Commentary

iMedPub Journals
www.imedpub.com

Molecular Enzymology and Drug Targets
ISSN 2572-5475

2021
Vol.7 No.3:7

Molecular and Biochemical Aspects of De-nitrification

John Edgar*

Department of Pharmaceutical and Pharmacological Sciences, University of Padova, Via F. Marzolo 5, 35131 Padova, Italy

***Corresponding author:** John Edgar, Department of Pharmaceutical and Pharmacological Sciences, University of Padova, Via F. Marzolo 5, 35131 Padova, Italy, E-mail: johnedgar@hotmail.com

Received date: December 8, 2021; **Accepted date:** December 22, 2021; **Published date:** December 29, 2021

Citation: Edgar J (2021) Molecular and Biochemical Aspects of De-nitrification. Mol Enzy Drug Targ Vol.7 No. 3:7

Description

De-nitrification is a microbially mediated process that reduces nitrate to create molecular nitrogen *via* a series of intermediate gaseous nitrogen oxide products. De-nitrification is a type of respiration performed by facultative anaerobic bacteria that decreases oxidised forms of nitrogen in response to the oxidation of an electron donor such as organic materials. In order of most to least thermodynamically advantageous, the preferred nitrogen electron acceptors are nitrate, nitrite nitric oxide nitrous oxide and ultimately di-nitrogen, which completes the nitrogen cycle. Microbes that de-nitrogenate require a low oxygen content of less than 10% as well as organic C for energy. De-nitrification can be strategically utilised to treat sewage or animal leftovers with high nitrogen concentration since it can remove NO3 and reduce its leaching to groundwater.

Heterotrophic bacteria (such as Paracoccus de-nitrificans and different pseudomonads) conduct the majority of the work, but autotrophic de-nitrifiers have also been discovered (e.g., Thiobacillus de nitrificans). Denitrifiers can be found in every major phylogenetic group. Several bacteria species are involved in the full reduction of nitrate to N2, and more than one enzyme route has been found. The de-nitrification process not only provides energy to the organism converting nitrate to dinitrogen gas, but some anaerobic ciliates can also get energy from denitrifying endosymbionts, similar to how mitochondria in oxygen-breathing animals do.

De-nitrification conditions

De-nitrification can occur in both terrestrial and marine ecosystems in nature. De-nitrification usually takes place in anoxic conditions, where the amount of dissolved and freely available oxygen is low. Instead of oxygen, a more energetically favourable electron acceptor, nitrate or nitrite can be employed as a substitute terminal electron acceptor in these locations. A terminal electron acceptor is a chemical that receives electrons and is thereby reduced in the process. Soils, groundwater, wetlands, oil reserves, poorly ventilated corners of the ocean, and seafloor sediments are all examples of anoxic habitats.

Isotopic fractionation can occur as a result of de-nitrification in the soil environment. The sediment profiles contain both 14N and 15N, two stable nitrogen isotopes. During de-nitrification, the lighter nitrogen isotope, 14N, is favoured, leaving the heavier nitrogen isotope, 15N, in the remaining materials. As a result of this selectivity, 14N is more abundant in biomass than 15N.

Treatment of waste water

De-nitrification is a method of removing nitrogen from sewage and municipal trash. It's also useful in artificial wetlands and riparian zones for preventing nitrate contamination of groundwater caused by excessive agriculture or domestic fertiliser use. Since the 2000s, wood chip bioreactors have been examined for their ability to remove nitrate from agricultural runoff and even manure.

Reduction can also occur under anoxic conditions through a process known as anaerobic ammonium oxidation.

Conclusion

Compounds including methanol, ethanol, acetate, glycerin, or proprietary products are added to wastewater at some wastewater treatment plants to offer a carbon and electron source for denitrifying bacteria. The nature of the electron donor and the process operating conditions affect the microbial ecology of such engineered de-nitrification systems. Industrial wastewater is also treated using de-nitrification techniques. Electro-Biochemical Reactors (EBRs), membrane bioreactors (MBRs), and moving bed bioreactors are among the commercially available denitrifying bioreactor types and designs for industrial purposes (MBBRs).