Liquid Chromatography Mass Spectrometry (LC-MS/MS)

Introduction

1. It is an exceedingly sensitive and specific analytical technique for quantitation and qualitations of organic compounds in plant samples and human fluids such as blood, serum, plasma and urine
2. It is used in the determination of endogenous components such as proteins, peptides, carbohydrates, DNA, and drugs or metabolites
3. It is used for pharmacokinetic studies, metabolites identification in the biological samples

Why need LCMSMS

- Sensitivity (Detection at very low concentration level)
- Selectivity (Selectively detect the analyte of interest)
- Qualitative analysis (Identify the presence of analyte & metabolite)
- Quantitative analysis (Quantitate the analyte & metabolite of interest)
- High Throughput (Analyze the large no. of samples)

Applications

- Quantitative and qualitative analysis of proteomic and metabolomics
- Quantitative and qualitative analysis of inflammatory markers (IL-4, 6, 10, 1beta, NFkB, TNFalpha etc.) in blood, serum, plasma
- Quantitative and qualitative analysis of neurotransmitters (Serotonin, melatonin, dopamine, acetylcholine etc.) in blood, serum, plasma and CSF
- Quantitative and qualitative analysis of amino acids such as tryptophan in blood, serum, plasma
- Quantitative and qualitative analysis of histamine in blood, serum, plasma
- Quantitative and qualitative analysis of vitamins
- Determination of drugs and metabolites in plasma or other biological fluids.
- Deteremination of pesticide residue in food and food products
- Quantitative and qualitative analysis of phytochemicals in food and food products such as EGCG, curcumin, gingerol, resveratrol, oxyresveratrol etc.

- Determination of contamination in food products
- Clinical Science, Neonatal Screening, Therapeutic Drug Monitoring, Occupational Bio-monitoring, Forensic Science, Drug Abuse

LCMS/MS in Era's Lucknow Medical College:

- QTrap/Ion-TRAP instrument
- Running time of samples depend upon the method development

1. If protein is known then it will take 24 hours
2. If protein is unknown, then it will take number of days
3. Phytochemicals and food product will take 1-2 hours if they are known
4. Phytochemicals and food product will take number of hours if they are unknown

In Era College, we are committed for the analysis of the following biological samples for their pharmacokinetic and therapeutic potential

Pulmonary fibrosis marker	**Inflammatory Markers**
Platelet Derived Growth factor (PDGF)	Interleukin 4 (IL-4)
Vascular Endothelial Growth Factors (VEGF)	Interleukin 6 (IL-6)
Connective tissue growth factor (CTGF)	Interleukin 8 (IL-8
EGF (Epidermal growth factor)	Interleukin 10 (IL-10)
Fibroblast growth factors (FGFs)	Interleukin 17 (IL-17)
Insulin-like growth factors (IGF-1)	Interleukin 18 (IL-18)
Transforming growth factor(TGFβ.)	Interleukin 33 (IL-33)
Alpha-smooth muscle actin (alpha-SMA)	Interleukin1β (IL-1β)
Type I Collagen (Col1a1)	Tumor necrosis factor (TNF-α)
	Nuclear Factor kappa-light-chain-enhancer of activated B cells (NF-kβ)
Markers for thrombosis (Clot Formation)	**Mucus markers**
P selectin	IL-5
Thrombin	MUC5AC
D- dimer	MUC5B
Coagulation Factor X	
Fibrin monomer	

Histamine markers	**Apoptotic pathway marker**
H1R	Caspase 9
H2R	B-cell lymphoma 2 (Bcl-2)
H3R	B cell lymphoma 2 associated death promoter (BAD)
H4R	PROTEIN 53
DAO	
HNMT	
CKD/ AKI RELATED MARKER	**NAFLD RELATED MARKER**
Kidney injury molecule-1 (KIM-1)	Sterol regulatory element binding protein 1ca (SREBC1c)
Hepcidin	Farnesoid X receptor (FXR)
Angiotensin-2	Ceramide
	Insulin receptor substrate 1 (IRS-1)
MITOCHONDRIAL BIOGENESIS RELATED MARKER	**MITOPHAGY RELATED MARKER**
Peroxisome proliferator-activated receptor gamma coactivator 1-alpha (PGC-1α)	Parkin
Sirtuin 1	Dynamin-related protein 1 (Drp1)
Nuclear factor erythroid 2-related factor 2