ECRONICON OPEN ACCESS

EC VETERINARY SCIENCE
Editorial

Potential of Nanotechnology for Advances in Veterinary Medicine

Desh Deepak, Amit Kumar Verma*, Arbind Singh, Vipul Thakur and Tarun Kumar Sarkar

Department of Veterinary Medicine, College of Veterinary and Animal Sciences, Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut, UP, India

***Corresponding Author**: : Amit Kumar Verma, Department of Veterinary Medicine, College of Veterinary and Animal Sciences, Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut, UP, India.

Received: July 05, 2019; **Published:** July 26, 2019

Recently nanotechnology has emerged as key technology of twenty first century but still can be considered naive and innovative in the field of veterinary medicine. Nanotechnology can be defined as "research and development aimed at understanding and working with seeing, measuring and manipulating matter at atomic level and supra-molecular level". The size of nanoparticles scales from 1 to 100 nanometers. Due to initial success in the field of medicine, researchers all around the world credits nanotechnology as solution to some of most rigid technical challenges in front of veterinary fraternity. Nanotechnology offers immense potential to significantly contribute clinical therapeutics in veterinary sciences with the help of microfluids, biocompatible, nano-drug carriers like liposomes, and through microarrays or biochips or nanosensors for disease diagnosis. Such drug delivery systems increases bioavailability of drug, potentiates action, elongates circulation half-lives and reduces undesirable effects of drugs. Current status of nanotechnology in veterinary science is limited to enhance animal growth and production but it provide us a break through to explore alternative microbial agents and vaccine targets to overcome the issue of alarming antimicrobial resistance and drug residues. Outbreaks of livestock disease causes extensive losses to income of farmers and delayed diagnosis of zoonotic diseases pose serious threat to human health. Developments in Nano technology can alleviate these losses and harms by aiding in development of new diagnostic tools especially nanosensors based field test kits, new form of treatments and noble nano-vaccine systems. Recent studies and advances in Nano medicine are more inclined towards controlled release and specific sites drug release.

There are various forms of Nano pharmaceuticals each with some peculiar properties like liposome nanoparticle, polymeric nanoparticle, dendrimer nanoparticles, micellar nanoparticles and metallic nanoparticles i.e. iron oxide, zinc oxide, silver and gold nanoparticles explored in veterinary medicine for disease diagnosis, treatment, drug delivery, animal nutrition and animal breeding. Among all these nanoparticle, liposomes are highly modifiable and well characterized therefore liposomal mediated drug delivery has shown maximum promise especially as new therapy systems like liposomally entrapped gentamicin for Staphylococcus aureus mastitis, liposomally entrapped niacin for various mastitis, liposomally entrapped phage for multi-drug resistant bacterial infections, liposomally entrapped Amphotericin-B for cryptococcosis and blastomycosis, liposomally entrapped ribavirin and liposomally entrapped 2'3'-dideoxycitidine for viral diseases. Micellar nanoparticles provides better loading capacities and stability, dendrimer nanoparticles are promising tools for gene transfer, antineoplastic drugs and in MRI imaging. Polymeric nanoparticles provides better stability in biological fluids and allows controlled drug release. Nanotheranostics explores metallic nanoparticles especially silver and gold as a tool of targeted delivery for short and long terms both. Nano-emulsions working on physical principle of killing microbe by merging its nano-drops to microbes by virtue of its surface tension and then tearing it apart. Such emulsion has advantage that they don't affects cells of higher organism. One such example is soya bean oil which in its standard form is not of significant medical use but after emulsification it becomes very potent microbicidal agent. There are many more types of biomaterial that have shown marvelous promise in some of important emergency conditions like aluminosilicate nanoparticles to reduce bleeding, buckyballs to trap free radicals produced during atopy and allergy, nanoshells aiming to destroy cancer cells using IR radiations, nano-robots for individual cell repair. Nanosensors are miniature devices with the ability

to detect microbial cells, toxins, antibiotics, pesticides and heavy metals in biological fluid and tissue samples. Most recent applications of nanotechnology is in the field of regenerative medicine which tends to develop ideal nanomaterial's called as nano-robots capable of sending signals to injured tissue to initiate and accelerate tissue regeneration.

Nanotechnology has marked the start of new era in various area of research interest seeking alternative strategies to encounter drug resistant strains, adverse effects of drugs, drug residue, various stages of cancers etc. and already is emerging industry all around the world with appreciable annual market of 7.24 billion dollar in 2017. Hypothetical nanodevices like respirocytes (hypothetical erythrocytes) and microbivores (Hypothetical leucocytes) capable of performing functions of equivalent to normal erythrocytes and leucocytes are some of exciting concepts that can be look forward to encounter important emergency respiratory and septicemic conditions. Currently nanotechnology is also employed for treatment of African animal trypanosomiasis. The day is not far away when most of the animal diseases will be addressed using Nano diagnosis and Nano medicine but it will take several years of intense applied research and clinical trials for obtaining valuable results. Initial success of nanotechnology in veterinary medicine has certainly raised our technological capabilities and confidence to new level but to appreciate and incarnate desirable advantages of this technology to field will require extensive studies, researches and encouragement.

Volume 4 Issue 6 August 2019