

Short Communication

POTENTIZED SULFUR – A POTENTIAL THERAPEUTIC INTERVENTION IN LUMPY SKIN DISEASE

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ABSTRACT: The vector-borne lumpy skin disease (LSD) virus is fast spreading in Asian countries, including India since 2019 causing substantial economic loss. There is no specific treatment available against the causative poxvirus. The present study presents a field trial of treating LSD-affected cattle with homeopathic sulfur preparation (Sulphur, potency 30). This therapeutic intervention not only reduced case fatality rate but also hastened recovery, without any adverse outcome, indicating its potential in the treatment of LSD.

Key words: Lumpy skin disease, cattle, treatment, homeopathic sulfur, India.

Lumpy skin disease (LSD), caused by a member of the genus *Capripoxvirus*, is one of the major diseases of cattle and water buffaloes. Enzootic to Africa and some Middle East countries, the viral disease has recently spread to South-Eastern Europe, Russia, China, India, Bangladesh etc. (Roche *et al.* 2020, Anwar *et al.* 2022). Clinically, the disease is characterized by fever, loss of appetite, nasal and ocular discharge, salivation, development of firm and circumscribed “lumpy” nodules on the skin and mucous membranes, enlarged superficial lymph nodes, mastitis, edema of legs and brisket region, and chronic debility (Nazami and Tafti 2021). Within a few days of the onset of the fever, slightly raised nodules develop in deeper layers of the epidermis which fast increases in size involving the dermis, subcutis, and superficial layers of the epidermis and finally necrotize and ulcerate (Sanz-Bernado *et al.* 2020). Although the disease has an average mortality rate of about 4-6%, a high morbidity rate approaching 100% causes significant direct economic loss due to prolonged suffering for months, reduced milk yield, mastitis, infertility, abortion, poor hide quality, etc. beside even greater indirect losses (Roche *et al.* 2020, Nazami and Tafti 2021, Down to Earth 2022).

India has the world’s largest cattle and buffalo population which provides livelihood to about 20 million

people. Such a huge animal population in high density are more vulnerable to new epizootics. LSD was first detected in Odisha in 2019 with no fatality (Sudhakar *et al.* 2020). Since then, the disease is fast spreading to different parts of the country with an increasing death toll (Choudhari *et al.* 2020). Despite the initiation of mass vaccination in several states, the country is currently facing a severe LSD epizootic with nearly two million cattle affected and the death of more than 98,000 animals, of which 64,311 death occurred so far in Rajasthan only creating panic and a livelihood crisis for dairy farmers, and unsubstantiated public fear of likely zoonosis from milk and infected animals (DownToEarth 2022).

There is no specific drug against the LSD virus and symptomatic treatment of ailing animals is based on supportive interventions such as administration of antibiotics, antipyretic, anti-inflammatory, and antihistaminic drugs, multivitamins, topical application of antibiotics and fly repellents, etc. following guidelines of the DAHD, Govt. of India (2022). However, such supportive treatments have been found insufficient to protect animals as evidenced by the rapidly increasing death toll from the disease. In this situation, vets are searching for likely options to save the animals’ lives and reduce farmers’ losses.

Like other pox viruses skin is the major organ affected

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by the LSD virus –the virus multiples in keratinocytes, causing ballooning degeneration and nodule formation in the skin (Sanz-Bernado *et al.* 2020). Skin is very rich in sulfur compounds including cysteine and methionine; cysteine constitutes about 10% of skin and is the key component of keratin synthesis (Wilkerson and Tulane 1939, Miniaci *et al.* 2016, Rehman *et al.* 2020). Interestingly, cysteine is important for pox viruses also. The 17L protein, responsible for the cleavage of core protein precursors of the vaccinia virus, is a cysteine protease (Byrd *et al.* 2003). Cell entry of the vaccinia virus requires a cysteine-rich membrane protein that is highly conserved among all members of the Poxviridae family (Ojeda *et al.* 2006). Several other proteins such as the L1 envelop protein (Su *et al.* 2005), and F9 protein (Diesterbeck 2018) contain cysteine residues that are conserved throughout the virus family suggesting critically important roles of sulfur moieties in the virus structure and pathogenesis. Relating the LSD virus replication in keratinocytes, the role of cysteine in keratinocytes as well as in replication and pathogenesis of poxvirus, we examined whether potentized sulfur might be a therapeutic intervention for LSD.

Field trial

The present clinical trial was conducted on LSD-affected cattle, with the sole objective of saving lives and fast recovery of affected animals, in the Hooghly district of West Bengal, India during July-mid October 2022. The disease was diagnosed clinically from its characteristic skin and mucosal lesions, associated with fever and other signs. The affected animals were administered orally with two drops of homeopathic S preparation (Sulphur, potency 30) for consecutive 2 days in calves and heifers, and three drops of the medicine for consecutive 3 days in adults. The treated animals were regularly monitored for general health, recovery, and undesired clinical signs or outcomes from the use of the medicine. Symptomatic treatments, indicated above, were also provided to the animals – 42.8% of the animals received analgesic, 57.14% received antibiotics (mostly, penicillin group), all the animals

received an antihistaminic, topical ointments and fly repellent ointments.

Results and discussion

LSD virus affects both sexes and Yousefi *et al.* (2016) did not observe significant gender differences in LSD prevalence in Iran. However, in our case females grossly outnumbered males (male: female = 1: 3.67), likely due to a much higher population of female cattle kept by local farmers for milk purposes. In Iran, the disease occurrence was highest among animals above 5 years old and lowest below 6 months old (Yousefi *et al.* 2016), but in the present case more animals up to 1 year age were affected.

A total of 85 LSD-affected cattle, of both sexes and different age groups, have been treated with the Sulphur-30 with a 98.8% recovery rate - one calf of 2 months of age succumbed to the virus during treatment and others recovered. The case fatality was much less than 4-10% reported in India earlier by Choudhari *et al.* (2020), or nearly 5% at present in Rajasthan (DownToEarth 2022) indicating the efficacy of the drug in saving animals' lives. Further, no adverse clinical signs and undesired events were noted in potentized sulfur-treated animals suggesting the safe nature of the drug.

The fastness of recovery, as indicated by the healing of skin lesions and regain of health, was also remarkable. LSD-affected animals generally take months to recover, but with the administration of Sulphur-30 animals took an average of 16 days to recover. Recovery time varied with the disease severity: mild cases took 11.7 days, while severely affected animals took 26.7 days to recover. Details of the results are summarized in Table 1. Nursing calves took longertime to recover than heifers and adult animals. At the beginning of the treatment, 74% of animals had ulcerated skin nodules, 34% had a fever, and 40% developed foot and/or brisket edema. Within 3-4 days of Sulphur-30 administration, the skin lesions showed signs of healing and were completely healed in 2-3 weeks (Fig. 1) except in a few severe cases with large skin lesions which took more than a month for healing (Fig. 2). Oedema regressed in 7-10 days. Overall improvement of

Table 1. Time required for recovery after administration of potentized sulphur.

	Mean ± S.D.	Mode	Male cattle (n=18)	Female cattle (n=66)	Calf up to 3 months of age (n=14)	Calf above 3 months to 1 year age (n=42)	Cattle above 1 year age (n=28)	Animals receiving antibiotic (n = 48)	Animals receiving no antibiotic (n = 36)
Recovery time (days)	16.43 ± 8.52	14	15	16.82	19.14	15.33	16.71	12.96	21.05

*One, out of 85 animals treated with potentized sulfur, died.



An animal with skin lesions before treatment.



The animal in process of recovery with healed skin lesions after 12 days of treatment.

Fig. 1. Photographs of affected animals before and after treatment with potentized sulfur.



A large LSD skin lesion before treatment.



The healing skin lesion after 15 days of treatment.

Fig. 2. Healing of a large skin lesion formed due to LSD by the treatment of potentized sulfur.

animals' health was evident from 3rd day of treatment and more or less complete recovery was evident in 2-4 weeks showing clear efficacy of potentized sulfur in curing the disease. Co-administration of antibiotics helped in recovery as antibiotic-treated animals recovered early.

The present result indicates the efficacy of homeopathic S preparation in treating LSD-affected cattle. The highly encouraging results demand a larger field trial to establish the use of homeopathic sulfur as an effective and cheaper treatment of LSD. Sulfur is known for its good antimicrobial activity and is used traditionally in treating skin infections as sulfur baths, sulfur-containing ointments, etc. Sulfur is also one of the common medicines for skin diseases in homeopathy. Whether inorganic sulfur inhibits cysteine use by the virus, thereby inhibiting virus replication

and cell entry needs further research. The efficacy of crude forms of sulfur as bath, spray, ointment etc., either alone or in combination with potentized sulfur, in treating LSD may also be investigated.

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