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EVALUATION OF BIOCHEMICAL INDICES SUBSEQUENT INDUCTION OF FATTY LIVER SYNDROME IN RATS FED BY HIGH FAT DIET

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ABSTRACT

Fatty liver syndrome (Hepatic lipidosis) is a major metabolic disorder in many animals in early period of lactation and it's combined with decrease in health and reproduction rate of livestock. In this study, 40 male Wistar rats (220–250 g and 2-3 month age) were selected for the study and were randomly divided into 2 equal groups: group1 considered as control group which received standard diet and Group 2 received high fat diet. At the end of the period, blood samples were obtained from retrobulbar sinus for measurement of some biochemical factors such as SGOT, SGPT, TG, Albumin, and Total proteins. Data showed that TG, SGPT, SGOT are increased and TP and albumin are decreased in compared control group. In conclusion, it can be confirmed that feeding animals with high fat diet affects liver parameters such as TG, SGPT, SGOT, TP and albumin in which.

Keywords: Fatty Liver Syndrome, TG, SGPT, SGOT, TP and Albumin, Rat

INTRODUCTION

Fatty liver syndrome (Hepatic lipidosis) is a major metabolic disorder in many animals in early period of lactation **[3, 6]** and it's combined with decrease in health and reproduction rate of livestock **[9, 14]**. Fatty liver syndrome was documented in forties (decade 1940) but there were few researches about it until mid-seventies. In early 70 and 80 decades, this syndrome was reported around parturition widely and it was recorded in many countries **[3, 6]**. When this disorder is severe, milk production and appetite, both are decreased. So effective prevention of fatty liver can save millions of dollars every year and prevent from decrease in milk production **[4]**. Incidence of Fatty liver in dairy cattle is mainly in first four weeks after parturition **[10]**, when more

than 50% of animals show different degrees of Triacylglycerol (TAG) accumulation in their livers **[13,14]**. One of the reasons is that daily nutrition of animal is not sufficient and it can't meet increasing need of energy in cattle that is producing milk. In this condition, none Esterified fatty acid (NEFA) is released from adipose tissue, often more than it's needed, and extra amount is transferred to liver **[15]**. Fatty liver occurs when liver harvesting of lipids is more than their Oxidation and secretion by the liver and it is with high plasma concentrations of NEFA that is resulted from high adipose tissue **[4, 10]**. Extra fat is stored in liver as TAG and results in decrease of metabolic function of liver **[4]**. Liver is classified to three types, according to fat level: normal liver, liver with average fat and liver with very high fat **[4, 10]**. The latter type is categorized to Non-encephalopathic fatty liver **[1]** and hepatic encephalopathy **[4, 10]**. Unbalanced or insufficient nutrition, overweight and high concentration of estrogen are involved in etiology of fatty liver **[9]**. The disorder can be accompanied with high rate of dystocia, infectious and inflammatory disease, long interval between parturitions and reduction of milk and longevity average **[9]**. Forasmuch as even slight fatty liver is dual with decrease in health and reproduction status of cow, prevention of its occurrence with supplying enough food and creating an isolated place at preparation period for parturition can reduce decline rate of producing milk and it would be the most efficient therapeutic procedure among the other methods **[18]**. However this prevention is not enough for fat cows or the ones that are not feed well, the cows that have problem during parturition or had twins, the cows that have metabolic or infectious disease and the ones that have developed severe energy imbalance because of producing high amount of milk immediately after parturition **[18]**. Assuming existence of about 9 million dairy cattle all over the America, annual charges of fatty liver in this country is estimated more than 60 million dollars **[1]**. If there are more studies about molecular changes and relationship between the disease and immunity function, better remedies and more efficient ways to prevent fatty liver can be presented **[19]**. In our country, because of industrial methods that speed for nurture and maintenance of dairy cattle, and because of producing more milk, more nutrition is considered; occurrence of this syndrome is most likely. According to these conditions, providing exact diagnose of this syndrome and estimate it's incidence rate and finally how to prevent it in our country is a necessity and this case made us do the first study about this disease in Tabriz. It's

possible that origin of many diseases happening around parturition could be fatty liver incidence in this region's dairy cattle.

MATERIALS AND METHODS

Present study is experimental intervention types of study. In this study, 40 male Wistar rats (220–250 g and 2-3 month age) were selected for the study and were purchased from Animal House, Islamic Azad University and randomly divided into 2 equal groups: group1 considered as control group which received standard diet and Group 2 received high fat diet. Animal care and experiments confirmed with the Guide for the Care and Use of Laboratory Animals of China and approval of the ethics committee of Islamic Azad University was obtained before the commencement of the study. The animals were housed under standard environmental conditions (23±1°C, with 55±5% humidity and a 12 h light/12 h dark cycle) and maintained with free access to water and a standard laboratory diet ad libitum. For induction of NAFLD, the routine method presented by Liang et al., (2006) was used. In this method, animals were received high fat emulsion at a dose of 10 ml/kg daily for 4 weeks through gastric gavage. At the end of the period, blood samples were obtained from retrobulbar sinus for measurement of some biochemical factors such as SGOT, SGPT, TG, Albumin and Total proteins. Blood samples were centrifuged at 2500rpm for 15 min at 30°C then serum was separated. At the end, the Statistical Package for Social Sciences (SPSS Inc., Chicago, IL, USA), version 13.0, was used for statistical analysis. All data are presented as mean ± SEM. Before statistical analysis, all variables were checked for normality and homogeneity of variance by using the Kolmogorov-Smirnoff and Levene tests, respectively. The data obtained were tested by ANOVA followed by Tukey's post-hoc multiple comparison test. $P<0.05$ was considered statistically significant.

RESULTS

Data obtained from measurement and analysis of parameters is given in **Table 1**. Based on data showed in **Table 1** it comes that the numerical value of parameters has been affected by high fat diet. According to table and ANOVA results revealed that there is a significant difference in total protein value between groups ($p<0.000$) so, this value in control group was higher than in treatment group.According to table and ANOVA results revealed that there is a significant difference in Albumin value between groups ($p<0.000$) so, this value in control group was higher than in treatment group. According to table and ANOVA results revealed that there is a significant difference in SGPT value between groups ($p<0.000$) so, this value in control group

was lesser than in treatment group. According to table and ANOVA results revealed that there is a significant difference in SGOT value between groups (p<0.000) so, this value in control group was lesser than in treatment group. According to table and ANOVA results revealed that there is a significant difference in TG value between groups (p<0.000) so, this value in control group was lesser than in treatment group.

Table 1: The Mean±SD of parameters in animals fed with high fat diet

Parameter Group	SGOT (µEq/l)	SGPT (µEq/l)	Total protein (g/dl)	Albumin (g/ml)	TG (mg/g)
1 (standard diet)	142.40±7.23	216.40±15.50	86.80±7.15	1.09±0.01	38.00±1.58
2 (high fat diet)	301.40±19.73	414.50±18.05	59.90±3.90	0.14±0.31	48.70±5.88
p-value	0.000	0.000	0.000	0.000	0.000

DISCUSSION AND CONCLUSION

For awareness of fatty liver syndrome, blood biochemical parameters can be used or we can measure TAG and total fat of hepatic cell. Some researchers inspect fatty liver based on TAB or hepatic fat percent **[18]**. **Raid (1980)** divided livers in 4 levels depending on severity of fat accumulation in it: Normal, slight, average and severe **[16]**. Nowadays general opinion is that a high percent of mature cows show signs of slight or severe fatty liver around parturition **[4, 11]**. Almost near parturition NEFA increases in blood and moves to liver, and can cause ketosis, abomasums displacement, metritis and fatty liver after parturition **[4, 5, 8]**. In a normal situation and positive energy balance, NEFA value is about 200 meq/lit in blood. This value increases since 3 weeks is parturition and reaches to 300 meq/lit in the last week. In the last days before parturition, it reaches to 800 -1200mcq/lit. After parturition these acids should wane immediately and if it remains more than 700meq/lit after 7 days, represents negative energy balance and probability of fatty liver incidence. 3 weeks after parturition the amount of these acids should return to normal level (200meq/lit) **[5]**. Also the results of this study have conformity with Grummer results that showed three is most lipid aggregation in liver in first 4 weeks after parturition **[10]**. There was a research in Netherlands about 71 dairy cattle before parturition that showed 5 percent of liver is occupied with TAG **[12]**. Also in a slaughterhouse research in Tehran, aggregation of TAG more than 10% in liver in last month of pregnancy was reported. These researchers had not measured NEFA values. In this study, TAG aggregation in liver in last month of pregnancy had occupied more than 5% of liver cells and amount of NEFA was more than 900meq/lit being nonspecific and some other reasons. Slight and Mild forms of fatty liver con destroy hepatocytes and disturb liver function without making any changes in activity of hepatic specific enzymes found in serum. Measurement of liver enzymes in

serum is useful for evaluating fatty liver disease but with certain restrictions such as is being nonspecific. Mild and moderate forms of fatty liver with damaged hepatocytes can cause liver and no specific changes in liver enzymes in serum, liver dysfunction to establish **[2, 17]**. In conclusion, it can be confirmed that feeding animals with high fat diet affects liver parameters such as TG, SGPT, SGOT, TP and albumin in which TG, SGPT, SGOT are increased and TP and albumin are decreased in compared control group.

REFERENCES

[1] Bobe, G., Young, J.W and Beitz, D.C. (2004). Pathology, Etiology, Prevention, and treatment of fatty liver in dairy cows Journal of Dairy Science.87 (10): 3105-3124.

[2] Bogin, E., Avidan, Y., Merom, M., Soback, S. and Brenner, G. (1988). Biochemical changes associated with the fatty liver syndrome in cows. Journal of Comparative pathology, 98: 337-347.

[3] Bruss, M.L.(1993). Metabolic fatty liver of ruminants. In "Advances in veterinary science and comparative medicine, Animal Models in liver research" edited by C.E. Cornelius. 37: 417- 449.

[4] Drackley, J. K. (1999). Biology of dairy cows during the transition period. Journal of Dairy Science. 82:2259–2273.

[5] Drackley, J.K.(2000). Use of NEFA as a Tool to monitor energy balance in transition dairy cows, www.Livestocktrail.uiuc.Cdu.uplood s/dairy net/PP: 1-3.

[6] Eddy, R.G.(1992). Fatty liver syndrome. In "BovineMedicin" edited by A.H. Andrews, R.W. Blowey, H. Boyd and R.G. Eddy. Black well scientific publications, London. PP: 598-600.

[7] Edmonson, A.J., Lean, I.J., Weaver, L.D., Farver, T. and Webster, G.(1989). A body condition scoring chart for Holstein dairy cows.Journal of Dairy Research. (72) :68-78.

[8] Geelen, M.J.H. and Wensing, T. (2006). Studies on hepatic lipidosis and coinciding health and fertility problems of high-producing dairy cows using the "Utrecht fatty liver model of dairy cows". Veterinary Quarterly, 28(3):90-104.

[9] Goff, J. P. and Horst, R. L. (1997). Physiological changes at parturition and their relationship to metabolic disorders. Journal of Dairy Science. 80:1260–1268.

[10] Grummer, R.R. (1993). Etiology of lipid-related metabolic disorders in

periparturient dairy cows. Journal of Dairy Science. 76:3882–3896.

[11] Grummer, R.R. (1995). Impact of changes in organic nutrient metabolism on feeding the transition dairy cow. Journal of Animal Science. 73: 2820-2833.

[12] Johannsen, U., Menger, S. Staufenbiel, R. and Rossow, N. (1993). Investigations on morphology and function of the liver of high-yielding cows two weeks post partum. Dtsch. Tieraerztl. Wochenschr. 100:177–181.

[13] Jorritsma, R., Jorritsma, H., Schukken, Y. H. and Wentink, G. H.(2000). Relationships between fatty liver and fertility and some periparturient diseases in commercial Dutch dairy herds. Theriogenology, 54:1065–1074.

[14] Jorritsma, R., Jorritsma, H., Schukken, Y.H., Bartlett, P. C., Wensing, T. and Wentink, G. H. (2001). Prevalence and indicators of postpartum fatty infiltration of the liver in nine commercial dairy herds in the Netherlands. Livest. Product. Science. 68:53–60.

[15] Mcnamara, J.P.(2000). Integrating genotype and nutrition on utilization of body reserves during lactation of dairy cattle. Pages 353–370 in Symposium on Ruminant Physiology. P. B. Cronje, ed. CAB Int., London, UK.

[16] Reid, I. M.(1980). Incidence and severity of fatty liver in dairy cows. Veterinary Record. 107:281–284.

[17] Rukkwamsuk, T., Kiuip, T.A.M. and Wensing, T.(1999). Relationship between over feeding conditioning in the dairy Peroid and the problems of high producing dairy cows during the post parturient period. Veterinary Quart, 21: 71-77.

[18] Wensing, T., Kruip, T., Geelen, M. J. H., Wentink, G. H. and Van den Top, A. M. (1997). Postpartum fatty liver in high-producing dairy cows in practice and in animal studies. The connection with health, production and reproduction problems. Comp. Haematol. Int. 7:167–171.

[19] Zerbe, H., Schneider, N. Leibold, W. Wensing, T., Kruip, T. A. M. and Schuberth, H. J. (2000). Altered functional and immunophenotypical properties of neutrophilic granulocytes in postpartum cows associated with fatty liver. Theriogenology, 54:771–786.