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Mean Percentage of Skin and Visible Fat in 10 Chicken Carcass Weight

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Abstract: Chicken skin is not removed from the whole carcass before cooking in Iran and people prefer chicken with higher weight. The objective of this study was to distinguish the mean percentage of chicken skin and visible fat to chicken carcass weight. The ratio of chicken skin and visible fat to total chicken carcass weight in 10 weight groups were studied. These groups had approximate weight of 1100, 1200, 1300,1400,1500,1600,1700,1800,1900 and 2000 g. Samples were randomly collected 10 times, each time 20 chickens from Kordan slaughterhouse product from each weight were selected. The skin and visible fat were removed from the carcass and weighted. The mean percentage of skin and visible fat ratio to total chicken carcass weight were calculated in these 10 chicken weight groups separately. The mean percentage of poultry skin and visible fat ratio to total chicken carcass weight in these 10 weight groups were 11.7±1.5, 12.3 ±1.8, 12.8 ±1.9, 13.2±1.2, 14.1±1.3, 14.3±1.9, 14.1±1.5, 14.7±2.1, 14.9±1.9, 15.2±2.1 respectively. The minimum percentage was 8% and the maximum was 20% in total samples. Chicken carcass was conditioned in plastic bags without removing the skin and visible fat by the slaughterhouse. Skin and visible fat comprise 8-20% of chicken carcass weight, chicken with higher weight have higher percentage of skin and visible fat. Hence, chicken carcass with lower weight should be purchased and skin and visible fat has to be removed before cooking.

Key Words: Chicken Skin, chicken carcass, percent, visible fat, weight

Introduction

Obesity has reached epidemic proportions in the United States. Today, an estimated one in four children in the United States is at risk of overweight. Obesity in early life is associated with several risk factors for coronary heart disease and is predictive of coronary heart disease, hypertension, and diabetes in adulthood (Nicklas *et al*., 2001). Epidemiologic evidence and tightly controlled clinical studies indicate that variations in the amounts and types of fats in the diet influence the risk of cardiovascular disease (CVD) by increasing serum LDL cholesterol (Fried and Rao, 2003). The result of a study on serum lipid levels in school-aged Greek children who live in the suburbs of Athens (Greece) suggested that diet changes in the Greek population, especially in children and adolescents, living in big cities is significantly influencing their total cholesterol profiles throughout the last 10 years (Schulpis and Karikas, 1998). The role of raised blood cholesterol in causing coronary atheroma is established (Oliver, 1992). Hypertriglyceridemia is a commonly encountered lipid abnormality and frequently associated with other lipid and metabolic derangements (Pejic and Lee, 2006). High serum triglyceride concentrations were recently recognized as an independent risk factor for cardiovascular disease, particularly when HDL-cholesterol concentrations are concomitantly low (Jacobs *et al*., 2004). Epidemiologic, clinical, genetic, experimental, and pathological studies have clearly established the primary role of lipoproteins in atherogenesis (Havel and Rapaport, 1995). Coronary heart disease (CHD) is the single leading cause of death in the United States, accounting for a total of 656,000 deaths in 2002. The estimated direct and indirect medical cost related to CHD is $142.1 billion in 2005. Despite a large body of clinical and epidemiologic evidence which links elevated cholesterol and atherosclerosis, and supports treatment of hyperlipidemia ,fewer than 50% of Americans who are eligible for cholesterol lowering therapy receive it (Balbisi, 2006).The amount of dietary fat is important in maintaining energy balance, and the type of fat is important in reducing the development of heart disease. Low-fat foods are suitable at this life stage, but it is also important to avoid sources of "hidden" saturated fatty acids (biscuits and fast foods) and to include sources of polyunsaturated and monounsaturated fatty acids (oils, margarine, lean meat, poultry and nuts) (Tapsell and Batterham, 2002). In the U.S., 16 billion pounds of fat are added to processed food each year (http://www.drake.edu/journalism/health96/mag/departments/plate/out/outbox.txt). Dietary recommend-ations have been proposed in order to prevent or reduce the development of atherosclerosis in the general

population. According to the recommendations for a prudent diet from the 1994.

National Cholesterol Education Program (NCEP), the proportion of lipids consumed should be limited to 30% or less of total energy, consumption of saturated fatty acids should be 8% to 10% of total energy, consumption of omega-6 (n-6) polyunsaturated fatty acids (PUFA) up to 10% of total energy, and cholesterol consumption should be limited to less than 300 mg per day (Lacaille *et al*., 2000). Measures to lower plasma cholesterol have become fundamental to the practice of preventive cardiology, and their use in both patients who already have coronary disease and healthy people has materially contributed to the 50 percent reduction in mortality from coronary heart disease in the United States in the past two decades (Havel and Rapaport, 1995). Improvement in dietary habits in Poland during the past several years resulted in a decrease in mortality due to CVD. This finding may have an important impact on future efforts aimed at improving public health. A decrease in the consumption of butter by 52%, other animal fats by 20%, milk by 27%, and beef by 57% and potatoes by 8% was noted. On the other hand, the consumption of vegetable fat increased by 100%, poultry by 70% and fruit by 64% (Szostak *et al*., 2003). Saturated and Trans fats can raise your cholesterol levels. Saturated fat is the kind of fat found in meat, poultry skin, butter, 2% or whole milk, cream, cheese, lard, and shortening (Franz, 2003). In general, under isoweight conditions, different types of dietary protein or individual amino acids have little effect on lipoprotein patterns. Dietary carbohydrate tends to increase plasma triglyceride when it displaces fat, accompanied by a decrease in HDL cholesterol. Potential differential effects of type of carbohydrate are difficult to assess due to potential differences in rates of absorption and presence of dietary fiber. Saturated fatty acids increase LDL and HDL cholesterol whereas Tran's fatty acids increase LDL but not HDL cholesterol. Unsaturated fatty acids decrease LDL and HDL cholesterol, polyunsaturated more so than monounsaturated. There has been considerable interest in the potential benefit of major shifts in dietary macronutrients on weight loss and lipoprotein patterns. Short term data favors substituting protein and fat for carbohydrate, while long term data have failed to show a benefit for weight loss. However, lower triglyceride and higher LDL cholesterol concentrations are commonly seen during the active weight lose phase regardless of nutrient composition. Additional efforts need to be focused on gaining a better understanding of the effect of dietary macronutrient profiles on established and emerging cardiovascular disease risk factors beyond lipoproteins. Such data are needed to allow reassessment, and if necessary, modification of current recommendations (Lichtenstein, 2006). Meat, poultry, fish, and items from the milk group are examples of high quality proteins which supply all the essential amino acids. Foods in the meat group contain naturally occurring fat. A balanced diet which includes a variety of low fat & protein sources is recommended (www.mwlc.com/ clinic/ secure/ lessons/ Nutrition&ExerciseLesso). The lean beef diet reduced plasma total and LDL cholesterol by 7-8%, the lean fish diet reduced them by 5%, and the poultry diet (without skin) by 8-9%; no significant. The lean beef diet decreased plasma total triacylglycerols by 19%, the lean fish diet decreased it by 20%, and the poultry (without skin) diet by 25%. VLDL triacylglycerols and cholesterol were reduced by 21-22%, 31-32%, and 28-29% after the consumption of the lean beef, lean fish, and poultry diets, respectively. (Beauchesne-Rondeau *et al*., 2003). Normalization of the plasma lipid profile is the goal of nutritional intervention to prevent or reduce the development of atherosclerosis, Patients with hypercholesterolemia are often told to adopt diets in which either fish or poultry replaces red meats because of the lower saturated fat content of fish and poultry (Édith *et al*., 2003). In contrast, growth in total meat demand remain very rapid in developing countries, with a per capita demand growth rate of 2.9% / year for all of meat from 1981-1994. Growth was again fastest for poultry, with per capita demand growth 5.5% / year and total demand growth of an extraordinary 7.6% / year (Rosegrant *et al*., 1999). Broiler production is the economic activity that has shown the greatest progress in Iran in the last three decades. In Iran, the normal weight of consumed chicken is about 1500gr, but preferably higher weight near to 2000gr. The poultry consumption pattern in Iran is mainly boil form, and some extent fried, barbeque and roosted, since poultry skin is not been removed the whole carcass before cooking. The objective of this study was to distinguish the mean percent of chicken skin and visible fat to chicken carcass weight.

Materials and Methods

This study conducted over a period from October 2005 to October 2006, different flocks were transported to Kordan slaughterhouse. Kordan slaughterhouse obtained its necessary poultry from Tehran area or adjustant area with about 300 Km distance. We obtained the chicken carcass for this study from Kordan industrial slaughterhouse. Broiler production is the economic activity in Iran, there are a lot of unites of poultry breeding farm in Tehran area. The chicken races which are used in different Iranian poultry farm are mainly ROSS 308, COBB 500 and ABERACERS and chicken raised as recommended by Agroceres Ross (2000) the normal breeding period duration is about 50 days, but in some unites it may extended up to 60 days. The slaughterhouse prefer to buy chicken with live weight of up to 2000 g (Hence, in some poultry unites farm the

Table 1: Mean percentage of skin and visible fat to chicken carcass weight in different groups

Chicken weight groups	Mean percentage of Chicken skin and visible fat	The range percent of chicken skin and visible fat
Group 1100	11.7±1.5	8-14
Group 1200	12.3±1.8	8-15
Group 1300	12.8±1.9	9-16
Group 1400	13.2±1.2	10-17
Group 1500	14.1±1.3	9.5-17
Group 1600	14.3±1.9	10.6-17.8
Group 1700	14.1±1.5	11-18
Group 1800	14.7±2.1	11-18.8
Group 1900	14.9±1.9	11-19.5
Group 2000	15.2±2.1	12-20

breeding period may be extended). The ratio of poultry skin and visible fat to total chicken carcass weight in 10 chicken weight groups with a 100 g difference between each group was studied (chicken carcass weight from 1100 to 2000 g weight). Chicken carcass weight, chicken skin and visible fat were measured by electronic kitchen scales; the model of kitchen scales was Tefal (Paris, France). The electronic kitchen scales accuracy for weight 1-2 kg was of ± 2 g. The 45-55-days-old broiler chickens were stunned, slaughtered, bled and plucked in this local slaughterhouse. The birds were submitted to at least 6-h fasting, weighted and slaughtered. Birds were defeathered and the metabolic and digestive organs were removed from the body. The gastrointestinal tract of esophagus, proventriculus, gizzard, intestines, bile bladder, spleen and the bursa of fabricius was removed. After removal of the heart and liver, carcasses were chilled to 4°C, The remaining body, including abdominal fat pad, trachea, kidneys, lungs was defined as the carcass. After slaughter processing, carcass were conditioned in plastic bags and stored at 0°C in slaughterhouse before dispatching to the market. Some part of the product are stored after rapid freezing. This study was conducted on frozen chicken, which were slowly defrosted. Ten groups with 100 g difference between each group were considered for this study, these groups had approximate weight of 1100, 1200, 1300,1400,1500,1600,1700,1800,1900 and 2000 g. The samples were randomly collected for 10 times, each time 20 chickens carcass with ±20 g were selected among chicken carcass. After recording total weight of chicken carcass, skin and visible fat content were removed; skin and visible fat were conditioned in plastic bags and stored at 0°C to be weighed. The percent of skin and visible fat content was calculated as the division between the skin and visible fat content weight and carcass body weight and expressed in percentage. After 10 times, the mean percentage of skin and visible fat in different groups were calculated, and descriptive statistical about collected data was done for changes as percent.

Results

The mean percentage of chicken skin and visible fat ratio to total chicken carcass weight in these 10 weight groups were 11.7±1.5, 12.3±1.8, 12.8±1.9, 13.2±1.2, 14.1±1.3, 14.3±1.9, 14.1±1.5, 14.7±2.1, 14.9±1.9, 15.2±2.1 respectively. The minimum percentage and the maximum in these 10 weight groups were 8 and 14, 8 and 15, 9 and 16, 10 and 17, 9.5 and 17, 10.6 and 17.8, 11 and 18, 11 and 18.8, 11 and 19.5, 12 and 20 respectively. The percent of poultry skin and visible fat in every special weight group was not constant in different case of sample preparation. The minimum percentage was 8% and the maximum was 20% in total samples. The range of skin and visible fat percentage in these different weight groups was between 8-20 percent. The obtained results show a direct relationship between the percent of chicken skin and visible fat with total chicken carcass weight. Table 1 shows the mean percentage of skin and visible fat to total chicken carcass weight and the range of changes in every special weight. It should be noted that there is no standard ratio in the percentage of chicken skin and visible fat ratio that ground poultry may contain. In some sample with 1500 g carcass weight, the percent of skin and visible fat reach to about 17% of chicken carcass weight and in some cases with 2000 g carcass weight, the percent of skin and visible fat was about 12 percentages. The mean percentage of chicken skin and visible fat between the groups with 1100 g carcass weight had a difference about 3 percent with the group with 2000 g carcass weight.

Discussion

The present study produced several key finding in relation with poultry carcass weight and percent of skin and visible fat. First, the percent of poultry skin and visible fat in poultry carcass with 1100 to 2000 g of weight include 8 to 20 percent of carcass weight, which these percentage include significant part of carcass weight . Second, there was a direct relationship between chicken carcass weight and percent of skin and visible fat, with an increase in chicken carcass weight, the percentage of skin and visible fat increased. The mean percentage of chicken skin and visible fat between the groups with 1100 g carcass weight (about 12%) had a difference about 3 percent with the group with 2000 g carcass weight (about 15%). Third, in total samples, no sample with percentage lower than 8% and higher than 20 % was not observed. There is no standard regulating the amount of fat that ground poultry may contain. However, since meat and skin can only be present in no more than natural proportions, the amount of fat contained is self-limiting. In general, it is about 10 to 15 percent fats by weight. A turkey carcass contains about 15 percent skin and a chicken carcass contains about 20 percent skin on the raw basis. No extra fat may be added (Bob Guinn, Get the facts about ground poultry,

clemson Extension Agent). The percent of skin and visible fat could be affected by races, genus, diet balance or imbalance, season and other factors. The percentage of skin and visible fat in a chicken carcass with 2000 g weight reaches to 20% or 400 g of chicken carcass, the rate of total fat in this amount of skin is about 60 g and the rate of cholesterol is about 320 mg, this amount of cholesterol is equal to the upper limit of cholesterol entrance for an adult individual. The status of poultry skin in relation with harmful lipid is similar to cholesterol. The lipids from chicken epidermis were analyzed by a combination of quantitative thin-layer and gas-liquid chromatography and by chemical and spectroscopic methods. The lipid groups present included wax diesters (34%), triglycerides (32%), sterols (11%), phospholipids (11%), nonphosphorus-containing sphingolipids (3%), beta-D-glucosylsterols (3%), 6-O-acyl-beta-D-glucosylsterols (2%), steryl esters (1%), cholesteryl sulfate (1%), and free fatty acids (1%). The major phospholipids were phosphatidylcholine, phosphatidylethanolamine, and sphingomyelin, and the sphingolipids included ceramides, glucosylceramides, O-acylceramides, and O-acylglucosylceramides. Glucosylsterols and acylglucosylsterols have not been found in mammalian skin, and may be relevant to the evolutionary history of the epidermal water barrier. The wax diesters contained mainly 16-, 18-, and 20-carbon saturated fatty acids esterified to 20- through 24-carbon threo and erythro 2, 3-diols, while the chicken epidermal triglycerides contained some very long-chain (26-40 carbon) saturated fatty acids. These wax diesters and unusual triglycerides may be of significance in human health (Wertz *et al.,* 1986). The rate of contents of cholesterol oxides, cholesterol, and total lipid, and the fatty acid composition were determined in frozen turkey meat. The 7-ketocholesterol content varied from 33 microg/100 g in the breast to 765 microg/100 g in the skin, and the levels of 7 beta-hydroxycholesterol varied from not detected in the leg, breast, and skin to 370 microg/100 g in the skin. The values for total lipid (g/100 g) in the wings, legs, breast, and skin were 0.9±0.4, 1.1 ±0.2, 0.5±0.1, and 12±3, respectively. The contents for cholesterol (mg/100 g) were 46±5, 35±2, 27±3, and 81 ± 6 in the wing, legs, breast, and skin, respectively. The main fatty acids identified in all cuts were C18:2n6, C18:1n9, C16:0, C18:0, and C20:4n6 (Baggio *et al.*, 2002). The rate of cholesterol contents were determined in two hundred gram portion of carp F (fillets) and chicken TM (thigh meat) without skin represents 49 and 55% of the upper limit of daily cholesterol intake, respectively. (Komprda *et al.*, 2003). Most of the cholesterol in poultry is in the skin, and some in dark meat (Enas *et al.*, 2003). Abdominal and subcutaneous fat are regarded as the main sources of waste in the slaughterhouse. Fat stored intramuscularly is regarded a favorite trait related to meat quality. Therefore carcass traits could be improved by selection for increased breast muscle and reduced abdominal fat without decreased intramuscular fat (Zerehdaran *et al.,* 2004). Meat, poultry and fish are examples of high quality proteins which supply all the essential amino acids. Chicken meat contains naturally occurring fat, but wax diesters and unusual triglycerides which found in poultry skin can be harmful to human health. Boiled form is the main pattern of poultry consumption in Iran, lipid contents of poultry skin enter to food cycle completely in this pattern. In fried, barbeque and roosted form pattern of poultry, some part of lipid content may be eradicated during cooking process. In roasted chickens, regarding to the lipids content, the skinless breast showed the lowest content, 0.78 g/100 g, while the back with skin was the one with the highest content, 12.13 g/100 g except for the pure skin, with 26.54 grams of lipids by 100 grams.(Souza *et al.*, 1999). Thus poultry skin should be removed before cooking process in all pattern of poultry consumption. Antibiotics are extensively applied in veterinary medicine for the treatment of various bacterial infections (Kowalski *et al.*, 2003). Residues of enrofloxacin and the major metabolite ciprofloxacin in fat, kidney, liver, lungs, muscles, and skin were measured in chickens that received an orally administered dose of 10 mg/kg once daily for 4 days. Enrofloxacin and ciprofloxacin residues were cleared slowly. (Anadon *et al.*, 1995). Sulfadimethoxine was distributed evenly throughout the entire skin area of the broiler-chickens (Takahashi *et al.*, 1991). Due to poultry diseases, antibiotics and other drugs were used until slaughter's day in most of poultry breeding farm, skin is one of the tissues with high concentration of drug residues. As in many countries slaughterhouse's product did not examine for veterinary drug residues before dispatching to the market, hence poultry skin should be eradicated before cooking process. During slaughter operation, poultry skin contaminated with different microbes. It is not possible removal of the poultry skin before dispatching to the market, because poultry skin act as a protecting layer outside of broiler carcasses. Hence it is possible to lower the level of bacteria on the outside of broiler carcasses by removal of poultry skin before cooking. The results of our study are in agreement with other findings. Chicken carcass contains about 20 percent skin on the raw basis (Bob Guinn, Get the facts about ground poultry , clemson Extension Agent). Due to lipids composition of chicken epidermis, prevention of poultry skin to human food cycle is necessary and this recommendation is emphasized by different public health organizations. The American Heart Association recommends removing the skin from chicken, turkey and other poultry before cooking.

Conclusion: Chicken carcass was conditioned in plastic bags without removing the skin and visible fat by the

slaughterhouse. Skin and visible fat comprise 8-20% of chicken carcass weight, chicken with higher weight have higher percentage of skin and visible fat. Hence, chicken carcass with lower weight should be purchased and skin and visible fat has to be removed before cooking.

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