

STUDY ON BIOCHEMICAL PARAMETERS ON HYDATID CYST LAYERS (LAMINATED AND GERMINAL) AND SURROUNDING HOST TISSUES ISOLATED FROM DIFFERENT INTERMEDIATE HOSTS

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ABSTRACT

This study included biochemical analysis of hydatid cysts (HCs) (laminated and germinal layers) and hosts tissues of sheep, goats and cattle during the period from Nov. 2010 to Oct. 2011. Furthermore, biochemical analysis of germinal layer of HCs surgically removed from human liver and lungs were also included in study. The chemical analysis involved the determination of cholesterol, triglyceride and nitrogenous compound.

The germinal layer showed the highest content of cholesterol in HC of all hosts with the highest being in germinal layer of HCs in cattle liver (5.29 ± 0.65 mg/100g). Whereas, in host tissues, the highest level was observed in uninfected cattle liver tissues (35.71 ± 1.51 mg/100g).

The triglyceride in laminated layer of HC was higher than that in germinal layer in HCs of all hosts, with the highest being in the laminated layer of HCs in cattle lungs (11.85 ± 0.28 mg/100g). While in host tissues, the uninfected tissues showed the high level of triglyceride with the highest being in cattle lungs tissue (40.23 ± 0.97 mg/100g). The laminated layer of HC in sheep lungs contained the highest level of urea and uric acid which were (4.45 ± 0.80 and 1.71 ± 0.68 mg/100g), respectively as compared with the cyst in other hosts. The uninfected sheep lung tissues, showed the highest level of urea (31.0 ± 0.88 mg/100g), while the highest level of uric acid was observed in sheep lung tissues which was in direct contact with the HCs (1.52 ± 0.35 mg/100g). Creatinine contents of laminated and germinal layers of HCs in sheep liver along with host tissue in direct contact with HCs were the highest among the studied hosts (0.12 ± 0.01 , 0.17 ± 0.01 and 1.52 ± 0.17 mg/100g), respectively. The bilirubine content of laminated and germinal layers of HC in sheep lungs along with the host tissues which were in direct contact showed the highest level among all studied hosts (0.266 ± 0.02 , 0.342 ± 0.03 and 0.63 ± 0.013 mg/100g), respectively.

KEYWORDS: HCs layers- Biochemical analysis- Cholesterol-triglyceride -Urea- Uric acid- Creatinine -bilirubine - Animal- Human

INTRODUCTION

Hydatid disease (HD) or Cystic Echinococcosis (CE) is a major parasitic disease of veterinary and public health importance throughout the world. This disease has a great economic and zoonotic importance because it affects almost all the domestic animals and human (Baswaid, 2007). It is caused by the larval stage (metacestode) of the dog tapeworm *Echinococcus granulosus* by ingesting eggs, which passed with the feces of the definitive hosts, usually feral dogs (Rahimi *et al.*, 2011).

The larval form of *E. granulosus* in the intermediate host is characterized by its cystic aspect and behaves as a benign tumor in most of the cases (Amman and Eckert, 1996). There are seven species of *Echinococcus*; four of them are infectious to human, namely *E. granulosus*, *E. multilocularis*, *E. oligartharus* and *E. vogeli*. However, *E. granulosus*, is the most prevalent species in all continents, causing considerable public health problems in many regions of the world (WHO, 2001). Furthermore, it is also

common in Iraq (Al-Nakeeb, 2004), including Kurdistan region (Abdullah, 2010 and Meerkhan, 2011)

Epidemiological situation of this parasite is complicated due to the fact that several strains have been identified in most area where infection is endemic. These strains exhibit different degrees of infectivity for certain intermediate hosts (Thompson and McManus, 2001).

The aim of this study was to perform some chemical analysis of laminated and germinal layers as well as surrounding host tissues to get some information about the nature of these layers and also how close they are to the structure of the host's tissues. This study can form the basis for further studies in this direction which will help to find the weaknesses in these layers and it may lead for a specific chemotherapeutic measures in the near future by specialists.

MATERIALS AND METHODS

This study included a total of 42 HCs along with the tissues of infected organs which were collected from each infected sheep, goats, and cattle in addition to 11 humans HCs were obtained after surgical removal of cysts from liver and lung of patients at Azadi Teaching Hospital and Sheelan Private Hospital in Duhok city. In addition, 12 samples from organs (liver and lung) of uninfected sheep, goats and cattle were collected to be used as controls.

All cysts were examined to know whether they are fertile or sterile, by examining the hydatid fluid and pieces of germinal layer using compound microscope (40X and 100X).

The cysts were removed from the infected organs, washed with distilled water, then the laminated layer was removed with scissors and the germinal layer appears clearly. Then 0.5g of each one separately was cut to very small pieces, homogenized with 5mls of Tris-HCl buffer (pH 7.4) by using a glass homogenizer connected to a variable speed stirrer and placed in a beaker containing crushed ice (Mero *et al.*, 1988). The extract was centrifuged at 4000 rpm for 30 minutes and the supernatants were kept in labeled sample tubes and stored in a deep freezer at -40°C until used. In the same processes, 0.5 gm of liver and lung of each one of host tissues which were in direct contact with the cyst, those which were far away at a distance of 5cm from the cyst, and the uninfected host tissues(used as a control) were homogenized by using glass homogenizer as mentioned previously, centrifuged and the supernatants were kept in labeled sample tubes and stored in a deep freezer at -40 °C until used. The following parameters were analyzed:

1- **Triglyceride** (Fossati & Prencipe, 1982).

2- **Cholesterol** (Tietz *et al.*, 1999).

3- **Uric Acid** (Tietz *et al.*, 1999)

4- **Urea** (Tietz *et al.*, 1999)

5- **Bilirubine**(Malloy & Evelyn, 1937).

6- **Creatinine** (Labbe *et al.*, 1996).

Results

1. The chemical composition of laminated and germinal layers of HCs isolated from sheep

liver and lung along with the infected and uninfected liver and lung tissues:-

Table (1) show the cholesterol, triglyceride and nitrogenous compound of the germinal and laminated layer of HCs, infected tissue of both in direct contact and those which are at a distance of five centimeters from the cyst and uninfected tissue of sheep liver and lung.

It is obvious from the results that the cholesterol contents of germinal layer of sheep cysts isolated from both liver and lung was higher than that of the laminated layer of the same cysts, but this difference was statistically non-significant ($P > 0.05$). Furthermore, the cholesterol content in laminated and germinal layers of HCs in sheep liver was higher than that in the laminated and germinal layers of HC in sheep lung. Regarding the triglyceride in laminated layer of HCs isolated from sheep liver and lungs was higher than that in the germinal layer of the same cysts (9.52 ± 0.39 and 9.96 ± 0.29 mg/100g, respectively). On other hand, the triglyceride content in laminated and germinal layers of HC isolated from sheep lung were higher than that in the laminated and germinal layers of HC isolated from sheep liver, but these differences were statistically non-significant ($P > 0.05$).

With respect to hosts tissues, the cholesterol and triglyceride content in uninfected tissues of sheep liver and lung were higher than that of the infected tissues of sheep liver and lung. The lowest concentration was found in tissues which were 5cm away from HC, while in tissues at direct contact with HC were in between these values (Table 1).

The laminated layer of HC from sheep liver and lung contain more urea than that in germinal layer, and these differences were statistically non-significant ($P > 0.05$). On the other hand, the liver and lung tissues contain much higher urea, and the highest level of urea was found in uninfected tissue of liver and lung which were 30.06 ± 0.93 and 31.0 ± 0.88 mg/100g, respectively, and these values were decreased in the infected tissues in contact to the HC.

Table (1) Cholesterol, triglyceride and nitrogenous compounds of hydatid cyst's wall, infected and uninfected sheep liver and lung tissues

<i>Parameters</i>	<i>Organ</i>	Laminated Layer (mg/100g)	Germinal Layer (mg/100g)	Tissue in direct contact (mg/100g)	Tissue at five cm (mg/100g)	Uninfected Tissue (mg/100g)
<i>Cholesterol</i>	<i>Liver</i>	3.322 ± 0.38	4.24 ± 0.61	27.61 ± 0.99	25.85 ± 0.53	28.68 ± 1.39
	<i>Lung</i>	3.081 ± 0.62	3.86 ± 0.36	22.31 ± 0.79	19.95 ± 0.65	23.57 ± 1.58
<i>Triglyceride</i>	<i>Liver</i>	9.52 ± 0.39	8.56 ± 0.2	28.24 ± 0.2	27.56 ± 0.63	30.23 ± 0.83
	<i>Lung</i>	9.96 ± 0.29	8.95 ± 0.5	30.77 ± 0.98	29.04 ± 0.94	31.72 ± 0.83
<i>Urea</i>	<i>Liver</i>	3.40 ± 0.21	2.66 ± 0.2	25.77 ± 0.83	28.99 ± 0.49	30.06 ± 0.93
	<i>Lung</i>	4.45 ± 0.80	3.7 ± 0.93	27.30 ± 0.54	30.03 ± 0.45	31.0 ± 0.88
<i>Uric Acid</i>	<i>Liver</i>	1.66 ± 0.22	0.72 ± 0.11	0.96 ± 0.16	0.92 ± 0.06	0.91 ± 0.17
	<i>Lung</i>	1.71 ± 0.68	0.95 ± 0.11	1.52 ± 0.35	1.330 ± 0.4	1.29 ± 0.10
<i>Creatinine</i>	<i>Liver</i>	0.12 ± 0.01	0.17 ± 0.01	1.52 ± 0.17	1.41 ± 0.13	1.40 ± 0.25
	<i>Lung</i>	0.10 ± 0.02	0.15 ± 0.02	0.93 ± 0.07	0.91 ± 0.04	0.82 ± 0.05
<i>Bilirubine</i>	<i>Liver</i>	0.228 ± 0.07	0.335 ± 0.08	0.618 ± 0.03	0.593 ± 0.06	0.57 ± 0.09
	<i>Lung</i>	0.266 ± 0.02	0.342 ± 0.03	0.63 ± 0.013	0.61 ± 0.063	0.60 ± 0.013

In general the uric acid did not show high variation in the infected sheep liver and lung tissues as compared with HC layers. The uric acid in laminated layers of HC isolated from sheep liver and lung was higher than that in germinal layers. On other hand the uric acid in host tissues which were in direct contact with HC was higher than that at 5 cm distance and was slightly lower in uninfected tissue.

The highest creatinine content was observed in germinal layer of HCs isolated from sheep liver and lungs, which was 0.17 ± 0.01 and 0.15 ± 0.02 mg/100g, respectively. Regarding the organ involved, the creatinine contents of liver was higher than that in lung. With respect to hosts tissues, the highest creatinine concentration was found in liver tissues which was in direct contact with HC (1.52 ± 0.17 mg/100g), whereas, the lowest one was found in uninfected lungs tissues (0.82 ± 0.05 mg/100g). The bilirubine content in germinal layer of HCs in sheep liver and lung were higher than that in laminated layer (Table 1). Regarding the host tissues, bilirubine contents did not show any significant variation in the infected and uninfected tissues.

2. The chemical composition of laminated and germinal layers of HCs isolated from goats liver and lungs along with the infected and uninfected liver and lung tissues:-

The cholesterol, triglyceride and nitrogenous compound of the germinal and laminated layer

of HC, infected tissue both in direct contact and those which are at a distance of five centimeters from the cyst, and uninfected tissue of goats liver and lung are shown in table (2).

It is obvious from the results that the cholesterol content of germinal layer of goats cysts isolated from both liver and lung was higher than that of the laminated layer of the same cyst, but this different was statistically non-significant ($P > 0.05$). Furthermore, the cholesterol content in laminated and germinal layers of HC in goats liver was slightly higher than that in the laminated and germinal layers of HCs in goats lungs. With respect to host tissues, uninfected hosts tissues (both liver and lungs) showed the highest concentration of cholesterol.

Regarding the triglyceride, it was higher in the laminated layer of HCs isolated from goats liver and lungs than that in the germinal layer of the same cysts. With respect to host tissues, the triglyceride content in uninfected tissues of goats' liver and lung were higher than that of the infected tissues of the same organs. The lowest concentration was observed in tissues which were at 5 cm away from HC (Table 2).

The laminated layer of HCs from goats liver and lungs contain more urea as compared with the germinal layer; however, these differences were statistically non-significant ($P > 0.05$). The highest level of urea was found in uninfected tissues of liver and lung which were 17.67 ± 0.30 and 18.66 ± 0.37 mg/100g, respectively.

Table (2) Cholesterol, triglyceride and nitrogenous compounds of HC wall, infected and uninfected goats liver and lung tissues.

<i>Parameters</i>	<i>Organ</i>	Laminated Layer (mg/100g)	Germinal Layer (mg/100g)	Tissue in direct contact (mg/100g)	Tissue at five cm (mg/100g)	Uninfected Tissue (mg/100g)
<i>Cholesterol</i>	<i>Liver</i>	3.65 ± 0.32	4.367 ± 0.56	24.020 ± 0.7	22.78 ± 0.74	33.01 ± 0.78
	<i>Lung</i>	3.252 ± 0.14	3.44 ± 0.23	22.63 ± 0.81	21.05 ± 0.93	31.87 ± 1.2
<i>Triglyceride</i>	<i>Liver</i>	10.11 ± 0.66	9.14 ± 0.30	32.24 ± 0.56	31.78 ± 0.60	38.45 ± 0.98
	<i>Lung</i>	10.94 ± 0.34	9.58 ± 0.26	34.82 ± 0.62	33.12 ± 0.54	39.03 ± 1.20
<i>Urea</i>	<i>Liver</i>	2.53 ± 0.50	1.23 ± 0.20	15.65 ± 0.49	16.92 ± 0.95	17.67 ± 0.30
	<i>Lung</i>	3.16 ± 0.54	1.46 ± 0.29	16.90 ± 0.6	18.26 ± 1.18	18.66 ± 0.37
<i>Uric Acid</i>	<i>Liver</i>	1.19 ± 0.68	0.76 ± 0.09	0.92 ± 0.64	0.82 ± 0.06	0.78 ± 0.12
	<i>Lung</i>	1.33 ± 0.52	1.03 ± 0.40	1.45 ± 0.5	1.37 ± 0.4	1.32 ± 0.63
<i>Creatinine</i>	<i>Liver</i>	0.11 ± 0.01	0.16 ± 0.02	1.4 ± 0.10	1.38 ± 0.5	1.37 ± 0.1
	<i>Lung</i>	0.098 ± 0.01	0.13 ± 0.01	0.912 ± 0.01	0.83 ± 0.04	0.81 ± 0.03
<i>Bilirubine</i>	<i>Liver</i>	0.211 ± 0.02	0.256 ± 0.06	0.59 ± 0.03	0.57 ± 0.01	0.55 ± 0.01
	<i>Lung</i>	0.24 ± 0.09	0.285 ± 0.06	0.60 ± 0.09	0.59 ± 0.06	0.56 ± 0.03

Highest uric acid content (1.33 ± 0.52 mg/100g) was observed in the laminated layer of HCs isolated from goats' lungs. With respect to host tissues, the highest level (1.45 ± 0.5 mg/100g) was observed in lung tissues which were in direct contact with HC.

The highest creatinine content in HC was observed in germinal layer of HCs isolated from goats liver and lungs, which were 0.16 ± 0.02 and 0.13 ± 0.01 mg/100g, respectively. Regarding the organ involved, the creatinine content of liver was higher than that in lung. With respect to host tissues, the creatinine concentration did not showed any variation in infected and uninfected host tissues.

The bilirubine content in germinal layer of HC in goats' liver and lung were slightly higher than that in laminated layer (Table.2). In the host tissues, the values of bilirubine in infected and uninfected goats liver and lung tissues were somewhat similar (Table 2)

3. The chemical composition of laminated and germinal layers of HCs isolated from cattle liver and lungs along with the infected and uninfected liver and lung tissues:-

The cholesterol, triglyceride and nitrogenous compound of the germinal and laminated layer of HC, infected tissue both in direct contact and those which are at a distance of five centimeters from the cyst and uninfected tissue of cattle liver and lung are shown in Table (3).

It is obvious from these results that the cholesterol contents of germinal layer of cattle cysts isolated from both liver and lungs were higher than that of the laminated layer of the same cysts, but this difference was statistically non-significant ($P > 0.05$). Furthermore, the cholesterol contents in laminated and germinal layers of HCs in cattle liver were higher than that in the laminated and germinal layers of HCs in cattle lung. With respect to host tissues, uninfected hosts tissues (both liver and lungs) showed the highest cholesterol contents.

Regarding the triglyceride, the laminated layer of HCs isolated from cattle liver showed slightly higher triglyceride content than that in the germinal layer, which were 10.48 ± 0.60 and 9.98 ± 0.20 mg/100g, respectively. Similar pattern was observed in cysts isolated from cattle lung, (Table 3). On the other hand, the uninfected liver and lung tissues showed higher triglyceride contents as compared with the infected tissues (Table 3).

The laminated layer of HC from cattle liver and lung contained more urea than the germinal layer, but these differences were statistically non-significant ($P > 0.05$). On the other hand, the liver and lung tissues contained much higher urea, with the highest level being found in uninfected tissue of liver and lung which were 23.21 ± 1.21 and 23.67 ± 0.6 mg/100g, respectively. These values were decreased in the infected tissues getting close to that of the HC.

The highest uric acid level in HC was observed in the laminated layer of HC isolated from cattle lungs (1.37 ± 0.74 mg/100g). With respect to host tissues, the lung tissue which was in direct contact with HC showed slightly higher uric acid content (1.28 ± 0.09 mg/100g).

Regarding creatinine, both laminated and germinal layer of HC isolated from cattle liver and lungs showed somewhat similar levels. With

respect to host's tissues, the highest creatinine content was found in liver tissues which were in direct contact with HC (1.31 ± 0.26 mg/100g).

The bilirubine content in germinal layer of HC in cattle lung was the highest (Table 3). Regarding the host tissues, the values of bilirubine in infected and uninfected cattle liver and lung tissues were somewhat similar (Table 3)

Table (3) Cholesterol, triglyceride and nitrogenous compounds of hydatid cyst's wall, infected and uninfected cattle liver and lung tissues.

<i>Parameters</i>	<i>Organ</i>	Laminated Layer (mg/100g)	Germinal Layer (mg/100g)	Tissue in direct contact (mg/100g)	Tissue at five cm (mg/100g)	Uninfected Tissue (mg/100g)
<i>Cholesterol</i>	<i>Liver</i>	4.13 ± 0.03	5.29 ± 0.65	28.47 ± 0.71	24.21 ± 1.10	35.71 ± 1.51
	<i>Lung</i>	3.43 ± 0.9	4.72 ± 0.1	28.84 ± 0.88	24.23 ± 1.21	33.79 ± 1.78
<i>Triglycerid</i>	<i>Liver</i>	10.48 ± 0.60	9.98 ± 0.20	33.20 ± 0.8	32.56 ± 0.66	39.35 ± 0.68
	<i>Lung</i>	11.85 ± 0.28	10.31 ± 0.40	35.40 ± 0.88	35.02 ± 0.94	40.23 ± 0.97
<i>Urea</i>	<i>Liver</i>	2.15 ± 0.14	2.06 ± 0.07	16.7 ± 0.8	20.06 ± 1.5	23.21 ± 1.21
	<i>Lung</i>	3.27 ± 0.34	2.32 ± 0.24	17.64 ± 0.6	20.36 ± 1.2	23.67 ± 0.6
<i>Uric Acid</i>	<i>Liver</i>	1.31 ± 0.16	0.72 ± 0.5	0.97 ± 0.06	0.95 ± 0.08	0.93 ± 0.7
	<i>Lung</i>	1.37 ± 0.74	0.82 ± 0.18	1.28 ± 0.09	1.25 ± 0.4	1.15 ± 0.10
<i>Creatinine</i>	<i>Liver</i>	0.12 ± 0.05	0.15 ± 0.09	1.31 ± 0.26	1.24 ± 0.11	1.10 ± 0.05
	<i>Lung</i>	0.11 ± 0.06	0.12 ± 0.01	0.91 ± 0.05	0.90 ± 0.06	0.87 ± 0.07
<i>Bilirubine</i>	<i>Liver</i>	0.215 ± 0.04	0.27 ± 0.025	0.61 ± 0.01	0.60 ± 0.05	0.58 ± 0.05
	<i>Lung</i>	0.254 ± 0.03	0.30 ± 0.02	0.62 ± 0.04	0.607 ± 0.05	0.59 ± 0.04

4. The chemical composition of germinal layer of HCs removed from human liver and lung:

The cholesterol, triglyceride and nitrogenous compound of the germinal layer of HCs surgically removed from human liver and lungs are shown in Table (4). It is clear from the results that the cholesterol contents of germinal layer of human cysts removed from human liver was higher than that of the lung, but this different was statistically non-significant ($P > 0.05$). Regarding the triglyceride, the germinal layer of lungs HCs showed slightly higher concentration than that in the liver HCs, which were 9.18 ± 0.97 and 8.87 ± 0.68 mg/100g, respectively. On the other hand, the cholesterol and triglyceride content in germinal layers of HCs removed from human liver and lung was very low as compared with the normal values of

cholesterol and triglyceride in human blood serum.

The germinal layer of HCs removed from both human liver and lungs contains low concentration of urea and uric acid which were much lower than that of the normal values of human blood serum (Table 4). The creatinine content in germinal layer of HCs removed from both human liver and lungs were somewhat, similar (0.15 ± 0.03 and 0.14 ± 0.01 mg/100g, respectively). However these concentrations were much lower than that of normal values of human blood serum. Regarding bilirubine, its concentration in germinal layer of HCs removed from human lung was higher than that of liver cysts, but the difference was statistically non-significant ($P > 0.05$).

Table (4) Cholesterol, triglyceride and nitrogenous compounds of germinal layer of HC removed from human liver and lung along with normal values in blood serum.

<i>Parameters</i>	<i>Organ</i>	<i>Germinal Layer (mg/100g)</i>	<i>Normal values mg/100g</i>
<i>Cholesterol</i>	<i>Liver</i>	4.687 ± 0.41	150 - 239
	<i>Lung</i>	4.23 ± 0.50	
<i>Triglycerid</i>	<i>Liver</i>	8.87 ± 0.68	35 - 160
	<i>Lung</i>	9.18 ± 0.97	
<i>Urea</i>	<i>Liver</i>	1.81 ± 0.16	13 - 43
	<i>Lung</i>	1.61 ± 0.10	
<i>Uric Acid</i>	<i>Liver</i>	0.98 ± 0.14	3.5 - 7.2
	<i>Lung</i>	1.16 ± 0.11	
<i>Creatinine</i>	<i>Liver</i>	0.15 ± 0.03	0.9 - 1.3
	<i>Lung</i>	0.14 ± 0.01	
<i>Bilirubine</i>	<i>Liver</i>	0.24 ± 0.02	0.1-1.0
	<i>Lung</i>	0.31 ± 0.01	

DISCUSSION

The biochemical compositions of HCs play an important role in the metabolism, physiology and immunology of the disease (Thompson & Lymbery, 1995). The quantitative difference in the metabolism of *E. granulosus* and variation in the biochemical composition of HC reflect strain variation in different intermediate hosts (Thompson & Lymbery, 1995 and Shaafie *et al.*, 1999).

1. Cholesterol:-

The cholesterol concentration in the germinal layer was higher than that of the laminated layer of HC from infected liver and lungs in all hosts, with the highest being in the germinal layer of HC from cattle liver. However there is no any previous study in this direction in order to compare these results, the only available work is that of Hammodi (1989) who worked on germinal layer and Al-Zobaidy (1989) who worked on laminated layer, and if we compare their results, regarding cholesterol content, their results also showed that the germinal layer contains higher content of cholesterol. On the other hand, the high cholesterol content of infected tissues which is close to HC is in agreement with what has been recorded by Anwar (1997) where he also found high cholesterol content in infected tissues which are close to HC. He attributed it to aggregation of cholesterol in tissue which is near the cyst to be absorbed by HC, since HC cannot produce

cholesterol as mentioned by Frayha, (1971), while Vercelli-Retta, *et al.*, (1975) stated that the protoscolices of HCs have the ability to oxidize the acetate to produce lipids except cholesterol which was absorbed from host tissue. Čmelik, (1952) and Richards (1984) found that the cholesterol is an important component in germinal and laminated layer and the rises in its level in HC from cattle may be due to the nature of these layers in cattle as compared with its counterpart in other intermediate hosts.

The increasing in the level of cholesterol in the liver as compared with the lung may be related with its function as a structural component (Al-Bayati *et al.*, 2010).

2. Triglyceride:-

The laminated layer of HCs from liver and lung showed higher triglyceride content as compared to the germinal layer; also this content was higher in the laminated layer of cyst isolated from lung tissues. Refik *et al.*, (2002) and Meerkhan, (2011) also found high triglyceride content in protoscolices and fluid of HC isolated from host lungs. With respect to triglyceride in host tissue, the highest level was found in uninfected tissue. This agrees with what have been observed by Meerkhan, (2011).

3. Urea and Uric Acid:-

In the present study, also the laminated layer of lung cysts showed the higher contents of urea and uric acid, but these values are very low as

compared with urea and uric acid levels in infected and uninfected host's tissue. This could be a prophylactic measure to avoid deleterious effects on some vital processes (Frayha & Haddad 1980). However there is no data to compare these results, the only available data are those of Rahdar *et al.*, (2008) and Meerkhan (2011) who found low levels of urea and uric acid in the protoscolices of HCs. In the host's tissues, the uric acid in infected tissue of liver and lungs which were in direct contact with HCs is higher than that at 5cm distant, and the lowest level was in uninfected tissue. These results imply to the accumulation of uric acid in tissues surrounding the HCs. The presence of urea and uric acid indicate the occurrence of urea cycle which is essential to eliminate the toxic level of ammonia produced from amino acid and nucleotide metabolism (Dow *et al.*, 1996).

4. Creatinine:-

The highest creatinine level was found in germinal layer of HCs from sheep liver. Dow *et al.*, (1996) and Kahn, (2005) reported that the creatinine level reflects the ammonia metabolism and energy production. Therefore, this increase of creatinine in germinal layer may be attributed to the vitality effect of germinal layer as compared with laminated layer. On the other hand, these values are very low as compared with creatinine level in host tissue. The same difference was observed by Rahdar *et al.*, (2008) and Meerkhan (2011).

5. Bilirubine:-

Bilirubine concentration in germinal layer of HCs was higher than that in laminated layer. With respect to host tissues, the bilirubine content in tissue which is in direct contact with HCs was higher than that at 5cm distance and uninfected tissue. This may be attributed to the toxic effect of crude HF or filtered HF (Anwar 1997), there is no other previous studies in order to compare the results.

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كورتى

نهف قه كولينه هاتيه نه ناجامدان ل دور هندهك بيشه رين بايو كيمياوى بين هردوو تويخين كيسيكت نافي و پوشه كين ميلاك و سيه بين خانه خويبت نافه ندى نهوين هاتينه وهرگرتن ژ پهرز و بز و چيلا ل گوشترگه ها دهوك. ژ چريا دووى 2010 تا چريا نيكي 2011. زيده بارى تويخى جيرمينال بين كسين نافي پشتى هاتينه لادان ب نشته گه ريبى ژ مروفا. شلوفه كرنا كيمياوى، ريژا كوليسترونى و ترايگلاسيراييد و هندهك تيگه لين نايتروجينى بغوفه دگريت. تويخا جيرمينال بين كسين نافي بهررتين ريژا كوليسترونى ديار كر بهر اوورد دگه ل تويخا لامينيتد، و بهررتين ريژه هاتينه ديتن ل ناف تويخا جيرمينال ل كسين نافي بين ميلاك چيلى ($5,29 \pm 0.65$ ملغم/100غم)، دهر بارى ريژا وى ل پوشه كين خانه خويبت نافه ندى بين هاتينه خواندن، بهررتين ريژه هاتيه ديتن ل ميلاك چيلى ساخلمه ($1,51 \pm 35,71$ ملغم/100غم). دهر بارى ترايگلاسيراييد، ريژا وى ل ناف تويخا لامينيتد بهررتين ريژا وى تويخا جيرمينال، و بهررتين ريژه هاته ديتن تويخا لامينيتد ل كسين نافي ل ناف سيها چيلا ($11,85 \pm 0,28$ ملغم/100غم)، و دهر بارى پوشه كين خانه خويبت نافه ندى، بهررتين ريژه هاته ديتن ل ناف پوشه كى سيهين چيلى ساخلمه ($1,51 \pm 35,71$ ملغم/100غم). تويخا جيرمينال يا كسين نافي هاتينه وهرگرتن ژ سيهين پهزا بهررتين ريژا يوريا و ترشى يوريك ديار كر، نهوژى (0.80 ± 4.45 و 0.68 ± 1.71 ملغم/100غم). و پوشه كى سيها پهزى بين ساخلمه بهررتين ريژا يوريايى ديار كر، و ههروهسا ترشى يوريكى ب بهررتين ريژه هاته ديتن ل پوشه كى سيهه بين پهزى نهوى بكيسكى قه نويسياى. تويخين جيرمينال و لامينيتد بين كسين نافي هاتينه وهرگرتن ژ ميلاك پهزى زيده بارى پوشه كى ميلاك ييبى ب كيسكى قه نويسياى بهررتين ريژا كرياتيونيى ديار كر بهر اوورد دگه ل خانه خويبت نافه ندى بين هاتينه شلوفه كرن دقى خواندن، و دهر بارى بليروبينى، تويخا لامينيتد و جيرمينال و پوشه كى سيها پهزى يى بكيسكى قه نويسياى بهررتين ريژه ديار كرن.

الخلاصة

تضمنت الدراسة الحالية دراسة وبائية و كيموحيوية للطبقتين الصفائحية و الجرثومية للأكياس المائية وكذلك انسجة الكبد والرئة للمطائف الوسطية وذلك للفترة من تشرين الثاني 2010 ولغاية تشرين الاول 2011. هذا بالاضافة الى اجراء تحليل كيموحيوي للطبقة الجرثومية للأكياس المائية التي تم ازلتها بعمليات جراحية من كبد و رئات اشخاص مصابين. تضمن التحليل الكيمياءى دراسة كل من الكولسترول و الدهون الثلاثية و بعض المركبات النيتروجينية. وقد أظهرت الطبقة الجرثومية للأكياس العدرية محتوى أعلى من الكولسترول مقارنة بالطبقة الصفائحية في الاكياس العدرية المعزولة من جميع المطائف التي تضمنتها هذه الدراسة و اعلى قيمة للكولستيرول وجدت في الطبقة الجرثومية للأكياس المعزولة من كبد الابقار ($5,29 \pm 0.65$ ملغم/100غم)، اما بالنسبة لأنسجة الكبد و الرئة للمطائف الوسطية فأن اعلى قيمة وجدت في كبد الابقار الغير مصابة ($1,51 \pm 35,71$ ملغم/100غم). بالنسبة للدهون الثلاثية فان كمياتها كانت في الطبقة الصفائحية اعلى مما في الطبقة الجرثومية، و ان اعلى قيمة وجدت في الطبقة الصفائحية للأكياس العدرية المعزولة من رئة الابقار ($11,85 \pm 0,28$ ملغم/100غم) اما بالنسبة لأنسجة المضائف الوسطية فأن اعلى قيمة وجدت في نسيج الرئة للأبقار الغير مصابة ($1,51 \pm 35,71$ ملغم/100غم). أظهرت الطبقة الجرثومية للأكياس المائية المعزولة من رئة الاغنام المصابة اعلى قيمة لليوريا و حامض اليوريك وكانت (0.80 ± 4.45 و 0.68 ± 1.71 ملغم/100غم على التوالي، في حين أظهر نسيج رئة الاغنام غير المصابة اعلى قيمة لليوريا، كما ان حمض اليوريك وجد باعلى مستوياته في نسيج الرئة الملاصق للكيس العدرى في الاغنام. أظهرت الطبقة الصفائحية و الجرثومية للأكياس المعزولة من كبد الاغنام بالاضافة الى نسيج الكبد الملاصق للكيس اعلى مستوى للكرياتينين مقارنة بما هو موجود في المطائف الوسطية الاخرى. بالنسبة للبلروبين، أظهرت الطبقة الصفائحية و الجرثومية و نسيج رئة الاغنام الملاصق للكيس اعلى قيمة من البلروبين.