Effect of Acrylamide and Cadmium chloride on Chick Embryonic liver-A Histological Study
CHAPTER- IV
EFFECT OF ACRYLAMIDE AND CADMIUM CHLORIDE ON CHICK EMBRYONIC LIVER – A HISTOLOGICAL STUDY

Introduction

The environment plays a predominant role in the perception and causation of cancers. It includes various drugs, xenobiotics, radiation, viruses and dietary constituents. Cell transformation by chemical and physical carcinogens involves multiple steps with two phases, initiation involves changes in the genome and promotion stimulates cell division and in turn leads to malignant transformation. Induction of carcinogenesis results in the elevation of enzymatic activities coupled with histological studies provides a reliable study for monitoring the severity of chemical carcinogenesis.

Histology is the study of tissues and it gives the insight into the functioning of tissues and organs. In a precise sense it is the study of changes in cell environment which envisage the cell anatomy. Histological studies pave a way to understand the pathological conditions of the animal. Histological analysis gives a clear picture to understand how the drugs cause injury to the tissue.

It is obvious that any chemical insult could cause injury to cells in animal if it is consumed beyond the safe doses. Susceptibility to chemicals, exhibits variation among the tissues and cells. The extent of severity of tissue damage is a function of the concentration and potentiality of the toxic compound (Jayanth Rao; 1982).
The cyto architectural changes produced during chemical toxicity can be identified by microscopic examinations of the tissues and also explains the extent of tissue specificity to the chemical action. In the 11th day old chick embryo, histological changes were studied in the liver after acrylamide and cadmium chloride treatment.

**Objectives:**

1. To study histological changes of control, acrylamide and cadmium chloride treated 11th day old chick embryonic liver in a dose and time dependent manner.

Materials and methodology of this chapter were mentioned in the chapter "Materials and Methods".

**Results:**

The control liver showed normal architectural details with normal hepatocytes showing clear nucleus and cytoplasm (Fig. 49).

0.1mg AC (24, 48 & 72 hr) treated liver showed early hepatic changes with mild granulation, vacuolating changes in the hepatocytes. Nucleus was pushed to the periphery indicating mild fatty changes (Fig. 50 to 52).

11th day old chick embryonic liver treated with 0.2mg AC (24, 48 & 72 hr) showed pycnotic nuclei, sinusoidal hemorrhages and necrotic hepatocytes showing complete loss of architectural details (Fig. 53 to 55).

0.3mg AC (24, 48 and 72 hr) treatment showed hepatocytes with more fatty changes, proliferation of sinusoidal spaces, hemorrhages, fatty
infiltrations, necrosis and complete loss of architectural details of the hepatocytes (Fig. 56 to 58).

Cadmium chloride treatment with 0.01mg (24, 48 & 72 hr) in chick embryonic liver showed hepatocytes with mild vacuolations, moderate degenerative changes of cytoplasm in hepatocytes (Fig. 59 to 61).

0.02mg CdCl₂ (24, 48 and 72 hr) treated liver showed hepatocytes revealing various necrotic changes, pycnotic nuclei and hemorrhages (Fig. 62 to 64).

0.03mg CdCl₂ (24, 48 and 72 hr) treated liver showed complete loss of architectural details of hepatic cells, pycnotic nuclei and complete necrosis (Fig. 65 to 67).
Figure 49: 11\textsuperscript{th} day old control chick embryonic liver showing 1.

Normal hepatocyte with clear nucleus (H &E- 40x)
Figure 50: 0.1mg acrylamide (24 hr) treated 11th day old chick embryonic liver showing 1. Sinusoidal spaces (H &E- 40x)

Figure 51: 0.1mg acrylamide (48 hr) treated 11th day old chick embryonic liver showing 1. hemorrhages and 2. Loss of mild architectural changes (H &E- 40x)
Figure 52: 0.1mg acrylamide (72 hr) treated 11th day old chick embryonic liver showing 1. vacuolating changes in sinusoidal spaces (H & E- 40x)

Figure 53: 0.2mg acrylamide (24 hr) treated 11th day old chick embryonic liver showing 1. Hemorrhages, 2. Loss of architectural details (H & E- 40x)
Figure 54: 0.2mg acrylamide (48 hr) treated 11th day old chick embryonic liver showing 1. Sinusoidal spaces 2. Hemorrhages 3. Nucleus pushed towards periphery (H & E- 40x)

Figure 55: 0.2mg acrylamide (72 hr) treated 11th day old chick embryonic liver showing 1.pycnotic nuclei 2. Hemorrhages and 3.Necrotic changes (H & E- 40x)
Figure 56: 0.3mg acrylamide (24 hr) treated 11th day old chick embryonic liver showing 1. Sinusoidal spaces 2. Necrosis (H &E- 40x)

Figure 57: 0.3mg acrylamide (48 hr) treated 11th day old chick embryonic liver showing 1. Pycnotic nuclei 2. Hemorrhages 3. Mild necrotic changes (H &E- 40x)
Figure 58: 0.3mg acrylamide (72 hr) treated 11th day old chick embryonic liver showing 1. Complete loss of architectural details of the hepatocytes and 2. infiltrations (H & E- 40x)

Figure 59: 0.01mg cadmium chloride (24 hr) treated 11th day old chick embryonic liver showing 1. Loss of architectural details 2. granulated cytoplasm (H & E- 40x)
Figure 60: 0.01mg cadmium chloride (48 hr) treated 11th day old chick embryonic liver showing 1. Nucleus pushed towards periphery 2. Loss of architectural details (H & E- 40x)

Figure 61: 0.01mg cadmium chloride (72 hr) treated 11th day old chick embryonic liver vacuolations in sinusoidal spaces (H & E- 40x)
Figure 62: 0.02mg cadmium chloride (24 hr) treated 11th day old chick embryonic liver showing 1. Pycnotic nuclei 2. Hemorrhages 3. Necrosis (H & E- 40x)

Figure 63: 0.02mg cadmium chloride (48 hr) treated 11th day old chick embryonic liver showing 1. Pycnotic nuclei, 2. Sinusoidal hemorrhages and 3. Necrotic hepatocytes showing loss of architectural details (H & E- 40x)
Figure 64: 0.02 mg cadmium chloride (72 hr) treated 11th day old chick embryonic liver showing necrosis (H & E- 40x)

Figure 65: 0.03 mg cadmium chloride (24 hr) treated 11th day old chick embryonic liver showing 1. Hemorrhages 2. Necrotic changes (H & E- 40x)
Figure 66: 0.03mg cadmium chloride (48 hr) treated 11th day old chick embryonic liver showing 1. Necrotic changes 2. Pycnotic nuclei (H & E- 40x)

Figure 67: 0.03mg cadmium chloride (72 hr) treated 11th day old chick embryonic liver showing 1. Pycnotic nuclei 2. Necrotic changes 3. Mild hemorrhages (H & E- 40x)
Discussion:

Liver is the major metabolizing organ which detoxifies a number of drugs and xenobiotics. In the present investigation the acrylamide and cadmium chloride treatment to chick embryo induced several pathological changes in the liver like, pycnotic nuclei, hemorrhages, fatty infiltrations, necrosis, pushing of nucleus to the periphery, sinusoidal dilations etc.

Nagao et al., 2007 reported that acrylamide treatment in the liver of rats showed frequent necrosis and bleeding. Vasundhara in 2005, showed that acrylamide administration in rat liver showed hypertrophy of nuclei, pycnotic nuclei, proliferation of sinusoidal bile ducts and hemorrhages. Fatty infiltration in liver of rabbits on administration of cadmium was reported by Subramanyam et al., 1992. Extensive histopathological lesions like hepatocytic enlargements, necrosis and fatty changes were observed in rat and mice by Wolswoski, 2007; Koller, 2001 in cadmium administration.

From the present study it is clear that acrylamide and cadmium chloride caused mild to severe hepatic changes in 11\textsuperscript{th} day old chick embryonic liver. In chick embryo development liver plays a crucial role to metabolize the toxicants through detoxification mechanism. In the present study it is reported that to detoxify the molecules acrylamide and cadmium chloride, in the liver, a new class of GST may be induced to protect the embryo. Even other chemicals that can insult the chick embryo may also induce theta GST class GSTs in its liver.