

# **LIFE SCIENCE NANOTECHNOLOGY VERSUS INDUSTRIAL NANOTECHNOLOGY**

## **(nano-quantities versus nanometers)**

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As it is well known, multiple high-tech companies are focusing their attention to Nanotechnology, which is described as Nano-Spheres / Nano-Particles and other particle related technologies. This technological movement happens not only in the Technical Industries (computer science, new composed materials, chemical industry, etc.), but also intensively affecting industries related to the Life Science, such as pharmaceutical, nutritional, skincare and even bio-defense.

The presented material is an attempt to warn medico-biological scientific community from the mechanical and unjustifiable transformation of Industrial Nanotechnological approach (nano-particles) to Life Science Industries, specifically the use of biological active substances in nanometer sizes.

Based on more than two decades of the fundamental scientific research [in area of study of Pathogeneses of Post-Aggressive Reactions of Living Organisms] and more than a decade of experience in a new product development related to Bioactive Substances Modeling we would like to evaluate technological characteristics of health care related products claimed to be based on nanotechnology.

As of today, the majority of products developed in Life Science Industries claimed to be composed of nanometer size particles, which presume to have higher efficacy and dipper penetration to the targeted places due to small size of the active substances.

The question is what is the true benefit of having nanometer size substances to be administered orally, topically or parenterally? Often very limited, if any, because the simple reduction of the size of biologically active substance could not solve the problem why this drug/bioactive substance is administered. Even more, the reduction of biologically active molecules to nano-particle sizes very often damages there tertiary and quaternary structure, thus diminishing their biological function. At the same time, the simple reduction of particle sizes of biologically inactive substances, like Titanium Dioxide, or Zink Oxide has nothing to do with nanotechnology itself. All those reduction of the matter into nano-particles take place purely on a machinery level. It means that manufacturers, who have relatively high shear homogenizer, or high quality 'grinder', can claim that they are in nanotechnology business.

Allowing such kind of products to be called 'nanotechnology based products', we simply not only diminishing the real power of nanotechnology, but more importantly, are driving future development in bio-pharmaceutical industry in wrong direction.

Let's make clear our position, which should help to explain our vision, which sometimes looks little a bit complicated than it is in reality:

- Are we against nanotechnological processes in products related to Life Science Industries? Absolutely not.

- Are we against nano-particles in products related to Life Science Industries? Absolutely not, when it is necessary to achieve specific bio-physiological objectives, but against mechanistical approach, which dominates today and is focused on reduction of particle size of the matter.
- Based on our extensive experience in Biological Active Substances Modeling we can conclude that the most important for Normal Human Physiology **is not the size of the matter** (biological active substances), but **there usage amount in combination with bioactive substances providing their inter and/or intracellular transmission of signal** [biological effect] to the targeted places.

It is obvious that the simple reduction of the usage amount of biologically active substances will have biological effect close to zero, because either it is degraded before it reaches targeted places, or its concentration is not sufficient to activate the intracellular effects.

The Human Physiology is mostly 'concerned' about **quantity and composition of biologically active substances**, which surround the targeted cell/tissue/organ. Specific composition of biologically active substances and their precise quantities [usually in nano (one billions of a gram) and pico (one trillions of a dram) concentration] creates specific chain of biological information transfer that depends on the physiological response of the Living System.

The size of the biological active substances is determined by its higher-order bimolecular structure and consequence in the nature. As mentioned above, simple changing of the particle size of bioactive substance can cause significant degradation of its biological activity.

Our position is based on most physiological approach to the Living Organism and can be postulated that health care related products and/or new drug development should be focused **on a restoration of self-healing processes through restoration of genetically determined chain of biological information transfer**, but not on administering of a high dosage of singular bioactive substance.

How this can be achieved? That is where the real power of Nanotechnology in Life Science should be utilized, but in absolutely different way than the Industrial Nanotechnological approach. Life Science Nanotechnological approach for new product/drug development can be indispensable, thus allowing to re-establish naturally existing self-healing processes from within.

We have dedicated the last decade to a development of multiple products oriented toward **enhancement of self-healing processes** with specific curative effects to repair malfunctioning biological information transfer, targeting the problem-specific biochemical pathway. Practical implementation of the discovered scientific concept required development of new, previously non-existing technologies, which allowed construction/modeling of Biologically Active Composition of biomaterials in nano and pico quantities [NANO-COMPLEXERS™].

This is the base and foundation of MD SCIENCE, INC. / BIONOVA, INC. Nanotechnological Platform, allowing creation of products for different segments of Life Science Industries. Described Nanotechnological platform is composed of two major technologies:

- **Opti-Path™** - a method of imitation of multiple biologically active substances composition that exists in the Living System [NANO-COMPLEXERS™ modeling]. Major features of NANO-COMPLEXES™ are:
  - NANO-COMPLEXES™ is formulated to contain all necessary bioactive substances to restore normal function of a specific metabolic pathway. The type, concentration and

quantity of the substances in the NANO-COMPLEX™ depend on the pathway being addressed.

- NANO-COMPLEXES™ contains all necessary substances for imitation of biological information transfer existing in a living organism.
  - The efficiency and safety of NANO-COMPLEXERS™ is insured by concentration of the active agents that are completely governed by the buffering principle of the Living Organisms.
- **NuCell-Direct™ Delivery System** is a technology of a Cell Membrane Imitation. NuCell-Direct™ Delivery System has dual functions: (a) incorporates multiple bioactive substances (active ingredients) into one integral delivery system, thus allowing their synergistic effects; (b) powerful stabilizer of unstable substances. Major features of NuCell-Direct™ Delivery System are:
    - The composition and structure of the NuCell-Direct™ Delivery System imitates the structure of a human cell membrane.
    - NuCell-Direct™ provides entrapped active ingredients with the extraordinary stability to the extreme physical and chemical conditions.
    - Promotes direct delivery of the actives to the target tissue
    - NuCell-Direct™ provides with time-release effects of the incorporated bioactive ingredients.

Let's once more emphasize that the Bio-Medical researches related to a new drug development should focus not so much on particle sizes of the matter, but on more important, physiological element – quantity of biologically active substances and their combination used in products [for specific biological effects].

**Nanotechnology in Bio-Medical field (Life Science Nanotechnology) is not so much about the science of manipulating a matter on a nano-particles level, but most importantly is the science of assembling of targeted Biologically Active Complexes (NANO-COMPLEXES) by using nano- and pico quantities of biologically active substances in a very precise way to imitate/model physiological processes occurring in a living organism with previously unavailable biological effects. The outcome of such approach has a physiological impact to the normal biological information transfer, with strong and predictable results, without side effects.**

- **NANOTECHNOLOGY in Life Science is the science of using nano- and pico quantities of biologically active substances with previously unavailable biological effects that imitates physiological processes occurring in a living organism.**
- **The outcome of nano-quantities modus operandi in Life Science Nanotechnology should have a physiological impact on the normal biological information transfer, with strong and predictable results, without side effects.**
- **The usage amount [ $10^{-9}$  &  $10^{-12}$ ] of biologically active substances in NANO-COMPLEXES™ should be in the absolute range of buffering mechanism within normal function of the Living System.**