

Uncovering the facts

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Abstract

This article is related to exposing the facts along with scientific reasons. It will cover the cause behind the given scientific phenomenon, its mechanism in brief and any solution that is reported previously. It will help to improve the knowledge of a common man those are fascinated with scientific fact. The topics discussed here are such as diabetes, curling of hairs, smoking, and alcoholism, skin allergy to metals, and COVID-19 vaccination.

Introduction

In this section, the scientific phenomenon is discussed one by one to deal with the cause, mechanism of occurrence and possible solutions.

Diabetes

In the layman language, this disease is called "Sugar". This disease is characterized by an elevated level of sugar in the blood. We can say simply the situation in which your body is not getting glucose even though it is present in the blood because of some dysfunction occurring in your body. Elevated blood glucose level can cause serious health problems as it can damage the blood vessels, increase the risk of kidney and heart disease, affects the eyes and nerves. The most important hormone to regulate blood glucose level is "insulin". Insulin is produced by the pancreatic β -cells. Insulin causes the movement of sugar from the blood to the cells where it is utilized by the body as fuel. The situation where the body is not producing enough insulin or producing insulin but is unable to utilize it; leads to the condition of diabetes. There are two types of diabetes: type 1 and type 2. Type 1 diabetes occurs when the β -cells of the pancreas is defective in producing insulin that resulting in elevated blood glucose level. The cells are starved from the energy source therefore fat is being utilized as the energy source. As fat in the

human body cannot be converted to glucose, the ketone body formed as a result can make the blood acidic and may have a damaging effect on the brain. Type 2 diabetes β -cells are producing insulin but the body is not responding to the insulin that causing a situation called "insulin resistance". The reason may be due to being overweight and obese. The body is unable to utilize the blood glucose and leads to elevated blood glucose levels. Biosensor based glucometer contains immobilized enzyme glucose oxidase to estimate the average blood glucose level. The more accurate way to estimate the blood glucose level over is by measuring the level of glycated hemoglobin (Hb_{1c}). Type 1 diabetes is managed by controlling blood glucose levels and exogenous insulin supply. Carbohydrate restricted diet was found to be beneficial in Type 1 diabetes (Dikeman and Westman, 2021). American Heart Association Guidelines suggested the lifestyle changes that are related to the management of diabetes such as managing the following: weight, blood sugar, blood cholesterol and blood pressure.

Curling of hairs

Human beings especially females are fascinated with the hairstyles such as curling of hair, straightening of hair and giving a fixed shape to the hairs. All these phenomena involve the making and breaking of the disulfide bond of the keratin protein that is present in the hair. During curling first, the hair is molded over a shape, then a reducing agent is applied along with moist heat which breaks the disulfide bond; after that oxidizing agent is applied that leads to the reformation of the disulfide bond. The reformed disulfide bond help to take a new shape to the hair, and thus curling of hair occur. However, the effect of straightening and curling is not permanent as the newly grown hairs will have a different pattern of the disulfide bond.

Smoking

Every human being on this earth is familiar with the phrase that "smoking is injurious to health". But they are not afraid of the real meaning of it. Cigarette smoke that is inhaled contains carbon monoxide (CO). CO is not the usual gas that our body can use for "oxidative phosphorylation"; a phenomenon to generate energy in the body. A healthy human can tolerate the level of CO when the COHb (CO bound to Hb) level is below 1% of total hemoglobin. A smoker who is having high COHb levels in the blood cannot tolerate much high CO level in the atmosphere, as a result, they are vulnerable to hypoxic conditions and this may lead to death

when the COHb level rises above 60%. Apart from the depletion of dissolved oxygen levels in the blood; smoking leads to changes at the molecular level also. Exposure to cigarette smoke leads to DNA damage by forming a DNA adduct known as Benzo[*a*]pyrene-guanin which is a carcinogen. The balance between metabolic activation and detoxification of carcinogens determines the occurrence of cancer. Free radicals in cigarette smoke cause oxidative damage that also results in DNA damage. At DNA level G: C and T: A transversion occurs due to cigarette smoke-related lung cancer. These mutations lead to activation of oncogenes and inhibition of tumor suppressor gene (Ozlu and Bulbul, 2005)

Alcoholism

Alcohol consumption is not at all bad, but the quality and quantity matter. The purity of alcohol and the source from which the alcohol is prepared are very important from a consumption point of view. The basic method of alcohol preparation is “alcoholic fermentation”. The starting material which is taken for the fermentation purpose determines the health benefits of alcohol e.g. wine are prepared from the grapes and it is rich in resveratrol, antioxidants e.t.c. Composition of alcohol along with percentage are as follows: Vodka; ABV: 40-95%, Rum; ABV: 36-50%, Whiskey; ABV: 36-50%, Fortified Wine; ABV: 16-24%, Unfortified Wine; ABV: 14-16%, Beer; ABV: 4-8% (ABV: Alcohol by volume) (Alcohol Percentage Contents of Various Beverages; sunrisehouse.com). The biochemical basis of understanding alcohol consumption involves the enzymes such as alcoholic dehydrogenases and acetaldehyde dehydrogenases. The product formed is acetaldehyde and an ample amount of NADH is formed in the reaction. Availability of an ample amount of NADH leads to a signal for energy sufficiency condition. Therefore fatty acid breakdown stops and fatty acid synthesis starts which leads to the “fatty liver” condition. Acetaldehyde accumulation is harmful to the tissue. Ketone bodies are formed from acetaldehyde as well as lactic acid formed as NADH is utilized that leading to the condition of acidosis. Some people develop symptoms like rashes over the body after consuming a small amount of alcohol however the others are quite tolerant to even higher levels of alcohol. To understand the reason behind this we need to understand the fact that if the K_m value (a measure of the affinity of a substrate to the enzyme) for acetaldehyde dehydrogenase is high, it means a person cannot tolerate even a low amount of alcohol and develop rashes like symptom. Alcoholism leads to nutrient deficiency conditions. A condition

called “Wernicke Korsakoff syndrome” associated with the thiamine (vitamin B1) deficiency may result due to alcohol abuse.

Allergies from reactive metals

Some people are allergic to metals and will develop redness or itchy skin, it is very common for earrings and other jewelry. These symptoms are developed on the exposure of skin to allergens. The phenomenon in scientific terms is called "contact dermatitis". The diagnosis is based on the patch test as well as an oral metal challenge test for the metals such as cobalt, nickel, zinc and chromium. *In vitro* tests include the lymphocyte stimulating test (LST). Metals like nickel, zinc, cobalt and chromium are abundant in the environment. These metals are electrophilic and can ionize the proteins and thus forming complexes with proteins that are recognized by the dendritic cells that result in a hypersensitive response (Yoshihisa and Shimizu, 2012). The best solution for this problem is you need to avoid the contact and apply moisturizer to the affected area.

COVID-19 vaccination

COVID-19 pandemic has made us understand the importance of vaccination. However, people from different age groups and different areas are still afraid of taking vaccines. At this time the people like us; working in the science field can educate them to help to understand the importance of vaccination. Vaccination is not harmful, it is beneficial to boost our immunity against a specific pathogen. In this case, the COVID-19 vaccine contains the heat-killed, attenuated virus, coat proteins, etc. The vaccine when enters the body raises the antibody against the foreign pathogen and causes an alarming situation to prepare our body from further attack by the pathogen. COVID -19 vaccination is beneficial but in certain circumstances, it should be avoided as mentioned here:

- For those people who develop allergic reactions to the vaccine.
- People who got infected from coronavirus & have not completed 4-8 weeks since complete recovery from COVID-19 disease.
- The person who is severely ill, the person having low platelet counts & clotting factor deficiency.

- Steroids are synthetic hormones that are having anti-inflammatory as well as immunosuppressive functions. A high dose of steroids may impair the efficacy of the vaccine.



Figure: Demonstrating the topics covered in this article

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