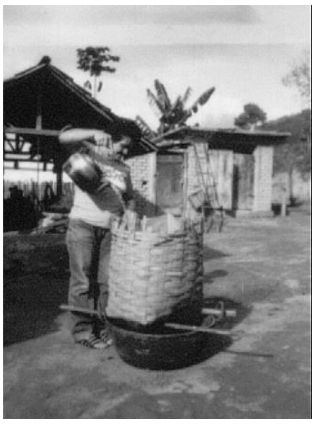
The women from Minas Gerais and the ash soap

Brief history of this research

The ash soap was investigated through interactions with eight individuals in three different regions of the state of Minas Gerais, Brazil, the majority of whom were women: Maria Celeste, Margarida, Maria Benedita, Izabel, Aparecida, Rosa and Anésia. Two were from the same family, where there was also the only man in the group studied: Sebastião, son of Mrs. Maria Benedita. The teachings of making the soap were transmitted from generation to generation by their mothers, grandmothers or people from the community, suffering adaptations and changes over time according to the availability of new materials.



Maria Celeste

Margarida

Maria Benedita

Izabel

Rosa

Anésia e Aparecida

Izabel and the ash soap

In the first interaction with one of these women the sensation was to be into "another laboratory" with similar processes related to those observed in the chemistry laboratories, but using different resources. Due to the influence of school science, the initial curiosity was to understand the ash soap making from this point of view, but to the extent that new interactions happened with other women it emerged "another science": a proper way to know, do and talk about the soap. Then, it became necessary to transit through knowledge of sociology and anthropology to understand better what was being observed. Over the time, the way to see science, chemistry and the ash soap making was widening.

The interactions with the women occurred in their homes backyards and kitchens, almost around the soap´s making. Prior visits were done previously in order to know them and explain about the interest to know on the ash soap making to teach about it in school, but there was not receptivity and openness at all times. Some women demonstrated mistrust and fear, while others were more receptive. However, with time and persistence all offered their knowledge for the research.

Therefore, the procedures of making the soap were followed during the hours and days in which it was done. Sometimes, the practice was photographed and video-recorded. In others, some undergraduate students mediated the interactions and were

involved in the research. In a particular interaction, an academic joined three women around the soap's making and the conversation of the group was video recorded.

The field work data fed school experiences and the composition of an ethnographic hypermedia about this soap, created to mediate the women knowledge to classrooms and to teachers' education courses. Parts of the hypermedia were incorporated on this environment and may be triggered by clicking over the blue characters. Enjoy it and have a good reading!

Persistence, changes and relationship with the early soaps

The knowledge and practices related to the ash soap making by the women from Minas Gerais are independent of any conventional chemical knowledge and do not use any industrial technological resource. Are their own and inherited from mothers and grandmothers, in general.

Most of the women do not produce the ash soap anymore, given the current easy access and low cost of soaps and cleansing agents produced industrially. For this reason and due to the work involved there is a tendency toward its extinction. However, some women persist on its use and making:

Rosa: I do make. Always I make. Make a little, but I do.

This persistence is probably due to the ash soap´s cleaning efficiency without harming the skin and to family and community values associated and transmitted over generations. Some heirs of the making knowledge used to produce the soap for trade:

Aparecida: Me, on that pan that I have there at home, I´ve taken yet 40 bars of soap. I made a lot to sell, you know? I made a lot of soap.

Over time, however, changes led to the ash soap´s oblivion:

Anésia: Nowadays the people don´t know.

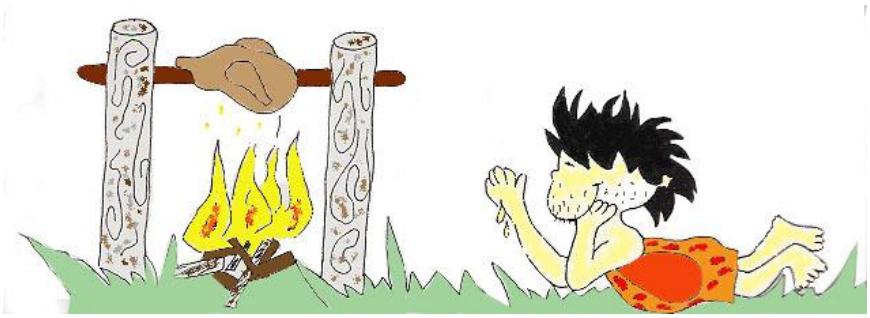
Aparecida: Many people do not know what is the ash soap, isn´t it? This is because everything changes, right? Then, there is no longer use for the ash soap.

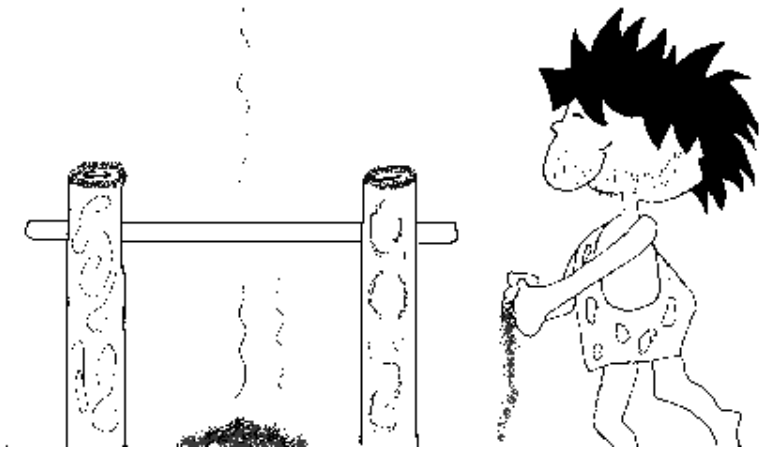
These changes also brought another type of social behavior, according to the women:

Anésia: Eeh, but people of today don´t want to know nothing no.

Rosa: When I came to make it here, the boys speak like that to me - give it to me. No, I won't give you anything. You are the ones that have to learn. So they speak - but I don't know to make this no. Oh, but you don't know because of what? They don´t know neither to learn.

In the quest to understand the origins of the ash soap between these women, there is a possible relationship with the oldest soap known. The literature points that soaps made with ashes were the precursors of modern soaps and cleaning products. However, the most ancient soap must has been produced unintentionally in the pre-historic times, by roasting meat over bonfires, where the fat ended to mix with the ashes in the fireplaces.





Over time this habit also may have led to the use of ashes and their wash waters (lyes) on cleaning, since the preparation of these waters were practiced by many ancient people. The method of loading ashes in a cloth bag, which was immersed in water for hands and face cleaning was in use in European homes until the 19th century

(Levey, 1954). Nevertheless, its use in soaps production seems to have occurred only since the beginning of the Christian era (Gibbs, 1939).

The discovery or the preparation of the ash soap seems to have occurred originally in the first century A.D., as recorded by Pliny, quoted both by Gibbs (1939) and Levey (1954). Gibbs mentioned that the discoverers of this soap were the Gauls and the Fanti people from West Africa, at the same time and independently. Nevertheless, its use in cleaning began to occur only in the second century A.D. in a restricted mode, according to Gibbs (1939). Before it was used to dye red the hair of the Gauls, probably due to the mineral composition of the ashes used on its preparation. There is also an indication of its medicinal use, probably in skin diseases.

Since its use in body and objects cleaning, the soaps made with ashes began to be produced and used in other places in Europe and Africa and afterwards were brought to the New World through the colonization processes. In North America, for instance, the British brought with them the soap produced in their country, but over time they found more advantageous to prepare it by themselves in the colony as a way to take advantage of the resulting ashes of household stoves and fat from the animal used on feeding. In the book *The Canadian Settlers Guide*, published in 1855, the writer Catherine Traill mentioned the preparation of ash soaps in Canada in a quite similar way to that observed in Minas Gerais in Brazil, with slight variations in the equipment and in the sources of the ingredients used.

Who brought it to Brazil? Is there a real relation with the first soaps produced in human history or is it independent? Who disseminated its making and use at the point to observe today the same procedures, materials and languages between different people that don´t know each other?

It is difficult to say if the ash soap arrived in Brazil through the Portuguese or other European immigrants, or came by other cultural groups, such as those who came from Africa, for example. It seems that there is no written record about it. It is not possible that it derived from the native people either, as it is not found between the current Brazilian indigenous groups.

A hypothesis is that the female slaves from Africa were the first ones to produce the ash soap in Brazilian lands and the responsible for its knowledge dissemination as it involves hard work, as these women played an important role in the cleaning and hygiene practices of the houses in the colony and also because this is the belief of some women who inherited its making mode. The language associated also suggests African roots for the ash soap and in the book *Tecnologia Africana na formação brasileira (African technology in brazilian formation),* Cunha Junior (2010, p. 31) mentioned the soap importation from Africa to the colony in the mid of 1780, as well as the coconut trees to oil production aiming to replace the animal fat on soap´s production.

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Of what this soap is made?

When describing how the ash soap is made Mrs. Rosa said: “First I put the ash there in the bucket. After I, I pound it down with a socket. Therein after that I have pound it very well down, then I put the water. Therein, after I drip the dicuada and after that that I put here into the pan. Put the dicuada there and put the tallow. The tallow or the fat and go, and go mixing. Therein after… then that depurates the soap”.

On her description, this lady mentioned the use of ash, a bucket, a socket, water, the “dicuada”, a pan and the tallow or fat. She first puts the ashes into the bucket, which contains holes on its base and is lined with a cloth, and pound them down, compact with a socket. After they are "very well down" she puts water to obtain the "dicuada", the solution that comes trickling from the bucket: "Therein after I drip the dicuada". Although Mrs. Rosa did not mentioned, the women use hot water in this procedure.

Mrs. Maria Celeste putting water over the ashes

As seen, the ashes are not directly used in the soap making:

Rosa: No, if you put the ash it doesn´t generate nothing no. It turns into a thing there, almost nothing.

Aparecida: *It doesn´t generate. It can´t pick up the ash. Without the ash. It is from ash and cannot let the ash pick it up.*

Anesia*:* It´s from ash because it´s made of dicuada, right?

If the ash is used as such it "doesn´t generate nothing", it does not produce the soap: "It turns into a thing there, almost nothing". The ashes cannot be used directly in the mixture: "It is from ash and cannot let the ash pick it up". They call it ash soap, black soap, soap of dicuada, ball soap, a bread of soap, "it´s from ash" but "because it´s made of dicuada". They use the ashes to prepare the dicuada, an ash lye.

To obtain the dicuada Mrs. Rosa uses a bucket, but traditionally it is done with a round hamper made with bamboo strips of varying sizes (of 50 to 100 liters or larger) lined internally with banana tree leaves before placing the ashes. The leaves act as a filter, retain the insoluble part of the ashes but let the solution pass through. They call this device by "barrilero", which can also be lined with a cloth bag rather than leaves, with the same effect. How did they get to this device? How did they find its application in the soap making? How did they discover the possibility of using banana leaves to retain the insoluble and unnecessary part of the ashes?

Superior view of the barrilero

However, the procedure to pound down the ashes is reinforced:

Rosa: You have to put in a bucket or in a little hamper and pound it down. And pound it down with a socket to be very well pounded, otherwise it doesn´t get out no. If we put the ash there only and put the water that gets out weeeak.

Aparecida: It does. You have to pound it down. You have to stick it well into the can in order to give strengthness to the dicuada. The stronger is the dicuada faster makes the soap.

The ashes are compacted into the barrilero using a socket or even the hands: "to be very well pounded". Otherwise, if not well compacted, if not "stick it well into the can", make it “very well pounded”, if “put the ash there only and put the water” the dicuada "doesn´t get out no”: it “gets out weeeak”, it becomes diluted, low concentrated. In Aparecida´s words this is “to give strenghtness to the dicuada", to increase the concentration of the ash lye. This is so because "the stronger”, the highest concentration of dicuada, "faster makes the soap", faster will be the saponification reaction rate.

Thereby, the experience of these women relates the speed of the soap´s making with the "strongness" of the dicuada, which itself will depend on the high compression of the ashes into the barrilero. Doing this they put greater amount of ashes and the result is that water will cross them slowly. A larger barrilero may takes an entire day to produce the dicuada or even more than a day.

The ashes used in the soap´s making usually come from stoves and furnaces fed with wood. This one undergoes combustion in these locations and the final product is the remaining ash. Its composition depends on the type of wood used. Generally, ashes have inorganic compounds from plants and powdered coal produced by combustion. Mrs. Maria Celeste mentioned that certain plants produce more suitable ashes for the soap´s making, such as the wood of “Assa Peixe” – *Vernonia polyanthes* Less, the bean´s straw – *Phaseolus vulgaris*, and the coffee´s straw – *Coffea arabica*. How does she know it?

The chemical composition of the ash lye from the “Assa Peixe” showed the presence of ions such as potassium, calcium, iron(III), aluminum, carbonate, phosphate, silicate

and carbonate levels equal to 40% of the total mass as potassium carbonate, also known as "potash". It is the substance involved in the reactions that produce the soap and can be observed as white fine grains in the ashes. Its high content attests Maria Celeste´s knowledge about this plant, but how did she acquire this knowledge?

Thus, they say that they will "drip the dicuada", to extract the potassium carbonate from ashes by its dissolution in hot water. The color of the dicuada usually is brown-reddish, which indicates the presence of iron(III) ions, but the women do not know it, what they know is that the concentration of dicuada, its "strenghtness", has no relationship with this color neither its intensity. As a matter of fact, the potassium carbonate is a white substance and its aqueous solution is colorless, but the solution acquires another color as iron compounds are dissolved by water in the process.

Another aspect of these women´s knowledge that is consistent with the chemistry knowledge is that they know that there is a proportional relationship between the amounts of dicuada and animal fat in the soap making. When the dicuada solution is very concentrated in potassium carbonate its quantity may be superior to the required. On the other hand, if it is very diluted it may be necessary to prepare another barrilero to obtain more dicuada. In the first case, the remaining portion can be used again but in a different way:

Aparecida: And this dicuada here if we put it into the pot and let it dry turns a salt.

Rosa*:* It turns salt. That´s right, I usually put it in a little caldron.

Aparecida: All right. We want to avail we put it to dry. And you can put that salt in other soap. When you´re going to make it, pick that salt and passes to other soap.

Rosa: You have to put it on fire, right?

Aparecida: You have to pass it to the pan and put it to dry. Therein it turns a salt.

Rosa: It gets white the salt, right?

Aparecida: Therein the salt can be stored. When you´re going to make other soap you can take that salt and put on the soap.

The reutilization of dicuada after its drying on fire ("put it in the pot and let it dry") occurs in the form of a "salt". With the boiling of water of the solution, it remains a “salt”, the residue containing the dissolved compounds from the ashes that re-crystallized "in the pot", the "little caldron" or in the “pan”. They say that "turns a salt", crystallizes a residue. The fact that "it gets white the salt" and "you can take that salt and put on the soap" shows the presence of the potassium carbonate in the evaporation residue, which is also a salt for the chemists, an inorganic white color salt, which "can be stored" and used to prepare another soap.

Did they discover that accidentally? Did they observe this salt production by chance in the natural drying of the dicuada and after that experiment to use it? How did they make the relationship between this salt and its use in the soap´s making? Was the experimentation their guide, or the curiosity and the logical reasoning allied to experimentation? Nevertheless, isn´t it something that is more usual between chemists or scientists?

Despite the possibility to reuse the dicuada in the form of "a salt", the ash soap is rarely made using only the remaining residue from its drying. The regular is to use the ash lye, as Mrs. Rosa said: “Put the dicuada there and put the tallow, the tallow or the fat and go, and go mixing. Therein after… then that depurates the soap”.

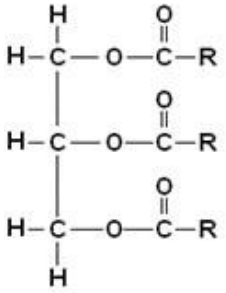
Another procedure of the women that is certified is the use of hot water to obtain the dicuada. Hot water favors the dissolution of potassium carbonate as it is endothermic (Dean, 1987). When dissolved in the water, this substance is dissociated and the carbonate anion undergoes hydrolysis turning the dicuada solution alkaline:

$$K_2CO_{3(s)} \rightarrow 2\,K^+_{(aq)} + CO_3^{2-}{}_{(aq)}$$

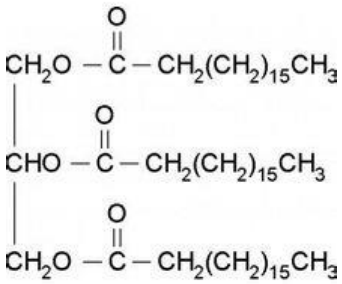
$$CO_3^{2-}{}_{(aq)} + H_2O_{(l)} \rightarrow HCO_3^-{}_{(aq)} + OH^-_{(aq)}$$

The tallow comes from the cow or ox and the fat from pork. They are solid materials at the temperature of 77° Farenheit. Both contain triglycerides, as the tristearin or glyceryl triestearate, for example, and small amounts of free fatty acids. Most of these is found in the combined form of triesters, which decomposes in alkaline aqueous

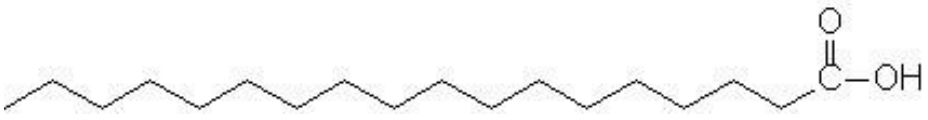
medium releasing acids as myristic, palmitic, palmitoleic, margaric, stearic, oleic and linoleic, which will react with the potassium carbonate from the dicuada and produce soaps. The tallow of ox usually contains higher amounts of stearic acid (octadecanoic), palmitic (hexadecanoic) and oleic (octadec-9-enoic acid).



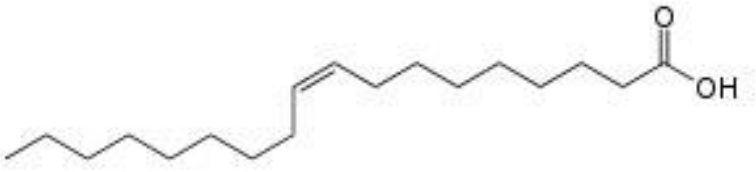
Typical formula of a triglyceride, where R (chain of carbon atoms) may vary



Structural formula of triestearin



Acid estearic



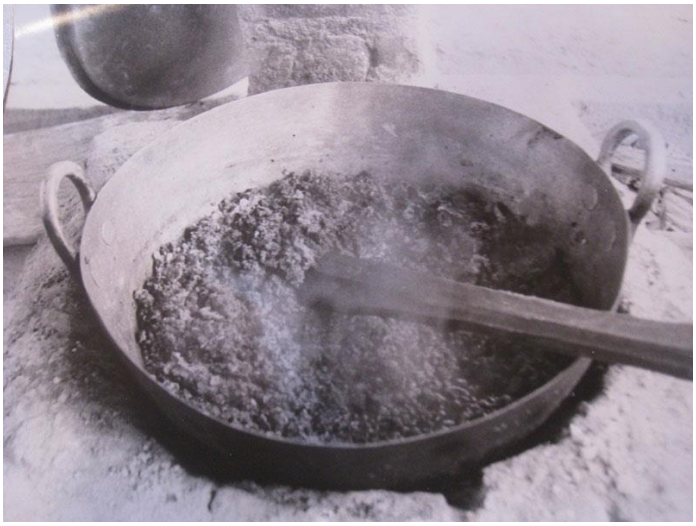
Acid oleic

Reference

Dean, J.A. (Ed.) (1987). Lange's Handbook of Chemistry. 13. ed. New York, Tab.10-2, 10-15.

“Where´s the fat in the pot?”

After they obtain the dicuada, the women put the animal fat previously dried or in its natural state in pieces into an iron pot or cauldron or in a copper pan and lead to heat on fire. They use wood stoves as source of heat. Some of them usually leave the tallow or the fat "soaking" (in contact with the dicuada) from one day to another and the fat melts when the mixture is heated.



The dicuada is added in portions to the fat. They use a wooden spoon with a long cable to mix them. After successive additions under heating the soap begins to form. It is ready after some days or weeks depending of the amount involved, the "strongness" of the dicuada and other tasks, as the procedure is interrupted and retaken many times. There are recipes that specify the amounts of fat, ash and dicuada required to make the soap, but these women prefer to guide themselves by the experience, observation and control of the mixture while the soap is being made.

The mixture of dicuada and fat acquires various aspects until the soap is ready. Initially it is homogenous and has yellow-brown color. With time, heating and addition of dicuada, the color changes to gray, which intensifies to a dark tone until the end of the process resulting in a pastiness gray-brown mass. That indicates the consumption and the transformation of the animal fat as Mrs. Rosa mentioned: “Therein after the fat is over, therein doesn´t have fat. Look *(shows the pan in which the soap was being prepared)*. Where's the fat in the pot”?

The ash soap has a “point” that indicates when it is ready: "If it has not the point then it doesn't, it doesn´t give. It´s like a candy, you know?" (Mrs. Anésia). The "point" is reached when the saponification reactions end and is noticed by the soap´s characteristic smell, appearance, detachment from the pan and by the bubbles that release a "white smoke" on heating:

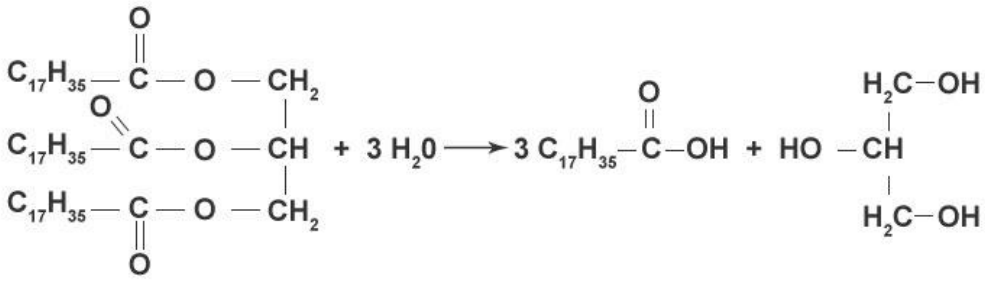
Sebastião: It began to release this white smoke there, look, it´s getting to the point. This is not ready yet. So, if you take it out, if it isn´t at the point, if take it out from here it becomes floppy. So must get it to the point again as it was. It begins to release the white smoke, unstick it from the pan and becomes firm…

However, before achieving the point and close to it they control the process by tests in order to regulate the consumption, absence or excess of the ingredients, their relative quantities. The tests vary between one woman and another. One of them consists on stirring a little of the mixture within water in a basin to produce foam and analyze its appearance and durability: the ash soap produces a white foam, which quantity and durability depend on the soap formed.

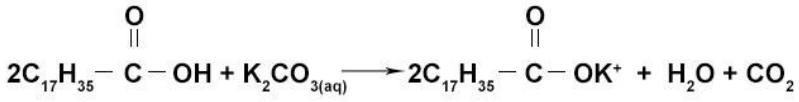
In another test, they put the mixture in water without stirring and observe if there is a butterfat layer on the surface indicating not consumed fat or excess of it. They put also a little of the mixture in the tongue´s tip to analyze its taste: if spicy indicates the dicuada. While the pungent taste does not disappear, the dicuada is not added to the mixture. Chemists control the chemical reactions through many ways and its usual the

use of specific instruments and technological resources, but it is not usual to taste what they are doing.

To explain the disappearance of the fat from the pot Mrs. Anésia said that "the dicuada can take the fat away", as it was a mechanical gesture, but Mrs. Aparecida said two times: "is the dicuada that cuts the fat", "the dicuada is that cuts the fat". Izabel explained that for her "to cut" means "to transform the fat". In the reaction, the esters are modified by the hydrolysis reaction in alkaline media, releasing the fatty acids that will react with potassium carbonate and produce soaps. As the substances are transformed by these chemical reactions, so their properties as well. That is why for Mrs. Aparecida “the dicuada is that cuts the fat”.



Equation of triestearin hydrolysis with the formation of stearic acid and glycerol



Equation of the reaction between stearic acid and potash producing potassium stearate, one of the soaps that is present in the ash soap

The soaps formed through the reactions correspond to specific salts according to the carboxylic acids that originated them. The glycerol, propane-1,2,3-triol, is also produced in these reactions. Thus, the ash soap comprises a mixture of different salts/soaps, according to the composition of the animal fat and glycerol.

However, to Mrs. Rosa the ash soap is not formed simply by mixing the ingredients. It is necessary to control their relational quantities: "if the fat stays" or "if it passes”, if it remains or a large amount is added, and "if it's missing”, if there is not the required

amount, the soap “doesn´t value nothing”, has no quality. There is a right amount of fat. She said the same for the ash lye: "if the dicuada passes too". Mrs. Aparecida and Mrs. Anésia agreed: "Right, the dicuada cannot let it pass either", must not be added in excess: “if it passes doesn´t grow" but "if it´s missing doesn´t grow either", it must not be added excess or lacking none of the ingredients: fat or dicuada. There is a proportional relation between the amounts of the ingredients, reactants or substances involved in the ash soap forming reactions. The chemists call it stoichiometry and the women make tests to control each one´s excess or absence.

Mrs. Rosa reported a case where there was a problem in the amount of one of these materials: "Once the cummer Zé gave me one to see what to do with it there". A known person asked her to help to decide what to do with a soap that had a problem: "It passed the dicuada, I don´t know what I´m going to do with this soap. I'll throw it out". The problem was that the soap had an excess of dicuada. Mrs. Rosa took the soap and examined it: "Then I took it home and looked, looked and looked well to it. I rubbed it in a cloth and it didn´t foam. Black!". The soap was carefully observed. She tested it washing a piece of cloth and did not observe foam production. She said that it was “black”, suggesting a correspondence between this color and its quality.

She continued: "I spoke, aaah, wait a little. I had a butter there. Then I put on it. Aaah, therein it became good, I took advantage". In order to correct the excess of dicuada, Mrs. Rosa added a source of fatty acids, probably mixing it to the soap under heating and control, which consumed the excess of dicuada, of potassium carbonate. However, to Mrs. Aparecida this happened because “It is that therein it weakens the dicuada, right?".

"With soda walks faster, right?"

Although Mrs. Rosa did not mention, some women use caustic soda or sodium hydroxide in the ash soap making too, as was the case of Mrs. Anésia's mother: *"*My mother used the two, right? Soda and dicuada. That she put a little of each one. With soda it walks faster, right? It makes the soap faster. My mother made this way. She used soda and ash, the two. She said that it was to make it walks quickly. She used minus soda, right?".

According to Mrs. Anésia´s mother the advantage of using soda in the soap´s making is that it "walks faster", "it makes the soap faster", "it walks quickly", it accelerates the rate of the saponification reactions. Generally, catalysts accelerate chemical reactions but this is not the case of adding sodium hydroxide as it is consumed in the reaction with the fatty acids, just like potassium carbonate and produces soap too. Why does its reaction "walks faster"?

A condition for the chemical reactions to occur is that reactants must collide with each other with an amount of sufficient energy to destabilize them and provoke rearrangements of the atoms with formation of new chemical species, the reaction products. This energetic condition varies from one reaction to another and is called "activation energy". In the case of the reactions involving sodium hydroxide in the ash soap´s production, the activation energy must be lower in comparison with that involving potassium carbonate. Thus, "with the soda walks faster", "it makes the soap faster", the reactions occur more rapidly due to the lower energetic demand.

Mrs. Anésia mentioned that her mother "created 12 sons and never bought a soap". It means that the cleaning and hygiene of her family was done using the ash soap that took soda on its making. Their colleagues, however, showed to be against the soda´s use:

Rosa: Ok, I don´t use soda at all. I put only the dicuada. If soda is put therein it doesn´t serve for people to wash the head, right?

Aparecida: Right, with the dicuada. And you can use it for burns, can use it for everything with no problem, right? And with the soda there can be no longer use, because the soda affect, you know? The skin. It isn´t good the soda.

The argument of Mrs. Rosa is that when soda is added in the making the resulting soap can be no longer used for washing the head. Mrs. Aparecida mentioned that the soda can harm the skin, but if the soap is made only with dicuada it can be used "for everything with no problem", observing the soap's use on epithelial burns treatment also. Mrs. Rosa said next that "there´s a lot of people that look for", "to give it to chicken, golgo thing, of chicken, that is also good", but "if put soda there has no longer use for medicine". She referred to a chicken disease and to people's search for healing it with the ash soap.

The caustic soda is a highly corrosive substance, which can irritate the skin and eyes provoking sores in the nasal cavity and permanent damage. The potassium carbonate has similar effects, but milder in comparison with caustic soda (Patnaik, 2002, p. 186). Then, why the soap made with the dicuada does not irritate the skin and the scalp and can be used in burns or a remedy for hens? How to explain the fact that Mrs. Anésia´s mother used the soap prepared with dicuada and soda, "a little of each one", and used it to clean 12 children and did not damage none of them? They did not notice that while they were talking?

We have seen that the mixture of the ingredients in the ash soap´s making is done with attention, especially closer to the "point" or the end of saponification. In the soap´s making the women seek to adjust the relative amounts of dicuada and fat in order to do not let "pass" or "miss" any of the two, none must be above or below the amount required by the "point", the stoichiometry of the reactions. Thus, if the control of the process is well done, there will be no excess of dicuada, soda or fat in the final product. These reactants will consume each other in the chemical reactions and their molecules will be modified, transformed in new substances with distinct properties.

Wasn´t Mrs. Rosa that said: "Where is the fat in the pot?", suggesting its disappearance by the dicuada´s action. Wasn´t Mrs. Aparecida that mentioned that

the fat "weakens" the dicuada? In the same way, isn´t it the same for the soda? Their positions about the use of this substance in the soap´s making suggest that they are seeing its action differently from that of dicuada. Perhaps they are trapped to the tradition or are afraid to use caustic soda because its dangerousness. Did they not notice that the mother of Mrs. Anésia created 12 sons using a soap that took caustic soda in its making?

Similar to the ash soap, handcraft soaps in general are more valued than those industrially made due to the greater control of the relative amounts between the reactants in the production processes. These soaps are, therefore, less aggressive to skin.

Reference

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Do the moon and a "fat eye" affect the ash soap making?

After the soap reached its "point", they withdraw it from heating and wait to cool down until it is possible to shape as balls, bars or like a bread. In the shaping of bars, they usually dump the soap in a wooden or pasteboard box and then cut it using a knife after completely cooled. The other formats are made according to Mrs. Aparecida: ″And before it stops to cool, roll it. Because if you let it cool it becomes hard, therein you can't do. You only have to wait it gets firm there that you can put the hand, right?". It means that the soap solidifies with cooling and there is an ideal temperature to shape it.

After that, they store it in dry places, often wrapped in sheets of paper, pasteboard, corn straw or in banana or mammon leaves. They use it to wash clothes, kitchen utensils and in bath, highlighting its benefits for skin.

Rosa: Yes, it’s good. It serves to wash clothes, serves for us to clean the kitchen, serves to wash the head, that it is good for skin, right?

Aparecida: And here it foams like a hand soap. It´s cool.

A characteristic of the ash soap is that it is composed by a mixture of different salts or soaps according to the variety of fatty acids found in the animal fat. However, all produce potassium salts in the reactions with dicuada, which are softer than those of sodium derived from the reactions with caustic soda. Therefore, the ash soap is softer in skin contact. It also acts as anti-inflammatory agent by softening the tissues, “can use it for burns, can use it for everything with no problem”, and it helps to keep the skin hydrated, which is enhanced by its glycerol content.

The ash soap also presents the following property:

Aparecida: The climate changes, the soap also changes, right? It sweats…

Rosa: Yeah, it sweats. It usually wets.

Aparecida: It´s like salt, right? Cause the salt too, the climate changes, it gets wet.

The fact that "it sweats" can be related to water absorption from environment, to its hygroscopy, such like cooking salt or sodium chloride. It may also lose composition water on hot days. However, the women believe that the phases of the moon influence the ash soap making. Izabel said that ″in the new and in the full moon it throws out too much. You have to put it in the waning to withdraw in the waxing crescent″.

As the Moon turns around the Earth, it passes through repeated cyclic stages throughout the year. The four main phases of the Moon (New, First Quarter, Full and Third Quarter) occur in this order for a period of approximately 29.5 days (Silveira, 2001, p. 1). Its appearance for an earth observer will depend on the relative position between itself, the Sun and Earth and each phase will represent the face illuminated by the Sun that is turned to the observer on Earth. The number of days between consecutive phases is seven or eight, but this can vary and occur at intervals of nine or six days over the course of a year. Taking seven days as the average time between one phase of the moon and other, Izabel´s soap must be prepared in a period longer than 14 days as the process is interrupted during the Full and the New Moon, because "it throws out too much" in these phases.

As the Moon describes an orbit approximately elliptical on their turns around the Earth showing different phases, its relative distance varies also. When hitter the distance is 221,705 miles and 252,550 miles when further (considering the average distance between the center of Earth and the center of Moon) (Silveira, 2001, p. 6). The distance variation is also related to the Moon phases and its gravitational influence over oceanic waters, which together with the gravitational force of the Sun causes the tides. If we consider the same kind of influence over the ash soap making, it is, however,

(…) very small (it is the weakest of the known physical forces). Being so small, the gravitational force only becomes noticeable when very, very big masses are involved, such as, for example, the masses of the Moon and of the oceans of the Earth (clarifying: it is proportional to the masses of the bodies and inversely proportional to the square of the distance between them). That is why, as you will be unable to realize tides in a

glass of water, also our body will not feel any discernible influence of the Moon. (Reis, 2005)

Even though we consider water masses smaller than those of the oceans and bigger than the water in a basin:

Even in a large lake, tides are extremely small. On the Great Lakes, for example, tides never exceed 2 inches, according to the National Oceanic and Atmospheric Administration (NOAA), which adds, "These minor variations are masked by the greater fluctuations in lake levels produced by wind and barometric pressure changes. Consequently, the Great Lakes are considered to be essentially non-tidal. (Britt, 2009)

If the Moon does not influence significantly small quantities of water, how to explain its influence over the ash soap making? Another belief shared by the women regards to the influence of a "fat eye" in the soap making, an evil eye, which makes it "diswalk". Therefore, they usually make the soap apart from strangers or known soap's "bad luckers", people whose presence is admittedly maleficent for the soap. Because of this, they make prayers in the beginning and during the process and put branches of rue – *Ruta graveolens*, behind the ear or close and tied to the pot.

How can we explain the influence of a "fat eye" over the soap considering that chemical reactions are happening? Generally, the occurrence and development of the reactions depend on several factors and the "fat eye" is not one of them. Initially, it is essential that meetings occur, collisions between the reactants with the amount of energy required to destabilize the atoms and cause rearrangements to produce new molecules, the products of the reactions, the soaps. These reactions depend, therefore, on the frequency of successful collisions in the reactional medium, which in turn depends on the activation energy, that in the specific case of ash soap is favored by supplying heat. How could a "fat eye" influence the collisions between the reactants or the activation energy of these reactions? What phenomenon could be involved?

Anthropologists search for other explanations in order to understand this kind of belief. Clifford Geertz (1999), for example, mentioned that the belief in witchcraft

usually appears when "common expectations fail", when "anomalies or contradictions" occur, acting like an "iron forehead" in the system of common sense's thought. If this is valid for the "fat eye" case, then it sounds like an excuse, as the soap was not made rightly. On the other hand, this belief indicates also that the women may be seeing the ash soap making as something magical and thus susceptible to other magic. After all, it is prepared from rude and coarse materials, as ashes, dicuada and animal fat, which are mixed and transformed into a more valuable material with better appearance and that permits to clean and promote hygiene and health. Maybe that´s because the women believe in the Moon´s infuence over the making but for phisics and astronomers or for the science point of view the gravitational influence over small amounts of water is negligible and will not influence the soap making.

It must be remembered that the making of this soap requires much attention to control and adjust the relative quantities between the dicuada and the fat, which is not easy to accomplish in practice. According to the chemists a "fat eye" will not effect the saponification reactions, being more likely to say that there was some mistake or lack of control over the process. A person near, for instance, could provoke absence of mind or distraction on who is doing the soap. Anyway, the women are not guilty because they do not know the other "invisible order" that is present in the ash soap making. In the other side, they did not need this knowledge to produce the ash soap either.

Howsoever, scientific understanding on the chemical composition of fats, saponification and the technological advances that occurred in the nineteenth and early twentieth century changed tremendously the production of soaps in world. If before there were many "artisans" of ash soaps, from there any homemade or craft production could compete with who considered these advances on soaps' production (Gibbs, 1939).

It was Michel Eugène Chevreul who put the manufacture of soaps in a scientific basis for the first time. Starting from previous studies, he carried out research and after 10 years published a book entitled *Recherches Chimiques su les corps gras d'origin animale* (Chemical research on the fatty bodies of animal origin) with experimental

details and theoretical conclusions. Other advances were the use of steam heating and the large scale production of caustic soda. What this tells us is that science and technology have changed the course of soaps' production in the world and those originally made with ashes were replaced by current soaps and cleaning agentes, with great diversity of colors, textures, smells and other qualities. Still, there are who prefer the ash soap, as Dona Rosa said: “I make. I always make. Little, but I do!”.

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