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Review Article

A REVIEW ON APPLICATIONS OF NANOTECHNOLOGY IN COSMETICS

Parinaz F. Elavia *, Vasanti Suvarna
SVKMS Dr. Bhanuben Nanavati College Of Pharmacy, Mithibai Campus, Mumbai, Maharashtra, India
*Corresponding Author Email: parielavia28@gmail.com

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ABSTRACT

Nanotechnology is novel innovation of a period which has been consider as a fortune in different fields of science and innovation. Nanotechnology is essentially gotten from two words - nano and techno which implies how materials responds at nanoscale. Numerous advances are going ahead in everyday life in pharmaceutical fields. The cosmetology is the recently creating branch these days. With the assistance of nano measured particles it ends up workable for the particles to infiltrate the skin and demonstrate the impact. It might be valuable in therapeutic work however the odds of unfriendly impact may get expanded. Hazard factors are to be remembered. The present audit intends to think about a promising region of Nanoparticles utilized as a part of different restorative items like Deodorant, Soap, Toothpaste, Shampoo, Hair conditioner, Anti-wrinkle cream, Moisturizer, Foundation, Face powder, Lipstick, Blush, Eye shadow, Nail clean, Perfume and so on.

KEYWORDS: Nanoparticles, cosmetics, risk factors.

INTRODUCTION

Nanotechnology implies any innovation on a nano-scale that has applications in different fields.Nanotechnology, from the Greek "nano" comprises of changing materials at the nuclear and sub-atomic levels to make new sub-atomic structures known as "Nanomaterials" having extraordinary and new qualities that vary from those of the first materials they are gotten from. Nanotechnology is basically a fundamental understanding about how materials works at nano scale in the creation and utilization of structures, devices and systems that have novel properties and functions. Nanotechnology deals with manipulation of structures of matter in the size range of 1100 nanometers (10-9 meter) approximately.[1-7]

Nanotechnology is the science of nano things. It was first thought of by famous physicist Richard Feynman . In 1959 he published his thoughts on the ability to manipulate individual atoms and molecules for the first time at the American physical society at the California Institute of Technology. Feynman now set two challenges. The first involved the construction of a nano motor.[8] The second challenge was to reduce the size of letters of the Britannica encyclopaedia, so it could fit on the head of a pin. This results in the more research into the field of nano science.

NANOTECHNOLOGY IN VARIOUS FIELDS

Nanotechnology incorporates different features in our everyday life, for example, cryonics, medication (diagnostics, sedate conveyance, tissue building), condition (filtration), vitality (diminishment of vitality utilization, expanding the proficiency of vitality creation), data and correspondence (memory stockpiling, novel semiconductor gadgets, novel optoelectronic gadgets, shows, quantum PCs). It additionally helps in substantial industry (aviation, catalysis, development, vehicle makers), purchaser merchandise (nano nourishments, family unit, optics, materials, beautifiers, agribusiness, sports).[9,10]

TYPES OF NANOMATERIALS USED IN COSMETICS

1. Liposomes
2. Nanoemulsions
3. Nanocrystals
4. Hydrogels
5. Dendrimers
6. Cubosomes
7. Solid liquid nanoparticles

Liposomes

Liposomes are spherical vesicle having at least one lipid bilayer. The liposome can be used as a vehicle for administration of nutrients and pharmaceutical drugs. Liposomes are oftenly composed of phospholipids, especially phosphatidylcholine, It may also include other lipids, such as egg phosphatidylethanolamine so long as they are compatible with lipid bilayer structure.[11] The lipid bilayer of liposomes can combine with other bilayers which further improves release of its contents, making them useful for cosmetic delivery applications. The simple method of preparation, increased absorption of active ingredients by derma and continuous supply of agents into the cells over a constant time period make them suitable for cosmetic applications.[12] Transferosomes[13,14] niosomes[15,16] and ethosomes[17] are the vesicles other than liposomes that helps to enhance the penetration of substances across the dermal region (skin).

Nanoemulsions

The term 'nanoemulsion' refers to a mini emulsion which is oil/water or water/oil dispersion which is stabilized by an interfacial film of surfactant molecule .Because of small size, nanoemulsions are transparent.

Nanoemulsions are a colloidal particulate system which acts as carriers of drug molecules. Their size ranges from 10 to 1,000 nm.

These carriers are solid spheres and their surface is amorphous and lipophilic with a negative charge. The smaller the particle size, higher the stability and better the suitability to carry the active ingredients; these leads to an increase in the shelf life of the product.[18,19]

Nanocrystals

Drug nanocrystals are crystals with a size in the nanometer range, which means they are nanoparticles with a crystalline character. A further characteristic of the drug nanocrystals is that they are composed of 100% drug; there is no carrier material as in polymeric nanoparticles.[20] They exhibit physical and chemical properties somewhere between that of bulk solids and molecules. They allow safe and effective passage through skin.[21]

Hydrogels

The term hydrogel basically deals with the three-dimensional network structures which are obtained from a class of synthetic and/or natural polymers which have a characteristic to absorb and retain sufficient amount of water. The hydrogel structure is created by the hydrophilic groups that are present in a polymeric network . They can change their property to prevent the damage.[22]

Dendrimers

The name has actually been derived from the Greek word "Dendron" which means "tree," which indicates their unique tree-like branching structure. Dendrimers are three-dimensional, extremely branched, well-organized nanoscopic macromolecules, which possess low polydispersity index and is considered to have an important role in the developing field of nanomedicine.[23]

Cubosomes

Cubosomes are nanosized liquid crystals, made of certain amphiphilic lipids in definite proportions, also known as biocompatible carriers in drug delivery. Different characteristics like thermodynamic stability, bioadhesion, the ability of encapsulating hydrophilic, hydrophobic and amphiphilic substances, cubosomes are regarded as assuring vehicles for different routes of administration.[24] They are an considered as an enticing preference in cosmetics as well as in drug delivery.[25]

Solid lipid nanoparticles

Solid lipid nanoparticles (SLN) are novel carrier system for cosmetic active ingredients and pharmaceutical drugs. They consist of biodegradable physiological lipids and stabilisers which are generally recognised as safe (GRAS). Solid Lipid Nanoparticles can prevent the shielded compounds from debasement, used for the controlled delivery of cosmetics ingredients over a prolonged period of time and have been found to enhance the infiltration of dynamic mixes into the stratum corneum.[26]

ROUTES OF EXPOSURE OR RISK

1. Dermal Absorption
2. Intestinal Tract
3. Eye
4. Respiratory Tract

Dermal Absorption

Basically there are three ways by which the risk factor can penetrate across the dermal layer. The pathways identified are: Intercellular, Transfollicular and Transcellular. If the skin is impaired, and the normal barrier disturbed, then the chances of the entry of particles may substantially gets increased.

Intestinal Tract

Nanoparticles which are being swallowed up by the individual will lastly reach the intestinal tract. An important questions arises is that what happens with food containing nanoparticles. Will they remain in the intestinal tract or will they move on into the body? The answer is According to a report by the Swiss Re, can particles of under some 300 nm reach the bloodstream, while particles that are smaller than 100 nm are also absorbed in various tissues and organs.[27] As a general rule, the smaller the particles are, the more of them are absorbed and the deeper into the body they can go.

Eye

The human eye has been called the most complex organ in our body. The eye provides only a small surface area for the exposure but the indirect exposure to Nanomaterial may occur by means of cosmetics which are intended to be used in the vicinity of the eye or from the other types of cosmetic products.

Respiratory Tract

Depending on the size of the particles, the inhaled particles are deposited in the nose region, and the upper and the lower level of the respiratory system. A recent study describes with a information that the central nervous system and the brain are on the higher risk of being targeted by airborne solid ultrafine particles and that the most likely mechanism is from deposit in the nose region.[28]

SAFETY REQUIREMENTS

Manufacturers using nanotechnology in cosmetics meets an challengeable future from both consumers as well as regulatory point of view. Prominent scientific bodies like the Royal Society, the US Food and Drug Administration warns that the health risk factors of nanocosmetics requires a detailed investigation before the commercialization of the product.[29]

However, being an increase in nano-cosmetic products there is no specific safety regulations. The European Parliament approved the revised recast of the EU Cosmetics Directive, introducing the 'nanomaterials' into an EU legislation. As requested by the European Parliament, the new regulation introduces a safety assessment procedure for all products containing nanomaterials, which could lead to a ban on a substance if there is a risk to human health.[30]

CHARACTERIZATION METHODS FOR SAFETY ASSESSMENT OF NANOPARTICLES IN COSMETICS

The characteristics of nanomaterials may require a new test method for determining the risks caused by them. The following are the major parameters which are evaluated for the safety of nanomaterials:

- Physico-chemical properties`
- Microscopic techniques

Physico-chemical properties: Physical properties such as shape, size,surface area, solubility, structure, size distribution, etc and chemical properties such as molecular structure, composition of nanomaterial, phase identity, surface chemistry, hydrophilicity or lipophilicity have to be examined.[31]

Microscopic techniques: Useful information from the *in vitro* studies can be obtained by microscopic examination of the skin posttreatment.[32]

ADVANTAGES

- Using nanotechnology in beautifiers helps in durable aromas, more viable sunscreens and hostile to maturing creams.
- To enhance the UV protection in combinations.
- Used to save active ingredients.

DISADVANTAGES

- May now and again brings about aggravation and may cause harm.
- Nanomaterial has been demonstrated to harmful to human so may cause cell harm.
- They may bring about numerous clutters, for example, pneumonic fibrosis, cytotoxicity and so on.

CONCLUSION

Nanotechnology is a quickly extending and possibly advantageous field with huge suggestions for Society, Industry, Medicines, and Cosmeceuticals. Nanomaterial has been consolidated into various healthy skin items to exploit the novel properties of matter on a nanoscale. It is basic for dermatologists personally included with the soundness of the skin to know about this new innovation, to teach our own particular associates about it, and to play a dynamic part in assessing this innovation and setting arrangements and rules for its safe and productive utilize.

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