

GRCP *InfoApex*

Half yearly news letter



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Gokaraju Rangaraju College of Pharmacy

Imparts Pharmaceutical Education of International Standards

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Motto of this Journal

- 1. To provide scientific, technical and social welfare updates**
 - 2. To promote scientific drafting among staff and students**
 - 3. To circulate institutional updates**
 - 4. To build flat form to serve the community**
 - 5. To identify and appreciate potential achievements**
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Importance of enzymes in diagnosis

Mrs Sunitha G and Ms Chandana M

Enzymes are biocatalysts synthesized by living cells, protein in nature. Enzymes perform a wide variety of functions in living organisms. Estimation of the activities of enzymes is very important for disease diagnosis and prognosis. The normal serum level of an enzyme indicates the balance between its synthesis and release in the routine cell turnover. The raised enzyme levels could be due to cellular damage, increased rate of cell turnover, proliferation of cells, increased synthesis of enzymes etc. Serum enzymes are conveniently used as markers to detect the cellular damage which ultimately helps in diagnosis of disease. Commonly assayed enzymes are alanine transaminase (ALT), aspartate aminotransferase (AST), lactate dehydrogenase (LDH), creatine kinase (CK), alkaline phosphatase (ALP), acid phosphatase (ACP), gamma glutamyl transferase (GGT), glutamate dehydrogenase, amylase, lipase, angiotensin converting enzymes (ACE), choline esterase etc. The disease which are diagnosed include myocardial infarction, liver diseases, muscle disorders, malignancy etc.

Enzymes are defined as biocatalysts synthesized by living cells. They are protein in nature (exception – RNA acting as ribozyme), colloidal and thermolabile in character, and specific in their action. Enzymes are large biomolecules that are responsible for many chemical reactions that are necessary to sustain life. Enzymes in circulation are divided into two groups – plasma functional and plasma non-functional. Concentration of non functional plasma enzyme increase greatly in diseases, causing breakdown of cells or increased cellular permeability. So estimation of the plasma concentration of these enzymes in blood is useful for the diagnosis of disease depending on their tissue origin. Commonly assayed enzymes are the amino transferases: alanine transaminase, ALT (sometimes still referred to as serum glutamate-pyruvate aminotransferase, SGPT) and aspartate aminotransferase, AST (also referred to as serum glutamate-oxaloacetate aminotransferase, SGOT); lactate Dehydrogenase LDH, creatine kinase, CK (also called creatine phosphokinase, CPK).

1. Transaminases

These are aspartate transaminase (AST) and alanine transaminase (ALT). ALT is a cytoplasmic enzyme while AST is both cytoplasmic and mitochondrial. AST is found in muscle, liver and red cells (hemolysis). It is also known as serum glutamic oxaloacetic transaminase, (SGOT). AST is commonly

measured clinically as a part of diagnostic liver function tests, to determine liver health, biochemical marker for the diagnosis of acute myocardial infarction. It is now redundant and has been superseded by the cardiac troponins. Muscle tissue (skeletal, cardiac) does not contain ALT which comes mainly from liver. ALT was formerly called serum glutamate-pyruvate transaminase (SGPT). Increased serum level of ALT indicates a severe liver disease, usually viral hepatitis and toxic liver necrosis.

2. Lactate Dehydrogenase (LDH); Lactate dehydrogenase (LDH or LD) is an enzyme found in animals, plants, and prokaryotes. Lactate dehydrogenase is of medical significance because it is found extensively in body tissues, such as blood cells and heart muscle. Because it is released during tissue damage, it is a marker of common injuries and disease. Isoenzymes of LDH have immense value in the diagnosis of heart and liver related disorders. For healthy individuals, the activity of LDH2 is higher than LDH1 in serum. In case of myocardial infarction, LDH1 is much greater than LDH2, and this happens within 12-24 hours after infarction.

3. Creatine Kinase (CK): Creatine kinase (CK), also known as creatine phosphokinase (CPK) or phospho-creatine kinase is an enzyme expressed by various

tissues and cell types. Serum CK activity is greatly elevated in all types of muscular dystrophy. Quite high values of CK are noted in viral myositis, polymyositis. There is an inverse relationship in the serum levels of T3 and CK in thyroid disease. Lowered CK can be an indication of alcoholic liver disease and rheumatoid arthritis.

4. Alkaline Phosphatase (ALP); The alkaline phosphatases are a group of enzymes that hydrolyse organic phosphates at high pH. They are present in most tissues but are in particularly high concentration in the osteoblasts of bone and the cells of the hepatobiliary tract, intestinal wall, renal tubules and placenta. Placental alkaline phosphatase is elevated in seminomas and active form of rickets as well as biliary obstruction, Bone conditions. Osteoblastic bone tumors, Osteomalacia, Liver disease or hepatitis, Leukemia, Lymphoma, Paget's disease, Sarcoidosis and Hyperparathyroidism.

5. Glutamate Dehydrogenase: Glutamate dehydrogenase (GLDH) is an enzyme, present in most microbes and the mitochondria of eukaryotes. GLDH can be measured in a medical laboratory to evaluate the liver function. Elevated blood serum GLDH levels indicate liver damage and GLDH plays an important role in the differential diagnosis of liver disease, especially in combination with aminotransferases. GLDH is important for distinguishing between acute viral hepatitis and acute toxic liver necrosis or acute hypoxic liver disease, particularly in the case of liver damage with very high aminotransferases.

6. Angiotensin Converting Enzyme (ACE): The main sources of this enzyme are endothelial cells of pulmonary artery, testes and brain. Serum levels are increased in leprosy and sarcoidosis especially pulmonary sarcoidosis, when disease is active. ACE may be used in the diagnosis of sarcoidosis but 5% of the positive cases turnout to be false positives because of elevated levels occurring in granulomatous conditions of the lung (tuberculosis, mycotic infections and berylliosis) and other disorders. Enzyme levels are also elevated in Gaucher's disease, amyloidosis, primary biliary cirrhosis and hyperthyroidism. CSF studies of this enzyme

have indicated neuronal dysfunctions of Alzheimer disease.

Conclusion: Serum enzymes are conveniently used as markers to detect the cellular damage which ultimately helps in diagnosis of disease. The activity of alanine transaminase (ALT) or SGPT is elevated in acute hepatitis of viral or tixuc origin, jaundice and liver cirrhosis. Aspartate transamina (AST) or SGOT activity in serum is increased in myocardial infarction and some liver diseases. Lactate Dehydrogenase (LDH) is useful in the diagnosis of myocardial infarction, infective hepatitis, leukemia and muscular dystrophy. Creatine kinase (CK) is elevated in myocardial infarction and muscular dystrophy. Alkaline phosphatase is elevated in certain bone and liver diseases, rickets, hyperparathyroidism, carcinoma of bone and obstructive jaundice. Acid Phosphatase is increased in cancer of prostate gland. Γ -Glutamyl transferase is a sensitive diagnostic marker for the detection of alcoholism, infectiver hepatitis and obstructive jaundice. Amylase is increased in acute pancreatitis. Pseudocholesterase is decreased in viral hepatitis, malnutrition, liver cancer and cirrhosis. Other serum enzymes like glutamate dehydrogenase, lipase, angiotensin converting enzyme, glucose-6-phosphate dehydrogenase etc. are also used in diagnosis of diseases.

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Radioactive nuclides

Dr. PR Satheesh babu

Radioactive nuclides, or radionuclides, are species of unstable atomic nuclei without the restriction of being forms of the same element. They consist of all the sets of radioactive isotopes. It includes the nuclear transformation involved, transmutation of one element into another, and the nature and properties of the radiation emitted. It may be natural, as with radium, artificial or induced, as in radioactive carbon. The emanations are in the form of alpha, beta, gamma rays. The natural radioactive elements are uranium, radium, radon and thorium. The ultimate end products being stable isotope of elements, e.g, sodium, iodine etc., can be made radioactive by bombardment with neutrons, deuterons. or other heavy particles.

Artificially produced radioisotopes are widely utilized as sources of radiation for radiography, gauging, and as tracers for a multitude of measurements that are not easily made by other methods. Radiopharmaceuticals are drugs containing a radionuclide and are used routinely in nuclear medicine for the diagnosis and therapy of various diseases.

Types of radioactive isotopes by origin

1. Long-lived radioactive nuclides
2. Cosmogenic
3. Anthropogenic
4. Radiogenic

Production of radioisotope

Production of radioisotopes includes three principle categories, which are neutron activation (bombardment), fission product separation, and charged particle bombardment. Nuclear bombardment constitutes the major method for obtaining industrially important radioisotope materials. Radioisotopes may exist in any form of matter, with solid materials comprising the largest group. Radio nuclide generator can be defined as convenient means of producing in lab a plentiful supply of short lived radio pharmaceutical.

Radiopharmaceuticals

Radiopharmaceuticals are drugs containing a radionuclide and are used routinely in nuclear medicine for the diagnosis and therapy of various diseases. Depending upon their medical applications radiopharmaceuticals are divided into two classes' diagnostic radiopharmaceuticals and therapeutic

radiopharmaceuticals. They are briefly discussed below.

Diagnostics Radiopharmaceuticals

Diagnostic radiopharmaceuticals are molecules which are tagged with a gamma ray emitting radioisotope. Such agents when administered into the body localize in certain organs or tissue, for which they are designed for, and the radiation emitted by the associated radionuclide could be detected from outside with the help of suitable instrument like gamma camera.

Therapeutic Radiopharmaceuticals

In this case the primary aim is not to get diagnostic information but to deliver therapeutic doses of ionizing radiations to specific diseased sites.

Advantages

- It can be used as diagnosis and treatment of patients.
- It is common cure to cancers.
- Can treat multiple disease sites.
- Directly treats tumor, especially useful for bone metastasis.
- Single dose is effective for some patients

Measurement of radioactivity:

The method selected for the measurement of radioactivity depends upon the extent of energy dissipation and penetrability of radiation. Following can be used:

- Ionization chamber
- Proportional chamber
- Geiger- muller counters
- Scintillation counter

Table-1 Isotopes used in radiopharmaceuticals with application and target organs.

<i>Radiopharmaceuticals</i>	<i>Target organs</i>	<i>Radiopharmaceuticals</i>	<i>Target organs</i>
¹⁸ F-sodium fluoride	Skeleton	^{99m} Tc-oxidornate	Skeleton
¹⁸ F-fluorodeoxyglucose	Brain, tumor	^{99m} Tc-polyphosphate	Skeleton
¹²³ I-sodium iodide	Thyroid	^{99m} Tc-DTPA *	Skeleton
¹²³ I-N-isopropyl-p-	Brain	^{99m} Tc-dimercaptosuccinate	Kidney
¹²³ I – HIPDM	Brain	^{99m} Tc-gluceptate	Kidney
¹²³ I-Iodoheptodecanoic acid	Cardiovascu	^{99m} Tc-mercaptoacetyltriglycine	Kidney

Precautions:

The manipulation and handling of radioactive solution in routine dispensing practices should be performed very carefully

- The container should be perfectly clean and dry, whatever possible disposable container should be used to avoid danger arising from the presence of traces of radio isotope.
- The label of a radio active preparation should display the content of radio isotope at a given date & hour. dosage schedule must be carefully recorded.
- All records pertaining to the dose given should be carefully maintained

CONCLUSION

Nowadays there are different types of radiopharmaceuticals are available and having an important role in diagnosis of disease. Radiation dose estimates for radiopharmaceuticals used in nuclear cardiology may vary, depending on the source of data used in their generation. Uncertainties in applying dose estimates to individual subjects or populations are considerable because of the use of standardized biokinetic and anatomic models. Considerations such as diagnostic accuracy, ease of use, image quality, and patient comfort secondary or even a tertiary consideration. Counseling of nuclear medicine patients who may be concerned about exposure should include a reasonable estimate of the median dose for the type of examination and administered activity of the

radiopharmaceutical; in addition, it should be explained that the theoretic risks of the procedure are orders of magnitude lower than the actual benefits of the examination.

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Microspheres

Himanshu Mishra

Microspheres can be defined as solid, approximately spherical particles ranging from 1-1000µm containing dispersed drug molecules either in solution or in crystalline forms.

DIFFERENT CLASSES OF MICROSPHERES:

1. Mucoadhesive Microspheres.
2. Radioactive Microspheres.
3. Magnetic Microspheres.
4. Floating Microspheres.
5. Polymeric Microspheres.
6. Glass Microspheres.
7. Ceramic Microspheres.
8. Enzyme – Activated Microspheres.

MUCOADHESIVE MICROSPHERES:

Drug action can be improved by developing new drug delivery system, such as the mucoadhesive microsphere drug delivery system. These systems remain in close contact with the absorption tissue, the mucous membrane, releasing the drug at the action site leading to a bioavailability increase and both local and Systemic effects.

ADVANTAGES:

1. Mucoadhesive microspheres have advantages like efficient absorption, enhanced bioavailability of the drug due to high surface to volume ratio, a much more intimate contact with the mucus layer and specific targeting of drugs to the absorption site.
2. Use of Specific bioadhesive molecules allows for possible targeting of particular sites or tissues.

3. Increased residence time.
4. Offers an excellent route, for the systemic delivery of drugs with high first pass metabolism, there by offering a great bioavailability.
5. Better patient compliance and convenience due to less frequent drug administration.
6. Uniform and wide distribution of drug throughout the gastrointestinal tract which improves the drug absorption.
7. Prolonged and sustained release of drug.
8. Increased safety margin of high potency drugs due to better control of plasma levels.

GENERAL METHODS OF PREPARATION:

1. Emulsification Techniques:
 - Single emulsion technique
 - Double emulsion technique
2. Polymerization Techniques:
 - Normal Polymerization
 - Interfacial polymerization
3. Phase Separation coacervation Technique.
4. Hot melt method.
5. Solvent Evaporation method.
6. Spray Drying.

TABLE : Examples of some mucoadhesive formulations

S.No.	Drugs	Category	Polymer used
1	Itraconazole	Antifungal	HPMC
2	Theophylline	CNS stimulant	Chitosan
3	Nystatin	Antifungal	Carbopol:HPMC
4	Lidocaine	Local anaesthetic	HPMC
5	Prednisolone	Immunosuppressant	Chitosan
6	Propranolol HCl	Beta blocker	Sodium alginate and carbopol

TABLE 2: Examples of mucoadhesive polymers:

<i>Synthetic Polymers</i>	<i>Natural Polymers</i>
<i>Hydroxyl Propyl Methyl Cellulose (HPMC)</i>	<i>Sodium Alginate</i>
<i>Poly Vinyl Pyrrolidone (PVP)</i>	<i>Xanthan Gum</i>
<i>Poly Vinyl Alcohol (PVA)</i>	<i>Gelatin</i>
<i>Ethyl Cellulose (EC)</i>	<i>Tragacanth</i>
<i>Methyl Cellulose (MC)</i>	<i>Soluble Starch</i>
<i>Hydroxyl Ethyl Cellulose (HEC)</i>	<i>Lecithin</i>
<i>Hydroxyl Propyl Cellulose (HPC)</i>	

CHARACTERIZATION:

The characterization of the microparticulate carrier is an important phenomenon, which helps to design a suitable carrier for the proteins, drug or antigen delivery.

1. Particle Size and Shape
2. Determination of Drug Content or Entrapment Efficacy.
3. *In Vitro* Mucoadhesion Studies for Mucoadhesive Microspheres
4. Drug release studies.

APPLICATIONS:

1. Nasal drug delivery:
2. Oral drug delivery
3. Protein/Peptide Stability
4. Drug targeting
5. Gene delivery
6. Microspheres in diagnostics
7. Antigen Release

APPLICATIONS:

Nasal drug delivery: Ex:- Propranolol Hcl of mucoadhesive microspheres are used for nasal administration.

Oral drug delivery: Ex:-Mucoadhesive microspheres of Metronidazole for oral drug delivery.

Protein/Peptide Stability: Mucoadhesive microspheres help to protect proteins because they are not allowed to react with anything until the polymer is degraded, thus minimizing the contact with solutions that could cause the patients to react.

Drug targeting: Drug targeting could be the greatest advantage of microsphere most drugs are targeted in the body to give desired results either in specific tissues or organs.

Ex:- Gelatin –Chitisan cross linked mucoadhesive microspheres have the potential to be developed as a brain – targeted drug delivery system for clonazepam.

Gene delivery: Encapsulation of therapeutic agents such as DNA in microspheres protects the agent from enzymatic degradation, enhances tissue specificity due to localized delivery, eliminate the need for multiple administrations and allows for controlled and sustained delivery.

Microspheres in diagnostic materials: Gamma emitters such as I^{131} have been incorporated with microspheres for diagnostic purposes. Radio labelling of microspheres is usually achieved either during or after their preparations. This is preferred, especially for shorter lived radioisotopes, because stability and logistical problems are minimized in this way.

Antigen Release: The release of antigens from the microspheres is influenced by the structure, micro-morphology, nature and type of the biodegradable polymer. The antigen release from microspheres can be of different types viz., burst mechanism, pore diffusion mechanism, erosion or combination of them.

The burst release mechanism is a result of influx of water through the coat, into the core causing increase in intra matrix pressure, this

increased pressure results in rupturing of the wall of microspheres and hence release of antigens.

In pore diffusion method, the pores are created as a result of the movement of water front towards the core of microparticles. The dispersed particles are dissolved in water and diffuse out through the pores or the channels created by water

CONCLUSION: Mucoadhesive microspheres offer unique carrier system for many pharmaceuticals and can be tailored to adhere to any mucosal tissue, including those found in eyes, oral cavity and throughout the respiratory, urinary and gastro intestinal tract. The mucoadhesive microspheres can be used not only for controlled release but also for enhancing bioavailability, for targeted delivery of the drugs to specific sites in the body.

Drug delivery through mucoadhesive microspheres is a promising area for continued research with the aim of achieving controlled release with enhanced bioavailability over longer periods of time, and for drug targeting to various sites in the body.

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INFORMATION RESOURCES IN PHARMACEUTICAL SCIENCES

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Information is valuable because it can affect behavior, a decision, or an outcome. For example, if a manager is told his/her company's net profit decreased in the past month, he/she may use this information as a reason to cut financial spending for the next month. A piece of information is considered valueless if, after receiving it, things remain unchanged. Pharmacists and pharmaceutical scientists assist patients in meeting their information needs with regard to drugs, therapies and diseases. Effectively communicating the wealth of information available to those needing is a major concern.

Need for the pharmaceutical science related information The pharmacists including student pharmacists, community pharmacists, hospital pharmacists and research pharmacists require adequate information's for their regular activities.

- Community pharmacists
- Hospital pharmacists
- Research pharmacists
- Pharmacists of teaching profession
- Student pharmacists

Information resources

Medical Literature Analysis and Retrieval System (MEDLARS): MEDLARS is a computerized biomedical bibliographic retrieval system. It was launched by the National Library of Medicine in 1964 and was the first large scale, computer based, retrospective search service available to the general public.

MEDLARS Online: In late 1971, an online version called MEDLINE ("MEDLARS Online") became available as a way to do online searching of MEDLARS from remote medical libraries. This early system covered 239 journals and boasted that it could support as many as 25 simultaneous online users (remotely logged-in from distant medical libraries) at one time.

MEDLINE: U.S. National Library of Medicine (United States). It covers 39 languages for current journals, 60 for older journals access, cost free coverage of Medicine, nursing, dentistry, veterinary medicine, health care, biology, biochemistry, molecular evolution, biomedicine, history of medicine, health services research, AIDS, toxicology and

environmental health, molecular biology, complementary medicine, behavioral sciences, chemical sciences, bioengineering, health policy development, environmental science, marine biology, plant and animal science, biophysics. Compiled by the United States National Library of Medicine (NLM), MEDLINE is freely available on the Internet and searchable via PubMed and NLM's National Center for Biotechnology Information's Enter system.

Is a bibliographic database of life sciences and biomedical information. It includes bibliographic information for articles from academic journals covering medicine, nursing, pharmacy, dentistry, veterinary medicine, and health care. MEDLINE also covers much of the literature in biology and biochemistry, as well as fields such as molecular evolution.

Importance of MEDLINE: MEDLINE functions as an important resource for biomedical researchers and journal clubs from all over the world. Along with the Cochrane Library and a number of other databases, MEDLINE facilitates evidence-based medicine. Most systematic review articles published presently build on extensive searches of MEDLINE to identify articles that might be useful in the review. MEDLINE influences researchers in their choice of journals in which to publish. A service such as MEDLINE strives to balance usability with power and comprehensiveness.

Medical Subject Headings (MeSH): MEDLINE uses Medical Subject Headings (MeSH) for information retrieval. Engines designed to search MEDLINE (such

as Entrez and PubMed) generally use a Boolean expression combining MeSH terms, words in abstract and title of the article, author names, date of publication, etc.

Medline Plus: For lay users who are trying to learn about health and medicine topics, the NIH offers Medline Plus; thus, although such users are still free to search and read the medical literature themselves (via PubMed), they also have some help with curating it into something comprehensible and practically applicable for patients and family members.

E-Journals Archival Library (Print Version): Besides receiving access to e-resources on complementary basis under the UGC-INFONET Digital Library Consortium, the Centre maintains a separate Archival Library consisting of print journals received as a part of the agreement with the participating publishers of the UGC-INFONET Digital Library Consortium. Under the agreement, the publishers are requested to submit a copy of all the issues of the journals. This archival library is open to all users interested in using these print resources for their study / research.

Developing library network (DELNET): DELNET has been established with the prime objective of promoting resource

sharing among the libraries through the development of a network of libraries. DELNET It was initially supported by the National Information System for Science and Technology (NISSAT), Department of Scientific and Industrial Research, Government of India. It was subsequently supported by the National Informatics Centre, Department of Information Technology, Ministry of Communications and Information Technology, Government of India and the Ministry of Culture, Government of India

Functions of DELNET: Delnet developed a network of libraries, by collecting, storing and disseminating information and by offering computerized services to the users. It maintains a central online bibliographic database of books, serials and non-book materials. It offers technical guidance to the member-libraries on collecting, storing, sharing and disseminating information. It helps in the establishment of referral and /or research centers.

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Teachers day Celebrations

The teachers day was celebrated by students in the college auditorium. B. Pharmacy IV year students organised the whole events. The students gifted each teaching and non-teaching staff as a token of their gratitude.



Honours and achievements of staffs

 <p>Mr Sayan Dutta Gupta ID No 8019</p>	<p><i>Mr. Sayan Dutta Gupta, Sr Asst Professor, Dept of Pharmaceutical Chemistry, was invited as a guest speaker at 6th RTTC Shanghai, China. He was awarded international travel grant for young scientist from DST. He presented a lecture on the topic discovery of novel anti-neoplastic agents</i></p>
 <p>Mrs Akhila ID No</p>	<p><i>Mrs. M. Akhila, Sr Asst Professor, Dept of Pharmaceutical Chemistry, has received DST funding project under Woman Scientist Scheme.</i></p>
 <p>Mrs A.D. Phani Kumar ID No 8017</p>	<p><i>Mr. Panikumar D Anumolu Sr Asst Professor, Dept of Pharmaceutical Analysis, has received Dr P. D. Sethi certificate of merit for the publication titled 'validated spectral discriminating derivative spectrophotometric method for simultaneous quantification of atorvastatin calcium and fenofibrate combination in tablets' in Orien J Chem.</i></p>