

## Physico-Biochemical aspects of Shock

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### Abstract

Shock is a clinical condition characterized by decreased blood flow to vital organs due to imbalance between size of vascular bed and effective circulating blood volume and the inability of body tissues to metabolize nutrients normally. The decreased blood flow to vital organs like kidney, liver, spleen, brain etc. is caused by pulling and stagnation blood elsewhere in circulation. The defective blood flow to tissues implies incomplete oxygen supply to the cells, tissues and organs consequent effect being interference with metabolism. It is very essential to study physico-biochemical aspect of shock because after knowing the pathways involved in various physio-pathological processes, we can undertake effective treatment and there by shock can be satisfactorily treated and prevented. Following are the various physico-biochemical processes stated by various workers to study the shock.

**Keywords:** Shock, Blood, Vital organ, Physiological, Biochemical.

**Psychic Neurogenic Impulsive shock:** - Cause vasodilatation of splanchnic vessels with resultant lowering of the blood pressure, cerebral ischemia, loss of consciousness resulting to neurogenic shock.

**Inadequate Blood Circulation:** - Will result fall in peripheral blood pressure leads to reflex sympathetic vaso- constriction, which in turn leads to deficient blood supply to brain. To conserve fluid ATP, Renin - Angiotensin Aldosterone system mechanism are stimulated but vaso- constriction causes renal ischemia and damage leading to finally death of the animal.

**Shock due to toxin of Bacterial or plant origin:** - Are absorbed from the gut, come into the systemic circulation and result into the vasodilatation. These toxins cause trauma to tissues to liberate histamine like substance, dilatation of capillaries, and increased permeability of blood vessels leading to diapedesis and decreased blood volume.

**Adjustment of Renal sodium excretion:** - Cardiac output fall cause carotid and aortic barrow receptor stimulation causing stimulation of sympathetic nerves and adrenal medulla to release catecholamine which causes vaso constrction in the vessels with the help of alpha-adrenergic receptors.

**Hypovolemia:** - Stimulates antidiuretic hormone vasopressin. There is contraction of spleen and venous

blood vessels, which cause increased peripheral vascular resistance and increased heart rates to compensate and maintain cardiac output and blood perfusion through coronary and cerebral blood vessels.

**Water shifts:** - During shock interstitial tissue fluid is depleted causing loss of elasticity of skin. Peripheral vasoconstriction leads to continued hypovolemia, falling of cardiac out put and blood pressure. In response to this there is opening of arterio venous shunt, decreased perfusion of tissues and organs having less oxygen content will produce tissue acidosis, hypoxia, anoxia, dyspnoea and peripheral vascular failure, unconsciousness some times comma and shock.

**Septic shock:** - In normal healthy animals intestinal mucosa will act as a effective barrier to prevent absorption of endotoxins and if toxins are in small quantity will be detoxified by liver, do not reach systemic circulation and shock will be prevented. In early hyper dynamic stage of sepsis and endotoxaemia there is increased demand for oxygen leading to pulmonary hypertension. Increase transvascular fluid filtration in the lung, clinically manifested by pulmonary oedema, dyspnoea and shock. Due to trauma or entry of endotoxin into systemic circulation will produce generalized septic shock. Entry of endotoxin into

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peritoneal cavity will produce acute diffused peritonitis and shock. Disintegrity of intestinal mucosa will also cause hypoxia, ischemia and shock.

**Endothelial damage to vessels:** - Will activate macrophages, neutrophils, platelets and will produce inflammatory mediators like interleukins, tumors necrosis factor leading to leaky vessels, vasculitis, hypertension, decreased intra vascular blood volume ultimate effect will be shock. Endothelial damage to blood vessels will expose to collagen cause production of tissue thromboplastin leading to intrinsic and extrinsic coagulation with production of Disseminated Intravascular Coagulation (DIC) factor.

**Deficient supply of oxygenated blood:** - Impedes oxidative cellular mechanism which releases arachidonic acid by metabolized cyclo-oxygenase pathway producing prostaglandins and thromboxane A<sub>2</sub> or by way of lipo-oxygenase pathway. Potent vasoactive component viz: leukotrienes and

eicosanoids etc are produced.

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Eliminating rabies in dogs is the optimal control method for preventing spread of the disease Dog vaccination and stray dog populations control are more efficient and cost effective than post-bite treatment in humans

**Paris , 13 March 2009** – Prevention at the animal source is the optimal key in dealing with a prevalent and perennial zoonotic disease like rabies. Upstream control of rabies infection in dogs, including the control of in excess stray dog populations, should rank high on the agenda of developing countries' national health and veterinary authorities for an efficient prevention of human and animal mortalities.

"The cost of a post-bite treatment in humans is about twenty to one hundred times more costly than the vaccination of a dog", Dr Bernard Vallat, Director General of the World Organisation for Animal Health (OIE) explains. « Currently with only 10% of the financial resources used worldwide to treat people after a dog bite Veterinary Services would be able to eradicate rabies in animals and thus stop almost all human cases », he added. Animal vaccination remains the method of choice to control and eradicate rabies. For ethical, ecological and economical reasons, the OIE advises against trying to control and eradicate rabies by killing potentially infected animals, as a sole method. It has been demonstrated repeatedly that all successful rabies eradication campaigns in the developing world have included programmes for the control of in excess stray dog populations as well as the systemic vaccination of owned dogs.

#### **National Veterinary Services are a buffer between the animal source and human infections**

It is the prime responsibility of veterinarians to apply their knowledge and skills in animal disease control to break the link between the animal source of the disease and infection of susceptible humans .

"Good governance of veterinary services, better laboratory diagnostic capacity and well structured vaccination campaigns in domestic and wild animals are the key actions to be taken. Raising public awareness of rabies and of the need for collaboration with other professions involved, namely the public health sector, should also be emphasised.

#### **Canine rabies and rabies in wildlife: different problems in different parts of the world**

Worldwide the most common cause by far of human rabies infections is dog bites, but animal reservoirs of the disease differ from one region of the world another. In developing countries the dog is the principal reservoir of rabies. Today, Far East Asia and Africa are the regions of the world most affected by canine rabies and where countries have the highest rates of human infection and human and animal deaths due to rabies. In the northern hemisphere, where dog rabies has nearly been eliminated, rabies in wildlife is the main problem. In Eastern European countries, the red fox is the main reservoir for the disease and vulpine (fox) rabies represents the majority of all cases. Rabies is a neglected and severely under-reported zoonotic disease in developing countries, killing each year worldwide an estimated 50,000 to 60,000 people, mostly children with terrible suffering and a much higher number of animals. The OIE strongly supports World Rabies Day on the 28 th of September.