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*Scientific research to esteem the results obtained  
from the devise Rugalift used for the wrinkles' treatment*

**ruga lift®**



Research purchaser:  
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# Index

<b>Index</b> .....	<b>2</b>
<b>Warnings and Distribution</b> .....	<b>3</b>
Distribution.....	3
Research copyright.....	3
Patents and commercial brands.....	3
Change on the products.....	3
<b>Study register</b> .....	<b>4</b>
Register title.....	4
Target.....	4
Materials and methods.....	4
Areas to be photographed.....	4
Devices which are used:.....	5
<b>The skin</b> .....	<b>6</b>
Epidermis.....	6
Dermis.....	7
Hypodermis.....	8
The epicutaneous lipidic film.....	8
Cutaneous and superficial lipids' composition and origin.....	8
<i>Epidermis physiology</i> .....	9
Keratonogenesis.....	9
Melanogenesis.....	9
<b>The cutaneous ageing</b> .....	<b>10</b>
<i>The wrinkles</i> .....	10
<b>The working principle</b> .....	<b>11</b>
Skin imperfection reparation through the MLM Microcurrents.....	11
The microcurrent theory.....	12
Lifting function through the MLM theories.....	12
Previous studies about the MLM theories.....	12
<b>The devise which is used</b> .....	<b>13</b>
<i>As it works</i> .....	13
<i>How use it</i> .....	13
Treatments.....	13
Maintenance.....	13
<i>Deviice security</i> .....	14
Before use the device.....	14
Specific precautions and recommendations.....	14
Warnings – Important specific recommendations.....	14
<i>Technical details</i> .....	14
Certifications and rules.....	15
Producer's quality system.....	15
<b>Research results</b> .....	<b>16</b>
Considerations.....	16
SAS Principle (Skin Age Score).....	16
<i>Method</i> .....	16
<i>Results</i> .....	17
<i>Photographic evaluation</i> .....	18
<i>Contraindications</i> .....	20
<i>Conclusions</i> .....	20
<b>Bibliography</b> .....	<b>21</b>

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Rugalift® is subjected to these international patents:

- World Patent: n° PCT-IT-2005-000213 "Portable electric device used for the wrinkles' treatment".
- European Patent: n° E-00007699-C

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Fatrotek® has the right to bring, without forewarning, modifications and/or changes on the apparatus and the relative fittings.

# Study register

## Register title

“Valuation of the efficacy of the device Rugalift®”

## Target

Valuation of the reduction's capacity of the wrinkles caused by ageing through an electromedical device, Rugalift® generating changed lots microcurrents (MLM) Rugalift®.

## Materials and methods

**Patients:** 12 patients, with an age between 30 and 65, will be enlisted, with a significant sample > 70% in an age brackets between 40 and 50.

The treatments will be done through the device **Rugalift®**.

During each sitting the microelectrodes will be applied on the wrinkles of the forehead, around the eyes, in the furrows around the nose and on the upper lip till a subjective endurance (about 5 seconds), this operation is repeated for 4 times on each wrinkle, with a total time of 20-30 seconds on each wrinkle.

For all the patients 3 weekly sittings will be applied, with a total of 12 sittings.

At the first appointment, before the treatment ( $T_0$ ) the *Skin Age Score* (SAS) and the quantitative valuation of ageing will be calculated, and also some instrumental probes will be conducted: transepidermis evaporation (TEWL), horny and sebo measurement.

The clinic photographic evaluation will be done::

1. at the beginning of the treatment ( $T_0$ ),
2. after 30-40 minutes from the first treatment ( $T_1$ ),
3. in the middle of the treatment ( $T_2$ ),
4. at the end of the treatment ( $T_3$ ),
5. after 30gg. ( $T_4$ ) from the treatment suspension
6. after 60 gg. ( $T_5$ ) from the treatment suspension

Exclusion criteria will be: the exposure to sunlight and UV artificial source, recent chemical treatment with glycolic and trichloroacetic acid, infectious disease (mycotic, viral, bacterial) pacemaker bearers.

Rugalift®'s principle is to stimulate the inflammatory exudative phase using the changed microcurrents lots MLM with a frequency of 6KHz.

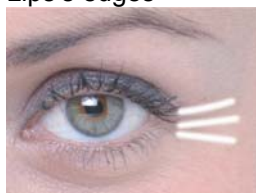
The microelectrodes are put longitudinally on the cleaned skin thanks to a suitable cream in the wrinkle's furrow so that the local heat generated by the microcurrents determines a local exudative edema to induce the fibroblast cells' migration and proliferation. These ones, using the thermic energy can speed up the ATP catalysis process and so the proteic synthesis, with the following neo-synthesis of collagen and elastin which, with a good quantity of water, supports the tissue turgidity.

## Areas to be photographed

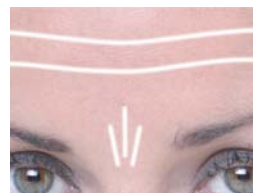
Periocular area Right, Furrows around the nose, forehead and upper lip



Lips's edges



Periocular wrinkles (crow's feet)



Frontal and wrinkles around eyes



Lips wrinkles (fan and nose- geniene)

*Devices which are used:*

**Corneometer (Corneometer CM 820 PC Courage – Khazaka electronic):** it's a impedenziometer, which sends into the skin a low frequency current and takes the skin's conductance. This value is inversely correlated to the skin impedance, which is mainly established by the water content of the corneum layer; in this way it's possible to obtain a direct measure of the cutaneous moisturizing. The instrument, used by us, translates this parameter in the moisturizing unit.

**(Tewameter TM 210 Courage – Khazaka electronic):** the apparatus measures the water quantity eliminated through a transepidermic way (TEWL). It allows to determine the cutaneous moisturizing level through moisture and temperature sensors.

**Sebometer (Sebometer M 810 Courage- Khazaka electronic):** allows a quick determination of the sebo quantity which is present on the cutaneous surface through the reflectometric technique.

**Digital camera:** the photographic detection of the results

# The skin

The skin is not a simple coating texture but one of the most important body's organ..

Apart from its defensive – sensorium function, which begins in the uterus, it has an important role in the immune defense.

The skin is the vehicle between us and the external world, the visiting card which show us other people; its aspect, more or less fresh and shining, it's the evidence of our age.

The complexion, which changes from race to race, has in the same white race several tinges which vary according to the gender, age and cutaneous areas.

The complexion is the result of four factors variedly matched among them:

- Corneum's thickness
- The haemoglobin level which behaves as a filter for the blue and green wavelengths, it gives a rosy complexion of the dermis.
- Carotene quantity present in the epidermis of the subcutaneous fat, selective filter, the haemoglobin is responsible for the yellowish complexion of these layers.
- Dark complexion, provided with the melanin's granules which, absorbing in a more or less selective way all the wavelength in the visible part, it behaves as a grey filter decreasing the light's reflection and penetration.

The skin is characterized by three layers:

## *Epidermis*

The epidermis is a pavement multistratified epithelium with a thickness of 0.04-1.5 mm. From the deepest layer we can distinguish:

*the basal state* called germinal layer, represented by palisade cells, irregularly cylinder, undifferentiated, in contact with the papillary dermis, the intensely basophil cytoplasm, a big quantity of ribonucleic acid, a nucleus with an active metabolism and remarkable reproductive capacity.

The keratinocytes live a continuous proliferative phase to produce new elements which easily move in the surface to replace and eliminate the old cells

*spinous layer or Malpighi* where the keratinocytes take a polyhedric shape, roundish nucleus and bosophil cytoplasm where it's possible to see clearly the keratinic filaments which give a remarkable resistance and create, between a cell and an another one, some little spaces (called interspinal) where there are glicoproteins, different classes of lipids and acid hydrolaseidrolasi secreted by lamellar bodies taken from the Golgi apparatus;

*granulous layer* where the cell begin to flatten themselves with the greater axis parallel to the epidermis's surface. In the cytoplasm some roundish bodies take shape they are strongly basophil and they are called "granules of keratojalina";

*clear layer* is considered a passing moment between the granulous layer and the corneum; the cell has lost its nucleus, we can notice a light flattening with the growth of rabbettings among the neighbouring cells.

The cytoplasm is nearly replaced with a oily substance called "eleidin".

It seems that in this area, rich in sulfridilic groups, the sulphurated aminoacid are used for the keratein synthesis. The clear layer's cells are part of a lamina with the jalina substance, like a gel, important because it hinders the water emission and the toxic substances penetration.

*In the corneum*, the cells in the shape of lamellas, dehydrate progressively till to desquamate and to be removed. These cells, now keratinized, are properly called: *comeociti*.

They are strongly close among them that create several joints among the cells durino the exsiccation process of the citogel.

The protective function of the comeocites is complete thanks to the keratine's function, whose function is act as a barrier against the most radiations coming from outside and avoid the thermic dispersion.

The turnover time, or the renewal speed of the epidermis cells has an average of 28 days.

We must remember that a greater mitotic activity exists during the night hours and that the traumas, cuts, scratches speed up the mitosis, indeed between 36 and 72 hours after the trauma, in the area we notice a remarkable increase of the epidermis's mitosis.

The corneum layer is opposed to the penetration of external substances and to the action of watery substances which are not able to dissolve the cutaneous fat, thanks to the presence of a very thin hydrolipidic coat.

The lipidic phase is characterized by the sebum, with a high percentage of squalene and unsaturated fat acids, lipids of epidermis origin, such as cholesterol and its esters and lipids present in the sweat.

The watery phase, rich in salts, comes from the sweat and the perspiratio insensibilis. The hydrolipidic coat, with a pH from 4.2 to 6.5, can also keep steady its moisturizing state.

We remind that the water content in the epidermis decreases gradually and so it goes from the deepest layers to the most superficial (90% of the basal state, (8% of the corneum). Between the epidermis and the dermis there is the “basal membrane” which surrounds also the pilonidal folliculus and it's useful for the regulation of the metabolic and nutritional exchanges; it is characterized by glycido-lipidic- proteinic complexes with a variable grade of polimerization which make a system with a selective permeability.

### Dermis

Among the three layers it is the most active part, for this reason each of its changes runs through the external aspect.

It is a thickness of about 3 mm and it is characterized by two distinct parts:

*the papillar layer*, placed under the basal membrane, characterized by a reticulum of collagen fibres and elastin, thin and perpendicular to the basal membrane;

*the reticular layer*, characterized by a reticulum of thick polymer bundles with a rocking course, parallel to the basal membrane.

The elastic fibres surround the collagen fibres and are plunged in the most important substance.

It contains vessels, nervefibres and nervous particles, pilonidal folicullus and sudoriferous glands.

The dermis is characterized by cellular elements which produce the proteinic fibrous part characterized by: collagen, elastin, reticulina, fibronectinis, proteoglycans; this fibrous component is plunged in the “intercellular substance” a polysaccharid proteic viscous gel able to detain a part of water.

The distensibility of the skin is given by the collagen fibres which go in a parallel and perpendicular way with the cutaneous surface; the elasticity is given by the reticulum of the elastin's fibres.

In the dermis we find the cutaneous adnexa: the sebaceous glands, excretory ductus of the sudoriferous glands, the same sudoriferous glands, the pilonidal folliculus, the cutaneous capillary and the several nervous structures.

The cellular elements are characterized by: fibroblasts – fibrocyte, placed along the course of the collagen's bundles, characterized by motility and phagocyte power, the mastocytes.

The difference between fibroblast and fibrocyte has the capacity to multiply, high in the former, scarce or nothing in the latter, the biosynthetic activity and the membrane's permeability.

The elastic and reticular texture prevails in the most superficial layer of the dermis, in the deep layer the collagen's inclination grows and is able to arrange itself in big bundles and to prevail on the fibrous structures.

*The proteinic collagen fibres* have their origin in a not polymerized precursory, the trophocollagen is a triple helix molecule rich in hydrogen binding. The organization of the collagen fibres in the extracellular matrix fits the texture's need; in the skin of the mammals they make use of a “tanglewicker” stabilized by a gelatinous matrix rich in water and applied stresses proof in several directions and at the same time guarantee the maintenance of the skin's turgor and freshness.

*The reticular fibres* have physics and chemical proprieties like collagen's and identical recurrence in the amino acid sequence. They represent a collagen's previous phase: the pre-collagen or the young gollagen.

*The laminin*, glycoprotein which take apt with the fibronectin to the fixation phase of the epidermic basal cells on the lamina matrix.

*The fibronectin* is a glycoprotein characterized by exact adhesive proprieties.

The first time its presence was observed on some wounds in 24 – 48 hours.

After having reached the greatest concentration and activated the collagen's synthesis, its concentration decreases.

It has been observed that the fibronectin is always in the matrix which surrounds the fibroblasts and it spreads, with the reticula fibres and hyaluronic acid among the cutaneous areas with injuries, after a speedy regranulation effect.

Its function is primary in the tissues' reconstruction and repair.

*The elastin* is a protein wrapped in casual spirals, interconnected with transversal bonds, it gives elasticity to the tissues.

The elastin molecules are secreted in the extracellular space where they shape a rather net with elastic fibres.

*The elastic fibres* are structured in their total shape with a high density in the reticular dermis, here they prevail with the reticular fibres and they stretch in the papillary dermis as vertical arborization in the young skin; in the deep dermis the collagen's tendency in the organization of big bundles grows and it prevails over the fibrous structure; the hyaluronic acid is present in a high concentration in the dermis and it goes well with the protoglycans and the collagen fibres.

The most important substance is characterized by polysaccharide macromolecules like the glycosaminoglycans and mucoproteins or proteoglycans which have to bind water and salt.

All the glycosaminoglycans, except the hyaluronic acid, shape complexes or combinations with the collagen and with the fibrous proteins. These components are very important for the skin's life and with the connectivum's ageing they decrease in favour of the fibrous collagen which increases. For this reason there is a clear reduction of the hyaluronic acid (from 78 to 30%) with a reduction of the watery content and tissue's turgor.

The glycosaminoglycans are generally classified according to the presence or the absence of sulphate groups like:

- GAG asulphurate (hyaluronic acid, chondroitin)
- GAG sulphurates (chondroitin-4-sulphate, chondroitin-6-sulphate, dermatan sulphate, cheratansulphate, eparansulphate).

The presence of the chondroitin-4-sulphate and 6 sulphate in the young and prenatal dermis decreases with time, while the percentage of the hyaluronic acid decreases and the dermatansulphate one increases.

### *Hypodermis*

It represents the deeper skin layer and it has, rarely, a total adipose nature. It has a variable thickness according to the several races, body areas and the individual nourishing of man.

The hypodermis is characterized by adipocytes and connectival collection.

The adipose cells which characterize it, have a little drop of fat which is in all the cellular body. The connectival parts have a vertical modulation and it's possible to note some vessel and nervous structures with a greatest dimension.

Hypodermis has the function to deaden in a mechanic way, has a function of energetical reserve and thermoregulator.

### *The epicutaneous lipidic film*

The sebum, is not known its specific composition yet about, helps with the sweat to shape the acid mantle— lipidic of the skin and shaping an acid Ph thin emulsion with a protective and germicide action. Its lipidic composition is independent of the nourishing phase.

The most endogeneous source (95%) is characterized by the sebaceous glands and influenced by the hormonal level and by the temperature. The other endogenous source is represented by the products of the keratinisation process of the epidermis cells which contain a little quantity of lipids.

The exogenous source is represented by the metabolism products of fungus and bacteria and with a content of lipids of probable cosmetics.

The sebum secreted by the glands joins in the follicular lumen, in the interstices of the corneous layer according to the capillarity, its viscosity and temperature. Only when the follicular channels and the reserves in the interstices of the epidermis are full, the lipids in excess go freely on the surface, spread over the next areas and give a greasy aspect to the skin, above all if it has sweat.

If the lipids are removed from the cutaneous surface they are immediately replaced by the content of the follicles.

The lipids quantity is variable according to the age: in a gradual increase till the puberty with a greater level at about forty and there is a decrease during the old age. Apart from the age, also the gender and the endocrine glands functioning affect the secretion.

### *Cutaneous and superficial lipids' composition and origin.*

*Fat acids:* they are present on the skin in their free and esterificated shape with glycerin, cholesterol or other obstacles. The free fat acids derive from the triglyceride hydrolysis thanks to the fat enzymes, lipase, probably placed in the sebaceous glands ductus.

*Triglyceride:* they are synthesized in the sebaceous glands like in the other tissues, it's not known if there is a proportionality with the content of the serum's triglycerides.

The triglycerides hydrolysis and the fat acid presence on the cutaneous surface, depends on the biochemical activity of the epicutaneous bacteria and their number is, anyway, selflimited by the antibacterial action of the free fat acid which are in the superficial lipids.

The cutaneous pH affects on the enzymatic activity which decreases with its decrease for the free fat acid increase which are able to rule the pathogen microorganism growing.

The sebum overproduction and its hoarding in the follicular channel, the hydrolysis of its components by the bacterial flos with the free fat acid production; this happen during the puberty, a consequence of the pathogenesis of the acne.

*Squalena:* intermediate product in the cholesterol synthesis starting from the acetic acid.



*Cere*: long chain fat acid and aliphatic alcohol esters. They belong to the saponifiable substances and they are resolved in aliphatic alcohol and fat acid.

*Cholesterol*: the cholesterol content of the skin decreases with time. It is in a free condition in the cellular membrane of the epidermis lower layers. During the keratinization process the free cholesterol is esterified and goes inside the cells which are under the cornification process.

*Phospholipid*: they have an important role in the cellular membrane maintenance, their content is greater in the epidermis than in the dermis even if it has a reduction from 2.6% to 0.14% in the layers which are going to finish the keratinisation process. The phospholipid hydrolysis, during the keratinisation process, causes the release of free fat acid that can be the cause of the cholesterol esterification in the corneum layer and ceres.

*Essential fat acid*: they are connected to the normal epidermis functions, particularly the linoleic and arachidonic acid lack increases the cutaneous permeability..

## Epidermis physiology

### *Keratinogenesis*

The epidermis proteins are divisible in two important groups: the proteins which have a not fibrous structure and that play an enzymatic role on the metabolism of the skin, and proteins which have a fibrous nature and that have a structural function.

The typical protein of fibrous nature is the keratin: highly qualified protein, insoluble, able to precede the fluid loss by the organism.

The keratinisation process starts in the epidermis basal state, where the most of the proteic synthesis takes place as while the cells arrive in the higher layers and the keratin filament orientation changes, which from the irregular location around the nucleus, are parallel to the cellular surface and to the other cellular organs, such as the nucleus, mitochondrions, ribosomes. They are destroyed and the residue of these organs are taken by the totally keratinized cells. Among the amino acids which are part of the keratin's synthesis, there are: tyrosine, cystin, istyidin, argynin, glutammin and aspartin.

### *Melanogenesis*

The melanogenesis takes place in the melanocytes, dendritical glands highly qualified placed in the epidermis basal layer. They have an enzyme, the tyrosinase (with copper inside) which changes the tyrosine in DOPA and then in DOPA-kinone to produce melanin.

When the melanosome are full of melanin they lose their enzymatic activity and are transferred from the melanocyte to the next epidermic cells. The tyrosinase has to be continually renewed and the quantity of the pigment produced is proportional to the percentage of the enzyme which is present.

The cutaneous keratinocytes receive the pigment, taking part actively to the transferring process and affect a checking action in the melanin synthesis. They phagocyte the melanosome of the melanoites' dendrites and they spread them more or less easily or uniformly.

The melanogenesis steps can be schematized in this way:

1. Melanosome components synthesis.
2. Melanosome formation
3. Melanosome melanization
4. Melanosome transferring in the next Keratinocytes.
5. Melanosome degradation.
6. Melanin removal with a desquamation of the horny layer and through the lymphatic way.

The pigmentation differences aren't caused by a difference in the epidermis- melanin unitary number, but they are caused by some functional differences and according the spreading.

## The cutaneous ageing

The cutaneous ageing is a more general picture's manifestation tied up all the organs and textures, characterized by a reduced speed of the cells' reproduction and by an alteration of all remedial and renewal processus.

This phenomenon begins at the age of twenty but its signs reveal themselves at about thirty and become more or less evident according to the genetic factor, the inherited skin, the organism status and the received cures.

### The wrinkles

The wrinkles can appear more or less early: after twenty years old the skin turgor decreases and the little wrinkles on the outside corner of the eye and on the sides of the mouth become frequent.

At about thirty the eyelids tend to go soft and the forehead shows some horizontal furrow; the skin appears less compact. The process repeats till at about seventy when everything can be lined by wrinkles and skin, uniformly rough and with irregular pigmentations. The skin aging must be correlated to the derma aging. While the epidermic cell shows an aging caused by the cell maturation which goes from the outside part to the external one to create a keratinized layer, and a second type is caused by the epidermis like tissue, linked to a reduced metabolic activity and with a low turnover grade, the derma undergoes some changes concerning the cells number and the elastic contents.

With time and compared to the elastic part the dermis' s fibrous one increases; with ages the turnover and nutritional exchange reduction occurs so that the dermis can't perform normally its function.

It is known, according to some Krohn's experiments, that the cells in the proliferative period get old more slowly than those ones separate from each other. When the epidermal cells separate from each other their aging is slowed down.

The corneum keeps its own thickness, even if the cohesion among the comeocytes and the barrier functions, performed by the corneum, are modified.

The thinning is the result of a reduction of the number of the spinous cell layer. The epidermal cell's renewal time draws out because of the reduced proliferative ability. The melanocytes and Lanherans cells' number is reduced, so we can also observe a reduced immune ability. The joint dermis – epirdermal levels out, expression of a bigger fragility of the elder skin.

The dermis, with ages, suffers from some alterations according to the cells' number and the contents in the elastic texture apart from the changes of the several collagen which is produced.

The dermis layer grows thin and lets shine the venous reticulum, the vascular plexus becomes poor and the capillary fragility increases except the waste of efficacy in the thermoregulation.

The fibroblasts number and activity are reduced. The elastic fibres become thicker and they shatter in the photoexposed areas; the collagen fibres show a granulous aspect with a structure's variation: we obtain some insoluble collagen. We can observe more and more steady intercellular bindings and the collagen's fibres become packed and firm, bringing about the sclerosis and the rigidity of the ageing textures. The secretion of fibronectinis and proteoglycans decrease.

Quanto più aumenta l'età, tanto più aumenta la parte fibrosa del derma rispetto alla porzione elastica.

With ages the collagen turnover decreases, the reticular and fibrous structure increases determining the skin's shrinking and the elasticity loss. The collagen's glucosamineglycans suffer from some quantitative variations, the hyluronic acid decreases and the chondroitinis sulphate B increases because of a variation of their synthesis in the fibroblasts, which because of turnmoils in the DNA transcription's mechanism increase the chondroitinis sulphate at the expense of the hyluronic acid which becomes less polymerized, determines huge quantity of water and keeps the skin young and drawn.

## The working principle

Rugalift® principle is based on the inflammatory exudative phase (edema) stimulation. Through the MLM microcurrents thanks to some microelectrodes it's possible to induce, according to the superselective applications only inside a wrinkle, the microcurrents are placed, obliquely, in the epidermis. The effect is the production of local heat, at the beginning of the migration and proliferation phase of the fibroblast cells, which allow the development of a reparative reaction.

Microscopically the cell uses the terminal energy in excess and available, promoting the ATP catalysis process, associated to the essential metabolic processes, as the proteic synthesis, so we would have the collagen and elastin fibres neosynthesis.

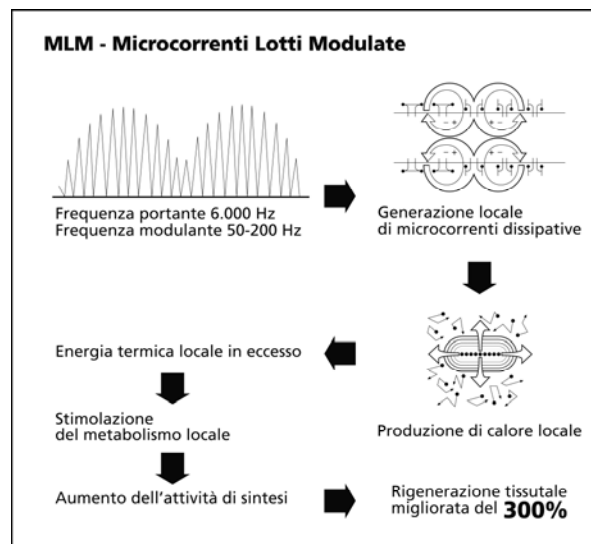
Thanks to this principle we can have a powerful collagen and elastin producer. With time collagen, elastin and glicosamminoglycans decrease which able to keep a huge quantity of water maintain the skin young and extended. Rugalift® through the MLM, stimulates on the dermis level the inflammatory exudative phase (edema), which recalls the fibroblasts proliferation, which synthesize the collagen and the elastin.

Thanks to this mechanism the collagen is not introduced from the outside part but it is produced by the body itself. This function use stimulates the cellular renewal, the neo collagen production by the fibroblasts with clear and lasting results after about ten applications.

After few meetings the skin regains the strength and the elasticity, the most wrinkles and the ageing signs disappear. There are clinical studies which show the device efficacy, which comes from apparatus used in the beauty centres.

MLM – Changed microcurrents lots

1. Bearing frequency 6.000 Hz
2. Modulating frequency 50-200 Hz
3. Local production of dissipative microcurrents
4. Local thermic energy in excess
5. Local metabolism stimulation
6. Local heat production
7. Synthesis activity increase
8. Tissue regeneration with an improvement of 300%



### *Skin imperfection reparation through the MLM Microcurrents*

The most important effects on the imperfections through the MLM are:

- Increase of the skin elasticity.
- Tissue firming up.
- ATP production stimulation and cellular proteins.
- Collagen and elastin neosynthesis.
- Local metabolism rebalancing.
- Membrane use improving.

### *The microcurrent theory*

The electrical characteristics of the biological tissues can be undergone to changes because of the tissue ageing. These changes are caused by structural and functional alterations of the cells themselves. Inside the connective filed, among the first the reticular and fibrous structure increase must be remembered to damage of the gel matrix of glucosaminoglycans and hyaluronic acid; among the last ones we have the alterations bound to the working of the pump  $\text{Na}^+ -\text{K}^+$  APT-asi, which cause a concentration extra ions and intracellular variation. These ones ( $\text{K}^+$ ,  $\text{Mg}^+$ ,  $\text{PO}_4$ ) generally decrease, the extracellular ones ( $\text{NA}^+$ ,  $\text{Ca}^{++}$ ,  $\text{Cl}^-$ ) increase.

Both of these factors want to establish a value of the tissue independence and a load disposition which characterize the young skin.

The use of the micro currents, widely documented in medical field since (Wing,1973) and considered as a "Standard electromedical device" in the U.S.A. From several years, it seems that they have reached the biggest impact on the transport modality and calls on the mobile phones.

Many authors support the theory according to which the cells inside an organ or tissue can communicate through frequencies in the microampere range.

When the sinusoidal carrying wave with a constant frequency is modulated in width by a low frequency biphasic current (from 50 to 200 Hz) it's possible to obtain a MLM wave. "Lots modified micro current", which associates at the characteristics of the traditional micro currents the capability to induce, thanks to local applications with needle electrodes, local dissipative micro currents obliquely epidermis-bond. The effect of the dissipative circulations is the local heat production. Heat that, macroscopically originates a local exudative edema, at the beginning of a migration and proliferation phase of the fibroblastic cells that allow the granulation tissue development. This is a temporary neo-formation of connective tissue which after will be handed again; in this process the fibronectin play san important role because it, probably, acts as a reticulum where there is the neo-synthesized collagen.

Microscopically the cell uses the thermal energy which is in excess and available, promoting the ATP catalysis processes associated to essential metabolic processes, such as the proteic synthesis, collagen and elastin fibres.

Greatest tolerability. Electrical stimuli can cause a painful sensation more or less intense according to the wave which has been used and the frequency. The use of bidirectional currents with frequency between 2500 and 8000Hz (medium frequency) assure the best tolerability by the patient (Djournou, 1949). The phenomena is tied up to the threshold of pain's elevation in comparison with the muscular contraction; with these frequencies the electrical impulses stimulate the motory nervous fibres and not the pain ones. The muscular contractions are painless.

### *Lifting function through the MLM theories*

The MLM theories, as we have seen, have a frequency of 6000Hz, modulated with a low frequency (50-100-200 Hz) with a wave modulating and an emisinusoidal wave with a change in the polarity till the 50% of the width of the defined value.

The MLM currents supply occurs through the use of specific electrodes, used in the several phases of the treatment.

This procedure uses a particular and exclusive carrier: the superselective electrode. It allows to act directly on the furrows through a series of (from 2 to 13) microelectrodes.

This phase is particularly effective on each little wrinkle, more or less deep, because it stimulates the exudative inflammatory phase which recalls the fibroblasts proliferation.

So, after few minutes since the first application we can observe the wrinkle flattening because of the edema.

The use of the lifting function stimulates the cellular renewal, the neo – collagen production by fibroblasts with evident and lasting results after about ten applications. It's possible to obtain the metabolism rebalacing through the MLM currents, with an improving of the cellular trophism, thanks to the ATP and membrane conveyance increase.

This function has its use also in the stria atrophica (stretch mark) which show a loss in the fibroblasts, collagen and elastin production, in the melanin activity reduction and in the local sprinkling.

### *Previous studies about the MLM theories*

Previous studies have been conducted about the results of the MLM theories application through biopsy of patients who have required the wrinkles' treatment through a device which uses the principle of Rugalift®. These studies are published on "**Treatment pearls from Europe**" and they have been conducted by Torello M. Lotti, G Menchini, C. Comacchi, I. Ghersetich, Department of Dermatology, "University of Siena" Italy, Department of Dermatology, "University of Florence" Italy

## The devise which is used

### As it works

Rugalift® is a device for aesthetical and not medical use.

Rugalift®, used according to the indications, is able to soften the face's wrinkles in natural way and not invasive. It stimulates the natural production of collagen and elastin, which are part of each of us. The results aren't permanent, but they can last some months thanks to a good maintenance program. Its function has been tested according to medical studies.

### How use it

Rugalift® can be used in a very simple way, we must respect all the instructions of the section "directions" and lay the device of the right transformer in the socket, now it is ready to be used. Its switching on occurs laying the microelectrodes on the wrinkle and keeping a finger on the relevant oval of contact; while it can be switched off automatically taking away it from the wrinkle.

After laying the microelectrodes in the wrinkle, within some second Rugalift gives off a sound which becomes more and more frequent when the current supplied intensity. When the current intensity isn't pleasant any longer, you must lift the microelectrodes and come back, for few seconds and after it's possible to go on in the treatment.

1. Connect the Rugalift® plug to the transformer.
2. Connect to a socket (220V)
3. Remove carefully the safety valve from the microelectrodes avoiding to break or bend them.

Wipe off and clean the interested part. A good moisturizing maximizes the result.

Lay slightly the microelectrodes in the wrinkle's furrow in parallel way. After few seconds the current's supply starts and you will feel a intermittent sound signal.

Keep still in the wrinkle's furrow the microelectrodes during the treatment. More time they are kept on the wrinkles, more frequent will be the sound signal emitted by the device.

Lift the microelectrodes as soon as the current is any longer pleasant.

Repeat the operation more times on the same furrow till an overall time of 20-30 seconds for every single wrinkle o part of it.

If there is a long wrinkle, repeat the operation from the previous point more times along the whole length of the wrinkle paying attention to go on the treatment in an uniform way.

Lift Rugalift to move horizontally and lay it again. Don't ever move the microelectrodes horizontally to the wrinkles during the treatment. It could cause some scratches.

After the treatments on the wrinkle, put away the device as showed.

The efficacy evidence of Rugalift is showed by the interested part's reddening. Probable itching feelings are the result of a right treatment. They disappear after 30/40 minutes.

### *Treatments*

To maximize the efficacy is necessary to carry out, with firmness, the use applications and a total treatment. Perform a test on a wrinkle and then measure the treatment cycle according to own need.

Repeat the operation more times on the same furrow till an overall time of 20-30 seconds for every single wrinkle o part of it.

The following wrinkle's smoothing effect (visible after 30minuts) can last also 4/5 days.

The ideal cycle is 3-4 times a week for two weeks.

After a total and continuous cycle of 10 days, the wrinkle's smoothing effect can last also some months because the natural collagen and elastin production has been stimulated.

### *Maintenance*

Carry out a treatment 1 / 2 times a week to keep the obtained results.

## Device security

### *Before use the device*

Before using the device it's important to read these indications and recommendations of general security.

1. Keep away from children.
2. Use for the device's power supply only feeder in conformity with EN 60101.
3. Use in the right and straight position in front of the mirror, non on footstool or stairs or uncertain and unsteady positions.
4. Rugalift can't be used near the water (ex. sinks or baths). The device isn't waterproof, it's important to avoid that it gets wet.
5. It must not be used by pace-maker and other implantations bearer and heart patients without medical advice.
6. It must not be used in risk settings or with a high moisture level (ex. Room after the shower)
7. If a liquid and solid object enters the device, separate immediately and take in some specialized centres or contact the assistance.
8. Use only fittings supplied by the producer.
9. It can't be used by irresponsible people if not assisted by specialized personnel.

### *Specific precautions and recommendations*

1. Don't treat injured skin or with some pathologic sign such as melanoma or other skin cancer, dermatitis, eczema, psoriasis etcetera.
2. It must not be used in a perpendicular way on the interested surface, a stronger or invasive pressure can cause the penetration in the skin and become painful.
3. The microelectrodes must be put on the wrinkle and must not enter in the skin. They have an shock absorber which suits at the wrinkle shape.
4. After the treatment disconnect Rugalift from the power supply, clean it and put it away as indicated in the suitable section.
5. Put attention if the interested area in near the eyes.
6. Consult the doctor in case of probable doubts about the devise use.
7. Use the device only according to its functions.
8. Don't use the device in crowded places where children are playing and can be dangers by other people.
9. Clean and disinfect always, before and after the treatments.

### *Warnings – Important specific recommendations*

- The microelectrodes must be put on the wrinkle. They must not enter it.
- The device is personal and it must be used by other people. If it is used by other people, it's important to buy another applicator.
- Put attention if the interested area is near the eyes.

## Technical details

- Power supply: 12Vcc + -3% through the right transformer
- Transformator: Type AC/DC 220Vac/12Vcc branded EN60601 for MEDICAL USE
- Bundle absorption: 183 mA
- Sizes and weight: 152x47x21mm max- CA58 gr only the body
- Current peculiarities MLM
- Outgoing maximum current: 4mA @ (0.1-10K) Ohm
- Outgoing maximum voltage: 4V @ 1000 Ohm
- Outgoing wave shape: sinusoidal a 6000 Hz modulated in its width through a diadinamic Difase at 100hz
- Sounds indications: Pulsating and increasing sound signal according to the supplied current

### *Working parameters*

- Temperature 10°C/+40°C
- moisture 30% a 70% RH (non condensed)
- Pressure from 860hPa to 1060hPa (from 0.860 to 1.060 bar)
- Storage: place the device without the transformator, in its original package. If there is no package put attention to place in a dry place, away from children and without any load on it. It's important that no mechanic pressure is exercised on it.

Storage parameters:

- Temperature 0°C/+50°C
- Moisture 20% a 80% RH (non condensed)
- Pressure from 860hPa to 1060 hPa (from 0.860 to 1.060 bar)

### *Certifications and rules*

The device has been produced according the standards of security and the specifications of the aesthetic field. Apart from the EC certifications, which is compulsory by the Producer, the device has been further tried out and tested by independent and conformities companies by the right authorities (Prima Ricerca s.r.l. [www.primaricerca.it](http://www.primaricerca.it)).

#### Device's authentications

Product identification: model Rugalift®

Product description: electrical stimulator with Microelectrodes for wrinkles.

Producer: Fatrotek s.r.l. Via Case Rosse n° 22, 84100 Salerno

EMC.TR.04.1288, SAF.TR.041350 Technical report certificate n° 04.259 issued by Prima Ricerca s.r.l. 22100 Taverola (CO).).

Classification: Class A Group II type BF Norme:

- CEI 62-39 (1992-10) Electrical Equipment for aesthetic use
- EN 60601-1-2 (2001) Medical electrical equipment Part 1-2: General requirements for safety – Collateral standard: EMC – Requirements and Tests
- EN 60601-2-1 (2001-11) Medical electrical equipment Part 2-10: Particular requirements for the safety of nerve and muscle stimulators.
- EN 60601-1 (1990-08) Medical electrical equipment Part1: General requirements for safety and its amendments: EN60601-1/Ec (1994-07) + A1 (1993) + A1/Ec (1994-07) + A2 (1995-06) + A13 (1996-01).

### *Producer's quality system*

The device is produced in Italy by Fatrotek s.r.l. whose quality system is certified ISO 9001:2000 with the certificate n° 9170.FATR by the CSQ ([link at the site www. csq.it](http://www.csq.it))

## Research results

The skin ageing is a phenomenon caused by both intrinsic causes (chronoageing) and extrinsic or environmental ones (photoageing) (1,2). Usually we distinguish the biological ageing (or chronological) and photoageing (dermatoheliosis or "photoaging"), where the alterations are caused by the cumulative action of the sunrays.

Many of the signs of the chronological ageing are caused by the sun. The two processes are biologically different, different is also their clinical expression: it's sufficient to compare the skin of an old man's arm, near the axillary lines with the external part of the forearm, this area is particularly exposed to the sun.

Generally, the skin shows its first ageing signs during the fourth decade and it's logical to think that the molecular alterations are the basis of this process. During the senile age the main functions of the skin are: protection, absorption, accumulation, excretion, secretion, pigmentogenesis, sensorial perception, thermoregulation, immune function.

The wrinkles' production and evolution, the most important ageing sign, hasn't been explained yet. They are furrows present in some areas of the body, above all where the skin is stressed by the muscular action. The area par excellence is the face, where there are, apart from the wrinkles caused by the ageing, (expression wrinkles or muscle-gesture and gravitational wrinkles), there are also the actinic ones. The wrinkles can be caused also by speedy loss of weight.

### Considerations

Wrinkles' prevention and therapy have been studied for years. Significant results can be obtained through medical techniques (ex. Botolinus, which is suitable for the wrinkles around the eyes) or surgical ones (ex. Several laser). They are expensive techniques which require a particular experience to reduce the possibility of side effects and definitive damages.

For this reason the new techniques have their importance, they have a lower price, the result can be obtained without side effects, even if the treatments must be done over and over.

According to this, the use of Rugalift is suitable for the treatment of the face's wrinkles with a different length and depth. The possibility that it can be used by the subject who wants to see the good results gives more validity.

### SAS Principle (Skin Age Score)

The "Skin Age Score" evaluation has been proposed [3] to express numerically the chronological aspect of the face. The proposal, made by French researchers, is based on the use of 24 parameters, according to the experience observing the skin of 361 female patients with an age between 18 and 80 anni.

In these women a close relationship has been demonstrated between the chronological age and the evaluation of: comedo, milium, hyperpigmented macula, wrinkles, reduced erythematous answer, in their variety and gravity. This method shows a linear progression of the global evaluation for subjects with an age between 30 and 70, with two plateau before and after the two indicated limits of age.

## Method

26 patients (W 25; M 1) with an age between 30 and 65 anni have been enlisted, with a significant sample > 50% in age brackets between 40 and 50.

The treatments have been done through the electromedical device Rugalift®.

During each sitting the microelectrodes have been put on the wrinkles of the forehead, around the eyes, on the furrows around the nose and on the upper lip till a subjective endurance of the itching / prick sensation (few seconds, according to the area, the individual and/ or daily endurance, etc), this operation must be repeated 4 times on each wrinkle with a total time of 20-30 seconds on each wrinkle.

All the patients have 3 weekly sittings with a total of 12 sittings

Before the treatment ( $T_0$ ) the Skin Age Score (SAS) has been calculated.

To estimate the wrinkles' level the linear wrinkles' atlas has been used (photographic score).

Furthermore, during the observation phase also some instrumental probes have been conducted: transepidermic evaporation measurement (TEWL), horny and sebo one

The evaluation of the treatment efficacy has been issued through some photos taken according to established times:

1. at the beginning of the treatment ( $T_0$ )
2. 30 minutes after the treatment ( $T_1$ )
3. in the middle of the treatment ( $T_2$ ) (14 days)
4. at the end of the treatment ( $T_3$ ) (28 days)



5. after 30 days (T<sub>4</sub>) from the treatment interruption
6. after 60 days (T<sub>5</sub>) from the treatment interruption

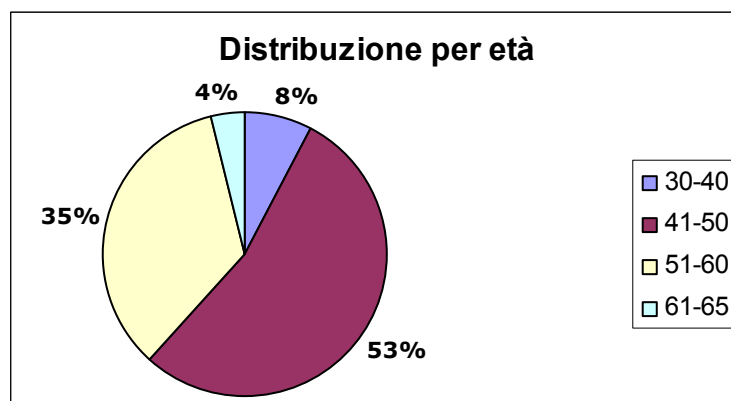
The exclusion criteria were: the exposure to sunlight and UV artificial source, recent chemical peeling, infectious disease, allergic contact dermatitis because of nickel, pacemaker bearers.

## Results

Among 26 patients, 17 have concluded the treatment and 9 have given up it, 7 because of personal reasons, unconnected from some allergy, and 2 because of contact answer. The two contact answers, according to the use of Rugalift, can be likely interpreted as an initial expression of an allergic contact dermatitis, because one of the patients said that in the past she had suffered from some eczematous effect touching bijouterie.

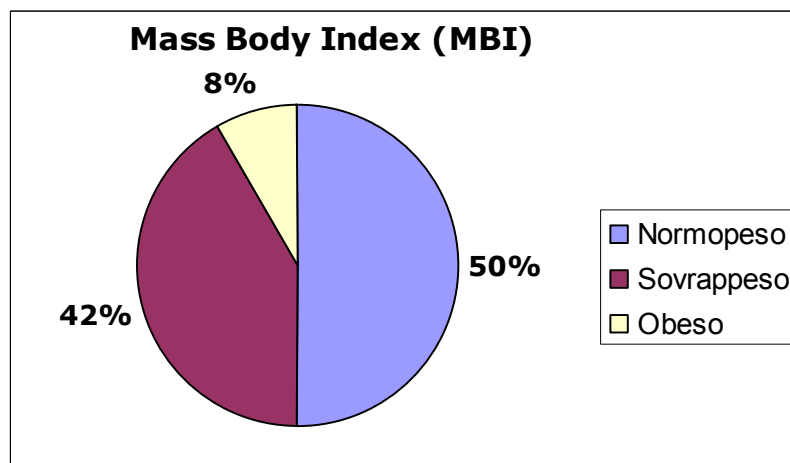
The 53% of the patients were between 41 and 50 year, 35% between 51 and 60, those ones between 61 and 65, 30 and 40 represented respectively the 4% and 8%.

Age arrangement



According to the patients' anamnesis it has been found that the 50% of the enlisted patients smokes, the 54% of the women is in menopause, the 75% of them uses sun filters, the 21% undergoes UV sunlamp treatments; furthermore, according to the *Mass Body Index* (MBI) estimate the 50% of the patients has a normal weight, the 42% is over weight and the 8% is obese.

Mass Body Index Normal weight Over weight Obese



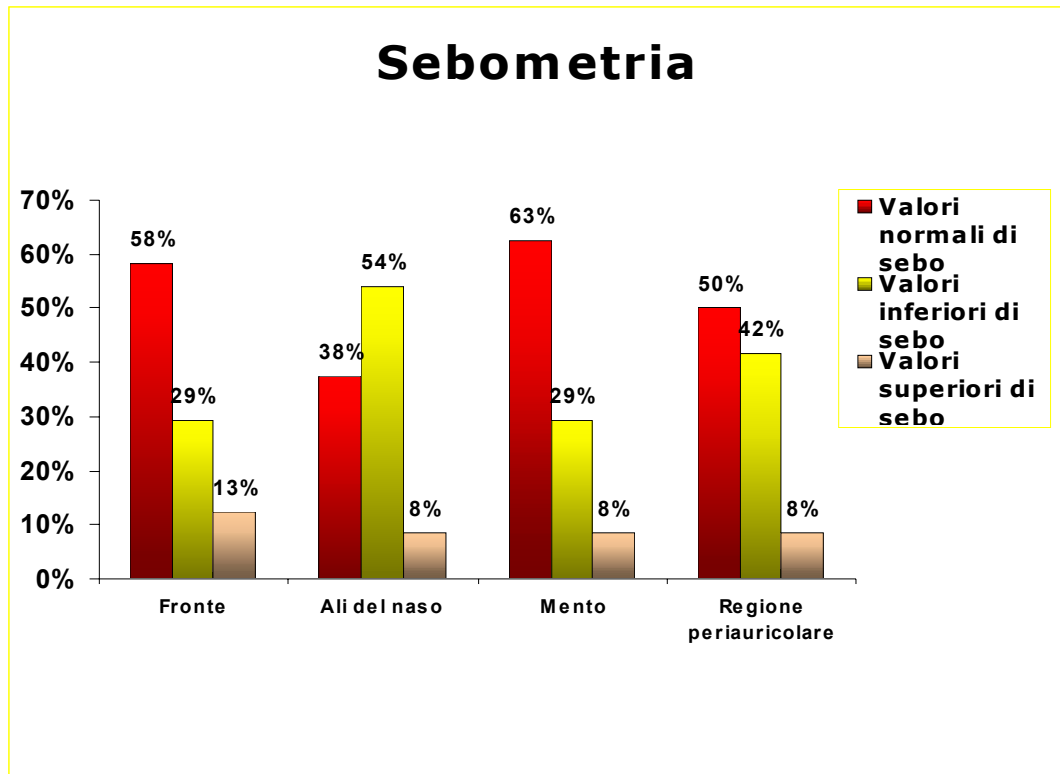
The horny measurement is a technique which measures the skin's capacitance, and it expresses the moisturizing level, it has been pointed out that the 58% of the subjects had a normal moisturized skin and the 42% had a dehydrated one.

The data according to the sebo quantity, established through the sebo measurement, were in the limits in all the examined areas, except the area around the nose, where there are lower values.

In all the patients who have concluded the treatment and in those ones who show more evident ageing signs the results have been good. Thanks to the experience obtained using Rugalift, we have noticed

that its efficacy is visible after only 20/30 minutes, at the end it's possible to see a softening of the treated wrinkle.

Sebo measurement Normal values of sebo Lower values of sebo Higher values of sebo  
Forehead External parts of the nose Chin Periaricular area



In the wrinkles "lips edging" the efficacy can be noticed during the make up phase; indeed, when the lipstick is used among the lips, this will not smear inside the wrinkles. The device appears, for this reason, suitable for the make up. It has been pointed out that also a little quantity of foundation cream is necessary to cover, always totally, the wrinkles which have been just treated.

### Photographic evaluation

"Facial" wrinkles. Treatment for 30 seconds and photo after 20 minutes.



Deep expression wrinkle. Treatment for 20 seconds and photo 30 minutes.



“Crow's feet”. Treatment for 35 seconds and photo after 35 minutes.



Expression wrinkle. Treatment for 20 seconds and photo after 15 minutes.



Expression wrinkles around lips. Treatment of 22 seconds and photo after 16 minutes.



Labial wrinkles and around the lips. Two treatments of 30seconds and photos after the second treatment.



### Contraindications

It is suggested that Rugalift can't be used in subjects who suffer from allergy to metals, a suspicious allergy or demonstrated according to patch test or other prompt skin test.

### Conclusions

Thanks to the photos, it's been possible to notice a reduction of the wrinkles' depth in all the patients who have concluded the treatment and in those ones who show more evident ageing signs.

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