

Determination of the Cholesterol Content in Different Tissue Homogenates of Cow

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Abstract: The total cholesterol content of different tissue homogenates of cow was determined. The tissues examined include the liver, kidney, heart, skeletal muscles lung, intestine and skin (Leather). The results of the analysis showed that the liver contained the highest level of cholesterol, followed by the skeletal muscle and the leather had the lowest content. The values in decreasing order is as follows; $141.94 \pm 2.12 > 138.74 \pm 2.19 > 129.04 \pm 2.01 > 117.41 \pm 3.44 > 95.37 \pm 1.59 > 91.35 \pm 2.59 > 84.21 \pm 59$ for the liver, skeletal muscle, intestine, heart, kidney, lung and the skin respectively. It was concluded that lungs and skin of cow contains little cholesterol and hence must be consumed in preference to other parts of cow.

Key words: Tissue homogenates • Cholesterol • Hypertensive diabetes • Cardiovascular diseases and aged people.

INTRODUCTION

Cholesterol is a soft, waxy substance found in the blood stream and in all the body cell. It is important for healthy body.

The importance of cholesterol in the body can not be overemphasized. For instance, cholesterol is a lipid found in the cell membranes of animal tissue, trace amount is also found in the membranes of plants and fungi [1]. It is the precursor of a large number of steroids which include the bile acids, adrenocorticoid hormones, sex hormones, D vitamins, cardiac glycosides, sistosterols of the plant kingdom and some alkaloids [2]. The cholesterol produced endogenously helps to build healthy cell membranes (Walls) in the brain, nerves, muscles, skin, liver, intestines and heart.

There are varieties of factors that can affect cholesterol levels in the body. Some of them include diet, weight, exercise, age gender, diabetes, hereditary among others. They can affect the concentrations of cholesterol either negatively or positively [3].

Cholesterol is transported in the plasma when they are bounded with specific proteins. This form the basis for the classification of cholesterol as High Density Lipoprotein Cholesterol (HDL), Low Density Lipoprotein Cholesterol (LDL), Intermediate Density Lipoprotein Cholesterol (IDL) and Very Low Density Lipoprotein Cholesterol (VLDL) [4]. According to the lipid hypothesis, abnormally high cholesterol levels

(Hypercholesterolaemia) or more correctly or specifically high level of LDLC are strongly associated with cardiovascular diseases because it leads to gradual blockage of the arteries which promote atheroma development. (Atherosclerosis) [5]. It is the high concentration of LDL that led to the various cardiovascular diseases (CVD), myocardial infarction, heart attack and stroke in diabetes, hypertensives and old age [6]. These diseased conditions are responsible for more than one third of all death in western world. The percentage of deaths resulting from cardiovascular diseases is also increasing tremendously in Africa sub-regions. It is in fact the number one killer disease in the United States and in other industrial nations [7]. It is on this basis that this present work was carried out to identify the major animal tissues that contain the lowest cholesterol concentration so as to recommend such to those with CVD, hypertension and *diabetes mellitus*. This will increase the protein consumption of these people and reduce their risk to heart attack and premature deaths.

MATERIALS AND METHODS

The tissues of cow i.e. Liver heart kidney, skeletal muscle, lung, intestine and skin were purchased at an abattoir in Ikare major market, Ikare Akoko in Akoko North-East Local Government Headquarters of Ondo State, Nigeria. The tissues were homogenized in

Table 1: Total cholesterol content of different tissue homogenates/extracts of cow

Organ	Cholesterol Concentrations (mg / g wet organ weight)
Liver	141.94±2.12
Skeletal muscles	138.74±2.19
Intestine	129.04±2.10
Heart	117.41±3.04
Kidney	110.94±3.04
Lungs	91.35±2.59
Skin (leather)	82.21±1.59

Each value represents a mean of four determinations ± SEM.

the Biochemistry Laboratory of Adekunle Ajasin University, Akungba-Akoko. Chloroform extract of the total lipids of the tissue homogenate were isolated. This was then followed by the determination of the cholesterol concentration in the chloroform extracts of the tissues using the method of Zlakis, *et al.* [8].

RESULTS

Table 1 shows the total cholesterol concentration of the different tissue homogenates/extracts of cow. It was clear that the liver had the highest level of cholesterol (141.94±2.12mg/g wet weight). This was followed by the skeletal muscle (138.74±2.19mg/g wet weight) of the organ. Others include 129.04±2.10, 117.41±3.04, 110.94±3.04, 91.35±2.59 and 82.21±1.59 for the Heart, kidney, lung and skin respectively.

DISCUSSION

As presented in Table 1 above, the liver has the highest concentration of cholesterol among the organ studied. This is followed by the skeletal muscle and the intestine. This finding is in agreement with other previous works [9], whereas high levels of lipid and cholesterol in the liver has been reported. High level of cholesterol in the liver is associated with the fact that it is the major organ responsible for lipid and cholesterol metabolism [10]. High level of cholesterol in the skeletal muscle as shown in this present study is agreement with earlier reports [11]. The skeletal muscle which is also high in protein serves as one of the storage organs of lipid and cholesterol [7]. This makes it come next to the liver in the content of cholesterol.

The high level of cholesterol in the intestine as presented in this work also commensurate the earlier report [12]. This increase in the intestinal cholesterol

content might be due to the absorption of cholesterol that takes place in the intestine coupled with intestine, acting as an excretory organ in reverse cholesterol transport (RCT) pathway. The reverse cholesterol transport (RCT) pathway is extremely important in prevention of cardiovascular disease because it removes excess cholesterol from macrophages present in the arteries vessels walls.

Low cholesterol contents in the lung and epidermal tissue (Skin) as presented in Table 1 has also been reported [13]. The lung is not involved in cholesterol metabolism and storage but the lower epidermal layer of the skin, whereas lipid and cholesterol act as insulator is removed during its preparation for food [14]. The kidney and heart contained moderate content of cholesterol as established by this study. Similar observation has earlier been reported [15]. This lower level of cholesterol may be as a result of these organs, serving as vessels for mere transportation of cholesterol. Having established high level of cholesterol in the liver, skeletal muscle and the intestine, frequent consumption of diet that contains these organs will result in hypercholesterolemia, which is the major cause of atherosclerosis, hypertension, cardiovascular diseases, kidney failure and stroke in diabetes mellitus, aged people and those that may likely be susceptible to such diseases. Based on the fact above, those with the history of hypertension, cardiovascular diseases, *diabetes mellitus* and related diseases should abstained from consumption of diet rich in liver, red meat (Skeletal muscle) and intestine. Parts of the cow that are low in cholesterol concentration such as the lung and the skin can be consumed by them. This will reduce the plasma and various lipid and cholesterol contents in patients with cardiovascular diseases and related diseases as well as preventing the occurrence of these diseases in healthy people.

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