

USE OF SOLID WASTE FROM SLAUGHTERHOUSES FOR PRODUCTION OF COSMETIC PRODUCTS

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SUMMARY: The extraction of bone collagen and other slaughterhouse waste for the production of cosmetic products is an important practice in the pursuit of the use of this material. Therefore, the article presents two different methods for collagen extraction. At first, the collagen extraction is performed using bones, by immersion in water bath and the second method is used as a raw material horns and hooves from cattle, with this extraction performed by acid-base method, which consists in washing the material in sodium hydroxide (NaOH), and then this material passes through a heated bath of citric acid (C₆H₈O₇). The collagen obtained is subjected to various tests to prove the efficiency for each method, and then the same can be used for the production of glues, creams or other cosmetic products. The production of creams with collagen extracted from solid slaughterhouse waste by acid-base method has proved to be a good alternative, better in consistency, appearance and odor.

KEYWORDS: Collagen, Extraction acid–base, Cosmetic.

APROVEITAMENTO DE RESÍDUOS SÓLIDOS DE MATADOUROS PARA PRODUÇÃO DE MATERIAIS COSMÉTICOS

RESUMO: A extração do colágeno de ossos e demais resíduos de matadouros para produção de produtos cosméticos é uma prática importante na busca do aproveitamento desse material. Dessa forma, o artigo apresenta dois métodos diferentes para extração de colágeno. No primeiro, a extração do colágeno é feita utilizando-se ossos, pela imersão em banho Maria e para o segundo método é usado como matéria prima chifres ou cascos de bois, sendo essa extração realizada pelo método ácido-base, que consiste em lavar o material em hidróxido de sódio (NaOH) e em seguida esse material passa por um banho aquecido em ácido cítrico (C₆H₈O₇). O colágeno obtido é submetido a vários testes para comprovação da eficiência, para cada um dos métodos e, em seguida, o mesmo pode ser usado para a produção de colas, cremes ou outros produtos cosméticos. A produção de cremes com colágeno extraído de resíduos sólidos de matadouros pelo método ácido-base mostrou-se como uma boa alternativa, apresentando melhor consistência, aparência e odor.

PALAVRAS-CHAVE: Colágeno, Extração ácido-base, Cosméticos.

INTRODUCTION

A country like Brazil produces more than 150 tons of solid waste daily about an estimated 2% of waste produced in the countries of South America are from slaughterhouses. The common treatment that is given to these residues in most of these countries is in the production of animal feed or fertilizer for soil. Collagen and keratin are two substances that are part of the bones, hooves, horns, skins and other waste left slaughterhouses. Keratin is also known as 'The Body Glue' as this has the function to unite the broken bones, nails and others (Planeja, 2011; Singular Derm, 2015).

In Colombia, 1072 tons of hooves and horns are produced in slaughterhouses, it is estimated that the same proportion is maintained in most Latin American countries (Guerrero, 2004) these wastes are not reused or it isn't give any special treatment. Hooves and horns have in their composition proteins, minerals and are mostly keratin. The mixture of keratin with minerals are responsible for giving hardness to this

material. Therefore through a process of demineralization you can separate the components of the hulls (Ramirez, 2011).

The extraction of collagen in bones by 'Water Bath' is a procedure that is performed from the beginning of time mankind because it is a procedure that only needs water and patience. This was done for the manufacture of paints, coating fabric and many more domestic uses, including different processes could become a low-quality glue, known as 'rabbit tail' (Ivan, 2010).

The extraction process in acid-base consists of immersing first in sodium hydroxide, for a period of 24 (twenty four) continuous hours, then neutralized with hot water, then submit it to a wash in citric acid ($C_6H_8O_7$) and finalize become neutralize to finally bring these to a crushing process and centrifuged for removal of excess water (Roberto, 2012).

In the manufacture of creams, the first thing to be done is a cream base, which is a mix of an oil phase and an aqueous phase. Subsequent to finish the base for the cream is added properties having desired, these may be the smell, texture color, proteins, minerals and others. Proteins and minerals to be added to creams are extracted from various plants and animals and are used by the properties or benefits they give to said flat or animals (Sussy, 2013).

MATERIALS AND METHODS

Two different extraction methods were carried out, the first was an extraction by 'bain-marie' in which only bone and cartilage were used. The second extraction was conducted using NaOH with a concentration of 7% and 5% citric acid.

'Water Bath' Extraction

In this procedure first bone size is reduced, then weighed, to put them in a Baker with enough water to cover the bones, then placed in the machine 'Water Bath', which was calibrated at a temperature of 90°C. They were left for one day in this machine, then let cool to room temperature, to complete the organic part of the aqueous portion separated. And this result was saved. Which he was subjected to different quality tests.

Acid-Base Extraction

Acid-base extraction was performed demineralizing the hooves of cows, for this demineralization Acid-Base method was used, the first thing we did was to downsize helmets after reduce the size they are cleaned with hot water and then It proceeded to dry them in the oven at a temperature of 80°C for 30 minutes. Then they immersed in NaOH with a concentration of 7% for 24 hours, then washed with water until neutral pH using pH paper, and reburied this time citric acid with a concentration of 5 % for 4 hours. And finally deliquesced centrifuge was used to extract water from the mixture.

The determination of the efficiency of the extraction was used the Equation1, which relates the initial weight of the bones and the final weight of the extraction.

Cream Base

To prepare the cream were performed simultaneously but separately forming the aqueous phase and oil phase. To the oil phase they were mixed 50 ml of olive oil and 15 g of beeswax in a finish bath at a temperature of 70° C stirring constantly with a glass rod until a mixture homogeneous, in another Baker it was heated 30 ml of distilled water to a temperature of 70 ° C, rear mind the hot water in the oily mixture was added gradually, whisking constantly, to speed the cooling time was held last step in a cold thermal bath.

Two different tests for the addition of collagen in the process of preparing the cream were made. In the first collagen as final step was added when the cream was already compact, in this case the collagen was not mixed completely. In the second collagen it was added in the first step, simultaneously with beeswax, to complete this process it was observed that the mixture was homogeneous.

Quality Testing

To check the properties of the resulting extractions different functionality and quality tests were conducted. Emulsification, gelation and water holding capacity: the tests were performed. Emulsification: To calculate the emulsification capacity of the sample in distilled water was diluted, then was stirred for a few seconds, then an emulsion is created using vegetable oil mixing for 2 minutes. Finally this mixture is

centrifuged for 10 minutes. Using the Equation 2 and taking the results obtained with the sample is calculated emulsifying activity.

Gelation: The gelation process is quite simple, consists in mixing a quantity of the sample with hot water and wait for it to cool to room temperature. If the test is good is because gel the sample.

Water retention capacity: this is expressed as the amount you have a sample to retain water in one gram of dry sample. To this was taken 1g of the sample was added 30 ml of distilled water, then the sample was centrifuged and the excess water is discarded, the sample was weighed and the result was obtained.

RESULTS AND DISCUSSION

Each of the extraction was performed three times to confirm the results of which were compared with the literature. For the first extraction it was observed that the result of the efficiency was very low. This was because the 'water bath' was conducted in three different periods of time. By performing this process over a period of 12 continuous hours a marked was observed, as shown in Table 1.

Table 1: Result about water bath extraction using bones

	FRIST	SECOND	THIRD
Raw material (g)	498.45	1146.23	502.75
Collagen (ml)	18.23	392.46	184.35
Efficiencies (%)	3.66	34.24	36.67
Emulsification	Neg.	Neg.	Neg.
Gelation	Neg.	Neg.	Neg.
Retention water	Neg.	Neg.	Neg.

Furthermore, in the second and third extraction the results were more efficient, thistests conducted on these samples yielded no result for which it was concluded that the removal was not having the best results, so the tests were left, and concluded that it obtained by these extractions had no necessary to meet the objectives set properties.

In the second method, acid-base extraction, on the contrary, when comparing the theoretical results with practical is that the percentage of production was better. And the tests that were performed for the properties of the results were favorable, as shown in Table 2.

Table 1: Results of acid-base extraction using

	Literature	First	Second	Third
Raw material (g)	Ne	78.134	47.546	82.651
NaOH 7% (ml)	Ne	200	100	100
Acid citric 5% (ml)	Ne	200	100	100
Collagen(ml)	Ne	32.51	19.46	37.1
Efficiencies (%)	39.55	41.61	40.93	44.89
Emulsification	83.06	74.15	88.15	91.04
Gelation	Neg.	Neg	Posi.	Neg.
Retention water	1:7	1:2	1:6	1:5

Analyzing Table 1, it can be seen that the amount of reagents, in this case citric acid and sodium hydroxide, is important to the final result of efficiency. All measures showed higher efficiency values than the reference obtained in the literature. But, at the first measure, using 200 mL of reagents, and the efficiency obtained was lower than in the third measure, even this difference being less.

However, comparing the second and third measurements , it can be seen that the volume of 100 ml reagent was the best result from the point of view of collagen extraction efficiency. In the second, the mass of raw material was 47.546g, approximately 57% of the third, and the extraction efficiency was 40.92%, while for the third step the obtained efficiency was 44.89 %.

Basic cream

Comparing the different methods of preparing cream, the consistency and the mixture it was better with collagen extracted by the acid-base method, as in this total mixture while the first could see small lumps that were not mixed completely he was. Thus it was determined that the best process of making collagen moisturizer with collagen was adding at the beginning of the development. The cream was used on hands and arms. No effects of irritation or burning. Thereby, it can be confirmed that the cream has produced good quality.

CONCLUSIONS

Collagen extracted from bones, hooves and horns was considered well to preparing a raw material for cosmetics creams, using slaughterhouse waste and different extraction methods. Which it proved to be more efficient extraction method acid-base, as this yielded an efficiency of 40% efficiency in the average measurements. That was positive when testing quality extraction method was used acid-base for demineralizing horns and hooves, which concluded that a smaller hulls the necessary amount of NaOH and citric acid are inversely proportional. The extraction method 'water bath' bones, which he concluded that this method has higher efficiency if performed for an uninterrupted period applied.

Final mind to make the process of preparing the cream was concluded that the best method was the second carried out and that the work it cream using as protein-based collagen was effective as when used on the hands and arms, a change was seen in hydration of the skin.

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