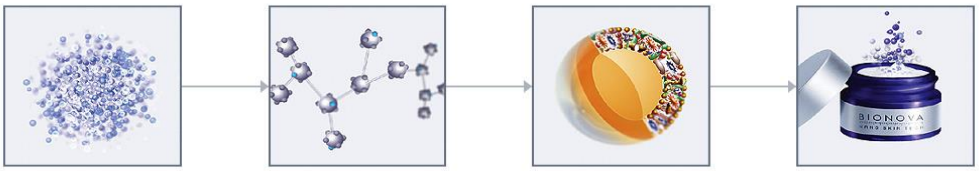
B I O N O V A



EFFICACY DATA

for

INTENSIVE CARE SERUMS

2010

INDEX

PART 1: IN-VIVO EVALUATION OF INTENSIVE CARE SERUMS FOR FACE AND EYE AREAS

Clinical studies was conducted to evaluate the efficacy of two BIONOVA's Intensive Care Serums for Facial and Eye Areas for there ability to enhance skin's homeostatic system reflecting in healthy looking skin, reduction of skin's fatigue and slowing down wrinkle formation.

INTRODUCTION

Intensive Care Facial Serums are based on BIONOVA's nanotechnological platform for creating products oriented toward enhancement of self-healing processes with specific curative effects to repair malfunctioning biological information transfer. This technological platform is based on the development of Bioactive Complexes Modeling (NANO-COMPLEXES™), which gives the ability to manipulate not only with Nano (10^{-9}), but also with Pico (10^{-12}) quantities of biologically active substances, targeting the problem-specific biochemical pathway. These usage amounts of bioactive substances in NANO-COMPLEXES™ are precisely within the physiological range of a Living Organism.

Intensive Care Serums consist of indigenous for Human Organism Bioactive NANO-COMPLEXES™ stabilized in the NuCell-Direct™ delivery system. Each Intensive Care Serum is formulated from NANO-COMPLEXES™ specifically adjusted to the targeted area. Bellow is the list of NANO-COMPLEXES™ used in formulations:

- B-TB NANO-COMPLEX™: AGE & WRINKLE CONTROL NANO-COMPLEX™ for prevention of signs of premature aging of skin and containing short chain polypeptides and glycoproteins;
- M-IT NANO-COMPLEX™: BIOACTIVE TRANSMITTERS NANO-COMPLEX™ for providing inter and intra-cellular signaling transmission;
- M-AX NANO-COMPLEX™: ANTIOXIDANT & ANTI-FREE RADICAL SCAVENGERS NANO-COMPLEX™ - complex of multiple potent antioxidants & anti-free radical scavengers stabilized in NuCell-Direct™ delivery system;
- A-VCB NANO-COMPLEX™: VITAMIN-COENZYME NANO-COMPLEX™ - complex of water soluble vitamins with their specific coenzymes and oil soluble vitamins stabilized in NuCell-Direct™ delivery system;
- A-SBRS NANO-COMPLEX™: SKIN BARRIER NANO-COMPLEX™ - complex of multiple bioactive lipids, bioactive carbohydrates, glycolipids and other bioactive substances for modeling natural Skin Barrier System to hydrate and protect the skin;
- A-IDL NANO-COMPLEX™: INTERMEDIATE DENSITY LIPOPROTEINS NANO-COMPLEX™ composed of bioactive substances modeling intermediate density lipoproteins to restore and protect skin lipids;
- NU-CELL DIRECT™ DELIVERY SYSTEM, a unique novel delivery system especially formulated for stabilization and delivery of bioactive substances formulated for Intensive Care Facial Serum. The composition and structure of the delivery system approximates the structure of a natural cell membrane. NuCell-Direct™ composed of highly specialized proteins, carbohydrates, and lipids; the very same ones that comprise the human cell membrane. The NuCell-Direct™ is capable of delivering both, water soluble as well as oil soluble actives. The active ingredients are entrapped within the delivery system and acting synergistically in one "unit". NuCell-Direct™ technology has dual function: (1) stabilization of the non-stable active ingredients and (2) penetration enhancer with time release effects.

1.1. SONOGRAPHIC EVALUATION OF INTENSIVE CARE SERUM ON FACIAL SKIN

PARTICIPANTS

28 women panelists in age 32 –57 who could meet the study criteria's were screened for the ultrasonic imaging of facial skin.
Eighteen (18) panelists selected for participation in the test phase of the study had received Intensive Care Facial Serum. Another ten (10) panelists selected for participation in the placebo (control) study and received only pure serum base without Bioactive Nano-Complexes™.

TEST PHASES

- Phase 1 – Study Week 1
- Phase 2 – Study Week 2
- Phase 3 – Study Week 3
- Phase 4 – Study Week 4
- Phase 5 – Study Week 5
- Phase 6 – Study Week 6
- Phase 7 – Study Week 7
- Phase 8 – Study Week 8
- Phase 9 – Study Week 9
- Phase 10 – Study Week 10

ANALYZED PARAMETERS

According to the published scientific data ultrasonic imaging technique of the skin is a reliable non-invasive test to determine the skin thickness and dynamics of its changes during the treatment of skin care products.

Ultrasonically on the images, the skin appears as two bands: a dark superficial one where the ultrasonic waves are propagated in a relatively homogenous or non-echogenic medium, and a deeper one, which is lighter in color, suggesting a heterogeneous medium.

The ultrasonic imaging technique we used provided cross-sectional images of facial skin in vivo with a resolution of about 80 microns axially (deep into the skin) and 250 microns lateral (parallel to the surface).

SUMMARY OF RESULTS

Table 1: Ultrasonic Imaging Data of Women in Test Group

Women on age 50 -55	
Week of Observation	Facial Skin Thickness (mm)
Week 1	0.185
Week 2	0.186
Week 3	0.191
Week 4	0.201
Week 5	0.205
Week 6	0.221
Week 7	0.233
Week 8	0.236
Week 9	0.239
Week 10	0.241

Women on age 30 - 40	
Week of Observation	Facial Skin Thickness (mm)
Week 1	0.325
Week 2	0.329
Week 3	0.332
Week 4	0.336
Week 5	0.339
Week 6	0.343
Week 7	0.345
Week 8	0.348
Week 9	0.35
Week 10	0.353

Table 2: Ultrasonic Imaging Data of Women in Placebo Group

Women on age 50 -55	
Week of Observation	Facial Skin Thickness (mm)
Week 1	0.186
Week 2	0.1 86
Week 3	0.186
Week 4	0.187
Week 5	0.187
Week 6	0.187
Week 7	0.187
Week 8	0.189
Week 9	0.189
Week 10	0.189

Women on age 30 - 40	
Week of Observation	Facial Skin Thickness (mm)
Week 1	0.325
Week 2	0.325
Week 3	0.335
Week 4	0.335
Week 5	0.336
Week 6	0.336
Week 7	0.336
Week 8	0.336
Week 9	0.337
Week 10	0.337

Diagram 1: Dynamics of Changes in Skin Thickness Changes of Woman in Test Group (Age 50-55)

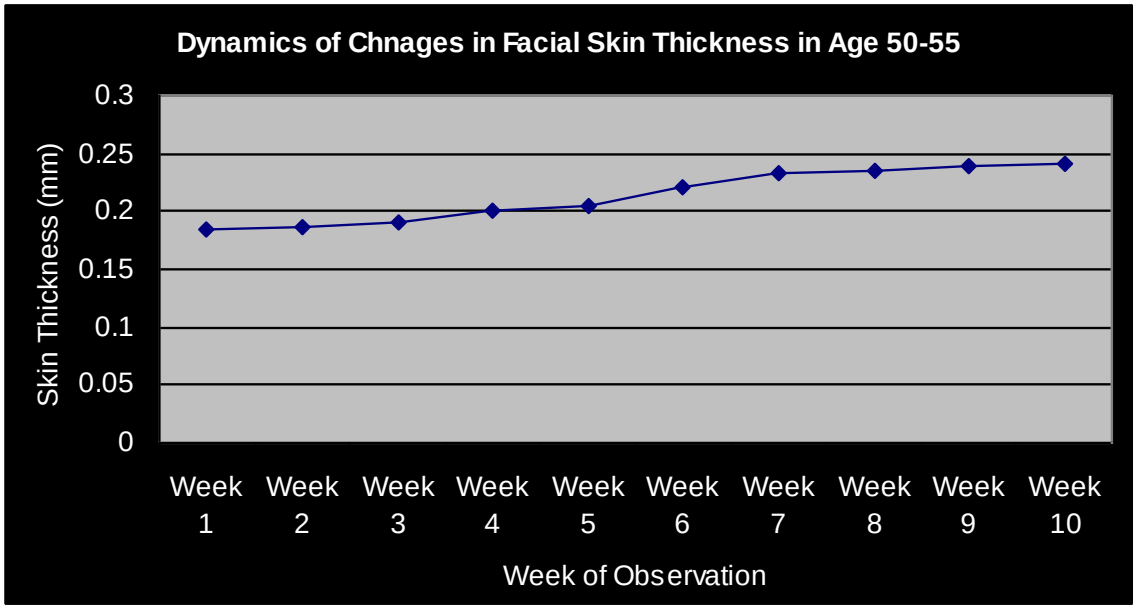
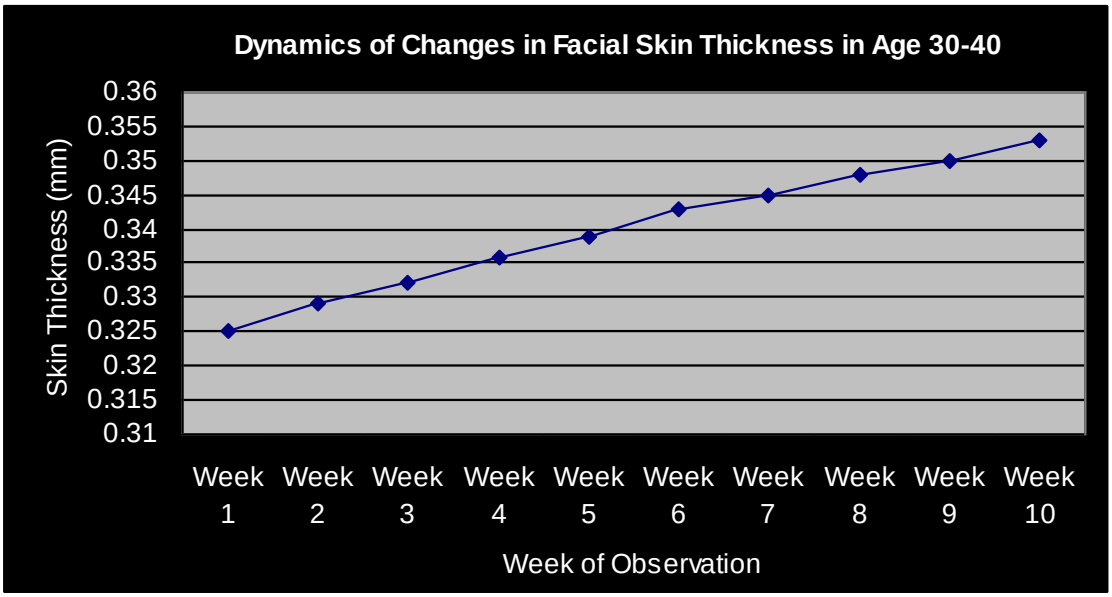
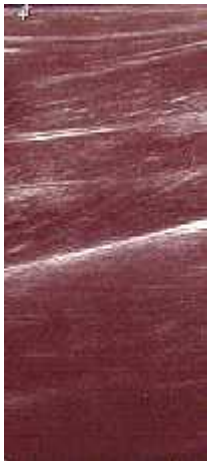


Diagram 2: Dynamics of Changes in Skin Thickness Changes of Woman in Test Group (Age 30-40)



Example: Ultrasonic Imaging Data of Woman in Test Group (Age 50-55)

Week 1	Week 2	Week 3	Week 4	Week 5
				
0.185 mm	0.186 mm	0.191 mm	0.201 mm	0.205 mm

Week 6	Week 7	Week 8	Week 9	Week 10
				
0.221 mm	0.233 mm	0.236 mm	0.239 mm	0.241 mm

Data generated on panelist shows that in age 50 and more (postmenopausal women w/o hormone replacement therapy) use of Intensive Care Serum promoted the average increase of skin thickness from 0.185 – 0.188 mm to 0.241 – 0.250 mm which equals to **30.3 – 33.0%** average increase in skin thickness.

In age 30 to 40 (active reproductive period) use of Intensive Care Serum promoted the average increase of skin thickness from 0.321 – 0.325 mm to 0.353 – 0.358 mm which equals to **8.6 - 11.3%** average increase in skin thickness.

At the same time panelists used placebo (**serum base without Bioactive Nano-Complexes™)** shows no changes in skin sonogram images and its thickness.

CONCLUSION

Skin thickness is a direct and proportional indicator of its elasticity and youthfulness. The data presented above clearly indicates that the tested Intensive Care Serum **increases skin thickness, elasticity up to 33.0 percent in 10 weeks of usage.**

REFERNCES for IN VIVO ULTRASONING IMAGING

Assessment of aging of the human skin by in vivo ultrasonic imaging. De Rigal J, Escoffier C, Querleux B, Faivre B, Agache P, Leveque JL. Advanced Research Laboratories of L'Oreal, Aulnay-sous-Bois, France.

1.2. CONTACT THERMOMETRIC ASSESSMENT OF INTENSIVE CARE SERUM ON FACIAL SKIN

A linear relationship between skin blood flow and temperature was confirmed by numerous of scientific works.
The purpose of this study was to observe dynamics of changes in facial skin temperature during the treatment with BIONOVA's Intensive Care Facial Serum.

PARTICIPANTS

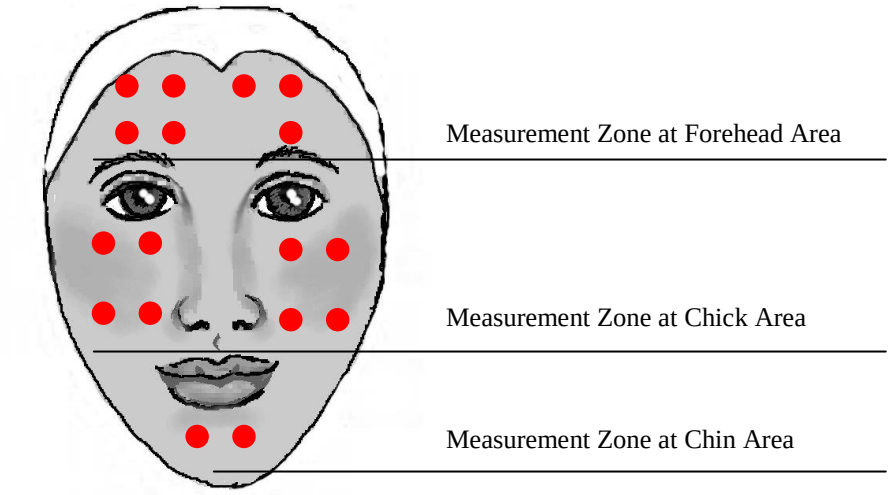
28 women panelists in age 32 –57 who could meet the study criteria's were screened for the ultrasonic imaging of facial skin.
Eighteen (18) panelists selected for participation in the test phase of the study had received Intensive Care Facial Serum. Another ten (10) panelists selected for participation in the placebo (control) study and received only pure serum base without Bioactive Nano-Complexes™.

TEST PHASES

- Phase 1 – Study Week 1
- Phase 2 – Study Week 2
- Phase 3 – Study Week 3
- Phase 4 – Study Week 4
- Phase 5 – Study Week 5
- Phase 6 – Study Week 6
- Phase 7 – Study Week 7
- Phase 8 – Study Week 8
- Phase 9 – Study Week 9
- Phase 10 – Study Week 10

ANALYZED PARAMETERS

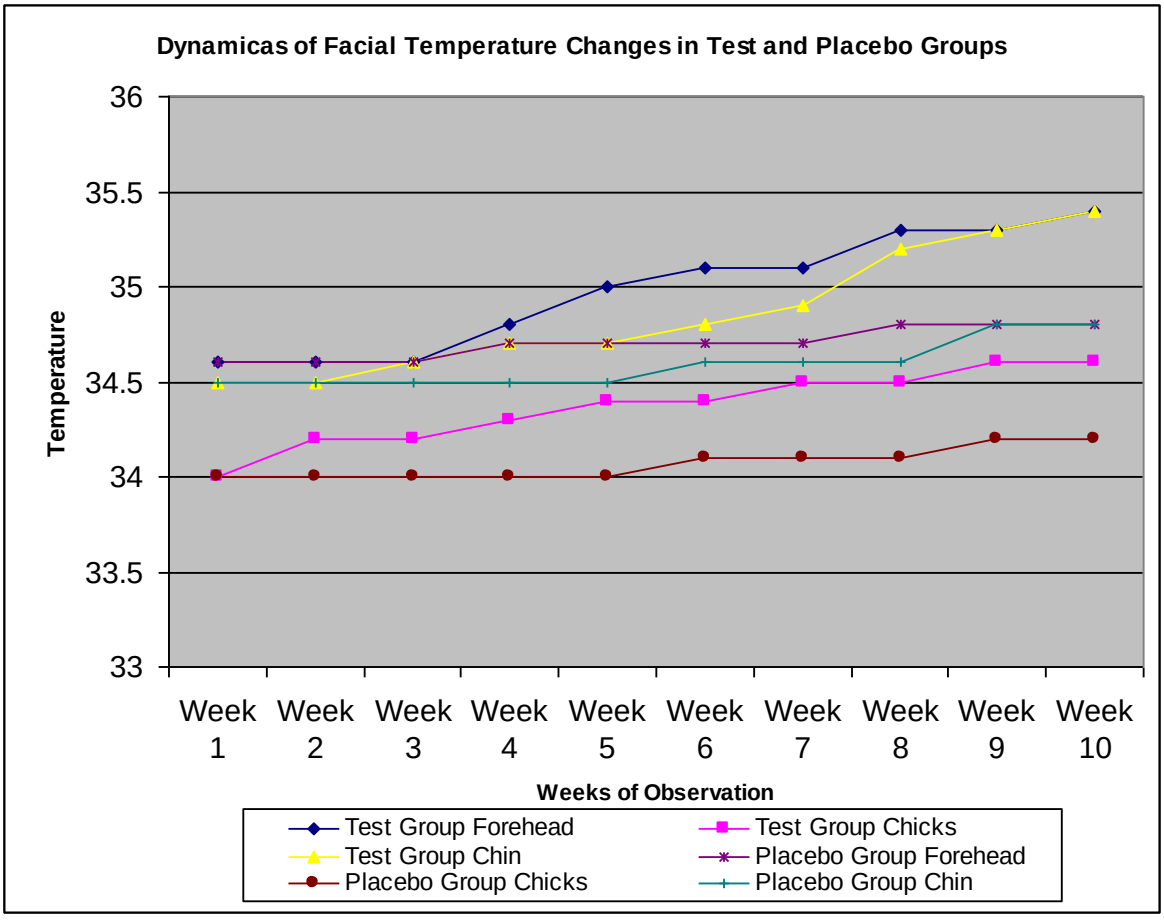
Temperature measurements were taken after 20-minute accommodation of panelists to the room temperature 22°C. The contact thermometric technique we used provided dynamics of facial skin temperature changes with a resolution of 0.1°C. Contact thermometric measurements were taken in 18 constant dots on the following regions of facial skin: Forehead – 8 dots, Chicks – 8 dots, Chin – 2 dots every week during 10 weeks (see a diagram bellow):



SUMMARY OF RESULTS

Results of the study are shown bellow:
Dynamics of Temperature changes in Test and Placebo Groups

	Test Group			Placebo Group		
	Forehead	**Chicks**	**Chin**	**Forehead**	**Chicks**	**Chin**
Week 1	34.6	34.0	34.5	34.6	34.0	34.5
Week 2	34.6	34.2	34.5	34.6	34.0	34.5
Week 3	34.6	34.2	34.6	34.6	34.0	34.5
Week 4	34.8	34.3	34.7	34.7	34.0	34.5
Week 5	35.0	34.4	34.7	34.7	34	34.5
Week 6	35.1	34.4	34.8	34.7	34.1	34.6
Week 7	35.1	34.5	34.9	34.7	34.1	34.6
Week 8	35.3	34.5	35.2	34.8	34.1	34.6
Week 9	35.3	34.6	35.3	34.8	34.2	34.8
Week 10	35.4	34.6	35.4	34.8	34.2	34.8
△T	0.8	0.6	0.9	0.2	0.2	0.3



The test data showed a steadily increase of the facial temperature up to 0.8°C in test group. That correlates to increase of skin blood circulation up to 2.5%. In placebo group temperature dynamics fluctuated in range 0.2°C that indicates at the absence of blood circulation increase.

CONCLUSION

There is a linear relationship between skin blood flow and local skin temperature. The data presented above indicates that the tested Intensive Care Facial serum **promotes steady increase of facial skin blood flow up to 2.5 percent in 10 weeks of usage.**

REFERENCES

Journal of Investigative Dermatology (1987) 88, 586–593; doi:10.1111/1523-1747.ep12470202
Blood Flow, Temperature, and Heat Loss of Skin Exposed to Local Radiative and Convective Cooling
A Lena Nilsson
Department of Biomedical Engineering, Linköping University, Linköping, Sweden

1.3. IN-VIVO EVALUATION OF EYE AREA INTENSIVE CARE SERUM FOR ITS ABILITY TO INCREASE VISCOELASTICITY OF THE SKIN IN EYE AREA

This study was conducted to evaluate the efficacy of the BIONOVA's Eye Area Intensive Care Serum for its ability to increase viscoelasticity of the skin around eyes.

PARTICIPANTS

Fifteen (15) panelists were selected for participation in the test phase of the study. All panelists have Moderate and Advanced fine lines near the eye, as determined by the modified Glogau classification.

EFFICACY TEST

Test Sites: The skin around the crow's feet area of the eyes.

Phases (Measurement Intervals):

- Visit I - Baseline - ballistometer measurements was taken on Test Day 0
- Visit II - After three weeks of product use
- Visit III - After six weeks of product use
- Visit IV - After nine weeks of product use

Panelists were randomly assigned either the test material or a placebo control. They were given sufficient test material to use two times a day for nine weeks.

Ballistometer Measurement

The Ballistometer was used to measure the firmness of the skin around the crow's feet area of the eyes. The Ballistometer scores increased where the skin become more firm.

Statistical Analysis

All Ballistometer parameters were analyzed by repeated Analyzes of Variance measures.

ADVERSE EFFECTS

No adverse effects were noted during the course of the study.

TOLERANCE

Eye Area Intensive Care Serum is based on the physiological substances which are equivalent to those which are bio-physiologically produced in the human organism. Namely, active ingredients in Eye Area Intensive Care Serum are 100% physiological to the human organism. They contain only what the human body has already produced, but for different reasons cannot accept at the cellular level.

SUMMARY OF RESULTS

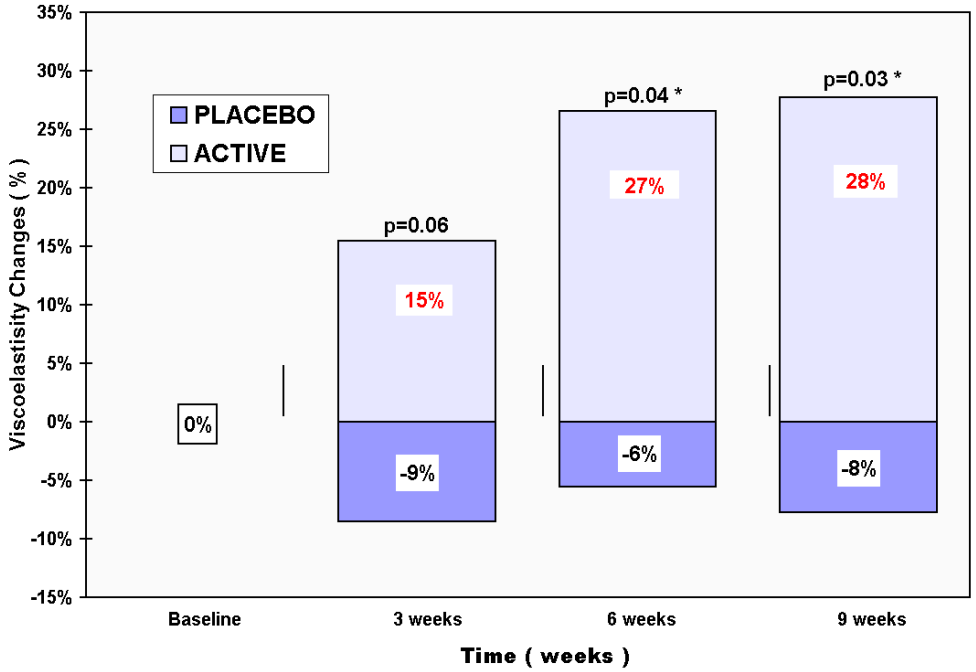
The results of the study show that 100% of the test panelist who received the formula containing BIONOVA bioactive complexes for Eye Area Wrinkles & Aging experienced positive improvement ranging from moderate to superior.

The results indicated that at week six (6), Ballistometer parameters for the treated group were significantly higher than in the control group ($p<0.04$). On the chart, we can observe ~ 18% increase of Ballistometer test scores in three weeks in the treated group. Continued usage of product increases Ballistometer test scores up to ~ 27% at week six and stabilized these scores at week nine. During the same time period viscoelasticity of the eye area in the control group decreased by ~ 8%.

All the above Ballistometer test results illustrate that in using BIONOVA's Cream for Eye Area it is possible to increase viscoelasticity of the skin and reduce the puffiness in the delicate eye area by ~ 28-35% after six weeks of use of the test formula when compared to the control.

Note: For additional targeted results provided by specific Nano-Complexes see appropriate data.

EFFECTS OF BIONOVA'S CREAM FOR EYE WRINKLES AND AGING



BASIC EFFECTS OF BIONOVA'S CREAM FOR EYE AREA WRINKLES & AGING

- Revives skin cell metabolism and reduces the signs of aging around eyes
- Increases elasticity and firmness of the Eye Area Skin
- Replenishes synthesis of skin natural collagen, elastin, and glycoprotein to minimize fine lines and wrinkle appearance
- Natural antioxidants and bioflavonoids protect the skin against damaging free radicals and oxidative stress
- Potentate anti-aging effects and preserve skin's youthful appearance
- Complex of essential vitamins and their coenzymes increases skin cell healing ability, energizes and nourishes the skin, reduces capillary permeability and increases oxygen utilizat

PART 2: EVALUATION OF SPECIFIC NANO-COMPLEXES ™ CONSTRUCTING THE INTENSIVE CARE SERUMS

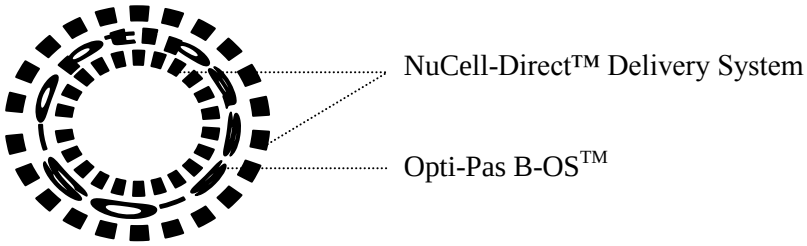
2.1. EVALUATION OF B-OS NANO-COMPLEX ™ FOR SEBUM OUTPUT REDUCTION

INTRODUCTION

The proprietary B-OS NANO-COMPLEX™ for Sebum Output Reduction is a unique complex of bioactive substances used in nano (10^{-9}) and pico (10^{-12}) quantities and incorporated into specially developed NuCell-Direct™ delivery system.

B-OS NANO-COMPLEX™ has been used in Intensive Care Serum in concentration up to 0.225%.

Diagram of B-OS NANO-COMPLEX™



PARTICIPANTS

Thirty (30) female subjects that had excessively oily skin and who could meet the study schedule were screened for the degree of oil production. Fifteen (15) panelists with the greatest oil production were selected for participation in the test phase of the study. Another fifteen (15) panelists were selected for participation in the placebo (control) phase of the study.

EFFICACY TEST

Test Sites

The chin, left and right sides of the forehead and cheeks (nasolobial fold).

Phases (Measurement Intervals)

- Baseline - evaluation of sebum production was made on Test Day 0
- Three weeks - post treatment
- Six weeks - post treatment

Panelists were randomly assigned either the test material or a placebo control. They were given sufficient test material to use two times a day for six weeks.

The test sites were wiped with 70% isopropyl alcohol and sebutape strips were applied to the left and right sides of the forehead and cheek (nasolobial fold) and to the chin. After thirty minutes of contact, the tapes were removed and sent for image analysis to quantify sebum production.

Sebutape Analysis

The sebutape analysis was evaluated by Image Analysis as follows:

- Prior to each analysis session and periodically during each session, the lighting conditions and system response was standardized to a reference gray target, ensuring reproducible illumination response at the video frame grabber.
- The patient data from each card was entered and through use of the same macro, each of the five sampled areas were measured by the analysis software. This assured identical manipulation of every analyzed area.
- The two (2) pieces of information gathered from the dark area on the sebutape patches representing trapped sebum were the number of spots and the total area of the spots detected in a given area (approximately 10mm * 8.2mm) of the patch. The area of spots was converted to nominal volumetric units from the known pore volume of the sebutape material (38%) and the thickness (0.0025cm).

Analyzed Parameters

- AG - the amount of Active Gland Count was expressed as counts/cm^2.
- SO (RSDR) - sebum output (Relative Sebum Delivery Rate) - volumetric sebum output was expressed as nanoliters/cm^2.
- IR - computed Inherent Rate = SO/AG.

Statistical Analysis

AG, SO and IR parameters were analyzed by repeated analysis of variance, as well as by linear regression by Least Square Method (LSM).

ADVERSE EFFECTS

No adverse effects were noted during the course of the study.

TOLERANCE

B-OS NANO-COMPLEX™ is based on the physiological substances, which are equivalent to those, which are bio-physiologically produced in the human organism. Namely, active ingredients in BIONOVA's B-OS NANO-COMPLEX™ are 100% physiological to the human organism. They contain only what the human body has already produced, but for different reasons cannot accept at the cellular level. BIONOVA's B-OS NANO-COMPLEX™ is non-toxic and physiologically innocuous.

SUMMARY OF RESULTS

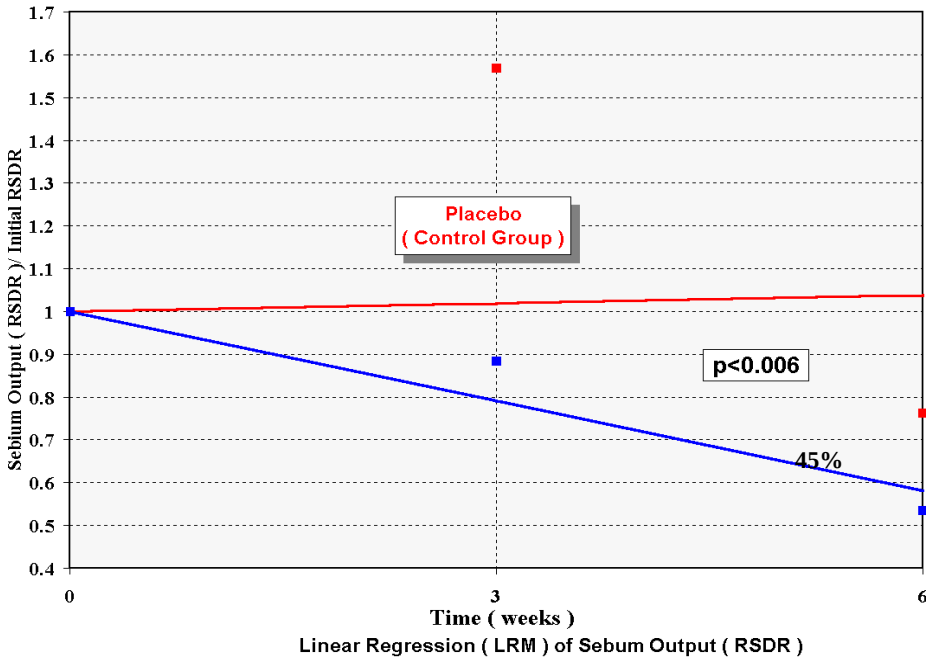
The results of the study show that 100% of the test panelist who received the formula containing BIONOVA bioactive complexes for Oily Skin experienced positive improvement ranging from moderate to superior.

The results indicated that at week six (6), Sebum Output (RSDR) and the Inherent Rate (IR) parameters for the group treated with B-OS NANO-COMPLEX™ were significantly lower than baseline ($p<0.006$ and $p<0.0176$ respectively), while there was no significant difference in either parameters for the control group.

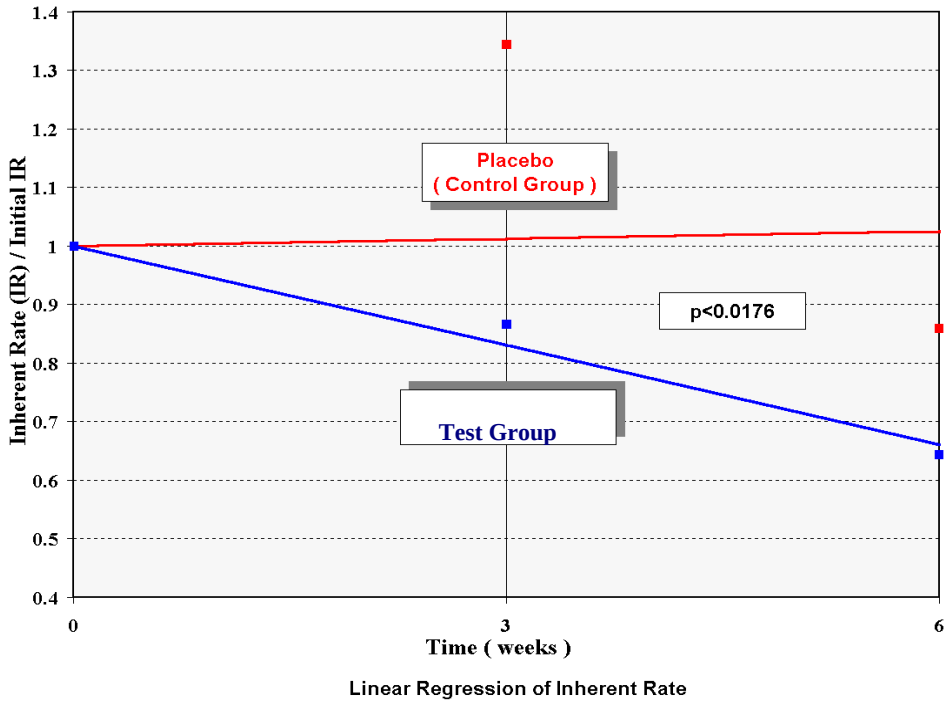
On the following charts, we can observe that in the group treated with B-OS NANO-COMPLEX™, the RSDR (relative sebum delivery rate) in three weeks reduced by ~ 14 - 20%, and in six weeks RSDR reduced by ~ 42 - 45%. At the same time IR (Inherent Rate) in the group treated with B-OS NANO-COMPLEX™ in three weeks reduced by ~ 14 - 18%, and in six weeks IR reduced by ~ 35%.

These data illustrate that using BIONOVA's B-OS NANO-COMPLEX™ it is possible to reduce endogenous sebum production by ~ 40 - 45% after six weeks as compared to the control. It is important to note that the actual number of active glands remained the same. Only the sebum output per gland decreased at each concentration tested.

EFFECTS OF BIONOVA'S B-OS NANO-COMPLEX™ ON SEBUM PRODUCTION



EFFECTS OF BIONOVA'S B-OS NANO-COMPLEX™ ON SEBUM INHERENT RATE



BASIC EFFECTS OF BIONOVA'S B-OS NANO-COMPLEX™

- Normalize endogenous oil production of the skin. Significant reduction in sebum production and normalization of the sebaceous gland function will be observed in 20 - 40 days and skin will remain normalized for an extended time period.
- Prevents blemishes and blackheads for clear and shine-free skin appearance.
- Complex of natural inhibitors of inflammation prevents and reduces skin inflammation and exerts anti-bacterial effects.
- Stabilizes extracellular matrix of the skin.
- Provides time-release effects of the active ingredients.

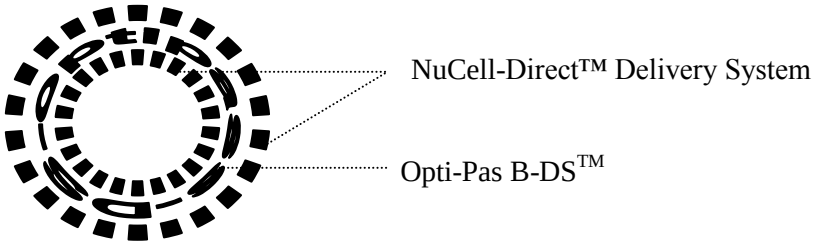
2.2. EVALUATION OF B-DS NANO-COMPLEX ™ FOR SEBUM OUTPUT INCREASE

INTRODUCTION

The proprietary B-DS NANO-COMPLEX™ for Sebum Output Increase is a unique complex of bioactive substances used in nano (10^{-9}) and pico (10^{-12}) quantities and incorporated into specially developed NuCell-Direct™ delivery system.

B-DS NANO-COMPLEX™ has been used in Intensive Care Serum in concentration up to 0.2%.

Diagram of B-DS NANO-COMPLEX™



PARTICIPANTS

Thirty (30) female subjects that had dry skin and who could meet the study schedule were screened for the degree of sebum production. Fifteen (15) panelists with dry skin were selected for participation in the test phase of the study. Another fifteen (15) panelists were selected for participation in the placebo (control) phase of the study.

EFFICACY TEST

Test Sites
The skin of the forehead, cheeks and chin.

Phases (Measurement Intervals)

- Visit I - Baseline - evaluation of sebum production was taken on Test Day 0
- Visit II - After three weeks of product use
- Visit III - After six weeks of product use
- Visit IV - After nine weeks of product use

Panelists were randomly assigned either the test material or a placebo control. They were given sufficient test material to use two times a day for nine weeks.
The test sites were wiped with 70% isopropyl alcohol and sebutape strips were applied to the left and right sides of the forehead and cheek (nasolobial fold) and to the chin. After thirty minutes of contact, the tapes were removed and sent for image analysis to quantify sebum production**.**

Sebutape Analysis

The sebutape analysis was evaluated by Image Analysis as follows:

- Prior to each analysis session and periodically during each session, the lighting conditions and system response was standardized to a reference gray target, ensuring reproducible illumination response at the video frame grabber.
- The patient data from each card was entered and through use of the same macro, each of the five sampled areas were measured by the analysis software. This assured identical manipulation of every analyzed area.
- The two (2) pieces of information gathered from the dark area on the sebutape patches representing trapped sebum were the number of spots and the total area of the spots detected in a given area (approximately 10mm * 8.2mm) of the patch. The area of spots was converted to nominal volumetric units from the known pore volume of the sebutape material (38%) and the thickness (0.0025cm).

Analyzed Parameters

- AG - the amount of Active Gland Count was expressed as counts/cm^2.
- SO (RSDR) - sebum output (Relative Sebum Delivery Rate) - volumetric sebum output was expressed as nanoliters/cm^2.
- IR - computed Inherent Rate = SO/AG.

Statistical Analysis

AG, SO and IR parameters were analyzed by repeated analysis of variance, as well as by linear regression by Least Square Method (LSM).

ADVERSE EFFECTS

No adverse effects were noted during the course of the study.

TOLERANCE

B-DS NANO-COMPLEX™ is based on the physiological substances, which are equivalent to those, which are bio-physiologically produced in the human organism. Namely, active ingredients in B-DS NANO-COMPLEX™ are 100% physiological to the human organism. They contain only what the human body has already produced, but for different reasons cannot accept at the cellular level.

SUMMARY OF RESULTS

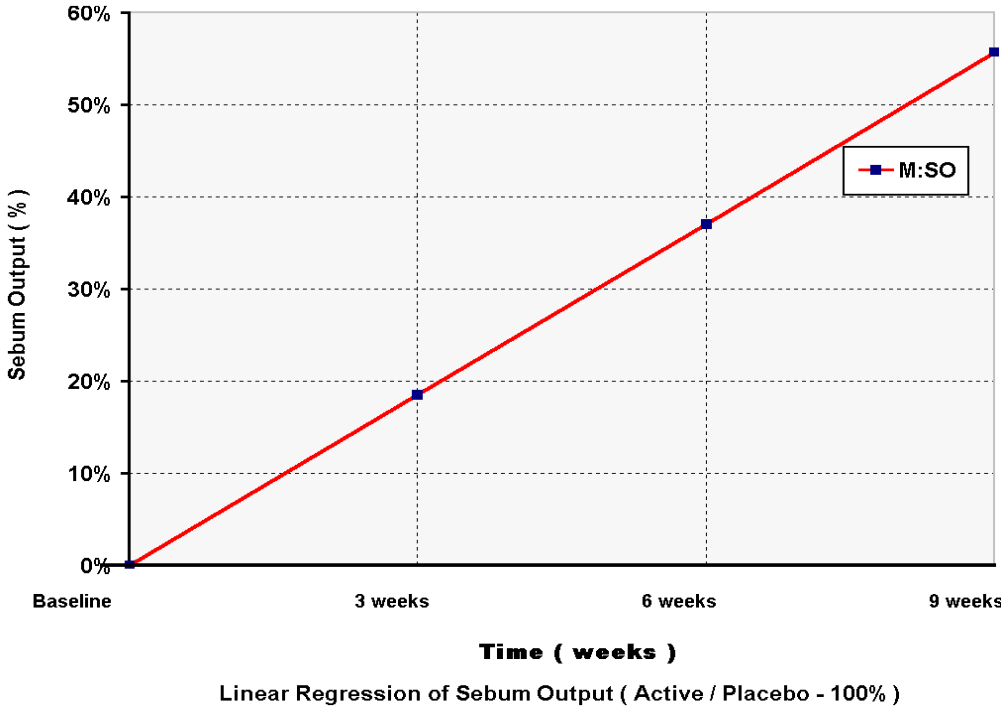
The results of the study show that 100% of the test panelist who received the formula containing BIONOVA bioactive complexes for Dry Skin experienced positive improvement ranging from moderate to superior.

Test results indicated that at the beginning of week six, Sebum Output (RSDR), Active Gland Count (AG), and Inherent Rate (SO/GC) parameters for the group treated with BIONOVA Cream for Dry Skin were significantly higher than the baseline, while there was no significant difference for either parameters in the control group.

On the following charts, we can observe that in the group treated with BIONOVA bioactive cream for Dry Skin we can observe ~ 20% increase of Sebum Output (SO) relative to the baseline, after week three. Continued usage of tested product increases Sebum Output up to ~ 38% at week six, and 55% at week nine. At the same time Active Gland Count (AG) increases up to 20% at week six and ~ 32% at week nine. The test data also demonstrate an increase of the Inherent Rate, as a consequence of Sebum Output and Gland Count growth.

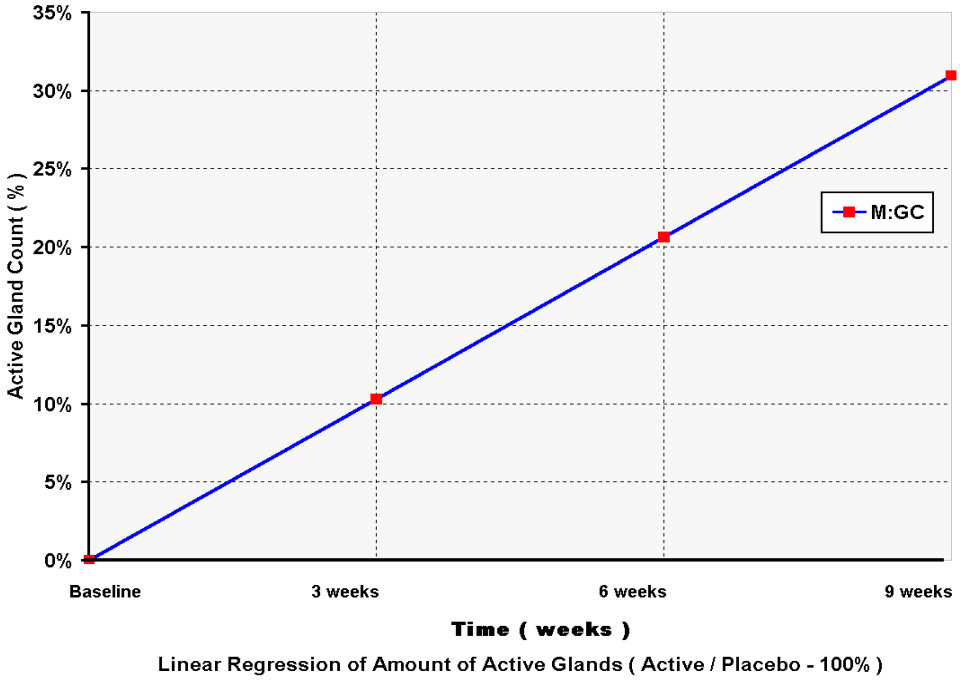
This data illustrate that using Cream for Dry Skin it is possible to increase endogenous sebum production by ~ 50% after nine weeks of use compared to the control. In addition, the amount of active glands producing sebum increased up to 32% after nine weeks of using BIONOVA's cream for Dry Skin.

EFFECTS OF BIONOVA'S CREAM FOR DRY SKIN ON SEBUM PRODUCTION



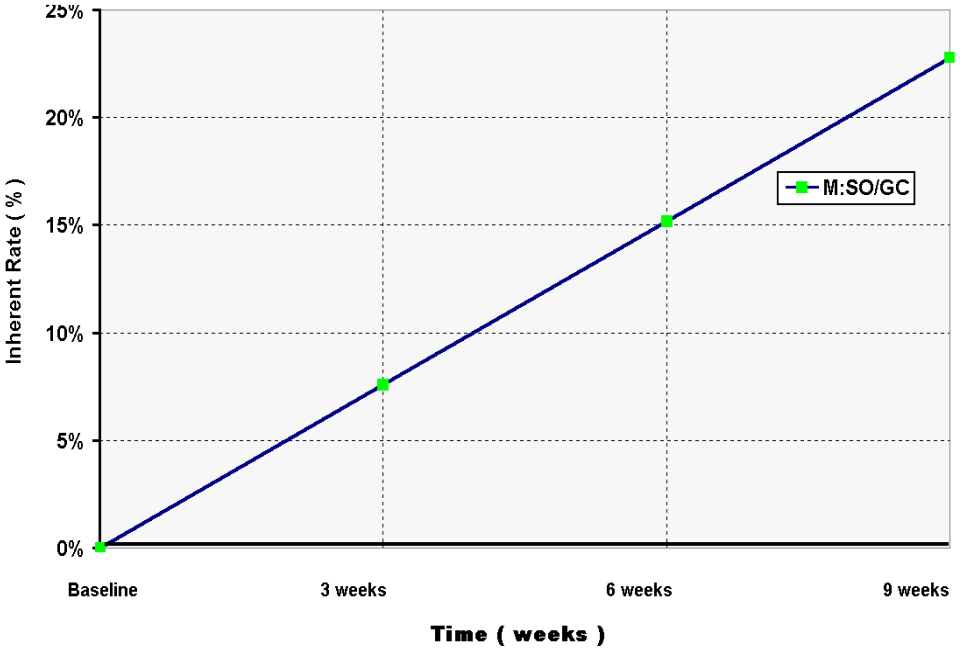
Linear Regression of Sebum Output (Active / Placebo - 100%)

EFFECTS OF BIONOVA'S CREAM FOR DRY SKIN ON AMOUNT OF ACTIVE GLANDS



Linear Regression of Amount of Active Glands (Active / Placebo - 100%)

EFFECTS OF BIONOVA'S CREAM FOR DRY SKIN ON SEBUM INHERENT RATE



Linear Regression of Inherent Rate (Active / Placebo - 100%)

BASIC EFFECTS OF B-DS NANO-COMPLEX™

- Stimulates production of endogenous skin oil by sebaceous glands. Significant increase of sebum production will be observed in 15 - 20 days. In an additional 20 - 30 days a complete normalization of sebaceous gland function will be noticed.
- Multifunctional skin barrier nanocomplex restores the skin natural hydration and refines skin texture.
- Stabilize extracellular matrix of the skin.
- Provides time-release effects of the active ingredients.

2.3. EVALUATION OF VITAMIN & COENZYME NANO-COMPLEX™

INTRODUCTION

VCBs (various compositions of Vitamin and Coenzyme Nano-Complex™) are developed in BIONOVA, Inc. and produced in multiple varieties with different activities, depending on the purpose for which they are created. Basically they are unique biocomplexes containing seven to ten water soluble vitamins with their specific coenzymes, bioflavonoids, antioxidants, and three to four oil-soluble vitamins primarily encapsulated into a proprietary carbohydrate delivery system (CDS) and secondary into a more complex novel delivery system – NuCell-Direct™ Delivery System.

VCBs are biologically active complexes, supporting the natural defense mechanisms against the adverse effects of free radicals. They are useful additives in preventing lipid peroxidation in skin and as an active complex for skin care products. This new technology allows the water-soluble and oil-soluble vitamins to act synergistically in an integrated water-dispersible Nano-Complex™. This synergistic action noticeably increases the effectiveness of the vitamins multiple cellular effects while using a reduced concentration of vitamins.

BIONOVA Vitamin & Coenzyme Biocomlpexes consists of the various combinations of following highly purified (95-99%) active ingredients:

Water Soluble Vitamins

* L-Ascorbic Acid (Vitamin C)
* Thiamin Hydrochloride (Vitamin B_1)
* Riboflavin (Vitamin B_2)
* Pantotenic Acid (Vitamin B_5)
* Pyridoxine Hydrochloride (Vitamin B_6)
* Nicotinamide (Niacinamide; Vitamin PP)
* Folic Acid (Pteroylglutamic Acid)
* Calcium Pangomat
* Choline Chloride

Oil Soluble Vitamins

* Retinyl Palmitate (Vitamin A)
* □□□-Tocopheryl Acetate (Vitamin E)
* Ergocalciferol
* Cholecalciferol Sulfate

Coenzymes

* Pyridoxal-5-Phosphate
* Coenzyme A (CoA)
* □-Nicotinamide Adenine Dinucleotide (NAD)
* □-Nicotinamide Adenine Dinucleotide Phosphate (NADP)
* Flavin Mononucleotide Sodium Salt (FMN)
* Flavin Adenine Dinucleotide (FAD)
* Tetrahydrofolic Acid
* Cocarboxylase
* Biotin (CoR)

Bioflavonoids

* Rutin Hydrate

* Quercetin
* Catechine
* Chrysin (5,7-dihydroxyflavone)

Antioxidants

* N-Acetyl-L-Cysteine
* Nordihydroguaretic Acid (NDGA)
* Selenium Oxide
* Ethylenediaminetetraacetic Acid
* Glutathion, Free Acid
* dl-Dithithreitol
* Aprotinin

BASIC EFFECTS OF VCBs

Depending on the composition of the particular VCB, they can participate in the following cell chemical reactions:

- Increased oxygen utilization in the tissue
- Increase decarboxylation and amino acid transamination
- Increase amino acids synthesis
- Increase nucleic acid synthesis
- Increase protein synthesis
- Ameliorate carbohydrate and lipid metabolism
- Antioxidant effects
- Anti-free radical effects
- Non-specific cell metabolism activation.
- Reducing effects

Many of the above mentioned benefits of VCBs are possible through new technology the basic idea of which is a synergistic action of the proper combination of water and oil soluble vitamins with their coenzymes in a single water soluble/dispersible **NANO-COMPLEX™**.

Using NuCell-Direct™ Delivery System it is possible to achieve the following additional benefits of Vitamins & Coenzyme **NANO-COMPLEX™**:

- Increase physical stability of the vitamins and coenzymes
- Time-release effects of the vitamins and coenzymes
- Stabilization of the extracellular matrix of the skin
- Increased viability of the skin cells
- Stabilization of the cell metabolism through non-specific effects of lipids, carbohydrates and proteins which are the major components of the SCM

TOLERANCE

VCBs are based on physiological substances, which have long been used in health care products. They are known to be non-toxic and physiologically innocuous. VCBs are very well tolerated by human skin and are based on the physiological substances, which are equivalent to those, which are biophysiologically produced in the human organism.

SUMMARY OF RESULTS

a) ANTI-IRRITATION EFFECTS OF CREAM WITH VITAMIN & COENZYME NANO-COMPLEX™

The method described below evaluates the anti-irritant efficacy of Vitamin & Coenzyme Biocomplex (VCB) using biologically active human skin equivalents (MatTech EpiDermR). Irritation is generated in tissue using a solar simulator and irradiation with 1.5 MED/hr/cm2 (31.5mJ/cm^2) UVA/B. This dose is chosen for its ability to simulate human skin equivalents while causing minimum cytotoxicity.

Test material is exposed to UVA/B irradiated tissue for specified exposure times and cell viability is determined through the use of 3-(4,5-Dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide (MTT) dye. MTT, the indicator of cell viability used in this assay, is incorporated into the living cells via the mitochondria. This results in the formation of insoluble formazin crystals that remain internal to the cells until extracted with isopropanol. The intensity of the extracted purple color is directly proportional to the viability of the tissues.

The Mat-Teck Epi-Derm-R skin model consists of normal epidermal keratinocytes that have been cultured to form a multilayered, highly differentiated model of the human epidermis. Keratinocytes are cultured on specially prepared permeable cell culture inserts which allow attainment of differentiation on the cutting edge of in-vitro skin technology. Ultrastructurally, the EpiDermR skin model closely parallels human skin, thus providing a useful in vitro substrate to assess dermal toxicity.

OBJECTIVE

To evaluate the anti-irritation efficacy of the Vitamin and Coenzyme Biocomplex in Substitute Cell Membrane (VCB) using the MatTek EPI-100 assay.

TEST MATERIAL CONCENTRATION & CONTROL

- VCB tested in two concentrations: 0.5% and 1.0%.
- Source of cells: MatTeck Corporation; EpiDermR Skin Model (EPI-100).
- Negative control: negative control for this study was untreated EpiDermR.
- Positive control: positive control for this study was EpiDermR Skim Model irradiated with 1.52 MED UVA/B w/o adding VCB.

UVA/B EXPOSURE DOSE AND TIME

Irritation is generated in tissue using a solar simulator and irradiation with 1.52 MED/hr/cm2 (31.5 mJ/cm2) UVA/B.

MatTeck EpiDermR skin models were exposed to UVA/B irradiation during 1, 4, and 24 hours.

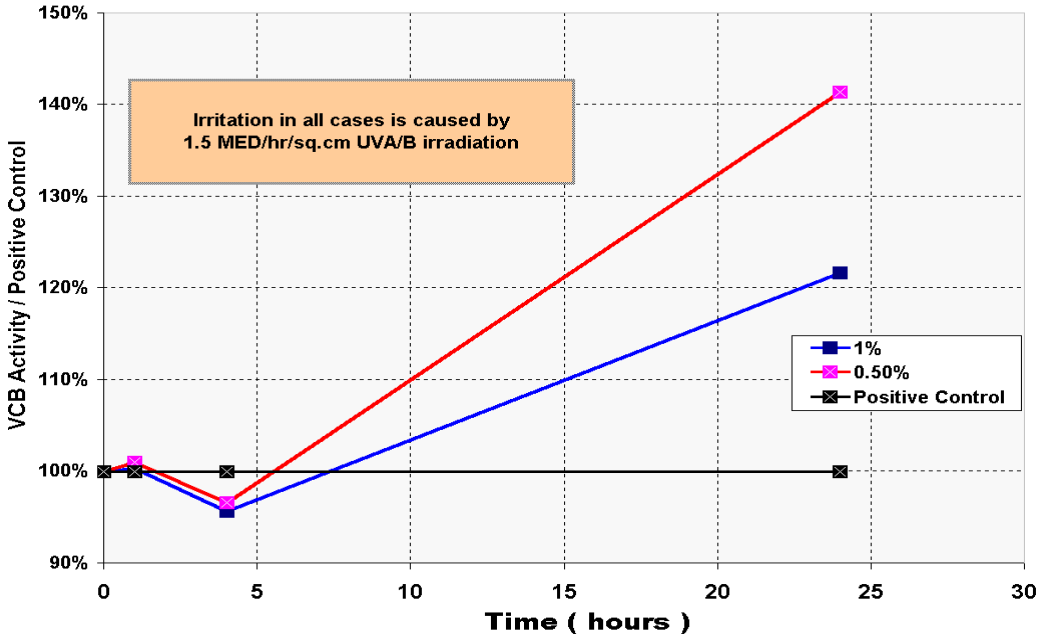
SUMMARY OF ANTI-IRRITATION RESULTS

At a concentration of 0.5%, the test material showed an enhancement of cell viability of 42% compared to the positive control at 24 hours.

The enhancement of viability at a concentration of 1% was less, approximately 22%. This may be due to the sensitivity of the tissue to the preservatives.

***The positive test results of the VCB show an increase in cellular activity in the area of cell metabolism* and its proliferation**

ANTI-IRRITATION EFFECTS OF EFFECTS OF BIONOVA'S VITAMIN & COENZYME



NANOCOMPLEX

b) CYTOSTIMULATION POTENTIAL OF CREAM WITH VITAMIN & COENZYME NANO-COMPLEX™

This cytostimulation assay measures the Vitamin & Coenzyme Biocomplex's (VCB) ability to stimulate an increase in the metabolic activity of the fibroblasts in culture. Fibroblasts are seeded into individual wells of a tissue culture plate that contains a nutrient-poor media. Test material is then containing nutrient-poor media so that the final specified test material concentration is reached. Cultures are incubated for approximately 48 hours. A cytostimulant will stimulate cellular metabolic activity despite the nutrient-poor media. After approximately 48 hours, the metabolic activity of the culture is measured using 3-(4,5-Dimethylthiazol-2-yl)-2,5-diphenyltetrazolium (MTT).

The MTT assay is a calorimetric analysis of the metabolic activity of the cell. Reduction of MTT by mitochondria results in the formation of insoluble blue formazin crystals, which are extracted from the cells with isopropanol and quantitative spectrophotometrically. The intensity of the blue color is directly proportional to the metabolic activity of the cells and inversely proportional to the toxicity of the test material. Test material which increases the metabolic activity of the culture compared to the control is considered a cytostimulant.

OBJECTIVE

To evaluate the cytostimulation potential of the Vitamin and Coenzyme Biocomplex in Substitute Cell Membrane (VCB).

TEST MATERIAL CONCENTRATION & CONTROL

VCB tested in the following concentrations: 0.5% and 1%.
The negative control for this study was culture media, while the positive control was culture media supplemented with 10% albumin.

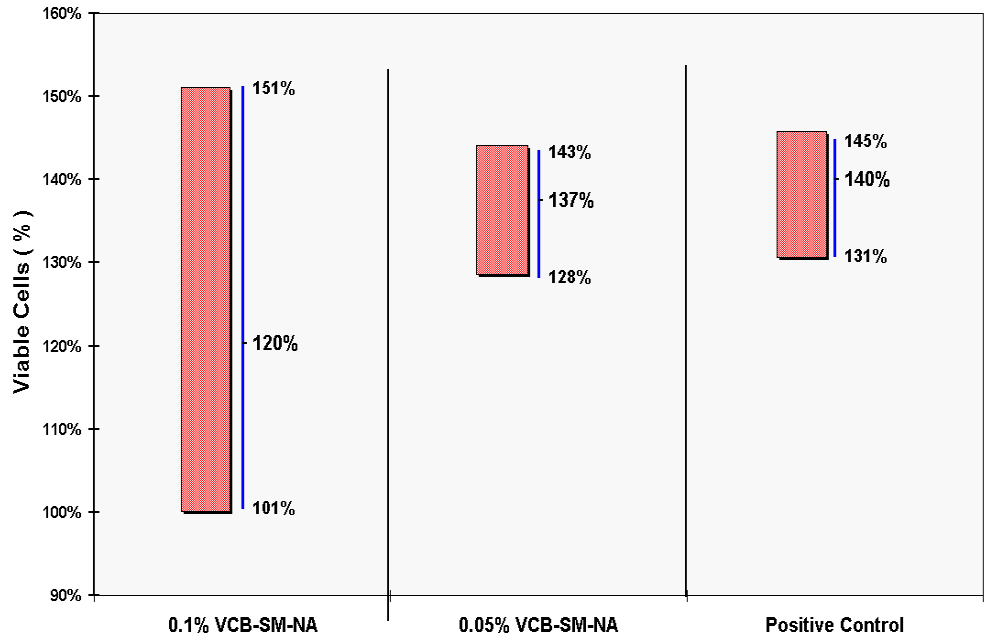
SUMMARY OF CYTOSTIMULATION RESULTS

The results show a significant increase in cellular metabolism at each concentration tested

Compared to the negative control, the test material, at a concentration of 0.05%, showed an average enhancement of cell viability of 37.5%, nearly equal to the cells grown in complete nutrient media. The average viability at a concentration of 0.1% was less, approximately 20.5%, than the results at 0.05%. Cells grown in tissue culture show enhanced sensitivity to preservatives; therefore, the apparent decline in efficiency with increasing VCB concentration may be due to the level of preservatives present in the VCB complex.

The data indicates reduction of stress factors on cell viability.

ANTI-IRRITATION EFFECTS OF EFFECTS OF BIONOVA'S VITAMIN & COENZYME NANOCOMPLEX



Metabolic Activity of Fibroblasts

48 Hours Exposure MTT Test; upper, mean and lower values

2.4. EVALUATION OF ASCORBIC ACID STABILIZED IN NuCell-Direct™ DELIVERY SYSTEM

INTRODUCTION

Stabilized Ascorbic Acid (SAA) is a unique complex of ascorbic acid antioxidants, and oil soluble vitamins primarily encapsulated into a prprietary carbohydrate delivery system (CDS), and secondary into a more complex delivery system - CellDirect™.

SAA is a technology, which allows the combination of water-soluble vitamins, antioxidants and oil-soluble vitamins to act synergistically in a single water dispersible complex. It represents a new technology that markedly increases efficiency of the functional ingredients on a cellular level because all the ingredients act simultaneously.

Stabilized Ascorbic Acid composed from active substances, which are essential for normal cell metabolism and functioning both on the skin surface, as well as on the epidermal levels.

COMPOSITION

Stabilized Ascorbic Acid consists of the following highly purified (95-99%) active ingredients:

Water Soluble Vitamins

* L-Ascorbic Acid (Vitamin C)

Oil Soluble Vitamins

* Tocopherol (Vitamin E)
* Retinyl Palmitate (Vitamin A)

Antioxidants

* Antioxidants
* N-Acetyl-L-Cysteine
* Glutathion
* dl-Dithithreitol
* Glucose Oxidase
* Selenium Dioxide
* Catalase

Carbohydrate Delivery System

* All active ingredients are primarily incorporated into a special carbohydrate delivery system.

Novel Delivery System - Substitute Cell Membrane

* NuCell-Direct™ is a unique novel delivery system especially formulated for stabilization of Vitamin C in water containing vehicles. The composition and structure of the NuCell-Direct™ approximates the structure of a Natural Cell Membrane. The NuCell-Direct™ is composed of highly specialized proteins, carbohydrates, and lipids; the very same ones that comprise the human cell membrane. The NuCell-Direct™ is capable of delivering both, water-soluble as well as oil-soluble actives. The Ascorbic Acid, Oil Soluble Vitamins, and Antioxidants are entrapped within the NuCell-Direct™ and acting synergistically in one "unit".

EFFICACY TEST

Test Material

Ascorbic Acid (Vitamin C) was incorporated into BIONOVA's CellDirect™ Delivery System (SAA). The freeze-dry powder of SAA was dissolved in aqua distillate. SAA concentration in water equal 10%. pH of solution = 3.7.

Measurement Conditions

Stability of Ascorbic Acid stabilized in CellDirect™ Delivery System was measured under the different conditions:

- At room temperature, under the ultraviolet radiation
- In refrigerator, at 4^0C
- At room temperature (RT)
- Acceleration test, at 37^0C

Measurement Intervals

Stability of Ascorbic Acid stabilized in CellDirect™ Delivery System was measured at day 3, 5, 7, and than once in a week for 33 days.

SUMMARY OF RESULTS

Stability test result of SAA demonstrates supperior stability of Ascorbic Acid under all the tested conditions (UV, 4^OC, RT), even under the accelerated temperature (37^OC).

In the control group the significant reduction of Ascorbic Acid started on day 3 and reduced to minimum detected concentartion in a one week.

STABILITY OF ASCORBIC ACID IN CELLDIRECT™ DELIVERY SYSTEM

(10% H_2O Solution, pH 3.7)

Test	UV		4°C		R.T.		37°C	
	Asc. Ac.	[%]	Asc. Ac.	[%]	Asc. Ac.	[%]	Asc. Ac.	[%]
Original	10.94	**100**	10.94	**100**	10.94	**100**	10.94	**100**
3 days	11.42	**104.4**	10.96	**100.2**	11.74	**107.3**	11.54	**105.5**
5 days	12.17	**111.2**	11.96	**109.3**	11.63	**106.3**	10.14	**92.7**
7 days	12.12	**110.8**	12.58	**115.0**	11.95	**109.2**	9.62	**87.9**
12 days	11.74	**107.3**	12.58	**115.0**	12.49	**114.2**	10.19	**93.1**
19 days	11.01	**100.6**	12.71	**116.2**	11.95	**109.2**	9.21	**84.2**
26 days	11.17	**102.1**	12.21	**111.6**	11.92	**109.0**	-	-
33 days	10.55	**96.4**	12.42	**113.5**	10.64	**97.3**	-	-

2.5. ANTIOXIDANTS & FREE RADICAL SCAVENGERS NANO-COMPLEX™ STABILIZED IN NuCell-Direct™

NATURE OF THE PROBLEM

FREE RADICALS: Atoms usually complete their outer shells by sharing electrons with other atoms. By sharing electrons, the atoms are bound together and satisfy the conditions of maximum stability for the molecule. Normally, bonds don't split in a way that leaves a molecule with an odd, unpaired electron. But when weak bonds split, free radicals are formed. Free radicals are very unstable and react quickly with other compounds, trying to capture the needed electron to gain stability. Generally, free radicals attack the nearest stable molecule, "stealing" its electron. When the "attacked" molecule loses its electron, it becomes a free radical itself, beginning a chain reaction. Once the process is started, it can cascade, finally resulting in the disruption of a living cell.

Free radicals arise normally during metabolism. The body's immune system purposefully creates them to neutralize viruses bacteria, and other foreign substances. However, environmental factors such as pollution, radiation, cigarette smoke and herbicides spawn excessive unnecessary amount of free radicals that is damaging for human health.

Normally, the body can handle free radicals, but if antioxidants are unavailable, or if the free-radical production becomes excessive, damage can occur. Unwanted free radicals accumulate with age.

ANTIOXIDANTS: An antioxidant refers to a substance that prevents or retards the oxidation of sensitive molecules found in the body or in foods. Antioxidants occur in many foods as nutrients or non-nutrients, or as synthetic additives. Antioxidants help prevent widespread cellular deterioration by willingly donating components to stabilize free radicals.

NANOTECHNOLOGICAL APPROACH IN NEW GENERATION OF ANTIOXIDANTS

Antioxidant Biocomplex (AXB) is a unique proprietary complex of antioxidants and anti-free radical scavengers developed and produced in BIONOVA for its custom designed skin care products. The usage of AXB in each particular skin care product depends on multiple factors, for which BIONOVA developed its own unique algorithm.

AXB composed from active substances which are absolutely indigenous to the human organism and are essential for normal cell metabolism to support natural defense mechanisms against the adverse effects of free radicals. AXB is a complex of biologically active substances functioning both on the skin surface as well as on the epidermal levels and was especially created to prevent oxidation under the sun exposure. They are useful additives in preventing lipid peroxidation in skin and as an active complex for skin care products.

AXB represents a new technology that markedly increases efficiency of the functional ingredients on a cellular level because all the ingredients act simultaneously. This technology allows the combination of various types of pure water-soluble and oil-soluble antioxidants to act synergistically in a single water-dispersible complex. AXB composed from active substances, which are absolutely indigenous to the human organism and are essential for normal cell metabolism. All antioxidants incorporated into a BIONOVA's proprietary novel delivery system – NuCell-Direct™ Delivery System.

COMPOSITION

Antioxidant Biocomplex is a complex system comprised of the following nanocomplexes:

a) NANO-COMPLEX™ OF ANTI-FREE RADICAL SCAVENGERS PERFORMING ON:

- Extra-Cellular Level - first level of defense
- Cellular Level - second line of defense

b) NANO-COMPLEX™ OF ANTIOXIDANTS:

- Specific Bioflavonoids
- Peptide Antioxidants
- Caratenoids

d) DELIVERY SYSTEM:

- NuCell Direct™ Delivery System

Antioxidant Biocomplex consists of the following highly purified (95-99%) active ingredients:

Basic Antioxidants

* Acetyl - L-Carnitine Hydrochloride (Vitamin B7)
* Dithiothreitol
* Nordihydrguaiaretic Acid
* N-Acetyl-L-Cysteine
* Glutathione, Reduced Form
* Glutathione ReductasePeptide Antioxidants
* Carcinine
* L-Carnosine
* a-Lipoic Acid
* L-Carnosine
* Genistein
* Coenzyme Q10

Extracellular Defence – Anti-Free Radicals Scavenger

* apo-Transferrine, Iron Poor
* Xanthine

Cellular Defence – Anti-Free Radicals Scavenger

* Superoxide Dismutase
* Catalase
* Glucose Oxidase

Bioflavonoid Antioxidants

* Astaxantin
* Morin
* Biotin (Vitamin H)
* Quercetin
* Rutin

Novel Delivery System - Substitute Cell Membrane

* NuCell-Direct™ is a unique novel delivery system especially formulated for stabilization of Antioxidant Biocomplex. The composition and structure of the NuCell-Direct™ approximates the structure of a Natural Cell Membrane. The CellDirect™ is composed of highly specialized proteins, carbohydrates, and lipids; the very same ones that comprise the human cell membrane. The NuCell-Direct™ is capable of delivering both, water-soluble as well as oil-soluble actives. The multiple individual antioxidants are entrapped within the NuCell-Direct™ and acting synergistically in one "unit".

SHORT DESCRIPTION OF MAJOR ANTIOXIDANTS

Acetyl-L-Carnitine acts as an antioxidant, has protective effects in the brain, and stimulates hormone (including testosterone) release.

N-Acetyl-L-Cysteine (NAC) is a powerful antioxidant and a premier antitoxin and immune support substance. NAC has been shown to provide protection against free radicals as well as a broad range of toxic hazards. The key to this protection is the sulfur and sulfhydryl groups contained in NAC and its derivative, glutathione. Supplemental NAC may have an anti-aging effect by increasing glutathione levels in the liver, lungs, kidneys and bone marrow.

Glutathione (GL) is a small molecule, which exists in almost every cell of the body. However, GL must be generated within the cell from its precursors before it can work effectively in the body. The presence of GL is required to maintain the normal function of the immune system. Furthermore, the cells of the immune system produce many oxiradicals resulting in a need for higher concentrations of antioxidants than most cells.

a-Lipoic acid (aLA)is a potent antioxidant in both fat- and water-soluble mediums. Furthermore, its antioxidant activity extends to both the oxidized form and its reduced form. aLA capable of chelating certain metals. It forms stable complexes with copper, manganese and zinc.

L-Carnosine (CN) functions primarily as a buffer in muscle tissue. High carnosine levels are associated with an increase in physical performance especially anaerobic performance. CN is best known for its ability to buffer lactic acid in muscle tissue and for its multiple antioxidant capabilities.

Quercetin (QT), which is primarily found in apples, onions, and black tea, is a type of flavonoid that serves as a building block for other members of the flavonoid family. QT appears to help fight a host of disorders, from asthma to cancer to heart disease. Among people with high dietary intakes of quercetin and other major flavonoids, studies show lower rates of stomach, lung, pancreatic, and breast cancers.

Genistein (GN), an isoflavone phytonutrient derived from soybeans. GN can bind to the same receptor sites as estrogen. Soybeans are the only significant dietary source of genistein; however, the amount of soy foods necessary to meet the body's needs can be difficult to incorporate into today's diet. In Asia, where soy is a staple, the daily intake can be up to 20 times that of a Western diet. GN is a scavenger of reactive oxygen species and inhibits lipid peroxidation.

Biotin (BT) is a water-soluble vitamin, generally classified as a B-complex vitamin. After the initial discovery of BT, nearly forty years of research were required to establish it as a vitamin. BT is required by all organisms but can only be synthesized by bacteria, yeasts, molds, algae, and some plant species.

Catechin (CT) is a bioflavonoid that is found in Green Tea. It works both alone and in conjunction with other flavonoids found in tea, and has both antiviral and antioxidant qualities. CT has been shown helpful in the treatment of viral hepatitis. It also appears to prevent oxidative damage to the heart, kidney, lungs, and spleen.

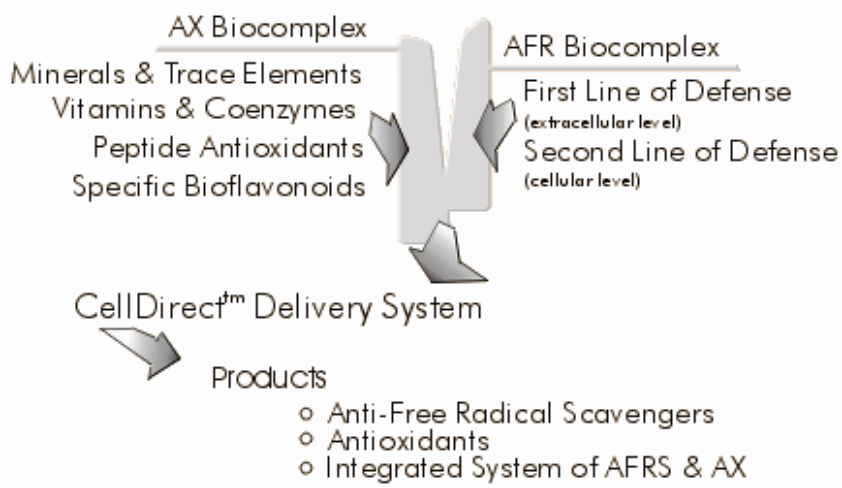
Rutin (RT) have antioxidant, anti-inflammatory, anticarcinogenic, antithrombotic, cytoprotective and vasoprotective activities. Many, if not most, of rutin's possible activities can be accounted for, in part, by rutin's antioxidant activity. Rutin can chelate metal ions, such as ferrous cations.

Astaxanthin (AX), a naturally occurring carotenoid pigment, is a powerful biological antioxidant. Astaxanthin exhibits strong free radical scavenging activity and protects against lipid peroxidation and oxidative damage of LDL-cholesterol, cell membranes, cells, and tissues.

Superoxide Dismutase (SOD) catalyzes the destruction of the O_2-free radical. It protects oxygen-metabolizing cells against harmful effects of superoxide free-radicals. The O_2-ion, which has been considered important in aging, lipid peroxidation and the peroxidative hemolysis of red blood cells is formed by the univalent reduction of O_2 during various enzymatic reactions or by ionizing radiation.

Coenzyme Q10 (also known as **CoQ10**, **Q10**, vitamin Q10, ubiquinone, or ubidecarenone) is a compound that is made naturally in the body. Q10 is used by cells to produce energy needed for cell growth and maintenance. It is also used by the body as an antioxidant. The highest amounts of Q10 are found in the heart, liver, kidneys, and pancreas. The lowest amounts are found in the lungs. Tissue levels of coenzyme Q10 decrease as people get older.

STRUCTURE OF BIONOVA'S ANTIOXIDANTS & ANTI-FREE RADICAL SCAVENGERS



BIOCOMPLEX

2.6. BIONOVA'S LIPOPROTEIN NANO-COMPLEX™

INTRODUCTION

Lipoprotein Bioactive Complexes (LBCs) represent a new generation of active ingredients and a new technology that remarkably increases efficiency of the functional ingredients on the cellular membrane and extracellular levels. The body responds to the administration of LBCs by restoring intercellular biological information transfer and stabilizing the internal information bonds between the cells.

LIPOPROTEIN BIOACTIVE COMPLEXES TECHNOLOGY

LBCs are members of the group of raw materials, which can be used in a health care industry as a well balanced food supplement (dietary product) and in skin care industry.

LBCs for cosmetics are completely unique combination of raw materials for the skin care formulations. Each type of LBC is a complex of substances especially balanced to improve skin cell membrane and extracellular matrix metabolism in a specific type of skin. The usage of type of LBC in each particular skin care product depends on multiple factors, for which BIONOVA developed its own unique algorithm.

LBCs technology allows the combination of various types of pure lipids and proteins to act synergistically in a single complex.

LBCs are produced from active substances which are absolutely indigenous to the human organism and are essential for normal cell metabolism. To increase the benefits of the LBCs and to obtain multiple skin care effects, LCBs are typically used in custom designed skin care products simultaneously with one of the BIONOVA's VCBs (Vitamin and Coenzyme Biocomplex).

TYPES OF LIPOPROTEIN BIOACTIVE COMPLEXES

- OptiCor-LDL™ - Low Density Lipoproteins
- OptiCor-VLDL - Very Low Density Lipoproteins
- OptiCor-IDL™ - Intermediate Density Lipoproteins
- OptiCor-HDL™ - High Density Lipoproteins
- OptiCor-SBS™ - Skin Barrier System

EFFECTS OF LIPOPROTEIN BIOACTIVE COMPLEXES

- Stabilize cell membrane structure
- Stabilize extracellular matrix of the skin
- Hydration effects on the skin surface
- Ameliorate lipids and protein metabolism in specific type of skin
- Increase elasticity and firmness of the skin
- Protect against moisture loss
- Made from ingredients natural to the human body
- Protects and restores normal cell metabolism in the specific type of skin for a long period of time
- Time release effects of the active ingredients

GENERAL STRUCTURE OF BIONOVA'S LIPOPROTEIN BIOCOMPLEXES

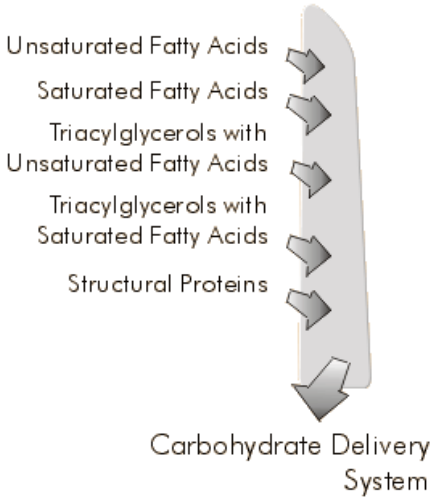
LBCs consists of the six various group of active ingredients. Each group represented by combination of 4-6 highly purified (95-99%) active substances, which are primarily encapsulated into a proprietary carbohydrate delivery system:

* Saturated Fatty Acids
* Unsaturated Fatty Acids
* Triacylglycerols with Saturated Fatty Acids
* Triacylglycerols with Unsaturated Fatty Acids
* Cholesterols
* Biologically Active Carbohydrates
* Structural Proteins
* Carbohydrate Delivery System

All the above-mentioned groups of bioactive ingredients are incorporated into a special carbohydrate delivery system.

The exact composition of any specific LBCs depends on the purpose for which it is created.

To increase the benefits of the Lipoprotein Biocomplexes and to obtain multiple skincare effects in the finished cosmetic product simultaneously with LBCs we used BIONOVA's Vitamin & Coenzyme Biocomplex and/or Antioxidant Biocomplexes.



TOLERANCE

LBCs are based on physiological active substances, which have long been used in health care products. They are known to be non-toxic and physiologically innocuous. LBCs are very well tolerated by human skin.

PART 3: BIONOVA NuCell-DIRECT™ NOVEL DELIVERY SYSTEM

INTRODUCTION

The most important aspect of any therapeutical method is the delivery of the active ingredient to the target receptors or cell of the organism. The delivery system utilized must provide stability for the incorporated active ingredient, while allowing its absorption and delivery. Especially in the areas of topical administration, it is critical to efficacy to provide a delivery system which crosses the cell membrane and allows the active agent or agents to exert their effects.

Stratum corneum, the outer layer of skin, is a multicellular membrane of flattened, metabolically active cells. In living organisms, the cell membrane is dynamic, and the transfer or non-transfer of various agents across this membrane is an important basis of cosmetic therapy. In order to provide useful therapeutic and cosmetic formulations, it is necessary to utilize a delivery system which is both compatible with the skin, i.e., non-irritating, and which will allow and preferably facilitate the transfer of the active agent, whether cosmetic or therapeutic, across the skin membrane. It is additionally necessary to utilize a delivery system in which the bioactive components are physically and chemically stable, yet still available for absorption in bioavailable form.

BIONOVA, Inc. has developed a new generation of proprietary delivery systems, specifically designed for the stabilization and proper delivery of very unstable active ingredients. Each specially designed delivery system, called the NuCell-Direct™ Delivery System, imitates the cell's own design, and provides a unique and effective system for the delivery active ingredients across the skin membrane. The NuCell-Direct™ Delivery System technology provides maximum flexibility in choice and quantity of active ingredient delivered.

BIONOVA's proprietary NuCell-Direct™ Delivery System is thus not only useful as a topical vehicle for the bioactive substances/complexes, but also can be used as a penetration enhancer for topical application of other skin treating agents. Bioactive agents/complexes are incorporated into the NuCell-Direct™ Delivery System, which enhances the absorption of the bioactive substances into the cell, thereby providing a useful therapeutic tool for both cosmetic and medical applications.

FUNCTIONALITY AND MECHANISM OF CELLDIRECT™ DELIVERY SYSTEM

The composition and structure of the NuCell-Direct™ Delivery System approximates the structure of a natural cell membrane. The NuCell-Direct™ Delivery System is composed of highly specialized proteins, lipids, and carbohydrates; the very same ones that comprise the human cell membrane. The NuCell-Direct™ Delivery System is capable of delivering both water-soluble as well as oil-soluble active substances.

The NuCell-Direct™ Delivery System has a more sophisticated composition and integrated structure than liposomes (the most advance delivery system currently available). In terms of physical stability, the choice of liposomes is often limited. In the NuCell-Direct™ Delivery System architecture of the multiple long chain lipids and saturated alkyl acids, simultaneously with carbohydrates, proteins, and attachment matrix factors provide rigid bilayers with low permeability for small, non-bilayer interacting compounds. The actives are actually entrapped within the NuCell-Direct™ Delivery System and are an intricate part of the NuCell-Direct™ Delivery System as opposed to being encapsulated in the liposomes and other delivery systems. In other words, active substances become an integrated part of the NuCell-Direct™ Delivery System. That is why, even if the entire structure of the NuCell-Direct™ Delivery

System for some extreme reasons is collapsed, crumpled or partially destroyed, active substances will continue to be protected.

Using NuCell-Direct™ Delivery System technology it is possible to incorporate or attach many different active substances, which in other delivery systems are very unstable. NuCell-Direct™ Delivery System technology is highly capable of providing modulated time-release effects.

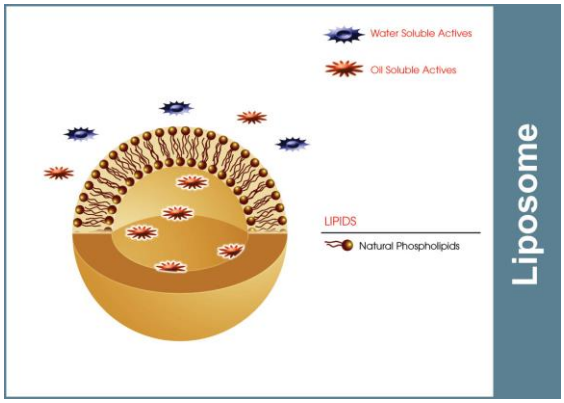
Each specific NuCell-Direct™ Delivery System is specially designed to maximize the effectiveness of the specific bioactive complex which is being stabilized and delivered. Using proprietary algorithms, BIONOVA efficiently creates specific NuCell-Direct™ Delivery Systems matched to the active substance.

GENERAL STRUCTURE OF CELLDIRECT™ DELIVERY SYSTEM

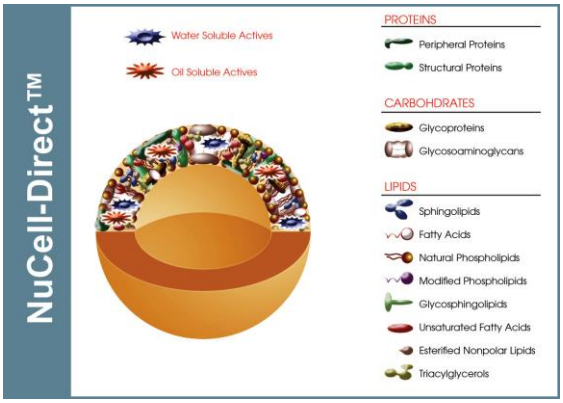
The NuCell-Direct™ Delivery System has an integrated structure, close to that of a human cell membrane and consists of the substances vital for a human body:

- Lipids
- Carbohydrates
- Proteins
- Attachment Matrix Factors

BENEFITS OF NUCELL-DIRECT™ DELIVERY SYSTEM



- **The actives are actually entrapped within the NuCell-Direct™ and are an intricate part of the delivery system, as opposed to being encapsulated in the liposomes or other delivery systems.**
- **Even if the entire structure of the NuCell-Direct™ for some extreme reasons is collapsed, crumpled or partially destroyed, active substances will continue to be protected.**



	Stabilizing Ability	Penetration Ability	Targeted Delivery	Technology	Loading Capacity	Production Limitations	Formulation Limitations	Shelf Life
LIPOSOME	Active ingredients are stabilized (encapsulated) inside the liposome globule. If the globule ruptures, than the active ingredients are discharged out of the globule and **LOOSE THEIR STABILITY.**	**MODERATE,** because of low affinity (association) between the liposome structure and the composition of the human cell membrane.	**MINIMAL**, because liposome itself has no tissue specific features. Also, the liposome composition cannot be substantially adjusted to the structure of active substances.	**CONVENTIONAL TECHNOLOG** is used in pharmaceutical and skin care industries.	**LIMITED** due to the size and loading capacity of the liposome's globule, and other physical and chemical factors.	Can be produced **ONLY IN LIQUID FORM**.	Use of liposome is **LIMITED** by adverse effects of such factors as temperature, pH, shear mixing, surfactants, alcohol, etc.	**LIMITED** depending on the type of Liposome. In general the shelf life does not exceed three months.
NUCELL-DIRECT™	Active ingredients are incorporated and **RELIABLY STABILIZED INSIDE THE NUCELL-DIRECT™** membrane wall. If the membrane ruptures it does not affect the stability of active ingredients, because they are still inside the membrane wall.	**EXCELLENT,** because the composition of NuCell-Direct™ is an imitation of the integral parts of a human cell membrane.	**STRONG** ability to deliver particular active ingredients to targeted biological tissues or groups of cells. The composition of NuCell-Direct™ can be adjusted to the structure of active substances and can target specific cells.	**A UNIQUE SOPHISTICATED NANO-TECHNOLOGY.** Modeling on the basis of a human cell membrane, and imitating living biological systems.	**LARGE.**Can hold and stabilize water-soluble and oil-soluble molecules simultaneously. Also can incorporate proteins, carbohydrates lipids, and their mixtures.	Can be produced in **ANY FORM** including fine freeze-dried powder.	Practically **UNLIMITED** formulating abilities.	Practically **UNLIMITED SHELF LIFE**.

BIONOVA INC. NY 11101
TEL: 718. 433.4180
Info @ bionovalab.com