

Therapeutic View on Immobilised Monoamino Oxidase

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Subject: Pharmacology

Abstract

Enzymes are the micro molecule protein which catalyzes various biochemical reaction in living organism. Retention of enzyme movement in definite area of space with their enzymatic activity and can reuse. Monoamine oxides' which is widely distributed in various tissues play an important catalytic role in oxidative deamination of primary, secondary and tertiary amines like catecholamine. Immobilization of Monoamine oxides' may increase its half life.

Keywords: *Immobilised Monoamine oxidase, enzymes, amines*

Introduction

Enzymes are the macromolecule protein which catalyses various biochemical reaction in living organism it also play an role in vitro therefore enzyme allow for industrial use in large scale industries including food sugar pharmaceutical and chemical enzyme are used for industrial application enzyme have advantages over chemical process. Enzyme occurs under more mild (physiological) condition and various no of processing which increase yield as well as reaction rate. It have high specific stereo region and chemo selective due to this enzyme property it gives higher purity product and process is more envirmintal friendly. With lower pressure milder solvent and reduced waste [1] Nelson and Griffin in 1916 was discovered the term immobilization when enzyme adsorbed on inert adsorbent surface it show its same activity "when uniformly distributed in the solution" this was 1st discover later on various enzyme are immobilized.[2] The term immobilization generally refers limiting movement.[3] Enzyme immobilization half in their economic reuse and in development of bioprocess.By using isolated enzyme or whole cell the biocatalyst are immobilized.[4] Keeping cell in one placed by adopting in to inert material refer to cell immobilizations in bioreactor, cell trapped stuck on surface while nutrient flow over them.[6]

Enzyme Immobilization

It is define as "Retention of enzyme moment in definite area of space with their enzymatic activity and can reuse" Immobilization means

associating biotacallist with insoluble matrix so it retained proper geometry, and can use repeated by stabilities condition. [5]

Fundamentals of Enzyme Immobilization

Following are the several method that can used to immobilised cell or enzyme like,

- 1) Cross linking
- 2) Physical adsorption
- 3) Ionic bonding
- 4) Metal bonding
- 5) Covalent bonding
- 6) Fiber entrapment
- 7) Micro-encapsulation for insoluble enzyme
- 8) Ultra filtration membrane and hollow fiber device are used for soluble enzyme

Above all method having their own advantages with particular limitation or disadvantages

The major components of immobilizations are as follow

- 1) Enzyme
- 2) The matrix
- 3) Mode of interaction of the enzyme with respective carrier

The stability of immobilized enzyme or cell is totally depend upon material or matrix that can choose for support there is no universal matrix for immobilization. No. of character are required to choose material consider for immobilization. [4]

Various techniques of immobilizations

In near future various technology have been adopted for immobilization depending upon ability of enzyme to catalised the reaction.[7] There are various methods are available for immobilization. Out of them following are 3 major methods of immobilization.

- A) Adsorption
- B) Entrapment
- C) Cross linking or covalent bonding.[8]

A) Adsorption :- Prime criteria for adsorption technique is enzyme must be insoluble in that solvent, which is generally water, in this method enzyme is physically adsorbed by support (i.e. polymer beads or membrane) deep the inert support on solution containing insoluble enzyme and incubating to allow time. Remove and dry on electrode surface and then rinsing away not adsorbed enzyme from support.[8,9]

Advantages:-

- 1) It is simple technique
- 2) It is economic method [8, 9]

Disadvantages:-

- 1) Method is trouble some
- 2) It allow leaching of the enzyme while leaching
- 3) So contamination may occurs [10, 11]

B) Entrapment: - In this method enzyme entrapped either lattice structure of material or in polymer membrane [12, 13, 14]. These techniques have ability to provide micro environment for the enzyme. This could be optimal ph, polarity or amphiphilicity. Generally polymer, sol- gel, polymers sol- gel, composites and other material are used to entreated [15,16 ,17 ,18]

Advantages:-

- 1) Minimum leaching of enzyme
- 2) And improves stability

Disadvantages:-

- 1) Transport limitation may occur to the enzyme active site
- 2) It is expensive method [19]

C) Cross linking: - It is one of the method of immobilization of protein to an insoluble support to prevent the loss of enzyme in to the substrate solution [13, 19, 20]

The other common technique for binding to support is covalently binding enzyme to the functional support [22, 23, 24]

Advantages:-

- 1) Retain its enzymatic activity

Disadvantages:-

Cross linking or covalently bonding the enzyme to the support material surface typically decreases the degree of movement of the enzyme which can dramatically decrease the enzyme activity. [21]

Main Application areas of immobilization technology:-

- 1) *Bioprocess Technology:* - Historically for production of antibiotics, mammalian cell culture, it is most important and wide area of immobilization. Now-a-days we can produced polysaccharide, medically important drug, solvent, protein-enhanced food, novel fermented are produced with help of immobilization.
- 2) *Enzyme technology:* - In industry for production of amino acid, high fructose syrup, semi-synthetic penicillin, starch as well as cellular hydrolysis etc., generally immobilization techniques are used due to its specific chemical reaction capability.
- 3) *Waste Technology:* - Through long historical important but more emphasis, couple immobilization technique with conversion of recycling of resources, food, and fertilizer and to produced biological fuel.
- 4) *Environmental Technology:-* Due to solving many environmental problem like pollution control , removing of toxic waste, recovery of metal from minimum wastes and low grade ores great scope exist for immobilization technique in this field.
- 5) *Renewable Resources Technology :-* The used of renewable energy sources in particular lignocelluloses to generate new sources of chemical raw material and

energy ethanol, methanol, and hydrogen, moreover total utilization of plant and animal.

- 6) *Plant and animal Agriculture:* - The major problem in plant and animal like nutrition, disease, stress tolerance can treat by immobilization. It also improves productivity for animal farming and improved the food quality flavor, taste and microbial softy.
- 7) *Health Care :-* In health care the immobilized enzyme or cell are used to diagnose, to treat, to prevent various disease and it also play an important role in health care by fascinating the production of new drug, and better treatment for delivering medicine. It is also used to understand human genome [4].

Monoamine oxides' (MAO) :- Flavin-adenosine dinucleotide (FAD) containing mitochondrial enzyme is called Monoamine oxides' or simply MAO, which is widely distributed in various tissue [25] MAO play an important catalysis role in oxidative domination of primary, secondary and tertiary amines like catecholamine. [26] MAO having two different is form i.e. MAO-A and MAO-B they distributed different tissue but having different substrate specificity as well as inhibitor sensitivity. Ex. MAO- A is used in mental disorder such as depression mean while MAO-B inhibitor used for neurological disorder like Parkinson and Alzheimer's. We can immobilize both MAO-A and MAO-B by using liquid chromatographic technique i.e. Immobilized Enzyme Reactor (IMER) are used as inert support. It retains its catalytic activity in appropriate system. The immobilization of polymer was initially reported in 1960 and now-a-day it is widely used in industry and scientific field. [27]

Role of Monoamine oxidase and their inhibitor and also immobilized MAO:-

- 1) For oxidative domination of primary, secondary and tertiary amine MAO is responsible and play catalyst. In this amine and oxidized to produced amine and further hydrolysis is occur to form aldehyde shows in fig.(1) The enzymatic reaction proceed for reduction of FAD then oxidized with molecular oxygen to form hydrogen peroxide in fig.(1)

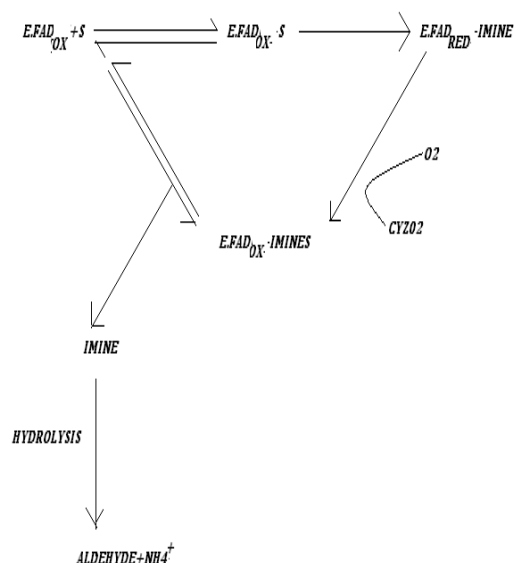


Fig.1:- Mechanism of oxidative domination by MAO

- 2) In addition, recent studies of MAO – B inhibitor used in addiction like tobacco, smoke. It seen that MAO-B inhibitor contributes to the addictive properties of tobacco.[28]
- 3) Immobilized MAO also used in analytical liquid phase and separation system has been extensively reviewed[26]
- 4) The development of method to rapidly identify these compound in complex chemical reaction and biological mixture the immobilized MAO are used due to pharmacological and therapeutic important of MAO.
- 5) Due to various development in technique of immobilization it allow for their use in industrial and in medical sector for ex. Production of various biological products, immobilized lipase are used. [29]

Scope of immobilized MAO :-

- 1) Immobilized MAO can be used for different therapeutic purposes including Hypertension, Angina pectoris, Cardiac arrhythmias, Myocardial infraction, CHF, Migraines, Anxiety, Glaucoma

Mechanism of Action of immobilized MAO:-

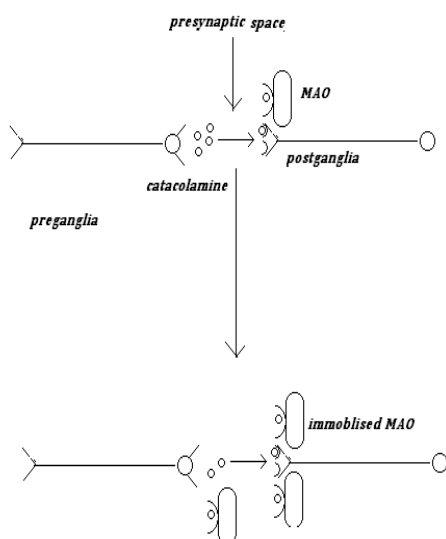


Fig. (2):- Mechanism of Action of immobilized MAO

When any stimuli given to the presynaptic vesicle of sympathetic neuron it release neurotransmitter and bind to their respective site of action and show its action. For example increase heart rate and cause hypertension. This neurotransmitter is metabolized by monoamine oxidase.

Disorder occurs by deficiency of monoamine oxidase

1) BRUNNER SYNDROM:-

It is hypothesis as a rare genetic disorder cause by a mutation in the MAO gene. It is characterized by mild mental retardation, problematic impulsive behavior such as Arson, Heterosexuality and violence sleep disorder as well as mood swinging. Attempt to rape and suicide was notated it has only been identify in 5 male from one family. [30]

Cause:-MOA-A deficiency lead to increase excess of monoamines in brain such as serotonin dopamine and epinephrine etc. [31]

2) NORRIE DISORDER (pseudoglonia):-

It is genetic disorder cause by mutation of NDP gene located on Xp 11.4.it show no clinical symptom but abnormality in mild hearing and vision may occur.NDP gene is near to MAO gene so prevention of gene product may occurs and simple change *single* amino acid in narrie disorder.norrie require for normal function and development of eye and other sympoter.It

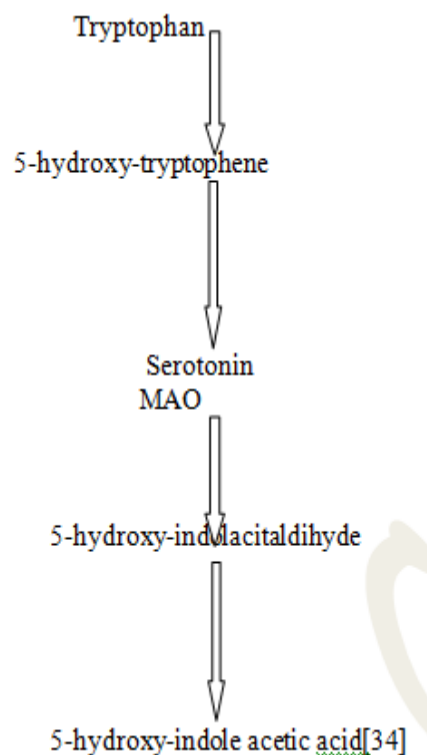
also appear to be crucial in specialization of the cell of retina and establishment of blood supply to inner ear and tissue of retina so may cause hearing loss and blindness[32]

Cause:-primary nurochemical level increase in urine such as phenylethilamine. [33]

3) FLUSHING AND ATTENTION DEFECT:-

It is diarrhea like disorder cause due to deficiency of monoamine oxidase

Cause:-



Use:-

Immobilized MAO used in defiancy of MAO.

Other possible used of immobilized MAO as therapeutic agent:-

- 1) Hypertension
- 2) Angina pectoris
- 3) Cardiac arrhythmias
- 4) Myocardial infraction
- 5) CHF
- 6) Migraines
- 7) Anxiety
- 8) Glaucoma

Conclusion:-

Hyperactivity of Sympathetic neurotransmitter can cause Hypertension, Angina pectoris, Cardiac arrhythmias, Myocardial infarction, CHF, Migraines, Anxiety etc. MAO can metabolize sympathetic neurotransmitter, administration of immobilized MAO could be

beneficial in such kind of diseases with prolonged half life.

Cite this article”

A. Subugade, D. Mohale, A.Chandewar “Therapeutic View on Immobilised Monoamino Oxidase” Int. J. of Pharm. Res. & All. Sci.2013; Volume 2, Issue 1,25-30

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