HANDLING ANEMIA WITH THE UTILIZATION OF CHICKEN FOOT

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A. Introduction

Anemia is a decrease in the number of red blood cells in the circulation, abnormalities in the hemoglobin content of red blood cells or both (Corwin, 2009). (The prevalence of anemia ranges from 40-88%, while the prevalence of adolescents with a thin BMI ranges from 30% -40%. Teenage girls need an average of 26 mg of iron per person, per day in their diet. This amount is 2 times that of the diet. young men of the same age (Yuliati, 2006). Nutritional problems in adolescents will have a negative impact on the level of public health, for example the concentration of learning, the risk of having a baby with LBW, decreased physical fitness. These nutritional problems include anemia and BMI less than normal or underweight.

There is a relationship between protein and hemoglobin levels in a study conducted by Pratiwi in Mojolaban District, Sukoharjo Regency. The intake of animal protein can increase the absorption of iron in the body. Low consumption of protein intake can cause low iron absorption by the body. This situation can result in the body being deficient in iron and can lead to anemia or a decrease in hemoglobin levels (Pratiwi, 2017).

One of the parts of a chicken's body that is less attractive to the public in general is chicken feet or better known as claws . Although chicken feet are less popular than other parts of the body of chickens, the benefits and nutritional content of chicken feet in supporting the growth of children cannot be underestimated. Claws have collagen, cartilage, and are high in protein. Protein plays an important role in the transportation of iron in the body, lack of protein intake causes iron transport to be inhibited, resulting in iron deficiency (Almatsier, 2010).

B. The utilization of checkers has not been maximized

Chicken is a type of poultry that is widely used as a food ingredient other than ducks and birds. Chicken is also used as a food source of protein besides beef and fish. The most popular parts of chicken meat are chicken breasts and thighs, while those that are less popular are the chicken legs or commonly known as feet.

The claws are one part of the body of chickens that is not in demand by the public, these chicken feet generally consist of skin, bone, muscle and collagen components so that a touch of technology is needed to be processed into products that have added value. So far, chicken feet have only been used as a mixture of food such as soup and some are made into claw crackers. From the two food samples, the added nutritional value is still low. One of the components of chicken claw that has the potential to be developed is chicken leg skin considering that it has a chemical composition that supports such as a water content of 65.9%; protein 22.98%; fat 5,6%; ash 3.49%; and other materials 2.03% (Miwada & Simpen, 2007).

Chicken feet chicken is less popular than the other parts of the chicken's body despite that the benefits and nutritional value of chicken claw in supporting growth can not be underestimated. 100 grams of chicken claw contains 9.84 grams of protein, 2.87 mg of calcium, 1.70 mg of phosphorus and 3.16 grams of fat, 4 mg of water-soluble collagen, 187 mg of omega-3 and 2,571 mg of omega-6 (Muyonga , Cole, & Duodu, 2004; Taufik, 2004; Voutila, Ruusunen, Jouppila, & Puolanne, 2009) Omega-3 is useful as anti-inflammatory and supports brain function (Soeparno, 2011). Meanwhile, water-soluble collagen in chicken claws is useful for increasing immunity (Tong et al., 2010).

From several studies regarding the benefits of chicken claws, in general, they conducted research to make gelatin made from chicken claws. Most commercial gelatin is made from beef, pork, or fish tissue; industrial processing is based on processing acidic or alkaline raw materials. The technology presented focuses on the manufacture of gelatin from the collagen as a byproduct of cutting chicken (chicken feet). The innovative technological element brings about the biotechnological process of (purified) raw materials by commercial food endoproteases, which, in contrast to acid (type A) or alkaline (type B gelatin) processing, has various economic, technological and environmental advantages (Mokrejš, Mrázek, Gál, & Pavlačková, 2019). Because it is known to contain lots of collagen, chicken claw is often used to make products. Collagen is a protein that makes up a lot of broiler shank skin. Kolagen is insoluble in water and when

hydrolyzed would be water-soluble gelatin. Gelatin is one of the ingredients for making edible films which is a thin layer on top of food components from edible materials and functions to increase the shelf life of food products (Abdurrahman, Nuhriawangsa, & Pudjomartatmo, 2013) .

Research conducted by Mokrejš, et al in 2019 regarding the use of chicken claws to make the process found results, namely that the raw material is processed with a small amount of enzymes (0.1-0.8%, based on the weight of dry raw materials) at room temperature roar; and processing time is significantly reduced. After enzymatic processing and washing of raw materials in water, hot water gelatin extraction was carried out according to standards. With good technological conditions, it was found that gelatin with high gel strength (220–320 Bloom) with an ash content of less than 2.0% can be prepared to meet food and pharmaceutical standards. The yield of gelatin is 18-38% for a one-step extraction process, which is of very good value; optimal utilization of the raw material can then be achieved in practice by a multi-step extraction process. The process parameters observed in the preparation of chicken gelatin also influenced the viscosity of the gelatin (3.5–7.3 mPa s). Gelatin strength (the key parameter of gelatin application) did not change significantly by changes in process parameters, because all gelatin prepared was included in the high gel strength gelatin category (> 220 Bloom). Chicken gelatin can be an alternative to beef, pork, and fish gelatin, because it meets both halal and halal requirements. For their excellent properties, they are suitable in many food applications; for example, for confectionery, sweet desserts, dairy products, or meat products. Gelatin from chicken claws can also be used in the pharmaceutical field for the manufacture of hard gelatin capsules (HGC) and soft gelatin capsules (SGC), as well as various applications in the biomedical field (hydrogels, membranes, carriers, and films) (Mokrejš et al., 2019) .

C. Acceptance of Checker Based Products

The part of the chicken that is still underutilized is the chicken feet (feet). The use that has been done so far is still limited for basic ingredients for cosmetics. In the culinary field, the use of chicken feet is only processed in the form of claw and spicy claw soup. There are also not many enthusiasts of these two types of culinary preparations, the claw and spicy claw soup are mostly sold as street food, not as the main menu in restaurants.

The lack of enthusiasts from this claw is because it is still in the form of chicken feet, so you feel disgusted when consuming it. Chicken feet became popular when it was processed into claw crackers, its crunchy texture made people like to consume it. Several regions in Java have begun to take advantage of the claws which are processed into claw crackers as snacks and souvenirs.

Rasbawati and Rauf conducted research in 2018 on making biscuits as well as determining the level of preference for biscuits that panelists like the most based on color and texture changes using 20 semi-trained panelists. The research method used was an experimental method with 4 treatments and 3 replications using a completely randomized design (CRD). The data obtained were analyzed using analysis of variance (ANOVA) SPSS Version 16 for Windows program. The results showed that the preference level test carried out by 20 semi-trained panelists showed that the best treatment was the 5% substitution of chicken claw flour in terms of the panelists' preference for the texture and color of biscuits (Rasbawati & Rauf, 2018) .

Another study conducted by Abdurrahman, et al. In 2013 was the use of broiler chicken shank as a gelatin-based *edible film* supplemented with ginger extract on a *coating* of beef sausage. This research used broiler chicken shank, Belfoods sausage and ginger. The preference test data which includes color, aroma, taste, texture, chewiness, lingering taste, and acceptability were analyzed using a unidirectional completely randomized design (CRD) involving untrained panelists. It was found that the mean value of the test results for the preference for color, aroma, taste, Texture, chewiness, lingering taste, and acceptability were seen in the results of the preference test for the aroma of sausages that had been coated with edible film gelatin solution of broiler shank skin with the addition of ginger extract at different levels showed a very significant effect ($P < 0.01$) (Abdurrahman et al., 2013) .

Research in tian conducted by Hadi et al in 2018 on the effect of the addition of chicken claw on a nugget of corn against the nutritional value and organoleptic quality which saw receipts panelists according to color, aroma, texture and taste of the product substituted chicken claw are found to result w Arna nuggets of corn The most favored by the panelists was the control treatment, namely without the addition of chicken claws. The chicken claw corn nugget that was most preferred by the panelists was the first treatment with the addition of 10% chicken claw. The most preferred chicken claw corn nugget texture was the third treatment with the addition of 30% chicken claw. The taste of chicken claw corn nuggets that the panelists liked the most was the third treatment with the addition of 30% chicken claw (Hadi et al., 2018).

D. Nutritional Content of the Checkers

It is known that one of the ingredients in chicken feet is Omega 3 and Omega 6.One of the fatty acids that help in preventing oxidation reactions are omega 3 and omega 6. Fatty acids are not only used as a source and energy storage in the body, but are also needed as amaterials for biological functions. Fatty acids are the main structural components of cell membranes (phospholipids), strengthening the integrity and fluidity of the membrane. Another effect of omega-3 fatty acids is to inhibit inflammatory function by reducing lymphocyte proliferation, cytokine production, natural killer (NK) cell cytotoxicity, and antibody production. In addition, omega-3 fatty acids suppress neutrophil chemotactics in response to leukotriene B4, decrease antigen-secreting capabilities, and decrease the expression of major histocompatibility complex II (MHC II) molecules for mononuclear phagocytosis. Neutrophil repair with EPA and DHA increases anti-parasitic activity (Zhou, 2020) .

The nutritional content of chicken feet per 100 grams according to my fitness pal is presented in table 1.

Table 1. Nutritional content of Chicken Feet per 100 grams

Nutrients	total
Energy	193.75 kcal
Carbohydrate	0 grams
Fat	13.27 grams
Protein	18.58 grams

Source: (My Fitnesspall, 2020)

The results of other studies, in 100 grams of chicken claws contained 9.84 grams of protein, 1.70 mg of phosphorus and 3.16 grams of fat, 4 mg of water-soluble collagen, 187 mg of omega-3 and 2,571 mg of omega-6 (Muyonga et al. al., 2004; Taufik, 2004; Voutila et al., 2009) . Zinc can stimulate the activity of 100 different enzymes and is involved as a cofactor in 200 other enzymes involved in a large number of enzymes that catalyze vital metabolic reactions. This means there will be an increase in the nutritional value of both macro and micro nutrients. The skin of the legs in chickens consists mostly of collagen protein. Histologically, the skin is divided into 3 parts, namely the epidermis, dermis/korium and the hypodermis. The process of making chicken feet based products is generally related to the mechanism of breaking down and hydrolyzing the collagen fiber bonds in the skin. Collagen fiber bonds, especially in the dermis/chorium layer of the skin that are affected by heat, will undergo a denaturation process (Muyonga et al., 2004).

In a study conducted by Rasbawati and Rauf in 2018 regarding the protein content in the flour from chicken feet, it showed that chicken claw flour had a very high protein content of 49.36%. The results of this study indicate that the protein content is still high, which means that the protein does not suffer much damage in the process of making chicken claws into flour (Rasbawati & Rauf, 2018) . The nutritional content of Chicken Feet flour is presented in table 2.

Table 2. Nutritional Content of Chicken Leg Flour per 100 grams

Nutrients	Amount (%)
Protein	49.36
Calcium	1.1 94
Phosphor	2,336

Source: (Rasbawati & Rauf, 2018)

Chicken claws are a food ingredient that is widely used as gelatin because it contains high collagen. Collagen is the main fiber in the dermis layer of the skin and is a protein that functions for mechanical strength and skin support. As you get older, the protein structure of the skin and other skin components will change and this causes skin aging. Changes in the amount of collagen are an integral part of the skin aging process. It is estimated that there will be a decrease in collagen of about 1% per year per unit of the skin area, however, on skin exposed to UV light, there is a decrease of up to 59% as found in skin that has photodamage (Katili, 2009) .

E. Benefits of Checkers in Anemia and Health Management

One of the highest content in chicken claws is protein. Protein has an important role as a functional and structural component in all body cells. Protein has a unique function that cannot be replaced by other nutrients, namely as a building and maintaining substance for body tissue cells. Another function of protein is that it *plays a role in various body secretions.* Hormones such as thyroid, insulin, epinephrine, and so on are proteins. Likewise, various enzymes such as amylase, catalase, lipase, are also proteins. These two components play a major role in the body's metabolic secretion process. In addition, protein functions to *regulate water balance.* Fluid in the body consists of three compartments, namely intracellular (inside cells), extracellular/intracellular (outside cells/between cells), and intravascular (inside blood vessels). Another function of protein is to *regulate the neutrality of body tissues, another important protein function is to help form antibodies.* The body's ability to ward off toxic attacks and perform detoxification is highly dependent on the enzymes found in the liver. In a state of protein deficiency, the formation of this enzyme will be inhibited so that it becomes susceptible to disease. And protein can *play a role in the transport of nutrients.* The digested nutrients must be transported to the body's cells for use. The transportation of these nutrients is mostly carried out by proteins, such as lipoproteins which play a role in transporting lipids and lipid-like materials, and transferrin which plays a role in transporting iron and manganese and as a source of energy (Furkon, 2014) .

Protein is associated with anemia because the hemoglobin which is measured to determine a person's anemia status is a red blood pigment that functions as a carrier for oxygen and carbon dioxide is a protein binding. Sources of animal protein from beef, goat, chicken, liver and fish play a role in increasing the absorption of iron in the intestine, on the other hand, vegetable protein such as legumes can inhibit iron absorption, especially if the protein is used as a meat substitute. Makassar generally consumes more vegetable protein derived from tempeh and tofu because it is relatively cheaper so it is affordable. It is suspected that this has an effect on the increased risk of anemia among the adolescents studied (Almatsier, 2001).

Protein is one of the nutrients needed by the body, especially for building cells and tissues, maintaining and maintaining body resistance, helping enzymes, hormones, and various other biochemical materials. Thus, lack of protein intake will greatly affect various body conditions needed to stay healthy (Almatsier, 2001). The results of research conducted by Syatriani and Aryani in 2010 on food consumption and the incidence of anemia in junior high school students in Makassar City showed that students with sufficient protein consumption and anemia (23.8%) and students who consumed less protein suffered from anemia (82, 8%). That means that a person who is deficient in protein has a 3.48 times greater risk of developing anemia than people who do not experience protein deficiency (Syatriani & Aryani, 2010).

F. Utilization of Food Technology of Checkers

Utilization of chicken feet in Indonesia or better known as chicken feet is generally only fried, cooked for a mixture of soup, a mixture of vegetables, porridge, made krecek rambak, boiled to take the broth, or used as a mixture of animal food. This occurs due to a lack of information and availability of appropriate management technology as well as the benefits of the chicken leg products produced (Rasbawati & Rauf, 2018).

Food processing technology is increasingly varied, drying techniques are then continued with the shading technique also carried out on chicken claws. After becoming flour, claws can be used for the manufacture of a food product. The use of claw flour can be in the form of addition or substitution of raw materials for a food product. For example, to add nutritional value of protein, nutritional value of collagen and nutritional value of calcium in biscuits, you can add claw flour to the dough for making biscuits.

The use of chicken feet or shank skin as raw material for gelatin is one of the uses of chicken feet that needs to be assessed for its potential, considering that these components are very abundant and so far have not been optimally utilized, but have supporting chemicals as a source of beneficial nutrients, namely total protein content is more than 80%, therefore a simple process is carried out but it can produce gelatin that can meet the national and even international markets the process that is carried out is the hydrolysis process so that it will be safer and trusted to be able to achieve national market standards (Suryati, ZA, Meriatna, & Suryani , 2017) . Another example of the utilization of chicken claw skin has been carried out by Miwada and Simpen through a modified extraction process that is extracted with a mixture of chloroform and methanol. The results of their research showed that the percentage yield of gelatin they got was 69.43%, the water content of gelatin was 95.77% and the fat content of gelatin was 7.99% (Miwada & Simpen, 2007) .

Based on the analysis conducted by Suryati et al. In 2017, it can be concluded that chicken claw (shank) can be used as an alternative raw material to substitute beef and pork bones in making gelatin. The highest yield obtained was 13.96% which was obtained in the immersion process for 10 days with a hydrolysis temperature of 90 ° C. The lowest water content was obtained for 10 days and the hydrolysis temperature was 60 ° C, with a level of 14.98%. The lowest ash content was immersion for 15 days and the hydrolysis temperature was 70 oC with a level of 3%. The FTIR test results showed that there was a typical absorption of gelatin functional groups in the Amida A, Amida I, Amida II and Amida III regions (Suryati et al., 2017) .

In research conducted by Petr Mrázek regarding the use of chicken feet using food technology to produce gelatin and supplements and cosmetics. Chicken feet which contain a lot of collagen should be cleaned, cooled, ground and homogenized. Once water-soluble proteins and pigments have been removed, the raw material must be removed because of their high fat content (about 35%) and involves testing various methods to determine which one is most effective. Fat removal with NaHCO3 solution and lipolytic enzymes proved to be unsuitable because the residual fat content in the raw material exceeds 25% and 26%, respectively. De-greasing with a mixture of petroleum ether and ethanol for 32 hours (the mixture was exchanged 3 times) at room temperature is the most efficient method for fat removal, where the residual fat content is approximately equal to 5%; The resulting product described here is very rich in collagen. The mixture of petroleum ether and ethanol will be the most efficient and economical system for fat removal of poultry tissue because the price of ethanol and potreleum ether is cheap compared to other fat solvents. Collagen concentrate (75.0% collagen) made from chicken claws has the potential to be used in the food industry (as a dietary or nutritional supplement) or in cosmetics (as a moisturizing agent) (Mrázek, Mokrejš, Gál, & Krejčí, 2018).

In other studies, looking for other alternative sources of glucosamine apart from shark fins because it is known that shark fins contain cartilage or cartilage which contains natural anti-inflammatory compounds, namely glucosamine which is useful for treating symptoms of arthritis or osteoarthritis. Animal protection organization WildAid says more than 70 million sharks are killed each year, putting sharks at risk of extinction. Therefore, it is necessary to find an alternative source of cartilage that has the same nutritional content as sharks. One of them is the use of chicken feet or feet. Chicken feet contain α-chitin which is useful for producing its derivative products, namely glucosamine compounds. The purpose of this study was to extract chicken claws so that the bioactive compounds, including glucosamine, were known. Extraction of glucosamine from chicken claw powder was carried out in a randomized block design (RBD) with 2 treatment factors : 2M ammonium carbonate (NH_4CO_3) solvent (1: 4 and 1: 6) and the maceration time of 6, 12, and 24 hours. The best results of the extract were taken using the Zeleny method and the best results were obtained from the treatment of chicken claw extract with treatment for 12 hours with a ratio of 1: 4 ingredients and solvents, 11.94% yield, 9.08% protein content, 0.36% ash content and 0.36% ash content. Glucosamine 66.93 mg/100 g (Widyaningsih et al., 2015).

G. Conclusion

Anemia is a decrease in the number of red blood cells in the circulation, abnormalities in the hemoglobin content of red blood cells or both. While chicken feet known as claws are one part of poultry that is less popular than other parts of the body of chickens , besides that the utilization of these feet is still low, this is due to the public understanding that claws are part of the body of poultry that is dirty and dirty. unhygienic. Chicken claws contain a greater amount of protein than fat and carbohydrates, it is known that 100 grams of chicken claws contain the most important macro nutrients in helping the body produce red blood cells, namely protein. Proteins associated with anemia due to hemoglobin that is measured to determine the status of a person anemia is blood red pigment serves as a carrier of oxygen and carbon dioxide is a bond protei n . Previous research has suggested that a person who is deficient in protein is 3.48 times more likely to develop anemia than a person without a protein deficiency. So it can be concluded that consumption of claws can be used as an alternative in treating anemia, because the protein content in claws is quite high. The use of claws as a source of protein can be circumvented by means of food technology such as flour that produces claw flour products as a basic material for the manufacture of food products.

Conflict of Interest

Authors declare no conflicts of interest with related parties in the research.

REFERENCES

1. Abdurrahman, ZH, Nuhriawangsa, AMP, & Pudjomartatmo, D. (2013). Utilization of Broiler Chicken Shank as Gelatin-Based Edible Film Material Supplemented with Ginger Extract on Beef Sausage Coating. *Tropical Animal Husbandry* , *2* (1), 8–14.
2. Almatsier, S. (2001). *Basic Principles of Nutrition* . Jakarta: Gramedia Pustaka Utama.
3. Corwin, E. (2009). *Handbook of Pathophsyology* . Jakarta: EGC. Furkon, LA (2014). Knowing Nutrition Substances. In *Nutritional Health Sciences* (pp. 1–53). Retrieved from http://repository.ut.ac.id/4335/2/PEBI4424-M1.pdf
4. Hadi, NS, Labatjo, R., Setiawan, DI, Domili, I., Rasyid, PS, & Rahmat, A. (2018). Effect of Addition of Chicken Claws to Corn Nuggets on Nutritional Value and Organoleptic Quality. *Department of Nutrition, Poltekkes, Ministry of Health, Gorontalo 1* .
5. Katili, USA (2009). Structure and Function of Collagen Protein. *Journal of Rainbow Sciences* , *2* (5), 19–29.
6. Miwada, S., & Simpen. (2007). Optimization of the Potential of Chicken Claws (Shank) from RPA Waste Products through Modified Extraction Methods to Produce Gelatin. *Department of Animal Production, Faculty of Animal Husbandry, Udayana University, Denpasar* , *2* , 1–11.
7. Mokrejš, P., Mrázek, P., Gál, R., & Pavlačková, J. (2019). Biotechnological preparation of gelatines from chicken feet. *Polymers* , *11* (6), 1–14. https://doi.org/10.3390/POLYM11061060
8. Mrázek, P., Mokrejš, P., Gál, R., & Krejčí, O. (2018). *Preparation of collagen concentrate from chicken feet* . Zlín, Vavrečkova: Polymer Engineering, Facultyof Technology, Tomas Bata University.
9. Muyonga, JH, Cole, CGB, & Duodu, KG (2004). Fourier transform infrared (FTIR) spectroscopic study of acid soluble collagen and gelatin from skins and bones of young and adult Nile perch (Lates niloticus). *Food Chemistry* , *86* (3), 325–332. https://doi.org/10.1016/j.foodchem.2003.09.038
10. My Fitnesspall. (2020). Chicken Paws / Feet. Retrieved from https://www.myfitnesspal.com/food/calories/chicken-feet-1083457237
11. Rasbawati, & Rauf, J. (2018). Protein Content of Chicken Claw Flour and Favorite Level of Biscuits with Substitution of Check Flour. *Galung Tropika Journal* , *7* (2), 115. https://doi.org/10.31850/jgt.v7i2.252
12. Soeparno. (2011). *Science of Nutrition and Meat Nutrition* . Jogyakarta: Gadjah Mada University Press.
13. Suryati, ZA, N., Meriatna, & Suryani. (2017). Preparation and Characterization of Gelatin from Chicken Claws by Hydrolysis Process. *Journal of Chemical Technology Unimal* , *4* (2), 66. https://doi.org/10.29103/jtku.v4i2.74
14. Syatriani, S., & Aryani, A. (2010). Food Consumption and Incidence of Anemia in Junior High School Students in Makassar City. *Kesmas: National Public Health Journal* , *4* (6), 251. https://doi.org/10.21109/kesmas.v4i6.163
15. Taufik, I. (2004). Nutritional Content Physical and Organoleptic Properties of Mixed Meatballs and Meat Balls with Broilers. *Bogor Agricultural Institute* .
16. Tong, T., Zhao, W., Wu, Y., Chang, Y., Wang, Q., Zhang, L., & Wei, W. (2010). *Chicken type II collagen induced immune balance of main subtype of helper T cells in mesenteric lymph node lymphocytes in rats with collagen-induced arthritis* . (59 (5)), 369–377.
17. Voutila, L., Ruusunen, M., Jouppila, K., & Puolanne, E. (2009). No Title. *Journal of the Science of Food and Agriculture* , *89* (5), 7. https://doi.org/0022-5142
18. Widyaningsih, TD, Handayani, D., Wijayanti, N., Dita, S., Dhyantari, O., & Milala, C. (2015). Extraction of Glucosamine from Chicken Claws. *Proceedings of the Agro-Industry Seminar and FKPT-TPI National Workshop* , (September), 6.
19. Yuliati. (2006). Nutritional Problems in Young Women. *Journal of Biology Education FMIPA UNY*, 1–10.
20. Zhou, W. (2020). The Coronavirus Prevention Handbook 101 Based Tips That Cloud Save Your Life. *Wuhan Center for Disease Control & Prevention*, 1–120.