

The Effects of Inositol Extracted from Rice on the Skin

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Abstract

Inositol, is a water-soluble crystalline compound. It helps with people's metabolism and decreases cholesterol levels. It is also known to have anti-cancer results. In order to find out the affects of Inositol on the skin, Inositol skin lotion was produced with each amount of Inisitol: 0, 0.5, 1.0, 2.0, 3.0wt% and tested on the faces and the arm areas of women in all ages for 7 weeks. The moisture, sebum, change in elasticity, and improvement of wrinkles were measured. Corneometer, Sebumeter, Cutometer, and an image analyzer were used as measuring equipments.

There are subtle differences in the subjects when 1-2% of Inositol is used the moisture of the skin improved 19%, elasticity by 17%, and the amount of sebum for dry and oily skin types adjusted to the amount of sebum of the neutral skin types. This influenced the length, width, the number of peak, and the height of the wrinkles to improve 12.4%. It is thought that Inositol would be an effective new raw material in cosmetics.

1. Introduction

Inositol, which belongs to the vitamin B group is a water-soluble crystalline compound with a sweet taste. It was first separated from an extracted solution from a heart muscle of a cow by a German scientist Scherer in 1850, which was later synthesized by Wieland and Wishart in 1915 for the first time.[1-3] Depending on the location of the OH radical, the Inositol is able to have 9 different isomers. Among these, Myo-Inositol has the most biological activity and is found the most in nature.[4-6]

Inositol participates in creating the secondary messenger in the cell wall transmission to help in metabolism, prevent baldness, decrease cholesterol level result, and is known to have an affect on the brain cells. It was announced that in the experiment with mice,[7-11] Myo-Inositol decreased the number of tumor in the lungs and the liver and had an affect on restraining cancer. With similar results as the above Inositol is used in medicine and health products and small amount in cosmetics.[12,13]

The skin is the most outer later that surrounds the body which has the ability to protect from exterior stimulations and control the secretion of the sebaceous gland and the sweat gland.[14] The surface of the skin is covered with sebum membrane in the form of natural emulsion which is made up of fat and moisture.[15] Fat of the sebum membrane restrains the moisture evaporating from the skin, which makes the skin moist and soft or blocks exterior substances from invading the skin. The natural moisturizing factor prevents dryness and controls moisture capacity of the skin and is a personal component of the sebum and performs the role as an ideal natural raw material in skin physiology. When there's a lack of the natural moisture factor it can cause dryness in the skin, the keratin layer may get thicker, and it can cause aging of the skin. One countermeasure to delay aging of the skin is to use the right cosmetics to continually give moisture and to control sebum and to supply aging restraint factors such as antioxidants.[16,17] Therefore, in this experiment, the natural ingredient Inositol extracted from rice was examined to study the affect that Inositol has on the skin in order to use in the cosmetics. In vivo was chosen as the experiment method and moisture skin lotion with 0%, 0.5%, 1.0%, 2.0%, 3.0wt% of the Inositol was produced

and used on the arm. Also, on the front area such as the forehead and the cheeks, moisture skin lotion with 0%, 1.0wt% of the Inositol was used in the experiment. The Corneometer was used to check the moisture level, the sebumeter was used to measure the sebum, the cutometer was used to measure the tension of the skin, the image analyzer was used to measure the improvement of the wrinkles.

2. Experiment and Methods

2.1 Experiment Ingredients

In order to produce the moisture skin lotion with the Inositol, Inositol from Tsuno Rice Fine Chemicals Co., Ltd (Japan), Allantoin from Hoechst Aktiengesellschaft Frankfurt (Germany), Disodium Ethylene diaminetetraacetic acid from Fushimi Chemical Co. (Japan), Hyaluronic acid from Sigma Aldrich (USA) were all bought and used. As preservative Germall 115, methylparaben were used. Glycerin from Shinyo Pure Chem. Co. (Japan), ethanol from Duksan Pure Chem. Co. (Korea), Cremophor RH-60 from BASF (Germany) were bought and used. All reagents were analyzable reagents and all the water that was used was distilled twice.

2.2 Production of Inositol moisture skin lotion

Each 0wt%, 0.5wt%, 1wt%, 2wt%, 3wt% Inositol and Allantoin 0.2wt%, EDTA-2 Na 0.05wt%, Germall 115 0.1wt% were put in order in 80wt% of distilled water and the Agitation Mixer was used to stir until completely dissolved. In this distilled water Glycerin 8.0wt% was put in and then the Agitation Mixer was used to stir and each concentration of Inositol aqueous solution mixture was produced. Ethanol 8.0wt% and Para-M 0.1wt% was stirred with the Agitation Mixer until dissolved and then added Cremophor RH-60 0.4wt% and perfume 0.08% mixed solution which was already stirred until it was 60 C and used the Agitation Mixer to stir and produced solubilization of perfume mixed solution. In the Inositol aqueous solution mixture, solubilization of perfume mixture of solution was added and used the mixer to stir at normal temperature for 2 minutes. Lastly, Hyaluronic acid 1.0wt% was added and water was added until water was 100wt% and used the mixer to stir to produce Inositol moisture skin lotion. As soon as it was produced, it was kept in an airtight container at normal temperature.

2.3 How volunteers was controlled and restricted

The inositol moisture skin lotion was tested on 15 healthy Asian women (8 women in 20,30's and 7 women in 40,50's) on appointed areas such as the face and the arm with inositol moisture skin lotion morning and evening twice a day for 6 weeks to test the moisture, sebum content, elasticity, and change in the wrinkles.

The concentration of Inositol in each measurement and the volunteers and the tested area and the measuring instruments that were used are shown on Table 1.

2.4 Method of experiment

Moisture : Inositol 0, 0.5, 1.0, 2.0, 3.0wt% concentration of moisture skin lotion was applied evenly on the restricted area on both arms of the volunteers twice a day.

The changes in moisture of the skin depending on the concentration of the Inositol moisture skin lotion was measured at intervals of 1 week for 6 weeks. To test the moisture, Corneometer (CM 820 PC, Courage & Khazka, Germany) was used. Corneometer is used by the electric conductivity theory. This Corneometer was used to measure the stratum corneum and at the time of the measurement, in order to decrease the error, it was measured 7 times each. Out of the 7 measurements, the highest and the lowest measurements were eliminated and the average of the other 5 were used. Moisture is very sensitive to the temperature therefore all the experiments were taken place in a constant temperature-constant humidity room (21C, 65%) and all the controlled people were in the constant temperature-constant humidity room to get used to the temperature and the humidity before the experiments were started.

Sebum : The sebum was measured by looking at the P.G of the sebum concentration. Using the middle of the face as the yardstick, 0, 1.0wt% inositol moisture skin lotion was applied on each side of the face before the experiments. As a measuring equipment Sebometer (SM80 Courage & Khazka, Germany), which uses an appointed film to touch the skin for a specific time to absorb the sebum. For the tested area, using the center of the forehead as the yardstick, three areas that do not overlap with each other were chosen and measured. The measured time was when the sebum secretion is known to be the most active, which is 30 minutes after washing the face. The sebum was measured and in order to increase the reliance, it was measured 3 times and used the average of the three as the measurement.

Elasticity : The elasticity of the skin of the volunteers were measured before applying the moisture skin lotion and after cleansing the face the Inositol 0, 0.1wt% included moisture skin lotion was applied twice a day on the appointed area of the face. It was measured at intervals of 1 week for 6 weeks. The Cutometer (SEM474, Courage & Khazka, Germany) was used to measure the elasticity. It uses the Non-Contact Optical measuring theory where the depth of the skin invasion is decided and the low pressure of the probe makes the skin to slowly suck in and then measured. Then uses the process of the skin, which goes back to its place as soon as sucked in to measure the elasticity. The measurement was taken place after washing the face and then 30 minutes after applying the moisture skin lotion. It was measured 5cm below the eye, which is the cheek and in order to increase the reliance, it was measured 3 times and used the average value.

Wrinkles : To measure the wrinkles, a replica was traced in the crow feet 1cm area of both eyes where nothing was applied. Then moisture skin lotion with 0% of inositol was applied on the left, inositol moisture skin lotion with 1.0wt% inositol on the right eye twice a day for 7 weeks and then a replica was traced again. The replicas were magnified 50 times and compared the improvement of the wrinkles using the image microscope (MW-200, Samsung, Korea). Also, using the Image Analyzer (KIT-500, PIAS, Japan) the replicas were used to see the change in the amount of the number of wrinkles, the depth, the length, the width of the wrinkles and compared the numerical values of the results.

3. Result and Discussion

3.1 The affect of inositol on the skin's moisture content

The cleansing of the skin gets rid of waste matter and the sebum membrane, which is made up of sebum and moisture and so the skin is exposed to the outside without a protection layer.[14,15] Therefore, the vaporization of the moisture from the stratum corneum becomes easy and the moisture quantity decreases suddenly. But after a specific time passes, sebum secretes from the sebum glad and mixed with the moisture from the stratum corneum and a natural emulsion layer is formed and stops the vaporization of the moisture. It helps to form such natural emulsion, changes the alkaline skin from the usage of soap to a weak-acidification quickly and in order to have a moist skin moisture skin lotion is used. Therefore, to find out the changes in the moisture of the skin as time passes after applying each amount of inositol moisture skin lotion (or inositol skin lotion),[16,17] the change in moisture of the skin is shown on fig. 1. In fig. 1. one can see that as time passes after applying the moisture from the skin suddenly decreases and after a certain amount of time passes skin's moisture layer forms which maintains fixed amount of moisture. After 60 minutes pass after skin lotion not including inositol and skin lotion with a 0.5wt% inositol is applied to the skin, it shows that the amount of the moisture of the skin shows stable value but in the case of inositol 1.0, 2.0, 3.0wt% there is a difference to a degree but after 40-50 minutes pass the moisture of the skin shows a stable value. Therefore, if the skin lotion with inositol is used after cleansing, the sudden decrease in the moisture eases and in a shorter time the skin shows a stable condition. I think that the structure of the Inositol is made up of 6

OH radicals and so it plays the role of multivalent polyal and shows moisturizing abilities.

According to the results of fig. 1. on the testing of amount of moisture, the measurement was done when the skin is able to be in a stable condition, which is after 3 hours.

Fig. 2. is to show how long the inositol skin lotion has to be applied for the skin to show moisturizing results. It shows the average amount of moisture when 0.5, 1.0, 2.0, 3.0wt% of inositol is used. After 1 week, the amount of moisture starts to increase to about 69 and three weeks, compared the skin before the usage of the lotion, 17% increased and after the third week, almost fixed amount of moisture is stabilized. After this, after the usage of the moisture skin lotion with inositol, moisturizing results started to show after 1 week has passed and at about the third week it shows the greatest improvement results.

Fig. 3. is a picture of the average amount of moisture of the skin in order to study the results of the continuation of usage of the inositol in each amount of inositol skin lotion for 6 weeks. When the amount of inositol increased from 0%(placebo) to 0.5wt% the amount of moisture increased 8.7%, from 66.2 to 72.0. When the amount of inositol increased 1wt%, compared to the placebo (0%), the amount of moisture increased 19% to 79.0. Although the amount of inositol increased to 2.0, 3.0wt%, the moisturizing result of the skin did not improve greatly anymore compared to the amount of inositol increase.

Likewise, the increase in moisture of the skin is the result of inositol, and moisture substances penetrating the stratum corneum or through the eccrine sweat gland and pores, partly absorbed into the skin directly. A part of the moisture substance is not absorbed into the skin but acts as a sponge with the moisture remaining on the epidermis stratum corneum to stop the sudden moisture vaporization. It is thought that at this moment, out of the moisture substances that were absorbed into the skin, inositol affects the skin's nerve cells and accelerate the eccrine sweat gland's activity and induce the appropriate secretion of moisture. It is presumed that such actions allow moisture to be supplied smoothly and keep the appropriate amount of moisture in the skin.[18-25]

3.2 The affects of Inositol on the amount of sebum in the skin

Sebum is known to form natural sebum membrane which have an affect on skin protection and the aging of the skin. Sebum is known to be one of the important factors that form natural sebum membrane, which has an affect on skin protection and the aging of the skin. Sebum is a general name for the existing soil left on the epidermis and is made up of the soil secreted from the pores as well as cholesterol, squalene, medium chain lipid which are soil in the cells. If more sebum than is needed is secreted from the pores it is easy to get infected of bacteria and if there is little secretion, the formation of the natural sebum membrane gets difficult and the result is that it is difficult for the skin to cut off the open air so it gets easier for the bacteria to penetrate. Therefore, to protect the skin from aging and bacteria penetration, it is needed to have an appropriate amount of sebum on the surface of the skin. It is being reported by dermatology that the right amount of sebum is 105-125 $\mu\text{g}/\text{cm}^2$ for the neutral skin. Fig. 4. is a picture to show the change in each average of moisture after the usage of the skin lotion with 0, 1wt% inositol for 6weeks. The volunteers were divided into two where there is a great difference of sebum before the use of inositol, the dry skin and the oily skin. In the usage of regular skin lotion with inositol, the amount of sebum for both the oily and dry skin had shown stable values. After the 2-3 week of applying inositol skin lotion, there showed a great change in the amount of moisture. The 5 dry skins average amount of moisture before using inositol skin lotion was 190 $\mu\text{g}/\text{cm}^2$ but after a week of using inositol skin lotion the result decreased to 180 $\mu\text{g}/\text{cm}^2$ and to 165 $\mu\text{g}/\text{cm}^2$ after the second week of usage and after the third week the result dropped to about 120 $\mu\text{g}/\text{cm}^2$ which is very close to the amount of sebum of the neutral skin. Through this one can see that if

one uses inositol skin lotion, the secretion of sebum and keratinization improves so the amount of sebum of the oily skin decreases and the amount of sebum of the dry skin increases so both skin types become neutral skin types.

The inositol used on the skin is eccrine sweat gland, penetrate keratin, absorbed through the pores, and the absorbed inositol maintains the right amount of cholesterol, which is secreted from the sebum gland in the pores. It also controls the secretion of the sebum gland. The inositol, which is left on the stratum corneum of the epidermis controls the amount of cholesterol that is produced by the keratinization of the stratum corneum. Also, inositol affects the internal secretion system and play the role of controlling the secretion of the male hormone (androgen) and the female hormone (estrogen) to balance the amount of sebum.[24-29]

3.3 That affect inositol has on the elasticity

The elasticity of the skin depends on moisture, sebum, and factors such as connective tissue. As time passes, the ability to reproduce skin cells decline, transformation of hypodermis occurs, and elastin fibrous tissue bondage weakens so the elasticity of the skin declines. Connective tissues are made up of various components that make such elements like bony tissue, collagen, and elastin and is stretched out as far as the hypodermis-apipose tissue. If the connective tissues become powerless then the skin tissues become powerless as well. The connective tissues are made up of cell groups like fibroblasts, collagen, stellate cells and gel like cells, which contain elastin, collagen, and retiform tissues. Fig. 5. shows the elasticity of 20,30's and 40,50's after the usage of moisture skin lotion with 0%, 1wt% of inositol on the face. Looking at a completely air filled balloon's elasticity as 1, 20,30's skin elasticity before using the inositol moisture skin lotion was 0.146 and 40,50's was 0.118. The elasticity of 20,30's after 6 weeks of usage was 0.148 and 40,50's after 6 weeks was 0.121. There was nearly any change in elasticity as time passed, no relation to age. But after a week of using 1wt% inositol moisture skin lotion, there was a great change in elasticity of the controlled groups. After the 2nd week, 20,30's and 40,50's elasticity each increased by 2%, 9% and after the third week 20,30's increased to about 0.158 but improvement after this time was insignificant. Contrary to this, results of improvement was the greatest 5 weeks after the usage of the inositol moisture skin lotion and improvement after this time was insignificant. Also, the elasticity of 40,50's after the usage of the 1 wt% inostiol moisture skin lotion for 5 weeks was getting close to the elasticity of 20,30's before the usage of the inositol moisture skin lotion.

Fig. 6. using the results of Fig. 5. is a picture to study the degree of elasticity improvement of the inositol skin lotion. Fig. 6. shows that improvement in measurement of elasticity after using 1wt% inositol skin lotion for a continuation of time was compared to the elasticity of the skin before the usage of the inostiol skin lotion according to the time of usage and the amount of inositol used. The elasticity improvement degree for 20,30's after using 0wt% inositol moisture skin lotion was within 2% which was not a great change but after usage of 1wt% inositol skin lotion for 3 weeks, the elasticity improved 7% and no further change occurred after this time. The elasticity improvement degree for 40,50's when 0wt% inositol moisture skin lotion was used, there was a slow increase in the elasticity and compared to the first result, there was a 3.5% increase. But after a week of using 1wt% inositol moisture skin lotion, the elasticity increased greatly and there was a great 17% increase after a continuation of usage for 5 weeks. Compared to the placebo (0wt% inostiol moisture skin lotion), the improvement degree was better when 1wt% inositol moisture skin lotion was used, no relation to age. Therefore, one can improve the skin's elasticity by using inositol skin lotion but compared to the 20,30's, the improving result is by far greater for the 40,50's. It is thought that the inositol increases the activity of the face tissues' age cells, increases hydration and softens a part of the accumulated adipose tissue which is accumulated by hardness of aging into a gel like condition,[30] to increase the skin's elasticity. It is also

thought that it increases the flow of the capillary vessel to easily deliver the cell's nutrition and reproduces the reticular layer cells to improve the skin's elasticity.

3.4 The affects on wrinkles of the skin.

As the aging process starts the keratinization cycle gets longer, so the stratum corneum gets thicker and the amount of moisture of the stratum corneum decreases which makes the skin dry. If the skin gets dry the bond between collagen and elastin cells weakens and fine wrinkles increase. Also, blood circulation of existing capillary vessels in the dermic layer slows down so the delivery of oxygen and nutrients decreases which makes it difficult to maintain healthy skin cells.[31] To understand the aging affects on wrinkles, a replica was used. A copy was made both before the inositol moisture skin lotion was used and 7 weeks after inositol moisture skin lotion was used and enlarged 50 times under an image microscope and a skin image analyzer was used to analyze the results which is shown in Fig. 7. using the Skin Image Analyzer on the wrinkles, peak (number of wrinkles), length (length of wrinkles) are shown on tables 2 and 3. Height (the depth of the wrinkles), width (the width of the wrinkles) are shown on tables 4 and 5.

Comparing the height and the width values when 0% inositol moisture skin lotion (placebo) was used on table 2, the number of wrinkles (peak) after the usage of the lotion decreased 2.2%.

Also, the change in width of the wrinkles after the usage decreased 0.7% which is insignificant.

On table 3, after using 1% inositol moisture skin lotion, comparing the results of the peak and the length, there was at most 23%, at least 0% decrease in wrinkles and on average 8.4% decreased. Also length after the usage decreased at most 39.2% and at least 0.7% and on average there was a 19.3% decrease.

If the height (depth of the wrinkles) and the width are compared on table 4, after the usage the value at least -20.5% and at most 12.6% and on average 1.1% decreased in number of wrinkles. Looking at the change of width of the wrinkles, after the usage at least -7.3% at most 12.8% and average of 3.4% width shrinkage so the improvement was very little.

In table 5, if height and width are compared, height after the usage at least -7.9% at most 38.2% and an average of 15.1% decrease showed at results. Also, looking at the change in width after the usage, at least -6.1%, at most 35.4% average of 10.9% shrank and compared to table 4, the improvement is by far better classified by subjects.

When looking at these 4 headings, all improved on average. But looking individually, the increase was not so high and in parts of the items, it showed a decreasing inclination.

Overall wrinkle improvement value was obtained by calculating the affect that the peak, length, height, width, has on the wrinkles and putting the same weight on the main factor (25%) when calculating. If calculated in this method the placebo is 1.9% while 12.4% for 1% inositol moisture skin lotion which has by far higher improving results.

From table 5, when 0% inositol moisture skin lotion was used, the degree of skin improvement per person was compared, the improved headings and the unimproved headings were different so there was personal variations. But the degree of improvement was 1.9% which was a flaw, so using this as a foundation, the value attained when 1% inositol moisture skin was used was compared.

From table 7, when 1% inositol moisture skin lotion was used, the degree of skin improvement per person was compared, the improved headings and the unimproved headings were different so there were personal variations. If each person's overall increase is shown on table 8, the person with the most improvement is 29.0%, the person with the lowest improvement is 0.6% so there were personal variations. Also improvement degree was shown as, within 5%-5 people, 5-10%-3 people, 10-20%-3 people, 20-30%-4 people so on average there was 13.4% improvement. From the

experiment, it is understood that when inositol was used there was overall improving results and the wrinkle improvement results was the results of moisture, sebum, elasticity organically working with each other.

4. Conclusion

Using the inositol moisture skin lotion with each amount of inositol 0wt%, 0.5wt%, 1.0wt%, 2.0wt%, 3.0wt% twice a day for 7 weeks on the faces and the arms of 15 Asian women with healthy skin and arrived at the following conclusion.

1. The moisture, sebum, and elasticity improvement degrees increased as the amount of inositol increased. The results increased as the time of usage increased by after 3-4 weeks the result was constant. Skin which used 1-2% inositol skin lotion compared to the usage of placebo was able to reduce the time for the skin to be stable which is 1 hour to 40-50 minutes.

2. Inositol skin lotion with 1-2wt% compared with the placebo was able to increase moisture and control the amount of sebum and if used continuously for 5 weeks, dry and oily skin types can improve to be neutral skin types.

3. After the usage of inositol skin lotion with 1-2wt% for 2 weeks, the elasticity of the skin starts to improve and if used for 4-5 weeks, maximum results can be reached. The improvement results were better for the already aging 40,50's than 20,30's.

4. The conclusion of using 1wt% inositol skin lotion for 7 weeks was that the average improvement of the number of peak, height, length and the width of wrinkle is 13.4%.

From this conclusion one can see that inositol 1%-2% is the most effective amount of usage in order to get maximum results.

Reference

- [1] D. W. Wolley, J. Biol. Chem., 136. 113 (1940)
- [2] E. V. Eastcott, J. Biol. Chem, 32 1094 (1928)
- [3] "Japanese Pharmacopia, 8th Ed". Hirokawa Publishing, Tokyo, P. C-170, (1971)
- [4] F. A. Hoglan and E. Bartow, Ind. Eng. Chem., 31 749 (1939)
- [5] F. A. Hoglan and E. Bartow, J. Am. Chem. Soc., 62 2397 (1940)
- [6] W. Klyne, Progr. Stereochem, 1 36 (1954)
- [7] S.A. Watson, Starch Chemistry and Technology, 2, 1, Academic Press, New York (1967)
- [8] M. Hashii et al., J. Biol. Chem., 268, 19403 (1993)
- [9] D. M. Hegsted, K. C. Hayes, A. Gallagher and H. Henford, J. Nutr., 103. 302 (1973)
- [10] J. F. Kroes, D. M. Hegsted and K. C. Hages, J. Nutr., 103, 1448 (1973).
- [11] D. M. Hegsted, A. Gallagher and H. Hanford, J. Nutr., 104. 588 (1974)
- [12] Wattenberg LW: Prevention, therapy, basic science and the resolution of the cancer problem. *Cancer Res* 53: 5890-5896. (1993)
- [13] Wattenberg LW: Chalcones, myo-inositol and other novel inhibitors of pulmonary carcinogenesis. *J. Cell Biochem (Suppl.)* 22:162-168. (1995.)
- [14] 고재숙, 하병조, 강승주, 고혜정, 장경자 공저. *피부과학*. 壽文社. p10-29. (2000)
- [15] 야스다토시아끼. *피부관리학*. 현문사. p53-61. (1994)
- [16] 김종대, 전선정, 최현숙 공저. *피부관리학*. 고문사. p135-142. (1994)
- [17] 윤여성. *신피부관리학*. 가림 출판, p85-172. (1995)
- [18] W. H. Daughaday, J. Larner and C. Hartnett, J. Biol. Chem., 212. 869 (1955)

- [19] S. J. Angyal and L. Anderson, *Adv. Carb. Chem.*, 14. 135 (1959)
- [20] F. Eisenberg and A. H. Bolden, *Biochem. Biophys. Res. Commun.*, 12. 72 (1963)
- [21] I. W. Chen and F. C. Charalampous, *Biochem. Biophys. Acta*, 540. 231 (1978)
- [22] E. Hayashi, R. Hasegawa and T. Tomita, *J. Biol. Chem*, 251. 5759 (1976)
- [23] E. Hagashi, R. Gasegawa and T. Tomita, *Biochim. Biophys. Acta*, 540. 231 (1978)
- [24] T. Tomita, R. Hasegawa and E. Hagashi, *J. Nutr. Sci. Vitaminol.*, 25, 59 (1979)
- [25] I. C. Wells and J. M. Hogan, *J. Nutr.*, 95. 55 (1968)
- [26] G. W. Becker and R. L. Lester, *J. Biol, Chem*, 252. 8684 (1977)
- [27] S. C. Hubbard and S. Brody, *J. Biol. Chem*, 250. 7172 (1975)
- [28] S. A. Henry, K. D. Atkinson, A. L. Kolat and M. R. Culbertson, *J. Bacteriol.*, 130. 472 (1977)
- [29] K. D. Atkinson, A. I. Kolat and S. A. Henry, *J. Bacterol.*, 132. 806 (1977)
- [30] A. Kotaki, T. Sakurai, M. Kobayashi and K. Yagi, *J. Vitaminol.*, 14; 87 (1968)
- [31] H. Eagle, V. L Oyama, M. Levy and A. E. Freeman, *J. Biol. Chem.*, 226. 191 (1957)

Table 1. The classification of the volunteers in each of the experiments.

Type Classification	Measurement of Moisture	Measurement of Sebum	Measurement of Elasture	Measurement of Wrinkle
Concentration(wt%) of Inositol Skin Lotion Used	0, 0.5, 1, 2, 3	0, 1	0, 1	0, 1
Volunteers 2.30's - 8 people 4.50's - 7 people	15 people	Oily skin 5 people Dry skin 10 people	2.30's - 8 people 4.50's - 7 people	15 people people
Tested Area	Arm Area	Face Area	Face Area (left ,right)	Face Area
Measuring Instrument	Corneometer	Sebumeter	Cutometer	Image Analyzer

Table 2. Degree of improvement for number and length of skin wrinkle after using 0wt% inositol moisture skin lotion by Image Analyzer

Item No.	PEAK(%)			LENGTH		
	Before	after	Improve	before	after	Improve
1	38	37	2.6	1154	1174	-1.7
2	41	42	-2.4	1783	1765	1.0
3	47	46	2.1	1872	1858	0.7
4	33	32	3.0	1242	1245	-0.2
5	47	43	8.5	1308	1300	0.5
6	37	40	-8.1	1456	1480	-1.6
7	39	38	2.5	1515	1518	-0.1
8	47	40	14.8	2088	2076	0.5
9	33	34	-3.0	1348	1334	1.0
10	39	35	10.2	1070	1055	1.3
11	38	39	-2.6	1428	1423	0.3
12	33	32	3.0	1114	1108	0.5
13	36	35	2.7	1100	1011	8.0
14	37	37	0.0	1677	1674	0.1
15	34	36	-5.8	1258	1238	1.6
Ave.	38.6	37.7	2.2	1428	1417	0.7

Table 3. Degree of improvement for number and length of skin wrinkle after using 1% inositol moisture skin lotion by Image Analyzer

Item No.	PEAK			LENGTH		
	before	after	improve	before	After	Improve
1	37	35	5.4	1174.7	1107.9	5.7
2	42	38	9.5	1766.1	1178.4	33.3
3	46	43	6.5	1859.4	1130.6	39.2
4	32	28	12.5	1248.8	1128.2	9.7
5	43	34	20.9	1298.6	862.5	33.6
6	39	36	7.7	1450.5	1439.1	0.8
7	41	36	12.2	1518.2	1439.1	5.2
8	45	41	8.9	2077.2	1448.3	30.3
9	34	34	0	1329.3	1319.5	0.7
10	38	36	5.6	1044.6	1044.5	3.8
11	36	29	19.4	1413.9	1008.6	28.7
12	36	39	-8.3	1104.4	743.1	32.7
13	38	36	5.3	1099.9	1091.9	0.7
14	39	30	23.1	1677.1	1126.6	32.8
15	37	39	-5.4	1258.3	1238.6	1.6
Ave.	39	35.6	8.4	1421.4	1151.1	19.0

Table 4. Degree of improvement for depth and width of skin wrinkle after using 0% inositol moisture skin lotion by Image Analyzer

Item No.	HEIGHT			WIDTH		
	before	after	improve	before	after	Improve
1	17.8	18.8	-5.6	14.9	13.9	-6.7
2	25.2	27.3	-7.9	11.1	12.4	8.9
3	27.4	25.4	7.2	9.8	10.9	12.2
4	28.9	25.8	10.7	13.9	15.8	14.4
5	17.2	19.4	-12.7	10.6	11.9	13.2
6	20.2	24.4	-20.5	11.7	13.2	12.8
7	23.9	25.1	-5.0	13.9	14.1	1.2
8	35.5	32.1	9.6	9.4	10.4	10.5
9	27.7	27.4	0.9	6.1	17.9	11.4
10	17.9	15.9	11.1	14.8	13.6	-8.1
11	26.1	24.6	5.8	15.9	14.3	-9.4
12	19.7	17.5	11.1	12.7	14.2	12.2
13	18.9	16.5	12.6	14.8	14.0	-5.1
14	25.6	27.1	-5.9	12.8	11.8	-7.4
15	20.5	21.0	-3.7	13.3	13.8	3.3
Ave.	23.5	23.2	1.1	13.0	13.5	3.7

Table 5. Degree of improvement for depth and width of skin wrinkle after using 1% inositol moisture skin lotion by Image Analyzer

Item No.	HEIGHT			WIDTH		
	before	after	improve	before	after	improve
1	18.8	18.9	-0.6	13.8	14.9	7.5
2	27.2	19.9	26.5	12.1	13.3	9.6
3	25.4	16.4	35.3	10.9	11.8	7.7
4	25.9	25.9	0	15.8	17.9	13.1
5	19.2	11.9	37.7	11.9	14.9	23.9
6	25.2	26.8	-6.8	13.2	14.3	8.3
7	24.9	26.8	-7.9	12.3	14.3	15.7
8	33.5	23.4	30.1	11.4	12.5	9.4
9	25.7	21.2	20.5	15.1	14.8	-1.9
10	15.9	16.6	-4.3	13.6	14.1	3.9
11	25.1	21.3	15.2	14.3	18.1	2.5
12	18.7	11.6	38.2	14.3	14.6	2.7
13	16.9	15.4	8.7	13.1	14.5	10.9
14	27.6	23.8	13.4	12.9	17.6	35.4
15	21.5	18.9	12.3	13.8	12.9	-6.1
Ave.	23.5	19.9	15.1	13.3	14.7	10.9

Table 6. Degree of total improvement after using 0% inositol moisture skin lotion

Item No	PEAK improve%	LENGTH improve%	HEIGHT improve%	WIDTH improve%	TOTAL improve%
1	2.6	-1.7	-5.6	-6.7	-2.8
2	-2.4	1.0	-7.9	8.9	-0.1
3	2.1	0.7	7.2	12.2	5.6
4	3.0	-0.2	10.7	14.4	6.9
5	8.5	0.5	-12.7	13.2	2.4
6	-8.1	-1.6	-20.5	12.8	-4.4
7	2.5	-0.1	-5.0	1.2	-0.4
8	14.8	0.5	9.6	10.5	8.9
9	-3.0	1.0	0.9	11.4	2.6
10	10.2	1.3	11.1	-8.1	3.6
11	-2.6	0.3	5.8	-9.4	-1.5
12	3.0	0.5	11.1	12.2	6.7
13	2.7	8.0	12.6	-5.1	12.1
14	0	0.1	-5.9	-7.4	-3.3
15	-5.8	1.6	-3.7	3.3	-1.2
Ave.	2.2	0.7	1.1	3.7	1.9

Table 7. Degree of total improvement after using 1% inositol moisture skin lotion

Item No.	PEAK improve%	LENGTH improve%	HEIGHT improve%	WIDTH improve%	TOTAL improve%
1	5.4	5.7	-0.6	7.5	4.5
2	9.5	33.3	26.5	9.6	19.8
3	6.5	39.2	35.3	7.8	22.2
4	12.5	9.7	0	13.1	8.8
5	20.9	33.6	37.7	23.9	29.0
6	7.7	0.8	-6.8	8.3	2.5
7	12.2	5.2	-7.9	15.7	6.3
8	8.9	30.3	30.1	9.4	19.7
9	0	0.7	20.5	-1.9	4.8
10	5.3	3.8	-4.3	3.9	2.2
11	19.4	28.7	15.2	26.5	22.5
12	-8.3	32.7	38.2	2.7	16.3
13	5.3	0.7	8.7	10.9	6.4
14	23.1	32.8	13.4	35.4	26.2
15	-5.4	1.6	12.3	-6.1	0.6
Ave	8.4	19.0	15.1	11.0	13.4

Table 8. Degree of total improvement after using 0% inositol moisture skin lotion

Improvement	People	Maximum	Minimum	Ave.
0 ~ 5%	5	29.0%	0.6%	13.4%
5 ~ 10%	3			
10 ~ 20%	3			
20 ~ 30%	4			

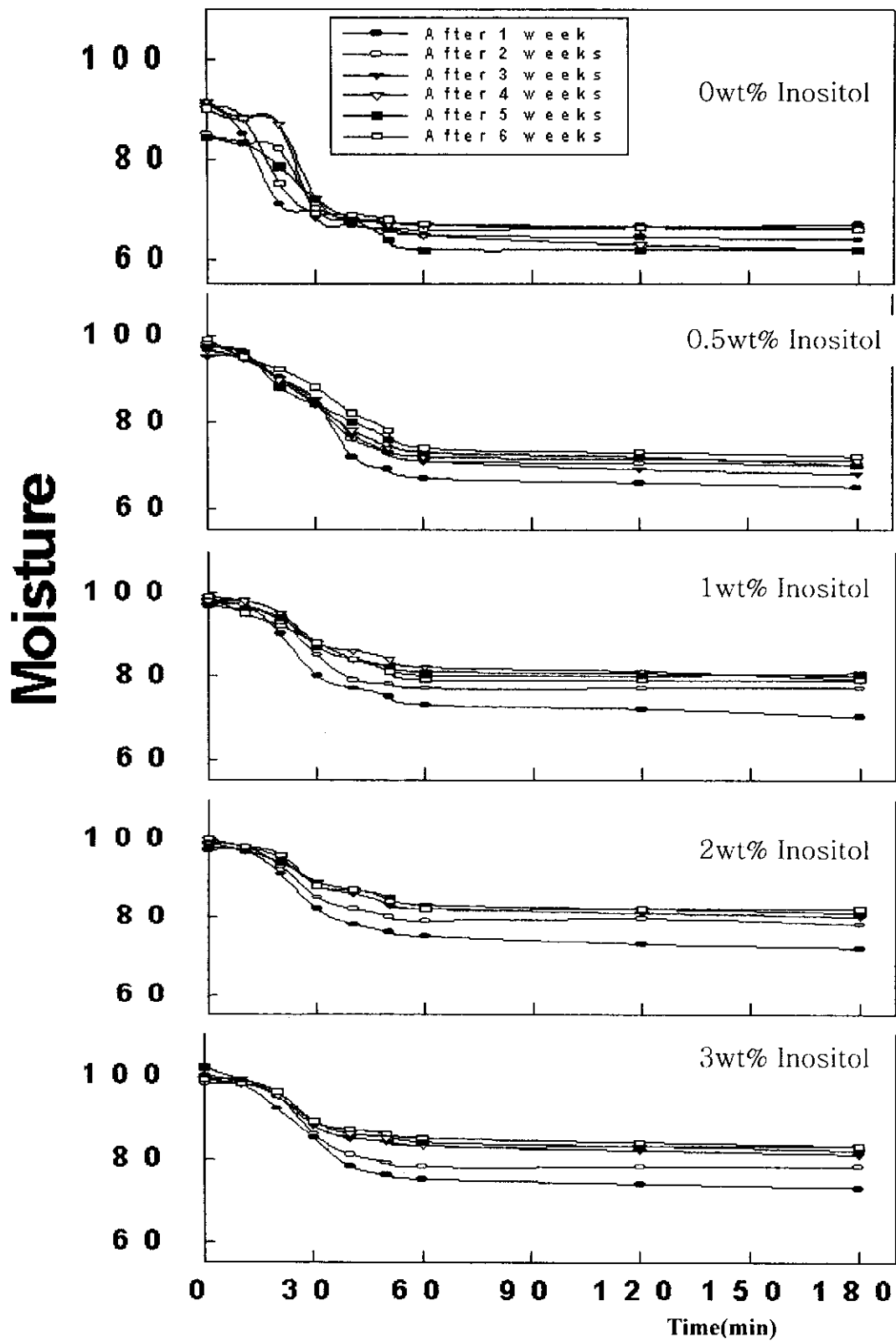


Figure. 1. Moisture variation as function of time after using 0, 0.5, 1, 2, 3wt% INOSITOLmoisture skin lotion.

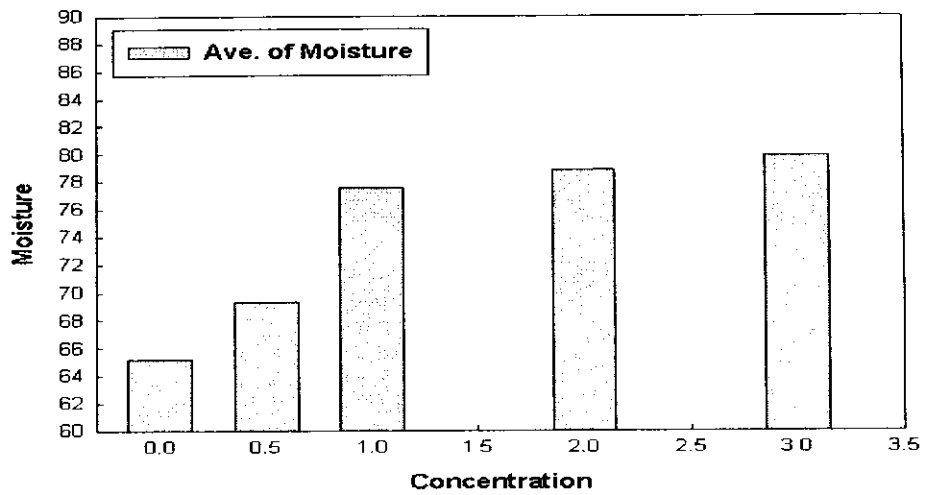


Fig. 2. Ave. of Moisture variation after using particular INOSITOL moisture skin lotion.

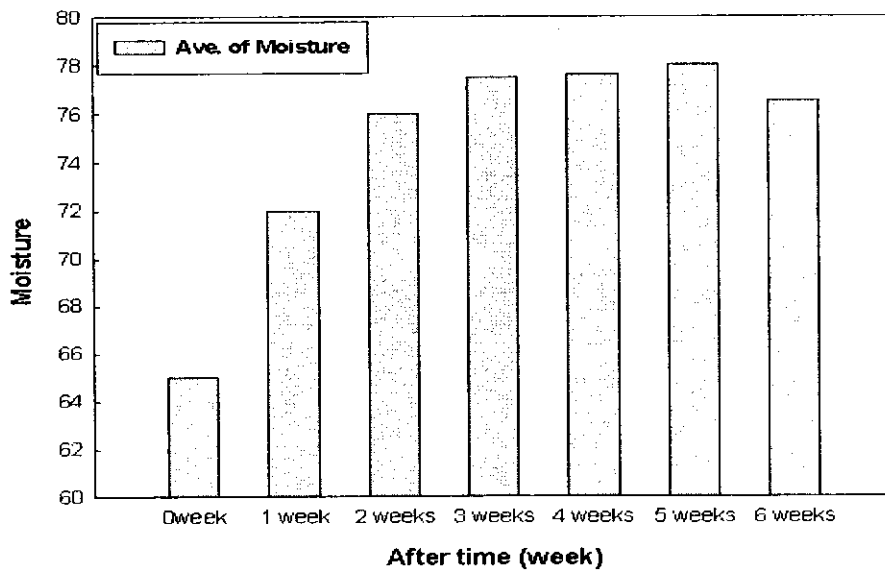


Fig. 3. Ave. of Moisture variation after using all INOSITOL moisture skin lotion.

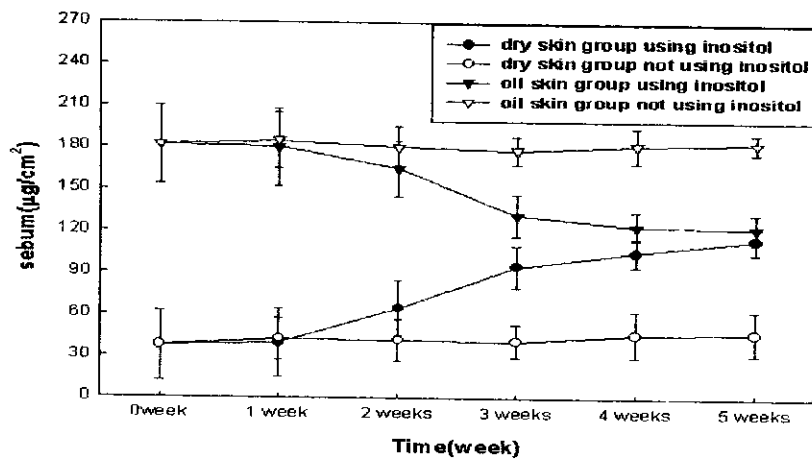


Figure 4. The variation of sebum as function of time after using 1% INOSITOL moisture skin lotion for dry skin and oily skin.

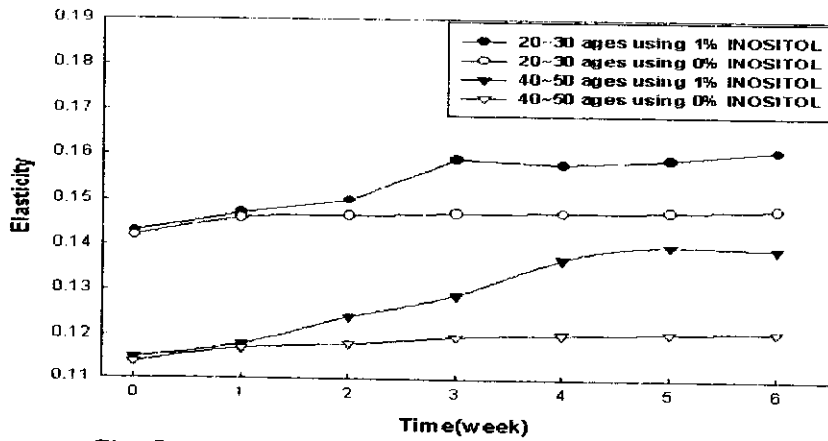


Fig. 5. Elasticity variation as function of time after using 0%, 1% INOSITOL moisture skin lotion from each ages.

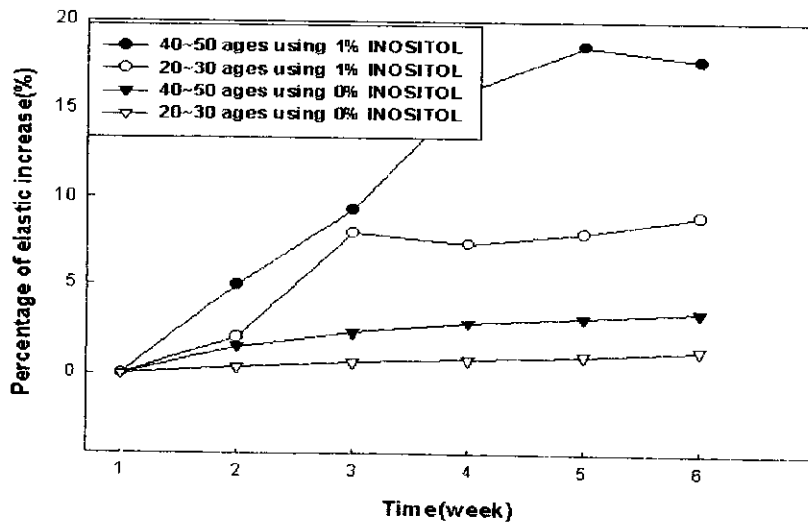
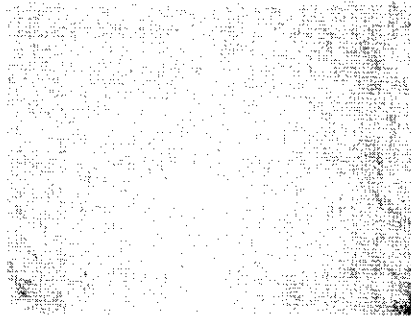


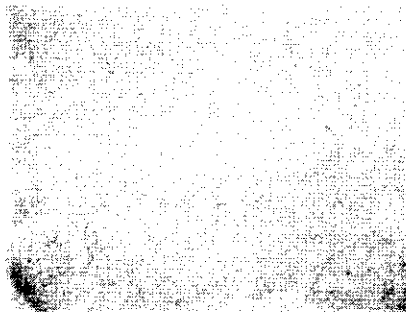
Fig. 6. Percentage of elastic increase as function of time after using 0%, 1% INOSITOL moisture skin lotion from each ages.



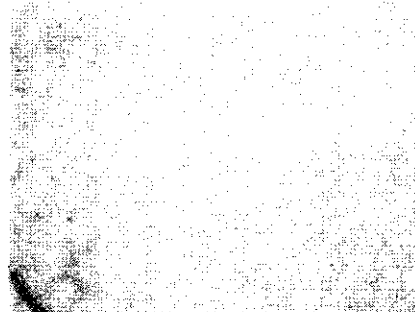
before



after 49 days



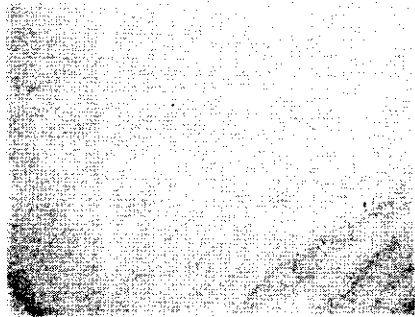
before



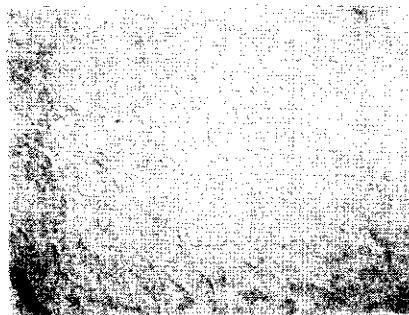
after 49 days



before



after 49 days



before



after 49 days

Fig. 7. wrinkle Replica picture magnifies fifty times by image microscope