

Diagnostic Enzymology in Veterinary Practice

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Diagnostic enzymology is very important for early detection and differential diagnosis of many diseases. Though it can play a very crucial role in modern veterinary practice, we are yet to start its application in the field.

The basis for diagnostic enzymology is that all tissues contain high concentrations of numerous enzymes. Some enzymes will be specific to certain tissues and others may be seen in different ones. These enzymes are kept inside the cells by energy dependant mechanism. In a healthy animal plasma or serum contains these enzymes in low concentrations. In the early stages of disease, even before showing specific

symptoms energy supply to the tissues will be impaired and the enzymes will leak in to the blood stream. Then increased concentration can be detected in the blood. At the later stage when tissue damage occur the concentrations will be still higher. Enzyme changes in blood cells, particularly erythrocytes also can provide important diagnostic informations.

Selection of enzymes

Choose enzymes as specific to organs as possible. Species difference in the distribution of enzymes should be noted and avoid choosing labile enzymes, unless analysis can be performed immediatly.

Enzymes and their use in different Disease

Enzyme	Disease Condition	Species
Alanine Amino Transferase (ALT) formerly SGPT	Parenchymal Liver Diseases	Dog, Cat
Glutamate dehydrogenase GLDH	Liver diseases	Ruminants
Ornithine and Carbamyl Transferase OCT	Chronic liver diseases	Cattle
Sorbitol dehydrogenase SDH	Liver diseases	Sheep, Cattle, Horse
Gama Glutamyl Transferase GGT	Hepatobiliary diseases Chronic/Toxic hepatopathies	Cattle, Sheep, Horse
Aspartate Amino Transferase (AST) Formerly SGOT	Liver and muscle damage and routine liver function test	Horse, Cattle, Pig, Dog
Arginase	Liver damage	Very specific but labile. Difficult to assay
Alkaline Phosphatase	Cholestasis, bone diseases	Dog, Cat
Acid Phosphatase	Metastatic bone diseases	
Creatine phosphotinas CPK	Myocardial infraction, Muscle damage (Tying up, white muscle disease)	All species
Lactate dehydrogenase LDH	Haemolytic/parasitic blood disorders cardiac/smooth muscle damage, chronic/toxic hepatopathies	Horse
Amylase/lipase	Pancreatic damage	Dog, Cat, Horse
Caeruloplasmin	Acute/chronic copper deficiency	all species
Glutathione peroxidase GPX	Nutritional myopathy, Selenium deficiency	Ruminants
Transketolase	Polioencephalomalacia	Ruminants

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Sample Collection

Use clean glass wares. Enzymes can be analysed either in plasma, serum or red cells. To collect plasma or red cells, use heparin as anticoagulant (1-2 mg/ 10 ml of blood). Other anticoagulants may interfere with enzyme estimation. Avoid haemolysed samples. Plasma or serum must be separated at the earliest and it is better to analyse the

sample as early as possible. Plasma or serum can be stored by freezing. Freezing of whole blood causes haemolysis. Enzyme assay can be done in a clinical laboratory using available kits. Facilities are available in Departments of Clinical medicine, Pathology, Physiology and Biochemistry, and Animal Nutrition in the Veterinary college, Mannuthy.

Serum enzyme levels (IV/L) at 25°C

Enzyme	Dog	Cat	Horse	Cattle	Sheep	Goat	Pig
Alkaline Phosphatase	3-16	2-7	11-31	0-38	5-30	7-30	9-31
Arginase	0-4.7		0-70	1-30	0-4.5		
Glutamate dehydrogenase	6	6	0-11.8	7	2		
Isocitric dehydrogenase	0.4-7.3	2-11.7	4.8-18	9.4-21.9	0.4-8.0		
Lactic dehydrogenase	10-35	16-69	41-104	176-365	60-111	31-99	96-160
Ornithine Carbamyl transferase	2.7±0.7	3.8±1	3.3±4.2	4.7±0.3			
Sorbitol dehydrogenase	2.9-8.2	3.9-7.7	1.9-5.8	4.5-15.3	5.8-27.9	14-23.6	1.0-5.8
Aspartate amino transferase	6.2-13	6.7-11	58-94	20-34	79±1	43-132	8.2-21.6
Alanine amino transferase	4.8-24	1.7-14	1-6.7	4-11	10-12	7-24	9-17
Gama glutamyl transferase	5	6	20	27	32		
Cratine Phosphokinase	80	80	90	300	300		

Intrepretation of results

Values higher than normal indicate some degree of tissue/cellular disruption, which may not be always indicative of disease. In pathologic condition there will be dramatic and recognizable changes.

For example both CPK and LDH show 2 to 3 times elevation following muscular exertion but in myopathic conditions an

increase of 100 to 1000 times or even higher are common.

As a general rule in pathologic conditions most enzymes will be 3 to 10 times above normal limits. While interpreting the results assay temperature also must be considered. Now attempts are made to pin point site of pathological changes within tissues or organ by using several enzymes. □

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