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Chlorpyrifos Toxicity in Sheep and Effect of Corchorus Olitorius

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***Keywords*— Chlorpyrifos, Acetylcholine esterase, Toxicity, Corchorus olitorius, Sheep.**

***Abstract*—** *The organophosphorus compound chlorpyrifos is widely used in southern Libya for pest control. Chlorpyrifos poisoning in sheep is very rare, however accidental poisoning could happen. The parent compound chlorpyrifos is not very toxic until metabolized to the toxic form which known as chlorpyrifos oxon. The delayed clinical signs of chlorpyrifos toxicity increase mortality rate due to the delayed treatment regime. Exposure of sheep to chlorpyrifos mainly develops nervous system toxicity accompanied with other systems toxicity including respiratory, cardiovascular and digestive system. Bowel evacuation by using blend of corchorus olitorius reduces chlorpyrifos toxicity and improves the animal health*

I. INTRODUCTION

Organophosphorus pesticides are widely used in agriculture as an alternate for organochlorine and other insecticides due to its high efficiency and lower persistence in the environment (Rao et al 2003). Chlopyrifos is also used to control house pest through applying it around the buildings and the in-discriminated uses lead to potential adverse effects on human and animal health by and over the time (Kammon et al 2011). Chlorpyrifos is an organophosphorus pesticide, undergoes to metabolic activation inside the body producing toxic substance called chlorpyrifos oxon (Abo-donia et al 1996). Chlorpyrifos oxon is 10-100 times more toxic than chlorpyrifos and acts on acetylcholine esterase with high affinity compared to other organophoshorous compounds (Sparling and Feller 2007) and depresses its activity (Banaee et al 2013) , and thereby affecting neuromuscular function of the organism, the toxic effect of acetylcholine inhibitor is caused by disruption of nervous system function due to accumulation of an excessive amount of acetylcholine in the synapse leading to muscle twisting and paralysis, low-level exposure to chlorpyrifos is linked with numerous physiological and behavioral changes (perez et al 2013). The oxon form of chlorpyrifos has also a negative effect on other body systems including the respiratory and digestive system (Banaee et al 2013). Nausea, vomiting, salivation, diarrhea and muscular tremor were observed in animal exposed to chlorpyrifos whereas in the chronic form animals show weight loss and decreased productivity (Akhtar et al 2009). Chlorpyrifos toxity increase lipid peroxidation and decrease antioxidant enzymes activity, intramuscular injection of vit C, vit E and melatonin reduce toxic effect of chlopyrifos (Karaoz et al 2002). Several antioxidants including phenolics were detected in corchorus olitorius and suggested to have potential effect in scavenging of free radical and health improving (Adedosu et al 2015). Atropine and pralidoxime have classified as effective antidotes for acute toxicity of chlorpyrifos and distinctively improve cardiorespiratory components impairments induced by acute chlorpyrifos poisoning (Felippe et al 2020).

II. CASE REPORT

A total of 6 rams have accidently accessed an emulsion of chlorpyrifos (100 ml of dorsban 48% EC in 20 L of water) prepared for pests control in an alfalfa farm located in southern Libya. Eurolax which acts as laxative, appetizer, anti-acid and detoxicant was given orally at dose of 2g/kg twice daily for 2 days. Animals were also injected with multivitamin (oligovit) from KELA and dexamethasone 200 mg (dexavet) from ANVET PHARMA JSC at dose of 1ml/20kg and 1ml/10kg respectively. Among the six rams, 2 rams were treated with multivitamins. Fluid therapy was given to one of the severely affected rams, all animals were kept under supervision for three days and the animals were also kept under the similar environmental condition. A blend of corchorus olitorius was given to the severely affected animals. Temperature, respiration and heart rates were also measured. The mildly affected animal which shows less clinical sign has only received multivitamin without eurolax and dexamethasone due to the owner request. No atropine or pralidoxime were administered to the intoxicated rams as veterinary service was limited in that area.

Following 24 hours of exposure to chlorpyrifos, toxicity was developed. 5/6 (83%) of the rams showed signs of toxicity presented by dullness, loss of appetite and tremor at the early stage which estimated from 24-36 hours. One ram was fastened and did not show any toxicity signs, among the 5 intoxicated rams; 4 rams showed signs of acute toxicity, and one ram showed signs of mild to moderate toxicity. Decreased bowel movement was observed in the poisoned animals. At the advanced stage which estimated from 36 hours and over, the intoxicated rams showed bloat, irregular rapid respiration with interrupted heart beats terminated with death. Temperatures of the affected animals were normal with average of 39.1 degree centigrade, respiration rate was about 85 per minute and heart rate was 76 beats per minutes. Irregular heart beat and disturbed respiration were characteristic. Feaces of the poisoned rams were sticky and covered with white grey material. Bowel movement with passing of smooth watery feaces was observed in the animal which received corchorus olitorius. Miosis was also observed in the poisoned rams. Nervous manifestations such as digging in ground and water containers accompanied with restlessness were seen in the moderately affected ram. Mortality rate was high as 80% of the animals have died even receiving intensive care. The animals have died in a time period ranged from 40-72 hours of toxicity; the severely intoxicated rams died after 40 hours, while the mildly intoxicated ram which did not received neither Eurolax nor Corchorus olitorius has died after 68 hours. The severely poisoned ram which showed bowel movement after receiving blend of Corchorus olitorius remained alive.

III. DISCUSSION

The parent compound of chlorpyrifos oxon is not very toxic (Sparlling and Feller 2007) as clinical signs of intoxication appeared after 24 hours of exposure to chlorpyrifos. Metabolic activation of chlorpyrifos by cytochrome P450 leads to formation of chlorpyrifos oxon (Heikal et al 2013) which is 10 times and over more toxic than the parent compound (Sparlling and Feller 2007). Exposure of animals to chlorpyrifos produces signs of acetylcholine toxicity due to inhibition of acetylcholine esterase activity at the synapses (Palanikumar et al 2004). Toxicity signs of acetylcholine in the intoxicated rams were presented by dullness, loss of appetite, frequent urination, miosis and tremor at the early stage which estimated from 24-36 hours. Neurotoxicity is characteristic for chlorpyrifos toxicity (Karaoz et al 2002) and this study has completely agreed with Karaoz and colleagues as clear nervous manifestations such as digging in ground and water containers accompanied with restlessness were seen in the intoxicated ram. Severity of organophosphorus compound toxicity is a dose dependent (Eskenazi et al 1999); among the intoxicated animals 4 rams showed signs of acute toxicity, and the heaviest ram showed signs of mild to moderate toxicity. At the advanced stage which estimated from 36 hours and over the intoxicated animals show several symptoms such bloat, irregular rapid respiration with interrupted heart beats terminated with death, these symptoms were also stated by Mohamed 1990. Mohamed 1990 and Yadav et al 2018 have demonstrated occurrence of catarrhal and necrotic enteritis in chlorpyrifos intoxicated animals respectively, in this study we observed that faeces of the poisoned rams were sticky and covered with white greyish material which is an indicator of catarrhal necrotic enteritis. Despite several studies found that diarrhea is a main sign of acetylcholine toxicity, no any of the intoxicated rams showed diarrhea and decreased bowel movement was observed in the all poisoned rams. Following administration of corchorus olitorius, bowel movement was stimulated and the intoxicated-ram passed dark green smooth watery feces followed by heath improvement unlike the other rams which died even receiving several medications without blend of corchorus olitorious. Previous study has also demonstrated benefit of corchorus olitorius for bowel movement (Nagahara et al 2020). Based on these observations, corchorus olitorious can be used as a powerful agent for reducing chlorpyifps toxicity and

decreasing mortality rates particularly in regions with poor veterinary services.

IV. CONCLUSION

Accessing of animals to Chlorpyrifos develops cholinergic toxicity. Treatment with Eurolax was not successful; the all Eurolax-treated animals have died, however the Corchorus Olitorious treated animal remained alive. Accordingly, corchorus olitorious can be considered as an important agent for Chlorpyrifos toxicity control particularly in areas with limited veterinary services.

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REFERENCES

[1] Abo-donia MB, Wilmarth KR, AbdeRahman AA, Jensen KF, Oehme FW, kurt TL.(1996). Increased neurotoxicity following concurrent exposure to pyridostigmine bromide, DEET, and chlorpyrifos. Fundamental and applied toxicology. 34,201-222.

[2] Adedosu OT, Akanni OE, Afolabi OK, Adedeji AL.(2015). Effects of corchorus olitorius extracts on certain antioxidants and biochemical indices in sodium arsenite exposed rats.american journals of phytomedicine and clinical therapeutics. 245-256.

[3] Akhtar N, Srivastava MK, Raizada RB.(2009). Assessment of chlorpyrifos toxicity on certain organs in rats, Rattus norvegicus. Journal of environmental biology. 30, 6, 1047-1053.

[4] Banaee M, Haghi BN, Ibrahim AA. (2013). Sub-lethal toxicity of chlorpyrifos on common carp Cyprinus carpio (linneaus, 1758): biochemical response. International journal of aquatic biology. 1, 6,281-288.

[5] Eskenazi B, Bradman A, Castorina R. (1999). Exposures of children to organophosphate pesticides and their potential adverse health effects. Environmental health Perspectives. 107,409-419.

[6] Felippe ISA, Müller CJT, Siqueira AA, Dos Santos L, Cavadino A, Paton JFR, Beijamini V, Sampaio KN. (2020). The antidotes atropine and pralidoxime distinctively recover cardiorespiratory components impaired by acute poisoning with chlorpyrifos in rats. Toxicol Appl Pharmacol 15;389:114879. doi: 10.1016/j.taap.2020.114879. Epub 2020 Jan 10. PMID: 31931016.

[7] Heilkal TM, Mossa AH, Abdelrasoul MA, Marei GI.KH. (2012). The ameliorating effects of green tea extract against cyromazine and chlorpyrifos induced liver toxicity in male rats. Asian journal of pharmaceutical and clinical research. 6,1,48-55.

[8] Kammon AM, Brar RS, Sodhi S, Banga HS, Singh J, Nagra NS. (2011). Chlorpyrifos chronic toxicity in broilers and effect of Vit C.Open veterinary journal. 1,21-27.

[9] Karaoz E, Gultekin F, Akdogan M, Oncu M, Gokcimen A.(2002). Protective role of melatonim and a combination of vitamin C and vitamin E on lung toxicity induced by chlorpyrifos-ethyl in rats. Exp toxic pathol. 54,97-108.

[10] Mohamed OSA, Eldirdiri NI, Karrar MA, Adam SEI. (1990). Toxicity of chlorpyrifos in nubian goats. Revue Elev Med Vet Pays trop. 43,4,431-434.

[11] Nagahara H, Nagahara M, Ohmi N, Takahashi Y, Takara T.(2020). Bowel movement improvement by Mulukhiya(corchorus olitorius)-containing food(AOTSUBU) consumption :Arandamized double-blind ,placebo-controlled parallel-group comparison trial.functional foods in health and disease. 5,10, 210-227.

[12] Palanikumar L, Kumaraguru AK, Ramaktritinan CM, Anand A. (2014). Toxicity,biochemical and clastogenic response of chlorpyrifos and carbendazim in milkfish Chanos chanos. Inte .J.Environ.Sci.Technol. 11,765-774.

[13] Perez J, Monteiro MS, Quintanearo C, Soares AM, Loureiro S. (2013). Characterization of cholinesterases in Chironomus riparius and the effects of three herbicides on chlorpyrifos toxicity. Aquatic toxicology. 144-145,296-302.

[14] Rao JV, Pavan YS, Madhavendra SS. (2003). Toxic effects of chlorpyrifos on morphology and acetylcholine toxicity in the earthworm, Eisenia foetida.Ecotoxicology and environmental safety. 54,296-301.

[15] Sparling DW, Fellers G. (2007). Comparative toxicity of chlorpyrifos, Diazinon, malathion and their oxon derivatives to larval Rana boylii. Environmental pollution. 147,535-539.

[16] Yadav B, Niyogi D, Tripathi KK, Singh JK, Yadav A, Kumar M. (2018). Patho-morphological effects in broiler birds induced with sub-acute chlorpyrifos toxicity and its amelioration With vitamin E and selenium. Journal of Pharmacognosy and Phytochemistry.7,2,1877-1882.