



## Biochemical and pathological changes associated with avocado leaves poisoning in rabbits - A case report

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### ABSTRACT

Avocado fruits are very popular among vegetarians as an excellent substitute for meats in sandwiches and salads in some countries because of its high fat content. It is also one of the common fruits in the state of Mizoram, India. Though the fruit is loaded with various nutrients, leaves are toxic. The study deals with biochemical and gross pathological changes associated with avocado leaves poisoning in rabbits. Serum enzymes, SGOT and SGPT were found to be elevated accompanied by the changes in concentration of sodium, phosphorus and chloride. Such biochemical changes can be correlated with the gross pathologic observation in various organs which includes fluid filled pericardium, congested and necrotic liver and detachment of stomach mucosal layer exposing the red congested submucosal layer.

**Keywords:** Avocado; *Persea americana*; leaves; poisoning; rabbits.

### INTRODUCTION

Avocado (*Persea americana*) is a common exotic fruit native to Mexico and central America. The fruit is loaded with nutrients such as dietary fiber, vitamin B<sub>6</sub>, vitamin C, vitamin E, potassium, magnesium, and folate. Avocados contain 60% more potassium per ounce than bananas. This fruit is an excellent source of monounsaturated fat. In addition, researchers have shown that avocado extracts improved calcium absorption in rats and addition of avocado to salsa significantly improved lycopene, lutein and carotenes absorption in healthy human subjects (Raonimalala *et al.*, 1980; Unlu *et al.*, 2005). It has also been reported that high intake of avocado have an effect on blood serum cholesterol levels. Specifically, after a seven-day diet rich in avocados, hypercholesterolemia patients showed a 17%, 22% and 22% decrease in total serum cholesterol levels, LDL and triglycerides respectively with 11% increase in HDL (Lopez *et al.*, 1996). Rich in an assortment of vitamins, high in monounsaturated fat and potassium, avocado fruits provide curative effects for a number of human ailments, from diarrhea to high blood pressure. However the leaves are harmfully and

even fatally poisonous causing a number of illnesses in animals. There is documented evidence that animals such as cats, dogs, cattle, goats, rabbits, rats, birds, fish and horses can be severely harmed or even fatally killed when they consume the avocado leaves, bark, skin or pit. The seed was also found to cause toxicity in canaries and have experimentally poisoned mice. It has also been suggested that leaves should not be allowed to fall accidentally into fish tanks (Hurt 1943; Fuller and Mc Clintock, 1986). Oelrichs *et al.* (1995) have reported that avocado leaves contain a toxic fatty acid derivative known as persin which in sufficient quantity can cause equine colic and without veterinary treatment, death. The symptoms include gastrointestinal irritation, vomiting, diarrhea, respiratory distress, congestion, fluid accumulation around the tissues of the heart and even death. Similar signs associated with poisoning in birds and mammals were reported by Clipsham, 2007 which includes edema of the throat and chest area, heart muscle failure, fluid-filled lungs and abdomen. Microscopic examination revealed severe cellular damage to cardiac muscle cells and possibly the liver and kidneys. In mammals that have been experimentally fed dried leaves suffered cell death of the mammary glands which are commonly observed clinical finding in livestock, including goats and cattle, known to have ingested avocado plant parts (Clipsham, 2007).

Due to paucity of the information about the biochemical changes associated with avocado leaves toxicity in rabbit, the study has been conducted to unravel the

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gross pathological and biochemical changes occurred due to ingestion of avocado leaves.

#### MATERIALS AND METHODS

Eleven male chinchilla rabbits (two months old) out of twenty in the Laboratory Animal House of College of Veterinary Science & A.H, CAU, Selesih, Aizawl, Mizoram were found dead in the next morning after ingestion of avocado leaves (Fig.1) the night before. The remaining 9 (nine) rabbits were showing the signs of weakness, anorexia, depression, dullness and dyspnea. All the rabbits were huddling at one corner of the cage. Blood was collected from one of the rabbits. Later four more rabbits became comatose after showing the signs and finally died. Post mortem examination of the dead rabbits was done to find out the cause of the death. Serum was collected from the clotted blood samples by centrifugation at the speed of 2500Xg in centrifuge machine (Eitek TC 4815 D). The serum sample was used for the estimation of various biochemical parameters spectrophotometrically (6505 UV/Vis Spectrophotometer, Jenway) by using commercially available standard test kits.



Figure 1: Avocado (*Persea americana*)

#### RESULTS AND DISCUSSION

Avocado poisoning has been a tremendous source of controversy since the fruits are reported to be loaded with nutrients and an excellent source of monounsaturated fat. In addition to these researchers from South Africa proposed to use avocado leaf extracts, which is considered to be poisonous, for the management of childhood convulsion. The data from their study in rats suggested that avocado leaf aqueous extract produced its anticonvulsant effect by enhancing GABAergic neurotransmission and/or action in the brain (Ojewale and Amabeoku, 2006). On the other hand there are evidences that animals such as cats, dogs, cattle, goats, rabbits, rats, birds, fish, and horses can be severely harmed or even killed when they consume the avocado leaves, bark, skin or pit (Oelrichs *et al.*, 1995 and Cliphsham, 2007). Oelrichs *et al.* (1995) have also reported that avocado leaves contain a toxic fatty acid derivative known as persin which have antifungal properties and

toxic to silkworms. In their report they have mentioned that at a dose of persin above 100 mg/kg body weight, necrosis of myocardial fibers may occur and hydrothorax may be present in severely affected animals. The poison is also reported as harmless generally, to humans but when consumed by domestic animals in large quantities it is dangerous. It has also been suggested to be effective as a treatment for breast cancer (Butt *et al.*, 2006).

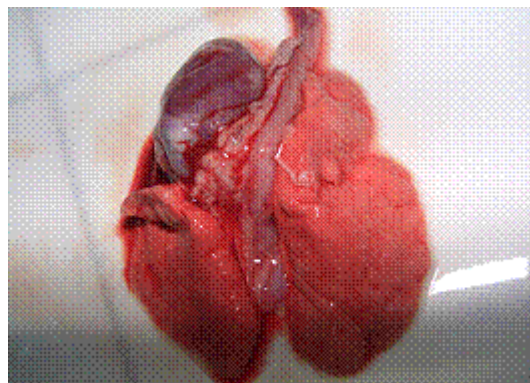


Figure 2: Fluid-filled pericardium and normal lungs of rabbit

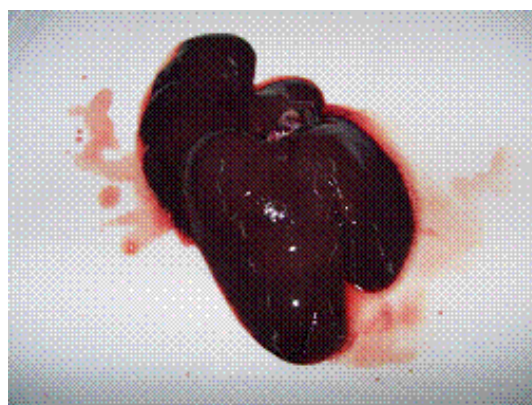


Figure 3: Congested, dark red colored liver of rabbit showing rounded edges

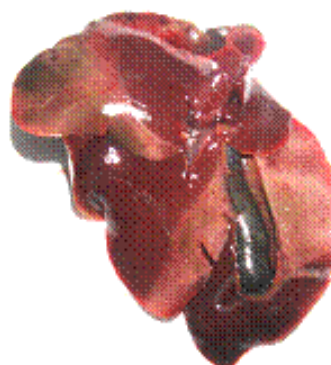
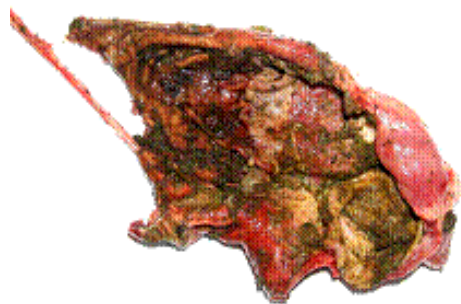


Figure 4: Rabbit liver showing necrotic pale area demarcated from unaffected region



**Figure 5: Stomach of rabbit with detached mucosa revealing red congested submucosa**

As reported by Oelrichs *et al.* (1995), the rabbits showed the signs of weakness, respiratory distress and finally died. During post mortem examination, the lungs were found to be normal but the pericardium was filled with fluid (Fig.2). A pronounced pathological change was observed in liver where there is swelling with rounded edges and congestion giving a dark red colour as shown in Fig.3. Further, all the lobes of the liver showed pale and necrotic areas well demarcated from unaffected regions. Gall bladder was found to be distended with bile (Fig.4). These pathological changes on heart and liver can be correlated with the changes in serum transaminases (SGOT and SGPT) activities (Table 1.). The biochemical parameters of the rabbit serum estimated using the kits are given in Table 1. The activities of the SGOT and SGPT were increased as compared to normal value which is indicative of hepatocellular damage (Nyblom *et al.*, 2006).

**Table 1: Blood biochemical profile of Avocado leaves poisoned rabbit**

Parameters (unit)	Observed value	Normal value**
Glucose (mg/dl)	79.35	75-140
Total protein (g/dL)	5.57	5.4-7.5
Albumin (g/dL)	2.72	2.5-4.0
Globulin (g/dL)	2.85	1.5-3.3
Urea (mmol/L)*	19.285	9.1-25.5
Alkaline phosphatase (IU/L)*	44.47	10-70
Magnesium ( mmol/L)*	1.26	0.8-1.2
Potassium ( mmol/L)	3.26	3.5-7.0
Sodium( mmol/L)	282.86	138-150
Chloride( mmol/L)	78.53	92-120
Phosphorus( mmol/L)*	1.38	4-6
SGOT (IU/L)*	165.0	10-98
SGPT(IU/L)*	495.0	25-65

All the other biochemical parameters were found to be within the normal range except sodium, chloride and phosphorus. The high sodium concentration might also be responsible for the fluid accumulation in the pericardium (Light *et al.*, 1983). The low phosphorus level can be correlated with the anorexic conditions ob-

served. Theiler *et al.*, (1924) reported that cattle suffering from hypophosphatemia showed loss of appetite. The electrolyte imbalance may be due to disrupted mucosal layer of gastrointestinal tract (Fig. 5). From these observations it may be concluded that the avocado leaves are highly toxic to rabbits and should be avoided from the green parts of their diet.

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#### REFERENCES

- Butt, A.J., Roberts, C.G., Seawright, A.A., Oelrichs, P.B., MacLeod, J.K., Liaw, T.Y.E., Kavallaris, M., Somers-Edgar, T.J., Lehrbach, G.M., Watts, C.K. and Sutherland, R.L. 'A novel plant toxin, persin, with *in vivo* activity in the mammary gland, induces Bim-dependent apoptosis in human breast cancer cells', *Mol Cancer Therap.* vol. 5 no. 9, September, 2006 pp. 2300-2309.
- Clipsham, R. "Avocado Toxicity". <http://kgkat.tripod.com/avocado.html>. Retrieved 2007, pp.12-29.
- Collins, B.R. Common diseases and medical management of rodents and lagomorphs. In: *Contemporary Issues In Small Animal Practice: Exotic Animals*, E.R. Jacobson and G. V. Kollias edition, Churchill Livingstone, 1988.
- Fuller, T. C. and McClintock, E. *Poisonous Plants of California*. Univ. California Press, Berkeley, Calif., USA., 1986
- Gillet, C. S. Selected drug dosages and clinical reference data. In: *The Biology of The Laboratory Rabbit*. 2<sup>nd</sup> edition. Academic Press, 1994
- Hurt, L. M. (1943). Avocado poisoning. LA. County Livestock Dep. Ann. Rep.,pp. 43-44.
- Jones, R.T. 'Normal values for some biochemical constituents in rabbits'. *Lab Anim.* Vol. 9 no. 2, April, 1975 pp. 143-147.
- Kerr, M. *Veterinary Laboratory Medicine, Clinical Biochemistry And Haematology*. Blackwell Scientific Publications, 1989
- Light, K.C., Koepke, J.P., Obsist, P.A., Willis, P.W. 'Psychological stress induces sodium and fluid retention in men at high risk for hypertension'. *Science* vol.220 no. 4595, April, 1983 pp. 429-431
- Lopez Ledesma, R., Frati Munari, A.C. and Hernandez Dominguez, B. C., Cervantes Montalvo, S., Hernandez Luna, M. H., Juarez, C. And Moran Lira, S. 'Monounsaturated fatty acid (avocado) rich diet for mild hypercholesterolemia" *Arch-Med-Res.* Vol. 27 no. 4, Winter, 1996 pp.519-523.

- Nyblom, H., Björnsson, E., Simrén, M., Aldenborg, F., Almer, S. and Olsson, R. 'The AST/ALT ratio as an indicator of cirrhosis in patients with PBC'. *Liver Int.* vol. 26 no. 7., September, 2006 pp.840–845.
- Oelrichs, P. B., Ng, J.C., Seawright, A.A., Ward, A., Schäffeler, L. and MacLeod, J.K., 'Isolation and identification of a compound from avocado (*Persea americana*) leaves which causes necrosis of the acinar epithelium of the lactating mammary gland and the myocardium'. *Nat. Toxins* vol. 3 no. 5, 1995 pp. 344–349.
- Ojewole, J.A., and Amabeoku, G.J. 'Anticonvulsant effect of *Persea americana* Mill (Lauraceae) (Avocado) leaf aqueous extract in mice'. *Phytother Res.* Vol. 20 no.8, August, 2006 pp. 696-700.
- Okerman, L. *Diseases of Domestic Rabbits*, 2<sup>nd</sup> edition, Blackwell Scientific Publications, 1994
- Raonimalala, A.F., Digaud, A. and Fournier, P. 'Action of soluble carbohydrates from avocado (*Persea gratissima* Gaertner) fruit on utilization of calcium in the rat. *Ann. Nutr Aliment.* Vol. 34 no. 4, 1980 pp.735-744.
- Robson, W.L., Bayliss, C.E., Feldman, R., Goldstein, M.B., Chen, C.B., Richardson, R.M., Stinebaugh, B.J., Tam, S.C. and Halperin, M.L. 'Evaluation of the effect of pentobarbitone anesthesia on the plasma K<sup>+</sup> concentration of the rabbit and dog'. *Can. Anaesth Soc. J.*, Vol. 28 no. 3, June, 1981 pp. 210-216
- Theiler, A., Green, H.H., and DU Tort, P.J. 'Phosphorus in the livestock industry'. *Jour. Dep. Agri. Union of South Africa* vol. 8, 1924 pp.406-504
- Unlu, N. Z., Bohn, T., Clinton, S.K. and Schwartz, S.J. 'Carotenoid absorption from salad and salsa by humans is enhanced by the addition of avocado or avocado oil'. *J. Nutr.* Vol. 135 no. 3, March, 2005 pp.431-436.