Chemical Composition of Hydatid Cyst Fluid of *Echinococcus granulosus*

A. Dalimi and Z. Eslami

Parasitology Dept., Medical School, Trabiat Modarres University,

PO Box 14155-4838 , Tehran, I.R. of Iran

Summary

The fluid of hydatid cysts occurring in the liver and the lung have been analysed for proteins, carbohydrates, nitrogenous waste products, lipids, electrolytes and nucleic acids contents. The data obtained from the fluid of the liver cysts were compared with those obtained from the lung cysts. Furthermore, the same analyses were carried out to investigate what kind of changes, if any, occur in the chemical composition of the cysts fluid after freezing.

Results indicated that quantities of uric acid, urea nitrogen, total protein, creatinine, cholestrol, triglycerides, chloride, calcium and phosphate significantly ($P< 0.05$) differed in fresh fluid from liver cysts than those in fresh lung cysts. Also, freezing of fresh hydatid fluid, both from the liver and the lung, caused changes in the quantities of some organic compounds and certain electrolytes.

Introduction

Different investigators have carried out chemical analyses of hydatid cyst fluid. Mazzocco(1) measured some of electolytes in hydatid fluid. Frayha and Haddad(2) determined the concentration of electrolytes, quantities of nitrogenous composition, carbohydrates and lipids in fresh and lyophilised protoscolices and fluid of hydatid cysts of *E. granulosus*. Anguino(3) measured the amount of glucose, lipids and proteins of hydatid cyst fluid. Sheriff(4) measured the total protein, cholestrol and triglycerides of hydatid cyst fluid. The present study has mainly been designed to quantively define certain chemicals and compounds in the hydatid cyst fluid of

E. granulosus which occur in breeds of sheep in Iran. It also aimed at demonstrating changes, if any, in the composition of the fluid of cysts, both from the liver and the lung, after freezing.

Materials and methods

Parasite material: Hydatid cyst fluid were collected from fresh cysts that were obtained from abbatoirs of Tehran. The hydatid fluid of fertile cyst collected under strile conditions was divided into two parts. One part was analysed freshly and ther other was kept at -20°C for susequent chemical analyses.

Analytical Procedures: Total protein was measured according to the technique of Lowry et al.(5), urea nitrogen by the method of DAM (Diagnostic reagent kit for the in vitro determination of urea in serum, code No. 25927 Span Diagnostic PVT Ltd). Uric acid by the method of phosphotungstate (Kit for the in vitro determination of uric acid in serum code No. 25917 Span Diagnostic PVT Ltd). Creatinine by the method of Chasson et al.(6), DNA by the technique of Burton(7), RNA by the technique of Munro and Fleck(8), glucose by Biuret and Damas method(9), cholestrol by the technique of Zak(10), triglycerides by the method of Carlson and Wadstrom(11), sodium, potassium and calcium by the techniques described by Gilbert(12), chloride and phosphate by method of Itaya and Ui(13) .

Results

Table 1 shows quantities of nitrogenous compounds in hydatid cyst fluid . Total protein, urea nitrogen, uric acid, creatinine and DNA and RNA were detected in measurable amounts. In fresh lung cysts total protein was of the highest proportion in the nitrogenous compounds whereas in fresh liver cysts this consisted of urea nitrogen. Carbohydrate and lipid contents of the hydatid cyst fluid are listed in Table 2 . The measurable lipids in the hydatid cyst fluid of sheep were cholestrol, triglycerides, fatty acids and phospholipids. Fresh lung hydatid cysts showed higher cholestrol and triglycerides contents. Glucose content was the highest in the fluid of the liver cysts which had been frozen. Concentrations of electrolytes in the fresh and frozen sheep hydatid cyst fluid are shown in Table 3 . The sodium

content was the highest, followed by that of calcium. Among the anions, chloride exhibited the highest concentration in the fluid.

Table 1. Quantities of nitrogenous compounds in fresh and frozen fluid of hydatid cysts of *Echinococcus granulosus* (mg/ml)

	Liver		*Lung*	
Compound	*Fresh*	*After freeze*	*Fresh*	*After freeze*
Total protein	3.30±2.20	3.60±1.40	7.80±3.30	4.00±1.50
Urea nitrogen	0.31±0.06	0.21±0.03	0.24±0.05	0.20±0.04
Uric acid	0.0045±0.0009	0.0023±0.0012	0.0070±0.002	0.0024±0.0009
Creatinine	0.0078±0.0015	—	0.0057±0.0013	—
DNA	0.042±0.017		0.044±0.01	
R N A	0.76±0.36		0.72±0.32	

Table 2. Quantities of carbohydrates and lipids in fresh and frozen fluid of hydatid cysts of *Echinococcus granulosus* (mg/ml)

	Liver		*Lung*	
Compound	*Fresh*	*After freeze*	*Fresh*	*After freeze*
Glucose	0.46±0.21	0.72±0.20	0.52±0.13	0.57±0.17
Cholestrol	0.06±0.018	0.023±0.01	0.098±0.014	0.02±0.01
Triglycerides	0.07±0.018	0.064±0.039	0.085±0.011	0.06±0.025

Table 3. Electrolyts concentration of fresh and frozen fluid of hydatid cysts of *Echinococus granulosus*

	Liver		*Lung*	
Electrolyte	*Fresh*	*After freeze*	*Fresh*	*After freeze*
Sodium(meq/l)	139.05±2.08	129.28±8..24	139.9±2.86	128.83±9.34
Potasium	6.15±0.89	4.39±1.01	6.11±0.65	4.72±0.86
Calcium(meq/l)	16.53±1.84		18.15±3.12	
Chloride(meq/l)	105.90±4.79	102.38±12.57	109.25±6.87	115.5±5.34
Phosphate(meq/l)	0.10±0.037		0.22±0.11	

Discussion

The results showed that quantities of uric acid, urea nitrogen, total protein, creatinine, cholestrol, triglycerides, calcium, chloride and phosphate of fresh liver cysts significantly ($P < 0.05$) differed from those of fresh lung cysts.

The quantities of uric acid, total protein cholestrol, triglycerides, calcium, chloride and phosphate in the fluid from fresh lung cysts were higher than those in fresh liver cysts. According to the stydy of Frayha (9) on Syrian sheep hydatid fluid, the quantities of uric acid, RNA, DNA and glucose were 0.002 ± 0.001 mg/ml, 0.05 ± 0.005 mg/ml, 0.02 ± 0.003 mg/ml and 1.16 ± 0.14 mg/ml, respetively. The quantities of total protein, cholestrol and triglycerides of Lybian sheep hydatid fluid were 0.15 ± 0.1 mg/ml, 3 ± 0.75 mg/ml and 60 ± 5 mg/ml, respectively(4). These results were not in accordance with those obtained by us. Anguiano (3) determined the total protein of hydatid fluid to be between 2.02 to 4.4 mg/dl which agreed with our results but the quantities of glucose, from 6.11 to 11.18 mg/dl, did not agree with the present results.

Quantities of some organic compounds and certain electrolytes changed when fresh hydatid fluid, both from the liver and the lung cysts, was subjected to freezing. After freezing, the quantities of urea nitrogen, total protein, cholestrol, triglycerides, sodium, potassium and chloride changed significantly ($P < 0.05$) in the fluid of the lung cysts, whereas, uric acid, urea nitrogen, glucose, cholestrol, sodium and potassium were the materials that underwent significant ($P < 0.05$) changes in the fluid from the lung cysts.

Acknowledgements

We wish to express our thanks to Dr. Allameh and Mr. Sadraii for the scientific help and assistance we received during the course of this work.

References

1. *Mazzocco, P. (1923). Composition du liquide hydatique . Competes Rendus da la Societe de Biologie. 88: 342-343*
2. *Frayha, G. J. and Haddad, R. (1980). Comparative chemical composition of protoscolices and hydatid cyst of* Echinococcus granulosus.

International Jouranl for Parasitology. 10: 359-364

3. *Anguiano benito, A. (1984). Hydatidosis of sheep: II, levels of glucose, lipids and proteins in hydatid liquid. Archives de zootechid 33(126) 163-169. ES.*
4. *Sheriff, S. D., Elfakhri, M. and Kidwai, S. A. (1989). Lipids in hydatid fluid collected from lungs and livers of sheep and man. Journal of Helminthology. 63: 266-268*
5. *Lowry, O. N., Rosebrough, A., Farr, A. and Randall, R. (1951). Protein measurment with the folin phenol reagent. Journal of Biological Chemistry. 193: 265-275*
6. *Chasson, A. L., Grady, H. J. and Stanley, M. A.(1961). Determination of creatinine by means of automatic chemical analysis . American Journal of Clinical Pathology. 35: 83-88*
7. *Burton, K. (1956). A study of the conditions and mechanism of the diphenylamine reaction for the colorimetric estimation of deoxyribonucleic acid. Biochemical Jouranl. 62: 265-275*
8. *Munro, H. N. and Fleck, A. (1967). The determination of nucleic acids.In: Basic Exercises of Immunochemisty. Spriner-Varlag, Berlin.*
9. *Varley, H. (1980). Practical clinical biochemistry. 5th ed., William Hienemann medical book Ltd, London.*
10. *Zak,B. (1977). Cholestrol methodologies : A review Clinical Chemistry 23: 1201*
11. *Carlson, L. A. and Wadstrom, L. B.(1959). Determination of glycerides in blood serum. Clinical Chemistry Acta. 4: 197*
12. *Gilbert, R. K. (1975). Progress and analytic goals in clinial chemistry. American Journal of Clinical Pathology. 63: 960-973*
13. *Itaya, K. and Ui, M. (1966). A new micromethod for the colorimetric determination of inorganic phosphate. Clinical Chemistry Acta. 14: 361-366*