Research Article

Regulatory Status on Nanoproducts of U.S.A, E.U and India

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ABSTRACT

The study was conducted with a work to chalk out the regulatory framework for Nanoproducts in U.S.A, E.U and India. The Various Nano Products being marketed was listed and observed. All the required guidelines have been pooled up and were studied and made understand pertaining to Nanoproducts in U.S.A, E.U and India. In the present work entitled "Regulatory Status of Nanoproducts in U.S.A, E.U and India" most of the data was collected from the official regulatory authority websites 1-3. All the guidelines published by the authorities were collected compiled and studied thoroughly. They were found to be sufficient till date for the authorization of nano-products. Further amendments and up-gradations will be welcomed. In USFDA, though the guidelines have been established long-back they seem to be a bit vague in structure as they revolve around a single point agenda i.e., the size of the nano-particle and all other physico-chemical properties are dimension-dependent. In E.U, the scenario is on the other side i.e., guidance with a well explained and all the physico-chemical properties were given in-detail with official procedures and formulae for the preliminary safety measures. In INDIA there are no regulations for the marketing authorization of nanoparticles.

INTRODUCTION

Drug regulatory authority means a network that administers the full spectrum of drug regulatory activities, including at least the following functions and others:

- Marketing authorization for new products and variation of existing authorizations;
- Quality control laboratory testing;
- Adverse drug reaction monitoring;
- Provision of drug information and promotion of rational drug use; Good Manufacturing Practice (GMP) inspections and licensing of manufacturers, wholesalers and other distribution channels ; Enforcement operations;
- Monitoring of Drug Utilization.

Definition of Nano Products in EU

- Nanotechnology is defined as the production and application of structures, devices and systems by controlling the shape and size of materials at nanometer scale. The nanometer scale ranges from the atomic level at around 0.2 nm up to around 100 nm.

But in case of US there is no definition offered by the regulatory authority.

Types of Nano Products being marketed

- Lipid Based Nano Particles.
- Nano Crystals
- Polymer Based Nano Particles

Table 1: Nano products being marketed (lipid based nanoparticles)

PRODUCT	DRUG	INDICATION	STATUS
Abelcet	Amphotericin B	Invasive fungal infections	Approved in 1995- marketed
Ambisome	Amphotericin B	Fungal and protozoal infections	Approved in 1997- marketed
Daunoxome	Daunorubician	HIV-related kaposi's sarcoma	Approved in 1996- marketed
depoCyt	Cybinetara	Lymphomatous	Approved in 1999- marketed
DepiDur	Morfine sulphate	Relief of postsurgical pains	Approved in 2004- marketed
Doxil/Caelyx	Doxorubicin	Various cancers	Approved in 1995- marketed
Inflexal V	Liposomal influence vaccine	Influenza	Approved in 1997- marketed
Visudyne		Wet age –related macular degenerated	Approved in 2000- marketed

Table 2: Nano Products Being Marketed (Nano Crystals)

PRODUCT	DRUG	INDICATION	STATUS
Rapamune	Rapamycin	Immunosuppressive	marketed
Emend	Aprepitant	Anti-emetic	marketed
Tricor	Fenofibrate	Hypercholesterolemia	marketed
Megace ES	Megestrol	Ant-anoretic	marketed
Paxceed	Paclitaxel	Anti-inflamatory	phaseIII

Table 3: Nano products being marketed (polymer based nanoparticles)

PRODUCT	DRUG	INDICATION	STATUS
Adagen	PEGlyted adenosine deaminase enzyme	Severe combined immune deficiency disease	Approved in 1990-marketed
Cimzia	Peglyated Fab' fragmented of a humanized anti-TNF- alpha antibody	Crohn's disease, rheumatoid arthritis	Approved in 2008-marketed
Copaxone	Polymer composed of L- glutamic acid, L-alanine, L- lysine,L-tyrosine	Multiple sclerosis	Approved in 1996-marketed
Eligard	Leuprolide acetate and PLGH polymer formulation	Advanced prostate cancer	Approved in 2002-Marketed
Macugen	PEG-anti-VEGF aptamer	Neovascular age- related macular degeneration	Approved in 2004-marketed
Mircera	Chemically synthesized ESA, methoxy PEG- epoetin beta	Symptomatic anemia associated with chronic kidney disease	Approved in 2007-marketed
Neulasta	conjugate of PEG and filgration	chemotheraphy- induced neutropenia	approved in 2002-marketed
Oncaspar	PEGYLATED formulation of L-asparaginase	Acute lmphoblastic leukamia	approved in 1994-marketed
Pegasys	PEGlyated interferon alfa-2a	hepatiti C	Approved in 2002-marketed

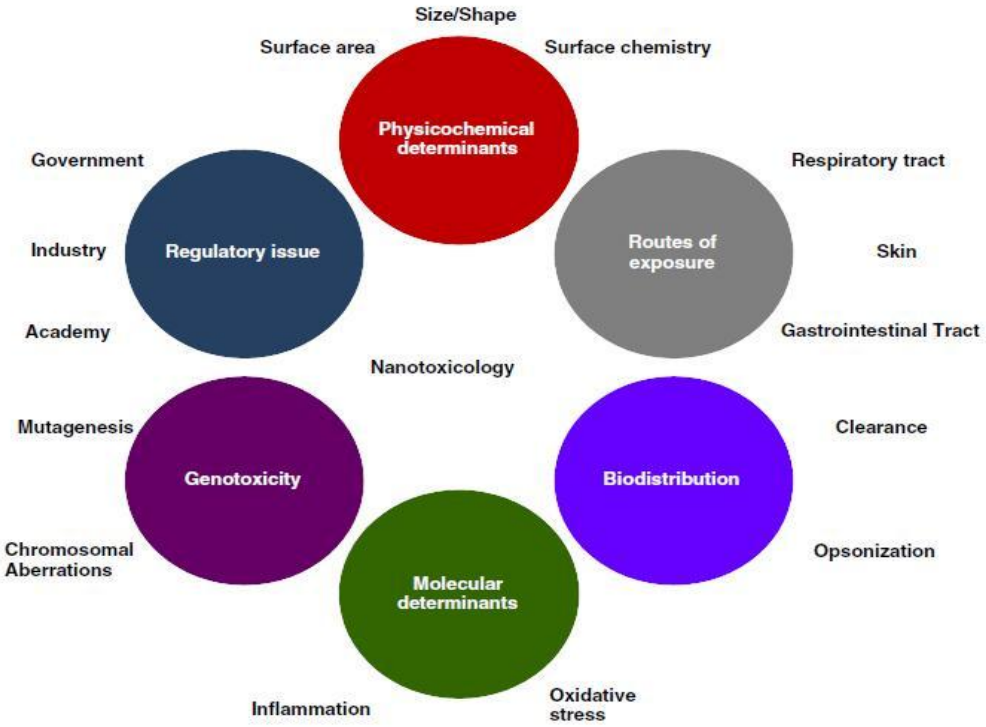

Fig. 1: Toxicity of Nano Particles

METHODOLOGY

The research was carried out with the collected data by analyzing the terms of the below parameters:

1. Types of study

The study was conducted with an objective to chalk out the regulatory framework for Nanoproducts in U.S.A, E.U and India. All the required guidelines have been pooled up and were studied and made understand pertaining to Nanoproducts in U.S.A, E.U and India.

2. Source of data

Major part of secondary data collection was done by means of following sources

3. Literature review

Literature review was done mainly on collection of the U.S.A, E.U and India Nanoproducts requirements. Typically covered the books and regulatory guidelines published officially by government authorities, newspaper articles, including the academic journals, online journals, market research reports and other resources4-8.

4. Internet using the web page content

The literature was collected using numerous websites e.g. Pharmabiz, ema.europa.eu, fda.gov.in, IMS & BMI articles, Google scholar and many more. Online books also served as a good source of information. Key words in the search involved Nanotechnology-Present Scenario along with the name of various parameters associated to pharmaceutical field, name of regulatory bodies and other variations were used.

DISCUSSION

This guideline throws light on the following characteristics of nanoproducts:

1. Particle size, shape, size distribution, and degree of agglomeration
2. Chemical description (composition and identification)
3. Specific surface area
4. Surface chemistry
5. Surface charge, zeta potential and Hamaker constant
6. Influence of water chemistry on nanomaterial properties and dispersion behavior
7. Preparation of liquid dispersions; octanol/water partition coefficients
8. Crystal structure
9. Interfacial tension

RESULTS[9-14]

	U.S.F.D.A	E.M.E.A
Particle size	1nm to 100nm	1nm to 100nm
Shape		Depends on employed methodology as well as on the properties of the medium supporting.
Size distribution		Depends on employed methodology as well as on the properties of the medium supporting.
Degree of agglomeration	All these physico-chemical properties are dimension dependent according to	Depends on employed methodology as well as on the properties of the medium supporting.
Chemical description	the guidance given by the U.S.F.D.A	Should comprise both purity and coating or surface modification
Specific surface area		Depends on measurements of pore size, pore size distribution, porosity and particle density
Surface chemistry		Ionisable sites may influence the surface charge which has been considered significant in toxicological studies
Surface charge Zeta potential and Hamaker constant		
Influence of water chemistry on nanomaterial properties and dispersion behavior		$CCC = \frac{8.74E\text{-}39\ \gamma^4}{A^2 z^6}\ (mol\ dm^{-3})$
Crystal structure		Crystal structure determination is useful for distinguishing among different crystal phases of materials of the same chemical composition.
Interfacial tension		$\log(Ksp, SSA) = \log(Ksp, SSA=0) + (2/3)\gamma(SSA)/2.303RT$
Nano-specific legal prescription	None	None (Yes for Cosmetics)

SUMMARY AND CONCLUSION

In the present work entitled “Regulatory Status of Nanoproducts in U.S.A, E.U and India” most of the data was collected from the official regulatory authority websites. All the guidelines published by the authorities were collected compiled and studied thoroughly. They were found to be sufficient till date for the authorization of nano-products. Further amendments and up-gradations will be welcomed.

In USFDA, though the guidelines have been established long-back they seem to be a bit vague in structure as they revolve around a single point agenda i.e., the size of the nano-particle and all other physico-chemical properties are dimension-dependent.

In E.U, the scenario is on the other side i.e., guidance with a well explained and all the physico-chemical properties were given in-detail with official procedures and formulae for the preliminary safety measures.

In INDIA there are no regulations for the marketing authorization of nanoproducts.

Hence we are expecting soon from Indian Regulatory Authority (CDSCO) may frame the suitable guidelines to provide nano products in India too….

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