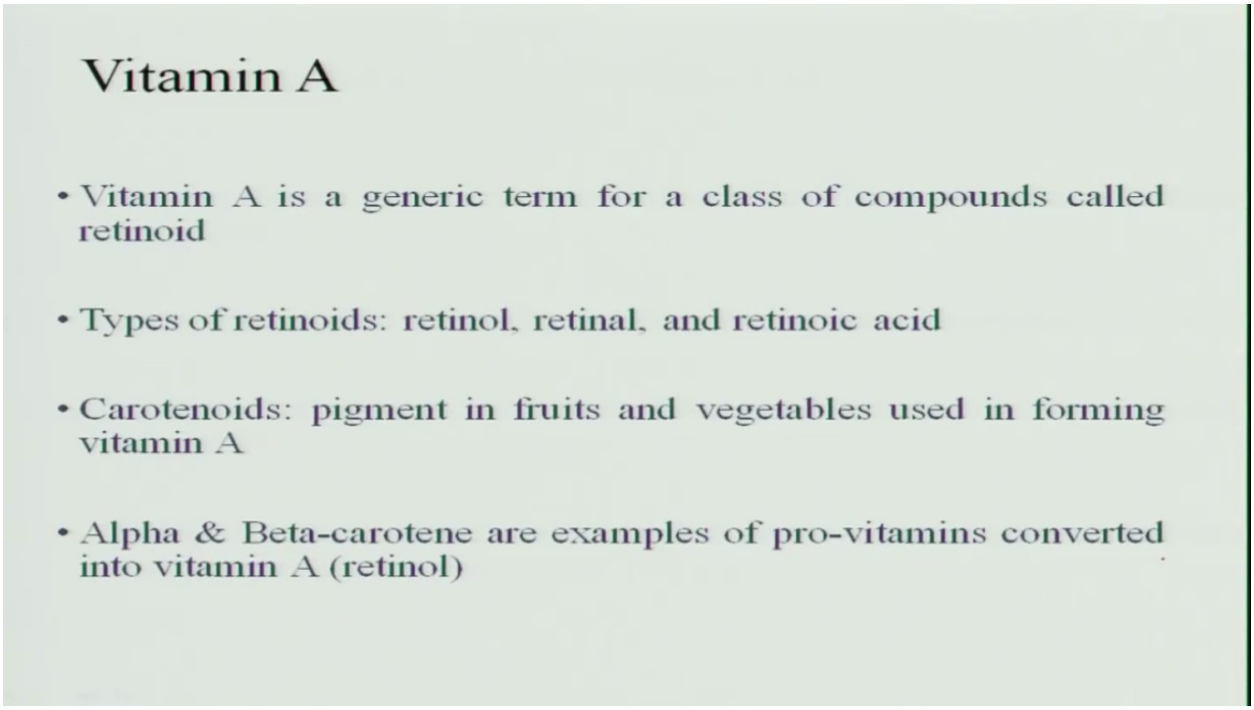


Initially we will start with the fat soluble vitamins which are vitamin A, D, E, and K.

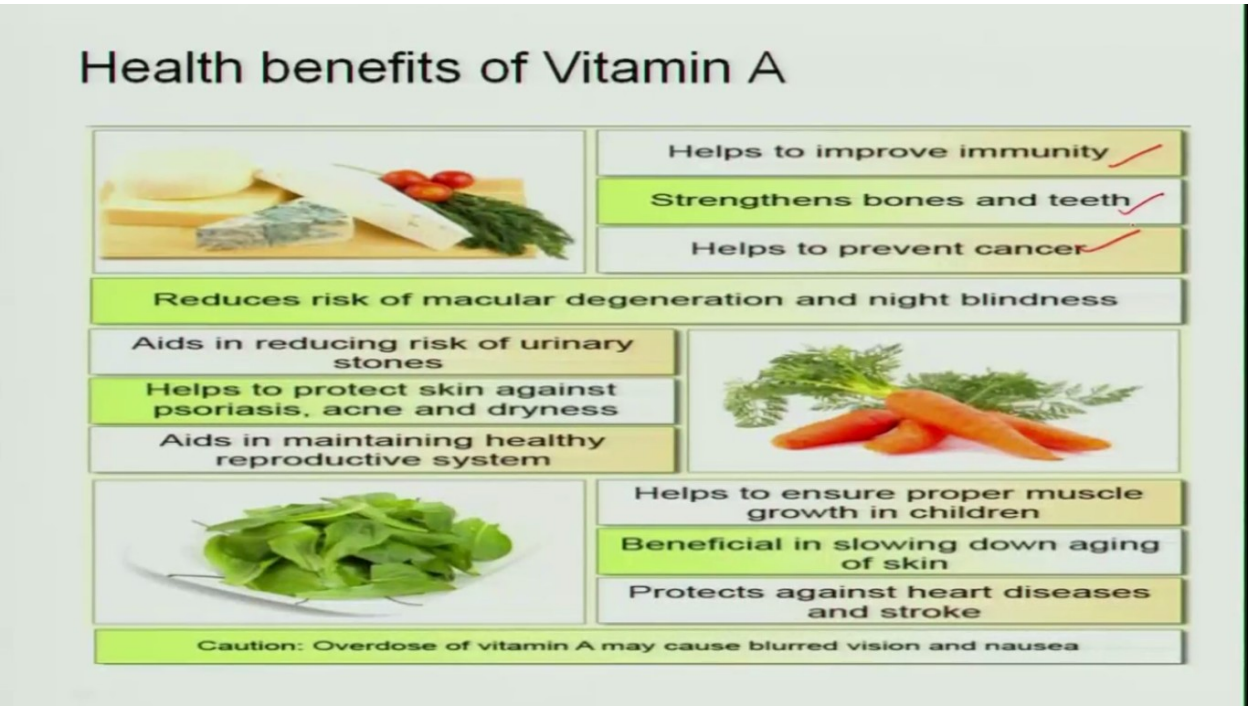
So vitamins are essential organic substances which are required in very small amounts in their diet but they are highly recommended for the normal function, growth, and maintenance of body tissues. And these vitamins cannot be synthesized in sufficient quantities in the body or sometimes they cannot be synthesized at all. Therefore we have to supply through the food and these are found in plant and animal sources and these should be supplied through diet. Now fat soluble vitamins they are not readily excreted and are stored in the cells.



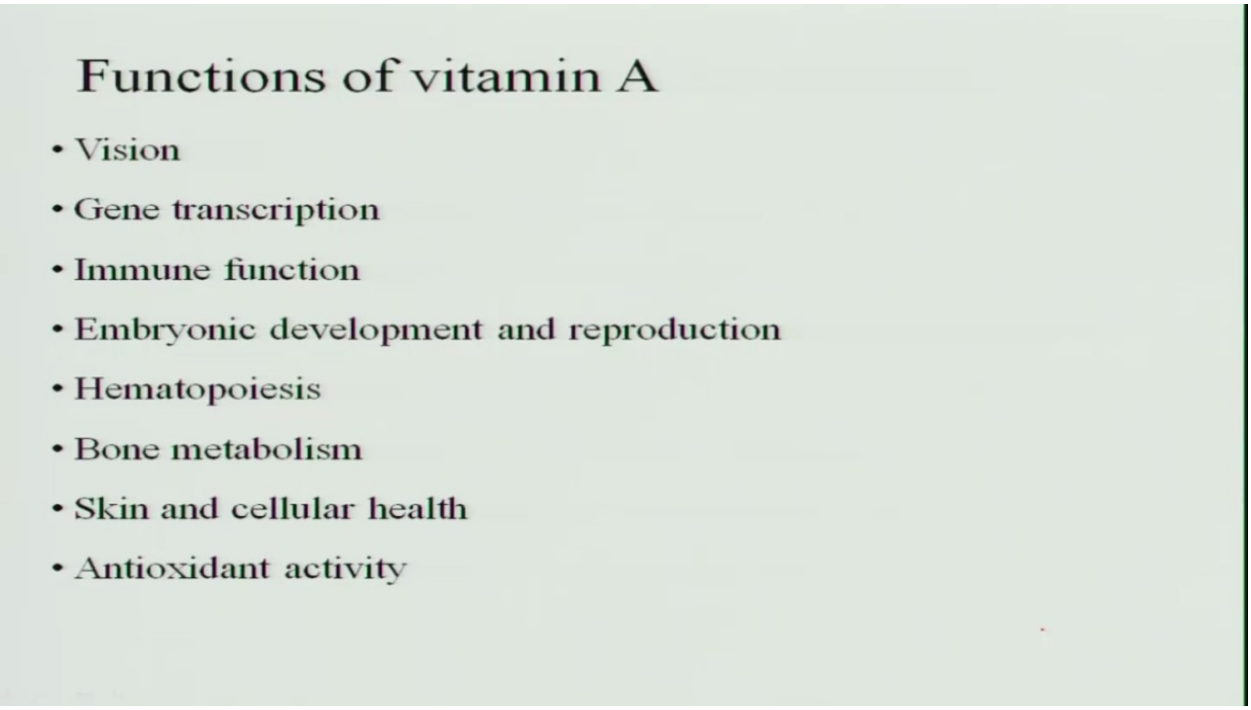
Now regarding the vitamin A, it is a generic term for the class of compounds called retinoids. So there are different types of retinoids. We have retinol, retinal, and retinoic acid which have different functions in the body. And Carotenoids are the pigments that are present in fruits and vegetables in forming vitamin A and of this carotenoid goes into the body it gets converted into vitamin A. We have Alpha and Beta carotene which are examples of pro-vitamins converted into vitamin A.



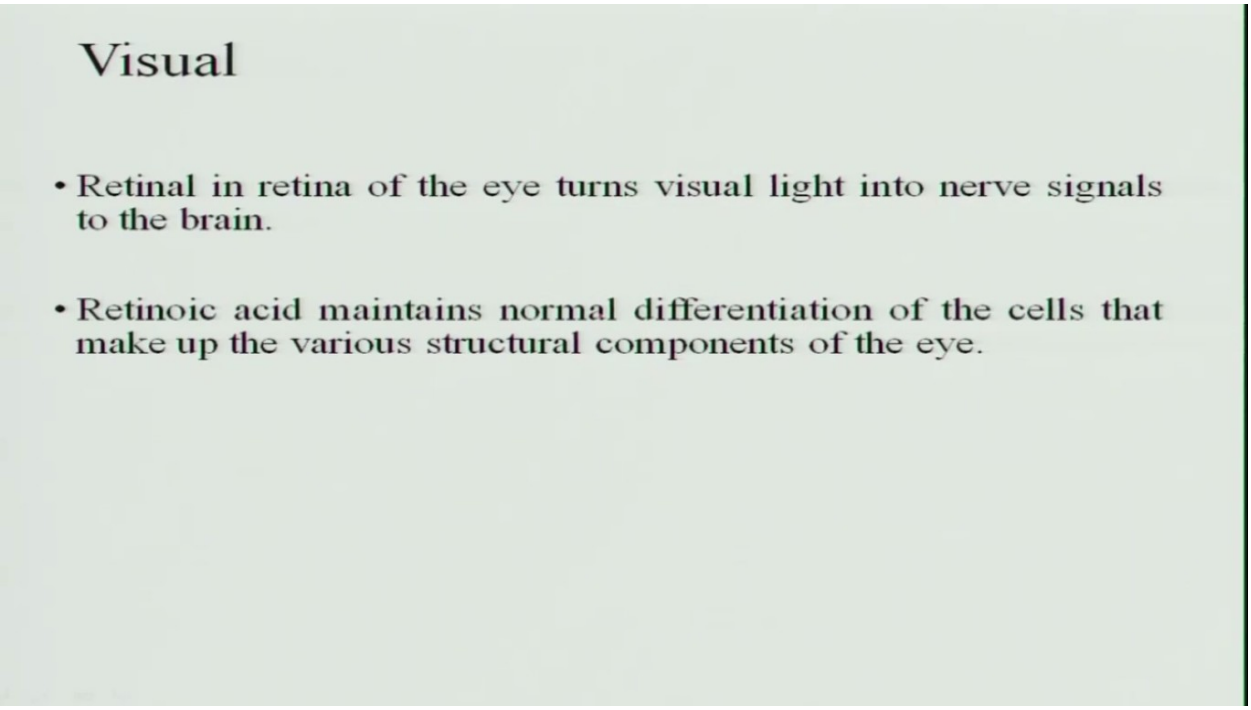
Now the health benefits of vitamin A. It helps to improve the immunity and strengthens the bones and teeth. Helps to prevent cancer. Reduces the risk of muscular degeneration and night blindness, then reduces stones, urinary stones, helps to protect skin against psoriasis and dryness, acne. Aids in maintaining healthy reproductive system. Ensures proper muscle growth in children. Beneficial in slowing down aging of the skin and protects against heart disease and stroke. At the same time over dose of vitamin A may cause blurred vision and nausea.



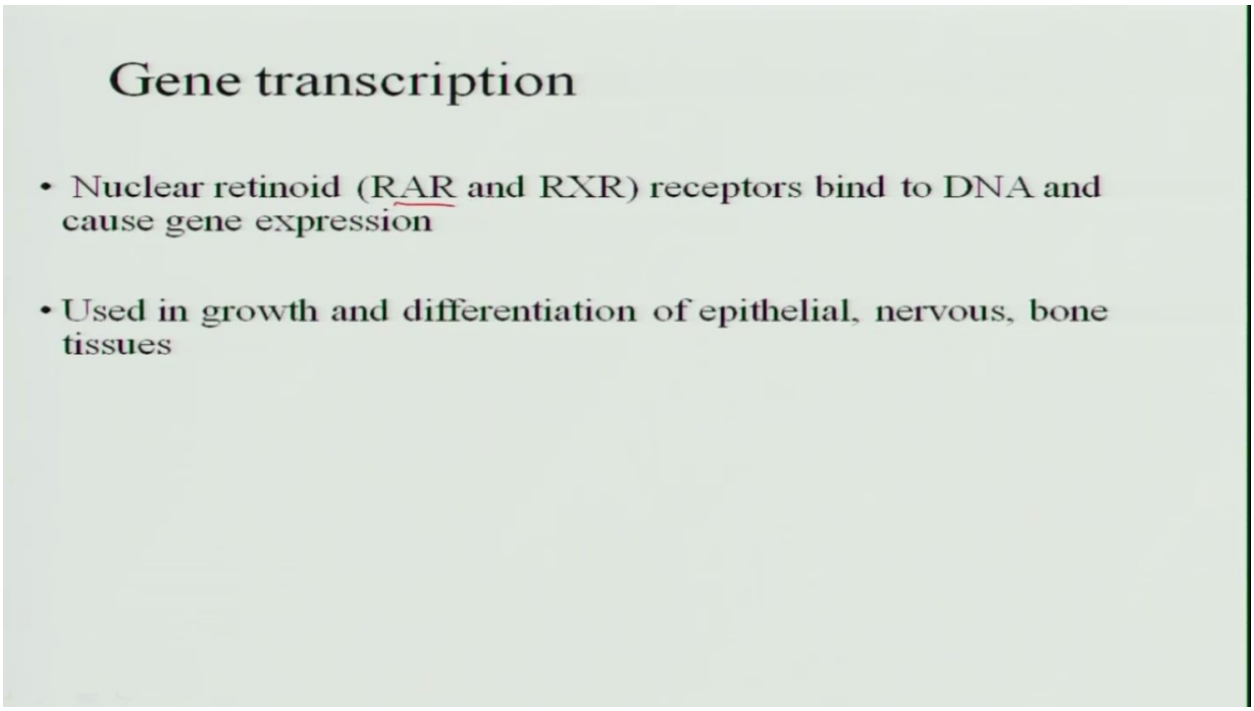
The functions of vitamin A we have seen and in brief it is used for vision, gene transcription, immune function, embryonic development, and reproduction, hematopoiesis, bone metabolism, skin and cellular health, and antioxidant activity.



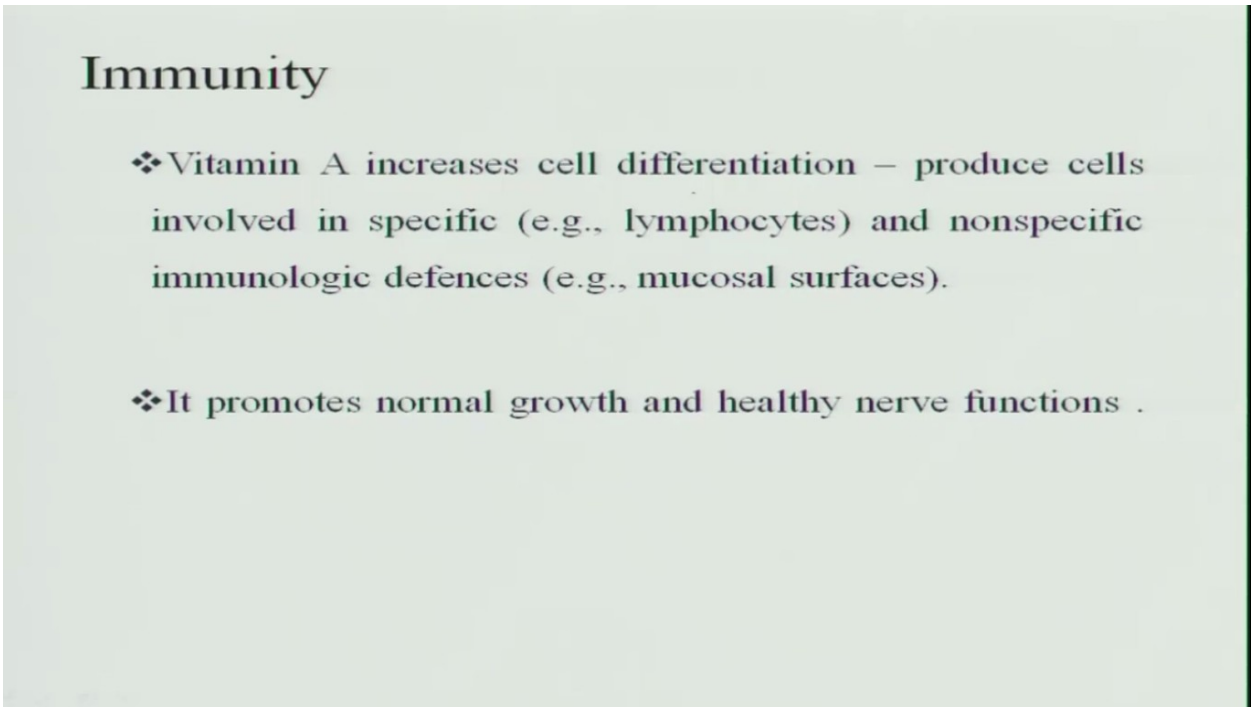
Regarding the visual function of vitamin A retinal that is present in retina of the eye it turns visual light into the nerve signals through the brain. So this retinoic acid it maintains the normal differentiation of the cells and makes a various structural components of the eye. So therefore because of this conversion the dark adaptation to light occurs in the human beings which is deficient when the less amount of vitamin A in the food.



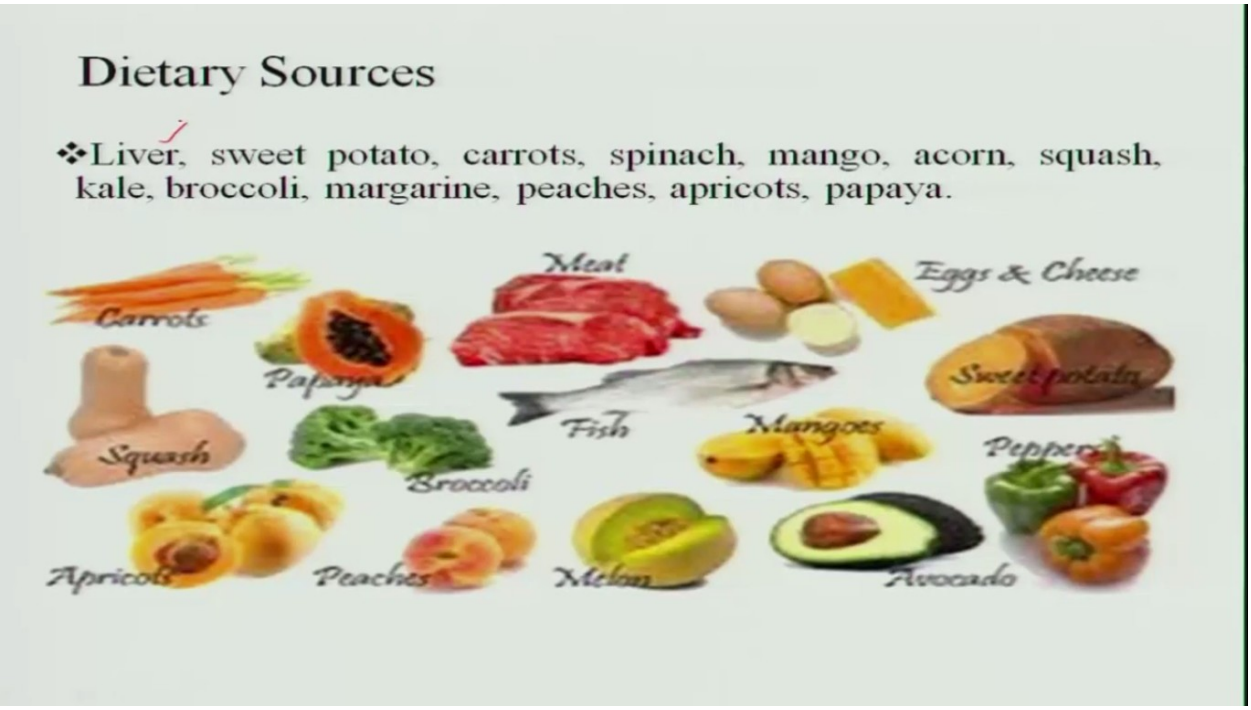
The second function is gene transcription. So the retinoids that is RAR and RXR they are receptors which bind to the DNA and cause gene expression. And they are also used in the growth and differentiation of epithelial nervous and bone tissues.



Regarding immune, vitamin A increases the cell differentiation, produce cells involved in specific and nonspecific immunological defenses. We all know that lymphocytes are used for the immune functions and mucosal surfaces also help in the nonspecific immune defenses. It promotes normal growth and healthy nerve functions. That means it is very important for functioning of the nerves.



Now the dietary sources of vitamin A we have liver. Level is the best source of vitamin A those who are non vegetarians but otherwise all the yellow and orange colored fruits and vegetables and dark green vegetables are rich in vitamin A.



Now the recommended dietary allowances we can see for all the adults it is about 600 micrograms of retinol and in terms of you can convert retinol into beta-carotene by multiplying into 8. herefore it is 4,800 whereas the same amount is for 7 to 17 years and for pregnant women there is an increase by 200 micrograms and lactating women there is an increase by another 350 microgramms. And for an infant it is only 350 microgramms and 1 to 3 years 400 micrograms of retinol.

Recommended dietary allowances

Group	Particulars	Vitamin A (µg/d)	
Man	Sedentary work	Retinol	Carotene
	Moderate work	600	4800
	Heavy work		
Woman	Sedentary work	600	4800
	Moderate work		
	Heavy work		
	Pregnant woman	800	6400
(0-6months)	Lactating woman	950	7600
(6-12 months)	Lactating woman		
Infants	(0-6months)	350	2800
	(6-12 months)		
Children	1-3 yrs	400	3200
	4-6 yrs		
	7-9 yrs	600	4800
Boys	10-17 yrs	600	4800
Girls	10-17 yrs		

Now we say vitamin A is very good for functioning of the body but at the same time when you consume excess of vitamin A it leads to some problems. So hypervitaminosis is the term that is given for excess consumption of vitamin A. When the dosage is hundred times more than the RDA it can be fatal. And the intake of vitamin A it can lead liver damage, hair loss, bone muscle pain, loss of appetite, dry skin, mucous membrane, hemorrhages, and coma whereas acute or vitamin A hypervitaminosis that is when you take excess of vitamin A for a very short period this leads to gastrointestinal upset, nausea, headache, dizziness and muscle contraction.

Problems of excess

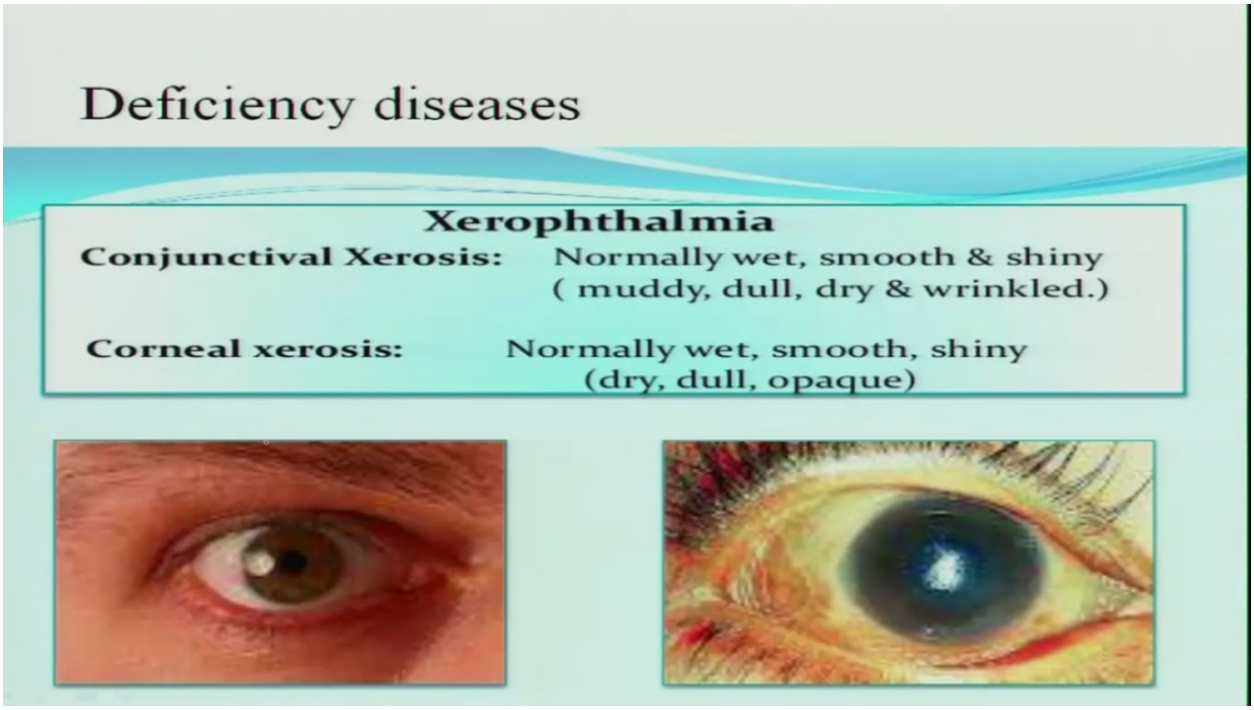
- Hypervitaminosis is caused by excess dosages (**100 times RDA**) and can be fatal (**13,000 times RDA**)
- Chronic: liver damage, hair loss, bone/muscle pain, loss of appetite, dry skin and mucous membranes, haemorrhages, coma.
- Acute: gastrointestinal upsets/nausea, headache, dizziness, muscle contraction.

Now vitamin A toxicity. So there is acute toxicity where the symptoms are headache, vomiting, stupor, and death. And chronic toxicity there is weight loss, dryness of lips, bones and joint pains, hepatomegaly the liver gets enlarged and bone fractures. There are congenital malformations also because of toxicity of vitamin A. So it causes a change in the central nervous system, cardiac and craniofacial defects.

Vitamin A toxicity :

- Acute toxicity : Head ache, vomiting, stupor, death
- Chronic toxicity : weight loss, dryness of lips, bone and joint pains, hepatomegaly, bone fractures
- Congenital malformations : cause CNS, cardiac and craniofacial defects

Now the deficiency of vitamin A also is dangerous. So it causes Conjunctival Xerosis and Corneal Xerosis. Initial symptoms are the night blindness and followed by the Bitot's spots then the cornea and the retina also are involved where Xerosis of eye occurs and the person becomes blind.



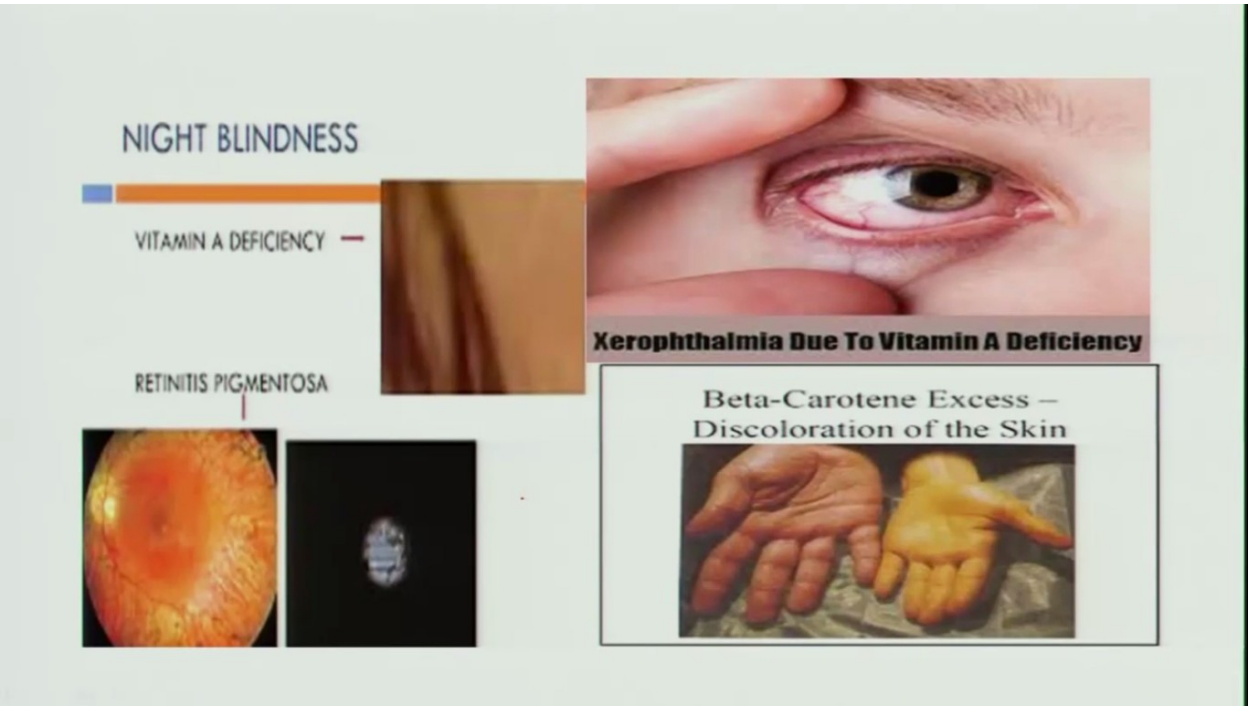
So Bitot's spots are the keratin that is deposited in the conjunctiva of the eye. So this is associated with night blindness. It is a white patch that occurs in the outer corner of the conjunctiva in the eye.

- **Bitot's spots** (keratin deposited in conjunctiva; associated with night blindness)

Follicular hyperkeratosis is the protein keratin is deposited around the hair follicle. So each hair follicle you have a keratin deposition and this leads to xerosis, immune suppression, and anemia, impaired tissue growth. So all the hair follicles on the body have a protein deposition and the follicles are closed.

- **Follicular hyperkeratosis** (protein keratin deposited around hair follicle)
- **Xerosis**
- Immune suppression
- Anemia
- Impaired tissue growth

This is how the xerophthalmia and the vitamin A deficiency looks. Pigmentation of the retina occurs and when the beta carotene is exists there is discoloration of skin. The skin becomes yellow in color or changes the color. So this is about the vitamin A, the functions, the sources, the deficiencies, and recommendations and what happens when they vitamin A is in excess, why we should take the the amount of vitamin A and to keep our body health. Though the vitamin A is required in a very small amount it is a very important vitamin for various functions.



Thank you.