SHORT COMMUNICATION
Open Access

Journal of Veterinary and Animal Sciences
ISSN (Print): 0971-0701, (Online): 2582-0605
https://doi.org/10.51966/jvas.2024.55.1.222-225

Haematobiochemical alterations observed in acute pancreatitis induced by L-arginine in rat[#]

Aravind K. Unni[1], K.S. Prasanna[2*], S.S. Devi[3], B. Dhanush Krishna[3], Suresh N. Nair[4], A. Rajendra Prasad[5], R. Bharathi[6] and S. Sruthi[6]
Department of Veterinary Pathology
College of Veterinary and Animal Science, Mannuthy, Thrissur - 680 651
Kerala Veterinary and Animal Sciences University
Kerala, India

Citation: Unni A.K., Prasanna, K.S., Devi, S.S., Krishna, B.D., Nair, S. N., Rajendra Prasad, A., Bharathi, R. and Sruthi, S. 2023. Haematobiochemical changes observed in acute pancreatitis induced by L-arginine in rat. *J. Vet. Anim. Sci.* **55**(1):222-225
DOI: https://doi.org/10.51966/jvas.2024.55.1.222-225

Received: 16.10.2023 *Accepted: 15.12.2023* *Published: 31.03.2024*

Abstract

Acute pancreatitis is an acute inflammatory condition that primarily affects the exocrine pancreas. Diagnosis and treatment of acute pancreatitis can be aided by evaluating particular haematobiochemical alterations. Twelve Wistar albino rats were split up into two groups. Group 1 served as control, while Group 2 (the experimental group) received two intraperitoneal injections of L-arginine at the dose rate of 2.5 g/Kg body weight on the 14th day of experiment. Haematobiochemical parameters were assessed on days 0, 7, and 15 of the experiment. Group 2 exhibited a significant rise in serum amylase and lipase levels when contrasted with Group 1 ($P<0.05$), coinciding with an observable reduction in both the volume of packed red cells and haemoglobin concentration. No significant changes were observed in the levels of glucose, total leukocyte count, total erythrocyte count, and platelet count between the two groups ($P>0.05$).

Keywords: *Acute pancreatitis, L-arginine, haemato-biochemistry, Wistar albino rats*

A comprehensive understanding of the haemato-biochemical and patho-morphological changes induced by acute pancreatitis is imperative for the development of advanced diagnostic methodologies and the formulation of innovative treatment strategies for the disease. Due to the uncertain nature of the pathogenic processes in acute pancreatitis, numerous experimental animal

[#]*Part of MVSc thesis submitted to Kerala Veterinary and Animal Sciences University, Pookode, Wayanad, Kerala*

1. *M.V.Sc. student*
2. *Assistant Professor and Head (i/c)*
3. *Assistant Professor, Department of Veterinary Pathology*
4. *Associate Professor, Department of Veterinary Pharmacology and Toxicology*
5. *Assistant Professor, Department of Animal Breeding and Genetics, PVNRTVU*
6. *PhD scholar, Department of Veterinary Pathology*

**Corresponding author: prasanna@kvasu.ac.in, Ph. 8589904780*

models have been investigated. L-arginine functions effectively to cause acute necrotising pancreatitis, and it can induce acinar cell necrosis in a dose-dependent manner (Hegyi *et al*. 2013) in rats. Therefore, this study centres on the haemato-biochemical alterations in L-arginine induced acute pancreatitis in rats, with a special focus on contrasting these alterations with those seen in human and animal conditions associated with this disease.

Twelve Wistar albino rats of either sex weighing approximately 150 – 200 g were procured from Small Animal Breeding Station (SABS), Mannuthy as per the approval from the Institutional Animal Ethics Committee. They were randomly divided into two groups. Group 1 was given *ad lib* food and water for 14 days without induction of acute pancreatitis. To induce acute pancreatitis in group 2, 20 per cent L-arginine hydrochloride solution was given @ 2.5 g/kg intraperitoneally (IP) on the 14th day (two doses at one-hour interval). On days 0 (the day just before the commencement of the actual experiment), 7, and 15 (24 hours after the induction of acute pancreatitis) of the trial blood was collected for haemato-biochemical analysis. The haemato-biochemical readings on day 0 and 7 were helpful in identifying any background diseases.

Serum amylase, lipase and glucose levels were estimated in a fully automated clinical biochemistry analyser (M/s. Elitech, France). Haematological parameters were estimated using a fully automatic Orphee Mythic 18, haematology analyser. The data was subjected to one-way analysis of variance (ANOVA), and after that, Duncan's multiple range tests were applied to enable comparisons between groups.

Group 2 showed a significant increase ($P< 0.05$) in the level of serum amylase and lipase on day 15 compared to that of day 0 and 7 (Table 1). This increase indicates damage caused by the L-arginine in the pancreatic acinar cells. Watson (2004) observed that dogs with acute pancreatitis showed elevated levels of serum amylase and lipase and this elevation can be linked to the release of hydrolytic enzymes into the circulation in acute pancreatitis. The study's findings provide support for analogous increases in serum amylase and lipase levels in acute pancreatitis reported by Khurana *et al*. (2019) and Gadicherla *et al*. (2019). There

Table 1. Haematobiochemical parameters of two groups on day 0, 7 and 15

Parameter	Group	Day of sample collection		
		Day 0	Day 7	Day 15
Serum amylase (u/l); (mean ± se)	Group 1	1008.61 ± 33.2	1195.28 ± 53.66	1125.78 ± 121.8
	Group 2	957.28 ± 35.9	981.78 ± 22	4058.83 ± 205.5^{a}
Serum lipase (u/l); (mean ± se)	Group 1	27.65 ± 1.5	30.31 ± 1.02	29.78 ± 1.63
	Group 2	28.53 ± 1.3	30.15 ± 1.59	340.31 ± 1.44^{a}
Serum glucose (mg/dl); (Mean ± SE)	Group 1	135.5 ± 3	137.6 ± 5.5	107.8 ± 11.6^{a}
	Group 2	141.8 ± 4.9	138.4 ± 4.05	112.8 ± 11.9^{a}
Volume of packed red cells (%); (mean ± se)	Group 1	43.4 ± 2.4	43.2 ± 1.8	36.08 ± 3.35
	Group 2	47.6 ± 0.95^{a}	42.5 ± 2.13^{b}	34.46 ± 1.54^{c}
Total leukocyte count (10^3/µl); (Mean ± SE)	Group 1	11.9 ± 1.0^{a}	6.9 ± 1.5^{b}	6.8 ± 1.4^{b}
	Group 2	13.5 ± 1.3^{a}	8.5 ± 1.5^{b}	8 ± 1.3^{b}
Total erythrocyte count (10^6/µl); (Mean ± SE)	Group 1	7.4 ± 0.4^{a}	6.8 ± 0.4^{a}	5.3 ± 0.47^{b}
	Group 2	8.0 ± 0.18^{a}	6.7 ± 0.3^{b}	5.2 ± 0.25^{c}
Haemoglobin (g/dl); (Mean ± SE)	Group 1	12.01 ± 0.63	11.6 ± 0.68	11.5 ± 1.13
	Group 2	13.4 ± 0.30	12.5 ± 0.31	11.2 ± 0.53^{a}
Platelet count (10^3/µl); (Mean ± SE)	Group 1	556.6 ± 103	593.5 ± 96.4	519 ± 97.4
	Group 2	839.5 ± 45	753 ± 115	611 ± 95

Means bearing different superscripts in rows differ significantly ($P< 0.05$).

were no statistically significant variations in the average glucose level (P>0.05) between groups on the 15th day of the experiment. This observation could be explained by the unique characteristic of L-arginine, which selectively destroys the pancreatic acinar cells while maintaining the morphology of islets of Langerhans (Mizunuma *et al*., 1984).

A significant reduction in the volume of packed red cells and haemoglobin levels were observed on the 15th day of experiment in comparison to the baseline measurement on day zero in group 2 (P<0.05). This outcome aligns with the findings by Trapnell (1966), whose study reached the conclusion that the diminishing levels of haemoglobin and haematocrit observed within the first week in humans with acute pancreatitis may be ascribed to a confluence of factors, encompassing haemodilution, intravascular coagulation, and haemorrhage transpiring within and around the pancreas. No significant differences in the average total leukocyte count (P>0.05) noticed between the groups. This finding implies that L-arginine-induced acute pancreatitis is not associated with a significant impact on the total leukocyte count within 24 hours of induction. An increased number of neutrophils with a shift to left was commonly noticed in canine patients suffering from acute pancreatitis (Watson, 2004). A significant decline (P<0.05) in the mean total erythrocyte count (10^6 / µL) was observed on the 15th day in both the group 1 and group 2. This indicated that reduction in the total erythrocyte count was not associated with induction of acute pancreatitis, may be due to a background disease in both groups. Reduction in the erythrocyte count and thrombocytopenia were the initial signs of disseminated intravascular coagulation in dogs with acute pancreatitis (Hess *et al*., 1998). No significant differences noticed in the mean platelet count of both groups (P>0.05) on day 0, day 7 and day 15 of the experiment. This finding was not aligned with the findings of Cridge *et al*. (2021) who claimed that one possible cause of the severe thrombocytopenia linked to acute pancreatitis is disseminated intravascular coagulation. The absence of any notable variation in platelet counts suggests that the pathophysiological processes associated with L-arginine-induced acute pancreatitis in rats may not have a substantial impact on platelet production, utilization, or retention within the bloodstream.

Summary

Increased levels of serum amylase and lipase were the major common findings seen in both L-arginine induced acute pancreatitis as well as in clinical cases of acute pancreatitis. Serum glucose level showed no significant changes in experimentally induced acute pancreatitis while in clinical cases elevation is noticed in the serum glucose level. Volume of packed red cell and haemoglobin showed significant reduction in experimental group. Total leukocyte count, total erythrocyte count, and platelet count were found to be unaltered by the L-arginine treatment to induce acute pancreatitis. Further studies should be conducted to investigate the haemato-biochemical changes in the subsequent days after the induction of acute pancreatitis.

Acknowledgements

The financial support provided by Kerala Veterinary and Animal Sciences University is acknowledged.

Conflict of interest

The authors declare that they have no conflict of interest.

References

Cridge, H., Twedt, D.C., Marolf, A.J., Sharkey, L.C. and Steiner, J.M. 2021. Advances in the diagnosis of acute pancreatitis in dogs. *J. Vet. Intern. Med*., **35**: 2572-2587.

Gadicherla, V., Challa, S., Basaveswara Rao, M., Kunda, P. and Prudhvi, R. 2019. *Morinda citrifolia* (Noni) fruit protects the exocrine pancreatic dysfunction against L-arginine induced acute pancreatitis in rats. *Pharmacogn. Mag*., **15**: 328.

Hegyi, P., Perides, G., Steer, M.L. and Rakonczay Jr, Z. 2013. Commonly employed rodent models of experimental

acute pancreatitis: their strengths and weaknesses, relevance to human disease, selection, and appropriate use. *Pancreapedia*: The Exocrine Pancreas Knowledge Base. **1**: Available doi: 10.3998/panc.2013.4.pdf. [18 Apr. 2023].

Hess, R.S., Saunders, H.M., Van Winkle, T.J., Shofer, F.S. and Washabau, R.J., 1998. Clinical, clinicopathologic, radiographic, and ultrasonographic abnormalities in dogs with fatal acute pancreatitis: 70 cases (1986-1995). *J. Am. Vet. Med. Assoc.*, **213**: 665-670.

Khurana, A., Sikha, M.S., Ramesh, K., Venkatesh, P. and Godugu, C., 2019. Modulation of cerulein - induced pancreatic inflammation by hydroalcoholic extract of curry leaf (*Murraya koenigii*). *Phytotherapy Res*., **33**: 1510-1525.

Mizunuma, T., Kawamura, S. and Kishino, Y. 1984. Effects of Injecting Excess Arginine on Rat Pancreas. *J. Nutr.,* **114**: 467-471.

Trapnell, J.E., 1966. The natural history and prognosis of acute pancreatitis. *Annals. R. Coll. of Surgeons of England*, **38**: 265-287.

Watson, P., 2004. Pancreatitis in the dog: dealing with a spectrum of disease. *In Practice*, **26**: 64-77.

■