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Toxic effect of amikacin sulphate on liver and kidney on white (Albino) rat

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Antibiotics are a family of medications used to treat against bacterial, fungal and parasitic infections. Numerous side effects are associated with antibiotic use and extremely high doses of antibiotics can have severe consequences. In present investigation, the approach was to study the effect of Amikacin sulphate on liver and kidney of albino rat. As this drug is reactive and the prolonged 9- days treatment to the albino rat created histopathological changes. It destroy the structure of hepatocytes, sinusoids, endothelial cells, Kuffer cells and bile canalicule in the hepatic cords. Where as in the kidney Bowman's capsule, glomerulus and their capillaries are degenerated. The cell wall of proximal convoluted tubule, loop of Henley's, distal convoluted tubule and collecting tubule are diminished. These effects are dose dependant. Due to this histopathological changes in liver and kidney will not perform their normal physiological functions. The excessive drug may destroy the liver and kidney, affect the physiology and at last leading to death of animal.

Key words : Toxicity, Amikacin sulphate, Albino rat, Histopathology

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INTRODUCTION

The safe use of chemicals and their toxicities have to be tested, which make toxicological studies important in medicine. Mankind constantly exposed to different chemicals. The primary approach and development of this studies have been reviewed. (Zbinden, 1969 and Gupta, 1985). In present investigation the approach was to study the effect of Amikacin sulphate. Basically the alteration occurring in animals by the presence of the foreign compound. Administrations of chemicals cause such type of alteration in metabolism.

Amikacin sulphate an antibiotic helps to treat with the infection. The drug will be either injected in to large muscle such as hip or added to intravenous fluid that will drip through a needle or catheter placed in vein for at least 30 min. one to three times a day. Amikacin sulphate injection USP to be effective in bacterial septicemia in serious infection of the respiratory tract, bone joints, central nervous system, skin and urinary tract infection. Amikacin sulphate injection USP indicates that in the short term treatment of serious infections due to susceptible strains of gram -ve bacteria including *Pseudomonas* spp. *Escherichia coli* spp. of indole +ve and indole -ve Proteus *Providencia* spp. *Klebsiella Enterobacter serratia* spp. and *Acinetobactor* (*Mima Herellea*) spp. Amicacin sulphate is semi synthetic amino glycoside antibiotic derived from kanamycin. All amino glycosides have the potential to induce auditory, vestibular, renal toxicity and neuromuscular blockade.

RESEARCH METHODOLOGY

The present investigation is designed to test the effect of Amikacin sulphate.

Experimental animal:

The male albino rats were used for experimental work weighing 175- 225 g. Albino rats were acclimatized under laboratory condition in standard housing system and are provided with food and water adlibitum, during experimental work. Amikacin sulphate was purchased from local chemist shop. 1- unit dose was given to the rat once in a day. Following experimental schedule gives the details of the experimental

work. As per the experimental schedule, the Amikacin sulphate injection was administered to the experimental animal. The histological technique used to study the kidney and liver are routinely used and are reviewed in detail by Thompson (1966). The liver and kidney were removed after sacrifice and fixed in CAF for histopathalogical studies. The microtomical procedure was carried out and then the tissue blocks cut in to 5 µm thick sections and stained using haematoxylene and eosin, mounted in D.P.X. The sections were observed under compound microscope for histopathological changes in liver and kidney and their photomicrographs were taken.

RESEARCH FINDINGS AND ANALYSIS

This drug is very reactive, it brings about much damage and changes. The changes in the histological structure are observed according to time period of treatment and dose administration of the drug.

In 3- days (Fig. 2 and 6):

Amikacin sulphate treated rats, the changes have been noted in histological structure of liver and kidney. In liver the Kuffer cells were stained intensely and their number was slightly increased. The hepatocytes became foggy with well stained nuclei. The degenerating hepatocytes also noted. In kidney the afferent and efferent capillaries were disturbed. They did not maintained their regular network. The Bowman's capsule was obliterated. The Bowman's capsule began to break. Proximal convoluted tubule increased in their diameter which indicated the swelling of epithelial cells. The loop of Henle, distal convoluted tubule and collecting tubule also showed the same condition.

In 6- days (Fig. 3 and 7):

Amikacin sulphate treated rat showed histological changes in liver and kidney. In liver the hepatic cords around central vein began to rupture. The hepatocytes were becoming still foggy and cloudy. The numbers of vacuoles increased. The bile canaliculi became wider. The sinusoids also became wider and disrupted. Hepatocytes began to separate from their normal cords. Kuffer cells increased. Sinusoids showed different compartments. Bile canaliculi were observed but breakage of hepatic cords joined with sinusoids. It indicates that the breakdown of liver tissue has been started. In kidney capillary network of glomerulus was broken and blood forming fibrous gelatinous liquid and on the way of degeneration. The cells of tubules were slightly dislocated and became foggy. The inner cellular spaces between tubules and the vacuoles were seen in spaces.

In 9- days (Fig. 4 and 8):

Amikacin treated rat showed histological changes in liver and kidney. In liver the central vein and hepatic cords were broken due to swelling. Foggy areas increased. The sinusoids were merged with one another, the numbers of Kuffer cells decreased in existing. Near peri-arterial region much disturbance in the liver tissue was there. Hepatic cells were about to degeneration also seen many vacuoles. No appearance of sinusoids and bile canaliculi. In kidney structure of glomerulus has been collapsed and did not appear in its normal network of capillaries. The Bowman's capsule was on the way of disappearance. The tubules began to disappear, in some areas the clumping of blood was observed. There was increase in the foggy areas and empty spaces in the tissue. There was damage in histological structure of liver and kidney in major parts. The normal structure of tissue has been collapsed.

In liver near centrolobular and periarterial regions the different parts were altered. The central vein increased in diameter, it accumulated more and more drug and the effect of this drug on the cell wall of central vein was progressively seen. In periarterial region the number of Kuffer cells also increased due to their phagocytotic activity. The Kuffer cells also increased up to certain stage of the drug administration. In the later stages the number of Kuffer cells was decreased especially after 9-days treatment of the drug. The hepatocytes were separated from one another when the hepatic cords began to rupture. As the drug was administered, the hepatic cords were swollen first and slowly and steadily they were broken, the endothelial or sinusoidal cells were also dislodged. Hence, the normal sinusoids and bile canalicalee will not remain normal but they were broken and their compartments were formed. These compartments become discontinuous on the 9^{th} day of treatment.

Due to the treatment of Amikacin sulphate the histological structure of kidney was also affected. The structure of Bowman's capsule was collapsed. The epithetical cells of double wall of the capsule will be broken and thick clumping created and to this there will no filtration which is important step in the urine formation. The cell wall of proximal convoluted tubule, loop of Henle's distal convoluted tubule and collecting tubule were diminished. These tubules are

No. of rat	Group of rat	Treatment of Amikacin in ml	Day of cessation of treatment	Day of killing of rat
1	I	-		1^{st} day
1	II	1- unit	3- days	4^{th} day
1	III	1- unit	6- days	7^{th} day
1	IV	1- unit	9- days	10^{th} day

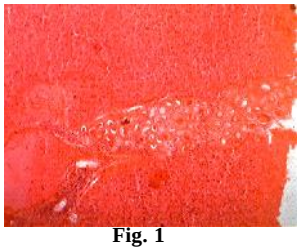


Fig. 1

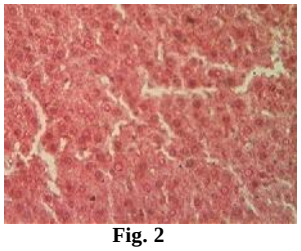
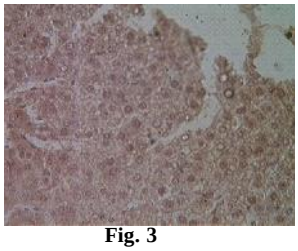


Fig. 2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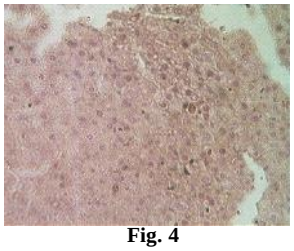
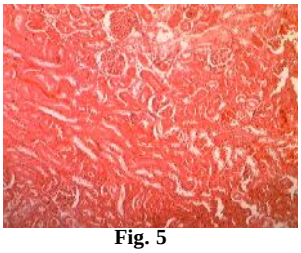


Fig. 4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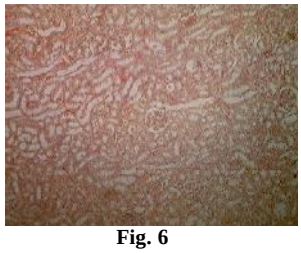
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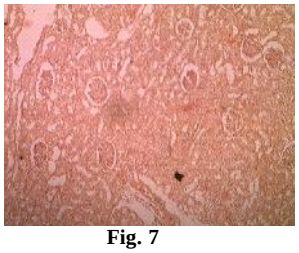
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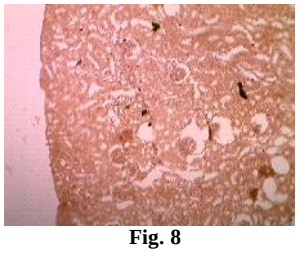
Fig. 8

Fig. 1: T. S. of liver of control rat.
Fig. 2: T. S. of liver of 3- days Amikacin treated rat.
Fig. 3: T. S. of liver of 6- days Amikacin treated rat.
Fig. 4: T. S. of liver of 9- days Amikacin treated rat.
Fig. 5: T. S. of kidney of control rat.
Fig. 6: T. S. of kidney of 3- days Amikacin treated rat.
Fig. 7: T. S. of kidney of 6- days Amikacin treated rat.
Fig. 8: T. S. of liver of 9- days Amikacin treated rat.

important for secretion, reabsorption of useful substances, concentration for urine formation and the removal of urine towards the pelvic of kidney. The drug Amikacin sulphate is reactive drug and it produces many adverse side effects on the different part of the body. It produces cytotoxicity in the cell wall of liver and kidney and causes abnormal changes in the organ. This normal functional unit of the organ will not remain in existence. Hence, the liver and kidney fail to perform their normal physiological functions and life of animal come in danger.

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