

ბიოლოგიური ინფორმაციის გადატანის მაკორეგირებელი  
ნანოტექნოლოგიური ძიებანი  
ნაწილი 2: სატრანსპორტო სისტემა.  
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(„ბიონოვა” ინს. ნიუ-იორკი, აშშ.)

## **Nanotechnological approach in the biological information transfer correction**

### **Part2: Delivery System**

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შრომაში აღწერილია უახლესი ნანოტექნოლოგიური NuCell-Direct™ სისტემის ბიოსამედიცინო კვლევის შედეგები. შეფასებული და გახსნილია ხსენებული ბიოკომპლექსის პათოფიზიოლოგიურ მექანიზმთა კასკადი.

NuCell-Direct™ სისტემა ავლენს ადამიანის უჯრედის მემბრანის სტრუქტურათა კოპირების უნარს. გარსის კონსტრუქციის იმიტირების გზით რეალიზდება ბიოინფორმაციის ტრანსმისიის ეფექტი, რაც განაპირობებს ბიოლოგიურად აქტიურ და არასტაბილურ სუბსტანციათა სტაბილურობას მათი ტრანსლოკაციის პროცესში.

პათოფიზიოლოგიური თვალსაზრისით ბიოლოგიური ბლოკი ხასიათდება მნიშვნელოვანი მასტაბილიზებელი ეფექტითა და კომპოზიციური მესენჯერული ფუნქციით, რაც ეფუძნება ფოსფოლიპიდური მემბრანის დიზაინის დუპლიცირების ერთიან პრინციპს ძუძუმწოვრების კლასში, უპირველეს ყოვლისა - ადამიანებში.

NuCell-Direct™ სისტემა ავლენს ორმაგ ეფექტს:

1. უზრუნველყოფს ორგანიზმში პერმანენტულად გენერირებად ნომენკლატურულ არასტაბილურ ნაერთთა მდგრადობას და
2. აყალიბებს დუალური ტიპის ბიოსატრანსპორტო Nano-Complexes™ სუბსისტემას აქტიური სინგულარული და ინტეგრირებული სუბსტანციების რიგი ფუნქციების რეალიზაციის მიზნით.

ინტეგრირებული სტრუქტურები წარმოადგენენ შეკავშირებულ ბიოაქტიურ სუბსტანციებს და/ან Nano-Complexes™ ერთეულებს, რომლებსაც

NuCell-Direct™ სისტემა აქტიურად იზიდავს და ნერგავს საკუთარ სივრცეში.

დადასტურებულია NuCell-Direct™ სისტემის ჩინებული მდგრადობა. ის ეფექტურად ახორციელებს ბიოაქტიურ ინგრედიენტთა ინკორპორაციას აქტიურ ფიზიკო-ქიმიურ გარემოშიც კი.

NuCell-Direct™ სისტემა დაკომპლექტებულია სერვერული კურიერული ფუნქციით, რაც განაპირობებს მის აქტიურ შებმას სამიზნე

ქსოვილოვან სივრცესთან. სისტემა ხასიათდება ინკორპორირებული აქტიური ინგრედიენტის დროის რეალურ მაშტაბში სწრაფი გამოჩენის ეფექტით.

NuCell-Direct™ სისტემა აღჭურვილია ბიოაქტიურ სუბსტანციათა და/ან Nano-Complexes™ -ის პენეტრირების წესით ტრანსმისირებისა და მათი ლოკალური და პარენტერალური აპლიცირების ფუნქციებით. ბიოაქტიური სუბსტანციები და/ან Nano-Complexes™ -ი პირველად ინკორპორირდებიან

NuCell-Direct™ სისტემაში, შემდგომ ფიქსირდებიან პერიცელულარულ სივრცეში და აბსორბირდებიან უჯრედშიდა სტრუქტურებში. ამდენად, ისინი წარმოადგენენ ეფექტურ თერაპიულ ინსტრუმენტს როგორც ზოგად სამედიცინო, ასევე დერმატოლოგიურ და კოსმეტოლოგიურ პრაქტიკაში.

NuCell-Direct™ სისტემის გამოყენების პროცესში აღინიშნება მის შემადგენლობაში შემავალ აქტიურ ინგრედიენტთა კონცენტრაციის სწრაფი დაქვეითება, რის გამოც ამ მოდულს არ ახასიათებს არასასურველი თანმდევი ეფექტები.

**გასაღები სიტყვები:** ნანოტექნოლოგია, უჯრედი, სატრანსპორტო სისტემა, ბიოლოგიურად აქტიური ნივთიერება

**Imitation of the Human Cell Membrane:** The novel delivery system, NuCell-Direct™ of the present finding has been developed for stabilization and proper delivery of the very unstable biologically active substances. NuCell-Direct™ imitates the cell's own design and provides the unique and effective system for the delivery of active ingredients across the cell membrane.

**Powerful Stabilize & Delivery in One:** NuCell-Direct™ delivery system is an imitation of the mammalian (primarily human) cell membrane. It provides dual benefits:

Powerful stabilizer of unstable substances, naturally presented in living organisms;

delivery system for both, singular active substances as well as or for complex of biologically active substances (Nano-Complexes™).

**Integrated Structure:** The bioactive substances and/or Nano-Complexes™ are actually entrapped within NuCell-Direct™ and are an intricate part of the delivery system. In other words, active substances become an integrated part of NuCell-Direct™ delivery system.

**Excellent Stability:** NuCell-Direct™ provide incorporated active ingredients (Bioactive substances and/or Nano-Complexes™) with the extraordinary stability to the extreme physical and chemical conditions.

**Targeted Delivery:** NuCell-Direct™ promote direct delivery of the active ingredients to the target tissue.

**Time-Release:** NuCell-Direct™ provide the incorporated active ingredients with time-release effects.

**Penetration Enhancer & Vehicle for Topical & Parenteral Application:** NuCell-Direct™ delivery system is thus not only useful vehicle for the topical and parenteral

application of bioactive substances and/or Nano-Complexes™ but also can be used as a penetration enhancer for topical application of other skin treating agents. Bioactive Substances and/or Nano-Complexes™ incorporated into NuCell Direct™ delivery system enhances the absorption of the bioactive substances into the cell, thereby providing a useful therapeutic tool for skin care and other treatment applications.

Reduction of active ingredients: NuCell-Direct™ technology allows significant reduction of active ingredients usage amount, and as a result significant reduction of their side effects.

Key words: Nanotechnology, cell, delivery system, biologically active substance

## INTRODUCTION

The most important aspect of any therapeutic method is to deliver the active agents to the cell's targeted receptors. The delivery system must provide stability to the incorporated active agents, while allowing its absorption and delivery thereof. For the adequate therapy it is necessary that both requirements be met. Especially in the areas of topical and parenteral administration, it is critical to have the delivery system, which crosses the cell membrane and allows the active agents to exert their effects.

Stratum corneum, the outer layer of skin, is the multi-cellular membrane of flattened, metabolically active cells. In living organisms, the membrane is dynamic, and the transfer or blocking of various agents across this barrier is an important process and the main attribute of a therapy. In addition, it is necessary for bioactive components to be physically and chemically stable, yet still available for absorption in bioavailable form and the delivery system must be able to meet all these criterions.

The weakness of the current topical or transdermal delivery systems include instability of active substances in it, the thermo-sensitivity for various groups and capability to cross the biological barriers. Another problem the current delivery systems face is inhibition mechanisms normally existing in the living organisms, as well as poor intracellular penetration.

Liposomes have been suggested as a technique for the delivering of active agents to cells. However, nanoparticles incorporated into liposomes suffer from problems such as long-term stability as well as transmembrane barrier characteristics, which are strongly determined by the overall composition of the liposome system.

Numerous studies have considered polymeric delivery systems. Each of these systems provide certain benefits, but none of them provide a universal system suitable for the multitude of various types of active agents available in the therapeutic world.

Thus, both the pharmaceutical and cosmetic industries still need a delivery system that will have the following features: delivery system which physically stable to different type of energy; often it is necessary to apply excess energy to incorporate active substance(s) into delivery system; chemically stable delivery system, which is capable to keep its integrity under multiple

chemical substances, pH and ionic forces; has the long lifetime; is compatible with multiple different types of active agents with diverse chemical structures, such as proteins, steroids, lipids, carbohydrates, etc; provides stability for non-stable active

substances; efficiently serves its primary function of facilitating the delivery of the active agent(s) to its target site.

#### FUNCTIONALITY AND MECHANISM OF NOVEL DELIVERY SYSTEM

The novel delivery system NuCell-Direct™ has been developed for stabilization and proper delivery of very unstable active substances.

NuCell-Direct™ delivery system has an integrated structure, approximating that of a mammalian, especially the human cell membrane. NuCell-Direct™ is composed of highly specialized proteins, lipids and carbohydrates; the very same ones that comprise the human cell membrane. It imitates human cell's own design and provides a unique and effective system for the delivery of bioactive substances and/or Nano-Complexes™ across the cell membrane.

Greatest increase in stability and proper delivery can be obtained when specific NuCell-Direct™ delivery systems designed for particular active ingredient or its combination. Composition of each NuCell-Direct™ is specially designed and adjusted to specific bioactive substances and/or Nano-Complexes™ to maximize its effectiveness. Using appropriate algorithms, BIONOVA efficiently creates specific NuCell-Direct™ delivery systems matched to the chemical structure and molar concentration of the active substances, so they can be stabilized and delivered properly.

Using NuCell-Direct™ technology it is possible to incorporate and stabilize multiple different unstable active substances with different chemical structures; even of the substances that ordinary would be unstable in presence of each other. NuCell-Direct™ is capable of delivering both, hydrophilic and hydrophobic substances, yet in one unified system. NuCell-Direct™ technology has triple physiological advantages:

Stabilizes very unstable singular active substances and/or complex of biologically active substances (Nano-Complexes™); efficiently delivers singular biologically active substances or Nano-Complexes™ to the site and its biological action provides modulated time-release effects.

NuCell-Direct™ delivery system is capable of incorporating quantities of bioactive agents up to about five [5] moles of bioactive agent per mole. The quantity of bioactive agents is preferably limited to less than about two [2] moles of bioactive agent per mole of the delivery system and desired to be less than about one-tenth [0.1] mole of bioactive agent per mole.

The bioactive substances and/or Nano-Complexes™ are actually entrapped within NuCell-Direct™ and are an intricate part of the delivery system as opposed to being encapsulated in the liposomes and other delivery systems (see Liposome & NuCell-Direct™ structures). In other words, active substances become an integrated part of NuCell-Direct™ delivery system. That is why 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.

These powerful features of NuCell-Direct™ effectively make obsolete the Liposome delivery system currently used by pharmaceutical, nutritional, and skin care industries.

## COMPOSITION AND STRUCTURE OF NUCELL-DIRECT™

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

NuCell-Direct™ delivery system comprises of:

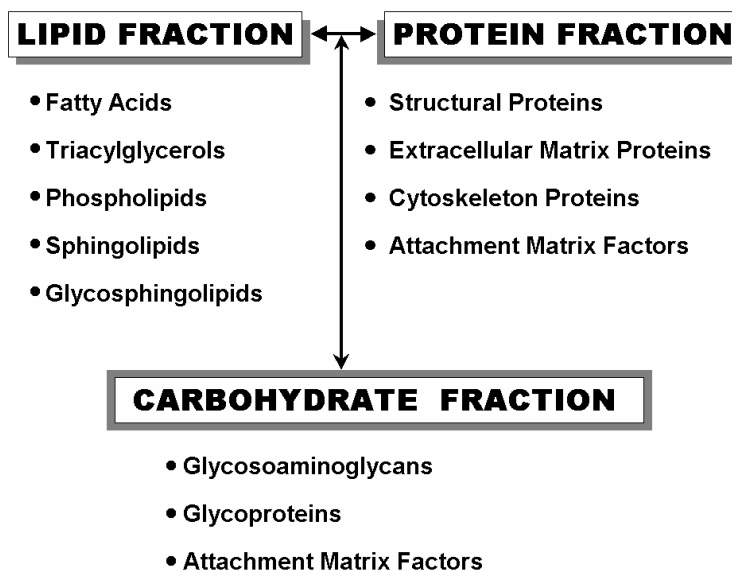
Stabilizing media

Lipid fraction

Carbohydrate fraction

Protein fraction

### Composition of NuCell-Direct™ Delivery System



**Stabilizing Media:** The stabilizing media of NuCell-Direct™ delivery system comprises of purified water in combination with adjuvants such as protein stabilizers, antioxidants, cryoprotectants, chelating agents, protease inhibitors, preservatives, bile acids, stabilizers, and other reagents. Depending upon the particular use of the delivery system, these adjuvants are added in minor amounts to perform their designated purposes.

**Lipid Fraction:** NuCell-Direct™ delivery system contains the lipid fraction. The lipid fraction is composed of a mixture of lipids. It is desirable that at least five different lipids be presented in NuCell-Direct™ delivery system, most preferably between nine to fifteen different lipids. Exact composition of lipid fraction depends on active ingredient/active complexes chemical structures to be incorporated, level of stability necessary to achieve and place of delivery of substrate.

The amount of each of the lipid in the composition varies within limits depending on the intended use of the particular delivery system. One of the major components of lipid fraction of the NuCell-Direct™ is the Hydrogenated Phospholipid. To increase the stability and reduce linkage of the actives from NuCell-Direct™ it is necessary to use various types of modified Phospholipids with the long chain lipids, like DMPE (C:14), DMPG\*Na (C:14), DPPC (C:16), DPPE (C:16), DPPG\*Na (C:16), DSPC (C:18), DSPG\*Na(C:18), DSPE (C:18) and others. To stabilize the system and to increase physico-chemo stability of actives it is also necessary to use multiple types of saturated

fatty acids with long chain lipids (C18:0 – C30:0) along with sterols, which increase the rigidity and reduce the fusion of the system. C18 - C22 Triacylglycerols with saturated fatty acids increases the potency of the NuCell-Direct™, while C18 – C22 Triacylglycerols with unsaturated fatty acids increases flexibility and fusion of the system. Sphingolipids and/or Glycosphingolipids can be added to the lipid fraction if it necessary to incorporate transmembrane cellular factors and are useful in applications where it is necessary to obtain specific biological effects.

**Carbohydrate Fraction:** NuCell-Direct™ also contain a carbohydrate component. The carbohydrate component is preferably composed of a mixture of one or more Glycosoaminoglycans, Glycoproteins, Mono & Disaccharides, and Attachment Matrix Factors.

The amount of each of these components in the composition varies within the limits depending on the intended use of the particular delivery system. To increase the stability and reduce linkage of the actives from NuCell-Direct™ it is necessary to use various types of Glycosoaminoglycans, particularly various types of Chondroitin Sulfates and Hyaluronic Acid. Heparin and Glycoproteins reduce fusion of NuCell-Direct™. Mono & Disaccharides increase the stability of incorporated active ingredients.

**Protein Fraction:** Another vital fraction of NuCell-Direct™ delivery system is protein component. The amount of each component of protein fraction in the composition varies as well depending on destination. The major component of protein fraction of the NuCell-Direct™ is a structural protein - Collagen. To increase the strength, stability, and reduce linkage of the actives from NuCell-Direct™ it is necessary to use various types of collagens. Another structural protein, Elastin allows increasing strictness and reducing fusion from the NuCell-Direct™. Also various non-animal derived proteins can be used in specific applications as an alternative to animal derived collagen and elastin. Cytoskeleton and extracellular proteins are useful in applications were it is necessary to obtain additional specific biological effects as well as to incorporate transmembrane cellular factors.

**Attachment Matrix Factors:** NuCell-Direct™ also contain an attachment matrix factors component. Usually attachment matrix factors are represented by carbohydrate and protein components. The attachment matrix factors component may be comprised of a single carbohydrate or protein, but it is preferably composed of a mixture of carbohydrate and protein components.

The amount of each of attachment matrix factor components in the composition varies within limits. The major component of attachment matrix factor of the NuCell-Direct™ is an Acid Soluble Collagen, and various types of Poly-Lysine Hydrobromides with the different molecular weights. To increase the adhesive ability of the NuCell-Direct™ components and to improve physical stability of the incorporated active ingredients it is necessary to use protein and/or glycoproteins, and carbohydrate components of the attachment matrix factors.

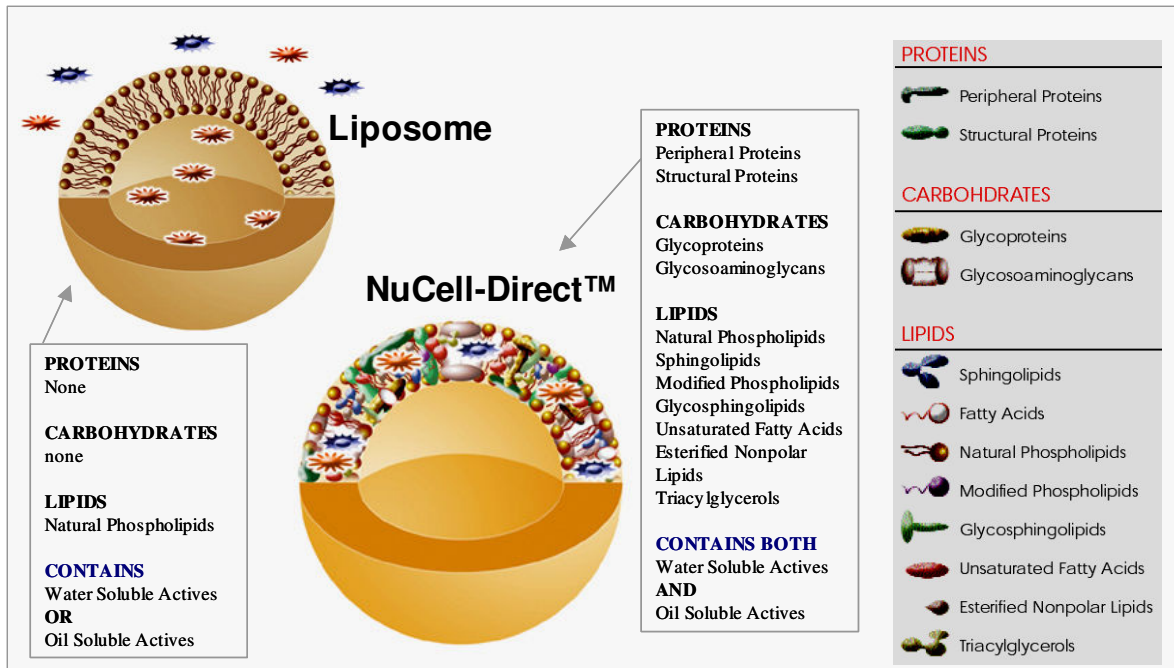
Only nano- and pico quantities of protein and carbohydrate attachment matrix factors in conjunction with specialized carbohydrates, lipids, and proteins allow incorporating active compounds into the NuCell-Direct™ matrix. This can be achieved as a result of the special technological process, including high energy mixing procedure of the above mentioned fractions.

NuCell-Direct™ delivery system has a more sophisticated composition and integrated structure than liposomes. In terms of physical stability, the choice of liposomes is often limited. In NuCell-Direct™ delivery system architecture of the multiple long chain lipids and saturated alkyl acids, simultaneously with specialized carbohydrates, proteins, and attachment matrix factors provide rigid bilayers with low permeability for small, non-bilayer interacting compounds.

### PHYSIOLOGICAL EFFECTS OF NUCELL-DIRECT™ DELIVERY SYSTEM

As a result of its integrated structure, close to that of a human cell membrane, NuCell-Direct™ delivery system promotes following effects:

### Structure of NuCell-Direct™ Delivery System



## Comparison of NuCell-Direct™ Delivery System and Liposomes

	Liposomes	NuCell-Direct™
Stabilizing Ability	Active ingredients are stabilized (encapsulated) inside the liposome globule. If the globule ruptures, the active ingredients are discharged out of the globule and <b>lose their stability</b> .	NuCell-Direct™ provides entrapped active ingredients (Bioactive Substances and/or Nano-Complexes™) with <b>extraordinary stability</b> to the extreme physical and chemical conditions.
Penetration Ability	<b>Moderate</b> , because of low affinity (association) between the liposome structure and the composition of the human cell membrane.	<b>Excellent</b> , because the composition and structure of NuCell-Direct™ Delivery System approximates the structure of a human cell membrane.
Targeted Delivery of Active Ingredients	<b>Minimal</b> , because liposome itself has no tissue specific features. Also, the liposome composition cannot be substantially adjusted to the structure of active substances.	<b>Strong</b> ability to deliver particular active ingredients to targeted place. Composition of NuCell-Direct™ should be adjusted to the structure of active substance(s), which has to be stabilized & derived to the targeted place. Provides with time-release effects of incorporated active ingredients
Technology	<b>Conventional technology</b> is used in pharmaceutical and skin care industries.	<b>Unique sophisticated Nano-Technology</b> . Modeling is based on imitation of the living biological systems.
Loading & Stabilizing Capacity	<b>Limited</b> due to the size and loading capacity of the liposome's globule, and other physical and chemical factors.	<b>Large</b> . Can hold and stabilize both, water-soluble and oil-soluble substances simultaneously. Provides dual benefits: - <b>delivery system for Singular substance or for Nano-Complexes™</b> ; - <b>powerful stabilizer of unstable substances. Capable to incorporate simultaneously biologically active proteins, carbohydrates and lipids.</b>
Production Limitations	Can be produced only in <b>liquid form</b> .	Can be produced <b>in any form</b> including fine freeze-dried powder.
Formulating Limitations	Use of liposome is <b>limited</b> by adverse effects of such factors as temperature, pH, shear mixing, surfactants, alcohol, etc.	Practically <b>unlimited</b> formulating abilities.
Shelf Life	<b>Limited</b> depending on the type of Liposome.	Practically <b>unlimited</b> shelf life.



Intra-and intercellular delivery of the bioactive compositions,;  
Enhances the penetration ability of the incorporated active ingredients;  
Promotes direct delivery of the actives to the target place;  
Reduces the usage amounts of active ingredients to very low levels and, as a result,  
significantly reduces their side effects.  
Time release effects of the incorporated active ingredients/complexes.

NuCell-Direct™ enhances the absorption of the bioactive substances/complexes into the cell, thereby providing a useful therapeutic tool for medical and cosmetic applications. The novel delivery system is also useful as vehicle and stabilizer for the nutritional and health care products, such as antioxidants and free radical scavengers, vitamins and their coenzymes, bioflavonoids, minerals and trace elements, food supplements (dietary products), and for modeling and standardizing herbal and botanical products.

A significant use of NuCell-Direct™ delivery system is as the delivery system for pharmaceutical products, especially pharmaceutical products targeting the patient's cellular communication system.

NuCell-Direct™ delivery system provides therapeutic methods, which utilize multi-component biologically active complexes (Nano-Complexes™) for the restoration of normal cell metabolism in patients in need of such treatment. These multi-component biologically active complexes can be utilized in the treatment of the wide variety of pathologies, which have their origin in the disruption of normal biological information transfer thus resulting in the consequent alteration of normal cell metabolism.

Delivery system for specific Nano-Complexes™ has been developed for topical application to treat multiple skin dysfunctions (skincare and cosmeceutical products), such as chapping (dry skin), oily skin, eye puffiness, dark circles, anti-aging products, stretch marks, cellulite and etc.

Specific complexes are provided which can be utilized to topically treat various skin diseases, such as atopic dermatitis, ichthyosis, psoriasis, acne, comedones, seborrhea, eczema, neurodermatitis, macular atrophies, skin aplasias, hyperkeratinizations, alopecia an many others.

Also developed completely new type of delivery system for parenteral administration of biopharmaceutical products (bioactive complexes) suitable for administration to patients suffering from trauma or shock. Targeted Nano-Complexes™ has been incorporated into the novel delivery system.

The novel delivery system is not only useful as a topical and parenteral vehicle for the aforementioned bioactive substances and/or complexes, but may also be used as a penetration enhancer for the topical application of other treatment agents, such as steroids, antimicrobial & anti-inflammatory agents, bioactive proteins & polypeptides (like Growth Hormone, Insulin, etc), sunscreens, etc.

Technology of bioactive complex modeling allows assembling NuCell-Direct™ delivery system specifically for parenteral administration of similar therapeutic agents. The big segment of benefits of NuCell-Direct™ delivery system is due to their biocompatibility, biodegradability, and low immunogenicity. The technological advance of NuCell-Direct™ significantly improves absorption, distribution, metabolization and excretion of the bioactive compounds they carry and mediates the pharmacological, therapeutic, and toxic response in animals and man.

It is important to mention that only this technological platform allows manipulating with nano (10<sup>-9</sup>) and with pico (10<sup>-12</sup>) quantities of active substances to assemble targeted Nano-Complexes™ stabilized into NuCell-Direct™ delivery system. This is the normal range of biologically active substances naturally presenting in a living organism. Thus, imitation of bioactive substances composition naturally presenting in a human organism (Nano Complexes™) allows achieving physiological effects with this tiny (nano & pico) quantities of actives.

Unprecedented ability to stabilize and deliver active substances, allows to obtain highest physiological and pharmacological meaning and at the same time provide the safety by using those substances in the concentrations, which never exceeds buffering mechanism, naturally presented in a living system (for each biological substance there thirtain range of concentration, which easily can be metabolized and degraded from the human body, without any negative impact on the normal physiology).

#### APPLICATION OF NUCELL-DIRECT™ DELIVERY SYSTEM

NANO-SKIN-TECH™ – new generation of skin care products.

Cosmetics

Highly specialized skin care products

For more information, please visit [www.bionovalab.com](http://www.bionovalab.com)

NANO-NUTRI™ – new generation of nutritional products

A new generation of antioxidants and free radical scavengers with Bioflavonoids & Nucleosides (see OXITREL™).

Targeted Nano-Complexes™ for prostate treatment, based on the unique composition of naturally existing antioxidants, Caratenoids, amino acid derivatives, Phytosterols and specific unsaturated fatty acids.

Targeted Nano-Complexes™ of Vitamins along with their Coenzymes, Bioflavonoids, Minerals and trace elements

Modeling and standardizing biological activity of herbal and botanical products

Highly efficient, well-balanced food supplements.

NANO-CEUTICAL™ – new generation of pharmaceutical products

A new generation of pharmaceutical products targeting the restoration of the body's own biological information transfer system, including products for parenteral application for various acute conditions, like shock as well as for chronic diseases.

A new generation of pharmaceutical and over-the counter products, including products for transdermal drug delivery systems for drugs like Insulin, Growth Hormone, etc.

NANO-DEFENSE™ – new generation of bio-warfare products

Bacterial invasion control system. This producta are based on the most potent antibacterial nanocomplex, BactoStat™. Help defend against biological agents. Creates a protective barrier on the skin. Increases skins anti-bacterial resistance. Enhances self-healing processes.

For more information, please visit [www.biodefender.com](http://www.biodefender.com)

Based on BactoStat™ technology it was developed whole family (QurFamily™) of products for civilian use, such as:

QurNail – multi-component nail treatment. Contains 6 Anti-microbial and 5 Antioxidants in one personal care formula.

For more information, please visit [www.qurnail.com](http://www.qurnail.com)

QurSkin –the most powerful Anti-microbial & Anti-inflammation product. For effective treatment of general skin infections, bedsores, skin lesions (diabetic, etc.), skin itchiness, skin cuts and scrapes, minor burns.

QurBurn – Powerful Anti-Burn Formula. For effective treatment of skin burn accompanied with infection and pain.

Sun Burn Formula - Anti-Inflammatory Spray. Relieves Pain Sensation. Protects from Sun burn inflammation.

Folliculitis Bikini - alleviates skin inflammation, relives burning and itching sensation, prevents ingrown hair.

Athletes Foot - for effective treatment of Athletes Foot and alleviation of symptoms caused by Tinea Pedis.

## რეზიუმე

ძუძუმწოვრებში, მათ შორის ადამიანებშიც ბიოლოგიური ინფორმაციის გადაცემა მოიცავს 3 ეტაპს. პირველ ეტაპზე ხდება ამ ინფორმაციის მატარებელი მოლეკულების დაგროვება უჯრედთაშორის სივრცეში. მათ მიეკუთვნებიან ჰორმონები და სხვა ბიოლოგიურად აქტიური ნივთიერებები, რომლებიც გამომუშავდებიან ორგანიზმში ან შეყვანილნი არიან წამლების სახით. მეორე ეტაპზე, უჯრედის მემბრანებზე მოთავსებული სპეციალური რეცეპტორების მიერ ხდება ამ ბიოლოგიური ინფორმაციის მატარებელი მოლეკულების ამოცნობა და შეკავშირება. მესამე ეტაპზე წარმოებს ინფორმაციის შეტანა უჯრედის შიგნით, მათ შორის ბირთვში და სხვა სტრუქტურულ ერთეულებში. საგულისხმოა, რომ ინფორმაციის გადატანის პირველი ორი ეტაპი მოლეკულების მეშვეობით ხორციელდება და მკვეთრად სპეციფიკურია. მესამე ეტაპი კი ბიოქიმიური რეაქციების სახით მიმდინარეობს და ნაკლებად სპეციფიკურია.

ბიოლოგიური ინფორმაციის გადატანის კორექცია შესაძლებელია სამივე ეტაპზე. ამ მიზნით მოწოდებულია ნანოტექნოლოგიურ საფუძვლებზე შექმნილი “Opti-Pass” და “NuCell-Direct™” სისტემები. პირველი გულისხმობს ნანოკომპლექსური ბიოლოგიური ინფორმაციის მატარებელი მოლეკულების კონსტრუირებას. მეორე კი – გადამტანი სისტემების სრულყოფას. ეს უკანასკნელი შედგება მასტაბილიზებული გარემოსაგან, აგრეთვე ლიპიდური, კარბოჰიდრატული და ცილოვანი ფრაქციებისაგან. მასტაბილიზებულ გარემოს წარმოადგენენ წყალშემცველი ისეთი ადიუვანტები, რომლებიც თავის მხრივ შეიცავენ პროტეაზის ინჰიბიტორებს, ანტიოქსიდანტებს, კრიოპროტექტანტებს და სხვა კომპონენტებს. ლიპიდური ფრაქციის შემადგენლობაში შედის ცხიმოვანი მჟავები, ტრიაცილგლიცეროლები, ფოსფოლიპიდები, სფინგოლიპიდები და გლიკოსფინგოლიპიდები. კარბოჰიდრატული ფრაქცია მოიცავს გლიკოამინოგლიკანებს, გლიკოპროტეინებს და მატრიქსისგან

გამოწვევლილ ფაქტორებს. ცილოვანი ფრაქცია კი მოიცავს სტრუქტურულ პროტეინებს, ექსტრაცელულურ მატრიქსულ პროტეინებს, ციტოსკელეტურ პროტეინებს და მატრიქსისგან გამოწვევლილ ფაქტორებს.

საგულისხმოა, რომ ეს ნანოტექნოლოგიური სისტემები თავისი სტრუქტურით თითქოსდა იმეორებენ ცოცხალი უჯრედის ელემენტარული მემბრანების ცალკეული უბნების შენებას, რის გამოც ისინი ადვილად ერთვებიან ამ ელემენტარული მემბრანების შენებაში, რაც ხელს უწყობს ინფორმაციის გადატანას. მოტანილია ნანოტექნოლოგიურ პრინციპებზე დამზადებული მედიკამენტების, საკვები დანამატების, კოსმეტოლოგიური, ანტისეპტიკური და სხვა საშუალებების გამოყენების შესაძლებლობა კრიტიკულ მდგომარეობათა დროს განვითარებული ოქსიდანტური სტრესის სალიკვიდაციოდ. აგრეთვე კანის (ფსორიაზი, სებორეა, ატოპიური დერმატიტი და სხვა), პროსტატიტების და სხვა დაავადებების სამკურნალოდ. აღნიშნულია მათი ეფექტურობა ვიტამინოთერაპიის მიზნით, კანის კოსმეტოლოგიური მოვლის დროს და ანტისეპტიკური ხსნარების მოსამზადებლად.