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The Effect of Biochemical Changes on Liver of Cattle Infected with *Fasciola spp.* in rats

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Abstract

Title: **The Effect of Biochemical Changes on Liver of Cattle Infected with *Fasciola spp.* in rats.**

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This study was designed to evaluate the changes in the nutritional value of cattle liver naturally infected with *Fasciola spp.*, and to reveal the consumption hazards of infected cattle liver by experimental rats. The present study was conducted on 100 cattle slaughtered in Assiut Governorate. Liver samples were classified according to worm burden into: mildly, moderately and heavily infected and zero *Fasciola* with cholangitis and zero *Fasciola* with haemorrhage groups. Liver, serum and stool samples were collected from each cattle. Biochemical and Pathological parameters were studied. Results indicated that liver enzymes **AST** and **ALT** levels estimation in cattle liver tissue were decreased, while in cattle sera were increased. Proteins in liver tissue revealed a reduction in **total proteins**. **Albumin** and **Triglycerides** in both liver tissue and serum were decreased. **Iron** level decreased in liver tissue except the heavily infected group. **Copper** level was decreased in liver tissue and increased in serum. In both liver tissue and serum, **zinc** and **magnesium** levels decreased. **Calcium** level increased in liver tissue, while it was decreased in serum. **The gross pathology** of infected liver revealed thickening in the wall of bile ducts with brownish thick exudates and sandy precipitations. **Histopathology** of cattle infected liver samples showed chronic cholangitis with hyperplasia of biliary epithelium in the **moderately** infected group. The **heavily** infected group showed biliary cirrhosis and necrotic hepatitis with presence of migratory tracts. **Histopathology of laboratory rat liver** samples in rats fed on heavily infected raw and cooked livers showed focal areas of necrosis, dilatation of the central vein and sinusoids. **Histopathology of laboratory rat intestine** in groups fed on heavily infected raw and cooked livers showed necrobiosis and thickening of the intestinal villi with mononuclear and eosinophils cells. Thus it is concluded that infected livers with *Fasciola spp.* must be condemned regardless the intensity of infection.

Key words: *Fasciola spp.*, cattle liver, rat liver, rat intestine, biochemical estimation, pathology.

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Abbreviations

- **ve:** negative result.

+ **ve:** positive result.

°C: centigrade.

A/G ratio: Albumin/ Globulin ratio.

ALT: Alanine aminotransferase .

APs: Alkaline Phosphatase

AST: Aspartate aminotransferase.

Ca: calcium

Cm: centimeter.

Cu: copper

F. : *Fasciola* worm.

Fe: Iron

g/dl: Gram/dice liter.

G6PD: Glucose 6-phosphate dehydrogenase.

GD: Glutamate dehydrogenase.

GGT: Gamma-glutamyl transpeptidase.

GLDH: Glutamate dehydrogenase

GOT: Glutamic Oxaloacetic Transaminase.

GPT: Glutamic – Pyruvic Transaminase.

GR: Glutathione reductase.

GSH-Px: Glutathione peroxidase.

H₂O₂: Hydrogen peroxide.

Kg: kilogram.

LDH: Lactic dehydrogenase

Mg: magnesium

Nm: Nano miter.

no.: number.

NO: Nitric Oxide.
O₂: Superoxide anion.
OCT: Ornithine Carbamoyltransferase
OH: Hydroxyl radical.
ROS: Reactive Oxygen Species.
rpm: round per minute.
SDH: Sorbitol Dehydrogenase
SOD: Superoxide dismutase.
spp.: Species.
u /gm: International unit/gram.
u /ml: International unit/ml liter.
wpi: weeks post infection.
X.: magnification power.
Zn: zinc

DEFINITIONS

- Acute necrotic hepatitis: Damage or death of the individual liver cells or groups of liver cells pattern due to varying degrees of inflammation.
- Acute phase: It is the active form of a disease.
- Chronic phase: It is the silent form of a disease.
- Cholangitis: Inflammation of the bile ducts.
- Cirrhosis: A chronic, diffuse hepatic fibrosis in which normal liver cells are damaged and are then replaced by scar tissue.
- Congestion: Excessive accumulation of blood or other fluid in a body part.
- Degeneration: Loss of structure or function of a cell, an organ or tissue.
- Exudates: A fluid with a high content of protein and cellular debris which has escaped from blood vessels and has been deposited in tissues or on tissue surfaces, usually as a result of inflammation.
- Fibrosis: An excessive growth of fibrous connective tissue in an organ, part, or tissue, esp. in response to an injury.
- Final host: It is the human or animal, which harbours the adult worm or sexual stages (protozoa) of parasites.
- Homogenization: The act of making something homogeneous or uniform in composition.
- Inspection: Examination by the naked eye.
- Intermediate host: It is the human or animal, which harbours the (larva) or asexual stages of parasites.
- Intestinal villi: Microscopic finger-like projections (0.5 to 1.5 mm in length) of the mucosal lining of the small intestine which are responsible for absorption of nutrients.
- Jaundice: Yellow colouration of skin and eye due to bile pigments, caused by pathological changes in liver cells.
- Parasite: It is an organism, which lives on the expense of another

searching for nutrition and shelter.

- **Parenchyma:** The inner substance of solid organs like the liver i.e. the liver cells
- **Proliferation:** Growth by rapid multiplication of cells.
- **Sinusoids:** Small, irregularly shaped, thin-walled cavities through which venous blood passes in various organs, such as the liver.
- **Goblet cells:** are glandular epithelial cells whose function is to secrete themucin, which dissolves in water to form mucus. They distend with mucin before secretion and collapses to a goblet shape after secretion. They are found scattered among the epithelial lining of the intestinal and respiratory tracts.
- **Hydropic degeneration:** a degenerative change in cells, in which the cells swell due to injury to the membranes affecting ionic transfer, causing the cytoplasm to appear cloudy and water to accumulate between cells, with resultant swelling of tissues. Also called albuminoid degeneration, parenchymatous degeneration or cloudy swelling.
- **Kupffer cells:** these are macrophage cells lining the walls of the hepatic sinusoids.
- **Leukocytes or white blood cells (WBC's):** The leukocytes can be divided into two groups: mononuclear (a monocyte) and granulocytic (a neutrophil) cells. Leukocytes are involved in various ways with the body's defense mechanisms.
- **Erythrocytes or red blood cells (RBC's):** The main function of the erythrocytes is the transport of oxygen from the lungs to the body tissues. Most of the cells in this wright's stained peripheral blood smear are red cells. one is shown at the arrowhead.
- **Eosinophils:** A type of white blood cell, which are activated in some kinds of allergies, infections, or other medical conditions. They can secrete

substances which turn off chemicals that mediate infections, and can destroy cancer cells.

- Necrobiosis: it means death of a cell or group of cells within a tissue whether normal (as in the natural death of cells or epithelial tissues through aging) or part a pathologic process.

Introduction

Liver dishes are delicious to worldwide populations. Cooked and /or smoked liver is a beloved meal to all family members; young and old, male and female. It is eaten not only for its nice taste, but also due to its high nutritional value. Even, in some Arabic countries (Syria and Lebanon), it is used to be consumed as raw, just after slaughtering of sheep and goats on basis of a traditional belief that uncooked liver gives more nutritional value; particularly in under weight and anaemic individuals. In far east special dishes of freshly prepared raw liver are consumed. In Japan, it is mixed with soya sauce (Liver- Sashi), and in Thailand, mixed with chili and lemon (Tab- Wan).

Scientifically, it is known as a vital organ to human and animals. Its vital functions are necessary for a healthy living; any disturbance of its functions may cause serious disease which may end fatally.

Unfortunately, the liver of animals and human is the target for many viral, bacterial and parasitic pathogens. Biologists, parasitologists and veterinary personell are leading sophisticated research studies on the biology, pathology and diagnostic measures as well as control and treatment of such pathogens, with a hope to prevent their infection and lessen- as much as possible- the damage of such vital organ and to prevent any chronic serious complications.

Cattle fascioliasis is not an exception. It is a parasitic disease caused by *Fasciola hepatica* and *Fasciola gigantica*. Their