UNIT 16: FOOD TOXICANTS

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1.0 Introduction

Ordinarily, foods are sources of nutrients needed for energy, growth, maintenance of body tissues and some body metabolism. Some foods still contain toxicants that inhibit the metabolic functions of some nutrients and enzymes that can cause physiological disturbances when they are consumed as part of the food.

Some of the toxicants are naturally present with the food and some are accidentally introduced into the food during cultivation and processing.

This unit therefore, treats the classes of toxicants and the methods of detoxifying the toxicants.

2.0 Objectives

At the end of this unit, you should be able to

- Know the classes of toxicants List some naturally occurring toxicants
- List some adventitious toxicants
- Discuss the mode of action of some toxicants
- Discuss some methods of detoxifying some toxicants

3.0 Nlain Content

3.1 Classes of Toxicants

There are two classes of toxicants. These are Natural toxicants and adventitious toxicants.

3.1.1 Natural Foods Toxicants

These are genetically determined substances that are naturally present in foods;

Soy beans contain anti-growth factor and anti-tryptic factor. The ant-tryptic factor prevents trypin from playing its digestive role.

Anti-pyridoxine in bean seeds causes vitamin B_6 deficiencies. Alkaloids in legumes induce carcinogenesis that is, it can cause caner if the alkaloids accumulate in the body.

There are some goitrogenic substances in cabbage. These substances induce goitre.

Cyanogen and glycosides are present in cassava and these can cause nerve deafness.

Oxalate in form of oxalic acids occurs naturally in spinach, beet and rhubarbs are toxicants. These foods are eaten without any ill effect because of the low concentration of the toxicants in them but in the leaves of rhubarb the concentration of acid is high enough to cause illness.

In bananas and some other foods there is 5-hydroxyl, tryptamin, adrenaline nor adrenaline. These toxicants produce effects on central and peripheral nervous system.

In cheese the presence of thyramine raises blood pressure and this is enhanced by monoamine oxidase inhibitors.

In some fish, meat and fish, there is nutrosamines which cause damage to liver and can also cause cancer.

In many furgi, we have various microtixins which produce toxic effects on nervous system and liver.

Aflatoxins is produced by Aspergillus flavus in mouldy nuts. Aflatoxins damage the liver and lead to casinoma in animals.

There are also some anti-vitamin factors. The Dicoumarin in clover produces haemorrhages in cattle by causing vitamin K deficiencies in the tissues. Thiaminase found in several species of fish has been found to prevent the absorption of thiamin..

There are some toxins that are found in food that cause hallucination. Alkaloids such as scopolamine consumed in a salad containing the jimson weed have been found to produce hallucination.

Cereals contain phytin which can bind calcium and make it unavailable to the body.

Eggs also contain avidin and conalbumin which are toxic substances that prevents protein digestion. Lipoxidase contained in soy beans destroys vitamin A.

Some vitamins such as vitamin A and D some amino acids such as methioline exhibit toxic effects when they are consumed in excessive doses.

3.1.2 Adventitious or Accidental Toxicants

Some harmful substances that are not naturally parts of foods but become part of the food as a result of human activities are called accidental or adventi ious toxicants. These types of substances are coming from outside. Among them are antibiotics in poultry and in food preservation. We also have sulphurdioxide that destroys vitamin B_i. Some trace elements like lead, mercury and cadmium may contaminate food and cause poisoning. Zinc and copper are among the trace elements needed in the body in small amount but they may be toxic if they are consumed in excessive amounts.

Other accidental toxic substances that can come in contact with food are pesticides, insecticides, fungicides, rodenticides and herbicides.

Students Assessment Exercise 16.4

List some examples of naturally occurring toxicants and accidental toxic substances in foods.

3.2 Methods of Detoxification

Some of the natural toxicants are removed during the processing of the different food items containing them.

Heat treatment destroys the thiamilase in fish, avidin in egg, the heamaglutin inhibiting enzymes present in beans. Heat is also used to destroy anti-growth and anti-tryptic factors in soybeans.

Soaking cassava tubers, fermentation of grated cassava tubers, pressing the grated tuber and the garrification process (frying) have been responsible for the removal of the hydrocyanic acid in cassava.

Peeling of potatoes helps to remove some toxicants like somarin under the skin of potatoes.

Naturally, the body of human being is able to detoxify many harmful substances when there is adequate nourishment with intake of nutrients that are adequate qualitatively and quantitatively.

A very healthy person with good nourishment will also be able to naturally detoxify toxicants. Some sulphur containing amino acids have been implicated in the detoxification of residual hydrocyanic acids in cassava products.

Student Assessment Exercise 16.2

Discuss the methods of detoxification of toxicants.

4.0 Conclusion

In this unit, you learned the classes of toxicants as naturally occurring toxicants and accidental or adventitious toxicants. You also learned how some of these toxicants could have been detoxified. Exercises are also provided to assist you to assess your understanding of contents of the unit.

5.0 Summary

Foods generally are supposed to supply nutrients for growth, energy, maintenance of body tissue and functioning of some metabolic activities in the body.

However, there are some naturally occurring toxicants in some foods. Some of other toxicants are adventitiously or accidentally added to the foods.

Some of the naturally occurring toxins are gosypol in cotton seed, anti-tryptic and anti-growth factors in soy beans. Anti-pyridoxine in lean seeds and alkaloids in legumes. Other naturally occurring toxins are cyanide in cassava, aflatoxin in mouldy nuts, dicoumarin in clover and so on.

Some of the accidental toxitants are pesticides, insectides, herbicides, fungicides and some trace elements like mercury, lead, cadmium, selelium.

Some of the toxicants can be destroyed by heating. These include thiamilase in fish, avidin in eggs, heainaghitin inhibiting enzymes in beans, anti-tryptic and anti-growth factors in soy-beans.

Cyahide in cassava can be removed during soaking fermentation and frying of the grated tubers.

Some sulphur containing amino acids have been impheated in the detoxification of the residual hydrocyanic acid in cassava products.

Healthy human beings with adequate supply of nutrients in correct proportions for growth, maintenance of tissues, energy and body metabolic functions can naturally detoxify some toxicants.

6.0 Tutor Marked Assignment

Discuss the naturally occurring toxicants in foods.

Answers to Students' Assessment Exercises

16.1 See answers in Section 3.1.1 of the unit
16.2 See answers in Section 3.2 of the unit

7.0 References and Other Sources

Davidson S. et al (1975) Human Nutrition and Dietetics. Sixth edition Longman Group Ltd.