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APPLICATIONS OFNANO-BIOTECHNOLOGY: A STATE OF THE ART REVIEW

Upendra Sharma.U.S
Assistant professor, Department of Life Sciences,
School of Sciences, B-II, Jain (Deemed to be University), Bangalore-560027, India.
Email Id:upendra.sharma@jainuniversity.ac.in

Abstract
In biological fields, nano-biotechnology is the application of nanotechnology. Nanotechnology is a multidisciplinary area that currently recruits techniques, technologies and facilities available in engineering, physics, chemistry and biology in both traditional and advanced avenues. A systematic literature review was conducted on the concepts, drawbacks, challenges, advances and applications of nanotechnology in the field of medical science. There are several possibilities for nano-biotechnology to advance medical research, thereby enhancing health care practises around the world. It is anticipated that several novel nanoparticles and nano devices will be used, with an immense positive effect on human health.Although nanotechnology's true clinical applications are still virtually non-existent, a large number of promising medical ventures are at an advanced experimental level. In medicine and physiology, the application of nanotechnology means that processes and devices are so technically developed that they can communicate with a high degree of precision with sub-cellular (i.e. molecular) levels of the body.Thus, with minimal side effects, therapeutic effectiveness can be achieved to the fullest by means of direct clinical intervention unique to the cell or tissue. In order to incorporate various components of nano-biotechnology in random clinical applications with success, more thorough research and careful clinical trials are still needed. In addition to the latest technologies, legal and moral issues still need to be discussed.

Keywords: *Applications, Biology, Medical, Nano-biotechnology, Nanotechnology, Nanoscience.*

I. INTRODUCTION

Nanotechnology is a novel scientific method that requires the ability of materials and equipment to modify a substance's physical and chemical properties at molecular levels. On the other hand, in order to control biochemical, genetic and cellular processes for the production of goods and services, biotechnology uses the knowledge and techniques of biology and is used in various fields, from medicine to agriculture[1].The unusual convergence of biotechnology and nanotechnology by which classical micro-technology can be combined into a real molecular biological approach is known to be nano-biotechnology. Through this technique, atomic or molecular grade machines can be created by imitating or integrating biological systems, or by constructing small tools to analyse or modulate, on a molecular basis, the various properties of a biological system.

Therefore, nano-biotechnology will relieve many avenues of life sciences by integrating cutting-edge IT & nanotechnology applications into existing biological problems. This technology has the ability to remove obvious distinctions between biology, physics and chemistry to some degree and form our current ideas and understanding[2]. For this reason, several new issues and directions may also arise in education, science & diagnostics at the same time through the extensive use of nano-biotechnology over time[3].For most diseases, existing diagnostic methods rely on the manifestation of observable signs before medical professionals can understand that the patient is suffering from a particular disease. But therapy may have a decreased chance of being successful by the time those symptoms have arisen[4]. Therefore, the sooner you can diagnose a disease, the better the likelihood of a cure. Until signs even present themselves, illnesses can optimally be diagnosed and healed. Diagnosis of nucleic acid will play a key role in this process, as it allows the identification of pathogens and diseases/diseased cells at such an early stage of disease development without symptoms that successful treatment is more feasible.

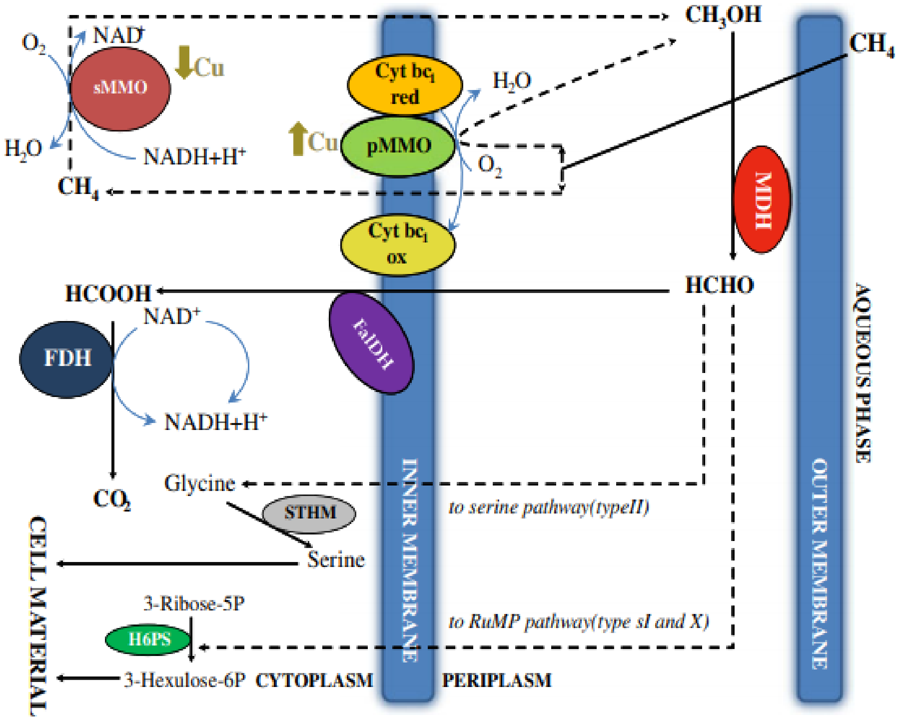

Figure 1: Depicts the Methane oxidation pathways in type I and II methanotrophs[5]

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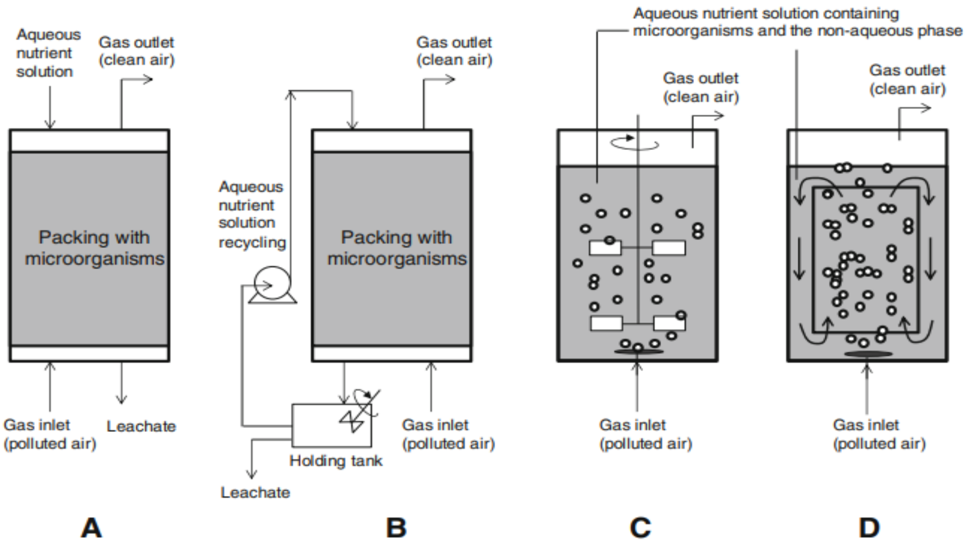

Figure 2: Depicts the Bioreactor configurations reported in the literature for CH4 abatement: (A) biofilter (B) biotrickling filter (C) stirred tank (D) concentric tube airlift[6]

II. CONCEPT OF NANO-BIOTECHNOLOGY

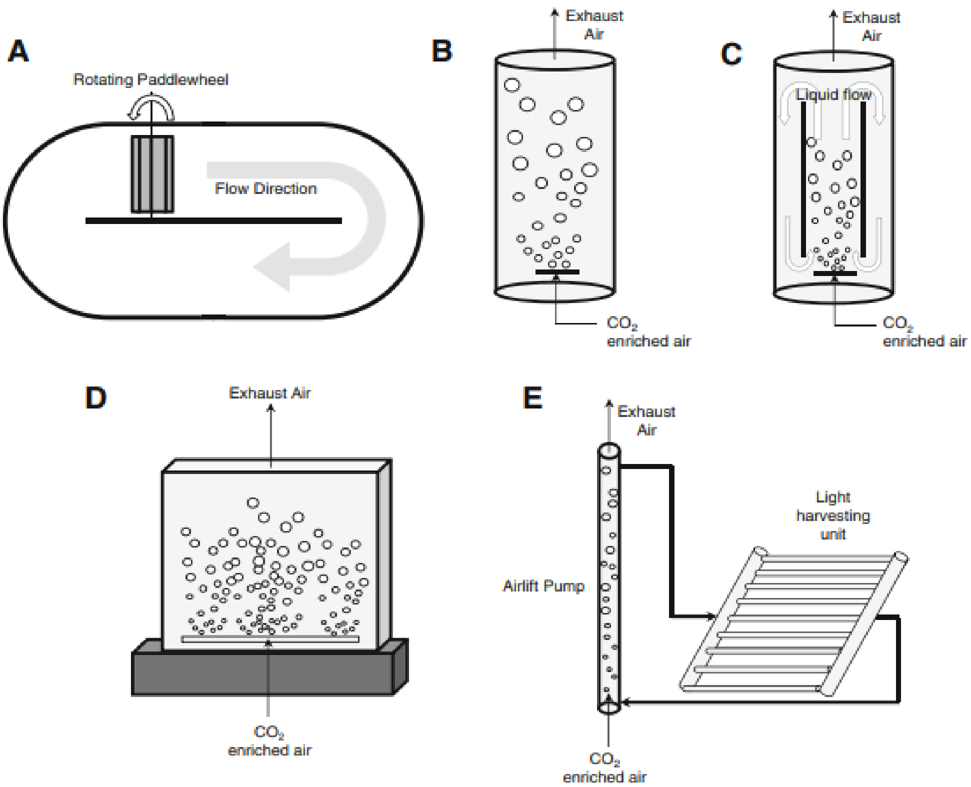

Figure 3: Schematic structures of PBRs for CO2 abatement: HRAP (A), vertical bubble column (B), vertical airlift (C), flat-plate (D), and horizontal tubular (E) PBRs[7]

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Nanoparticles can be delivered to targeted sites as therapeutics, including locations that standard drugs cannot easily reach. For instance, if a therapeutic can be chemically attached to a nanoparticle, radio or magnetic signals can then guide it to the site of the disease or infection. Only at times when particular molecules are present or when external stimuli (such as infrared heat) are given can these nanodrugs be engineered to 'release'. At the same time, by reducing the adequate dose required to treat the patient, adverse side effects from potent drugs can be avoided[8].Nanotechnology is very complex, ranging from extensions of traditional system physics to entirely new methods focused on molecular self-assembly, from the creation of new nanoscale-dimensional materials to the investigation of whether atomic scale/level issues can be managed directly. This definition includes the application of such diverse fields of research as surface science, organic chemistry, molecular biology, semiconductor physics, micro-manufacturing, etc.

Pathophysiological disorders and anatomical changes in diseased or inflamed tissues may potentially give rise to a wide number of possible scopes for the production of different targeted nano-technology items. In the following ways, this growth is like being advantageous: 1. Via taking advantage of the distinct pathophysiological characteristics of diseased tissues, drug targeting can be achieved; 2. It is possible to accumulate various nano products at higher concentrations than standard drugs; 3. Increased vascular permeability coupled with impaired tumour lymphatic drainage enhances the effect of tumour or inflamed tissue nano-systems by enhancing transmission and retention[9].

III. CONCLUSION

The early stages of nano-biotechnology are still ongoing. The multidisciplinary area of nano-biotechnology brings nearer and closer to existence the science of the almost incomprehensibly tiny unit. At some point, the implications of these advances will be so massive that nearly all areas of science and technology will possibly be affected. In medicine, nano-biotechnology provides a wide variety of applications. Innovations such as methods for the delivery of drugs are just the beginning of something new. In the future, many diseases that have no treatments today will be cured by nanotechnology.Although the aspirations of nano-biotechnology in medicine are high and the potential benefits are continuously recognised, the protection of nanomedicine has not yet been fully established. The use of nanotechnology in medical therapeutics requires that its risk and safety factors be properly assessed. Scientists who reject the use of nanotechnology nevertheless accept that development in nanotechnology should continue because it offers tremendous benefits in this area, but tests should be carried out to ensure people's protection.Nanomedicine can play a crucial/unparalleled role in the future in the treatment of human diseases and also in the improvement of normal human physiology. Nano-biotechnology will one day become an unavoidable part of our daily life if everything runs smoothly, which will help save many lives.

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