

The Therapeutic Effect of Ozone on Contagious Ecthyma in Korean Native Goats

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Abstract : We investigated possible therapeutic approaches to treat contagious naturally occurring ecthyma in Korean native goats in the Gongju area of Korea. Contagious ecthyma was found in 130 of 150 Korean native goats studied. Sixteen goats, ranged from 2 months to 2.5 years old, were selected for further experiments. The goats were divided into a control group, an ozonated oil group, and an ozonated water group consisting of 5, 5, and 6 goats, respectively. The control animals were not treated during the experimental period. The ozonated oil group was treated with ozonated oil, made by bubbling 200 ppm ozone gas into the oil, daily for 2 weeks. The remaining group of animals were given ozonated drinking water (0.1 ppm) *ad libitum* for 2 weeks. The ozonated oil treated group (4/5, 80%) had the highest therapeutic rate. The ozonated water group (4/6, 66.7%) had the second highest therapeutic rate, followed by the control group (1/5, 20%). Based on these results, a secondary experiment was performed that included a total of 121 Korean native goats with contagious ecthyma. Ozonated oil was applied daily for 30 days. All of the lesions on the goats with contagious ecthyma were completely cured by application of the ozonated oil. We concluded that ozone therapy was an effective treatment for contagious ecthyma in goats

Key words : therapeutic effect, ozone therapy, contagious ecthyma, goats.

Introduction

Contagious ecthyma, also known as orf, contagious pustular dermatitis or scabby mouth, caused by the parapoxvirus orf virus (ORFV), is a highly infectious viral disease of sheep and goats (7,16). ORFV is also transmissible to humans (4,11). ORFV affects the skin, and results in the development of pustular and scabby lesions (12,13). The lesions are most commonly found in the area between the lips and nostrils. The lesions have a typical progression of erythema, papule, vesicle, pustule, and then scab formation (12). The immune mechanism against the orf virus is not well understood. Generally, the infections do not generate long term immunity, and despite the presence of a normal immune response, the orf virus can repeatedly infect the same animal (3). The immune response to the orf virus is histopathologically characterized by the accumulation of neutrophils, basophils, dendritic cells, and both B- and T-lymphocytes at the lesions (6).

Ozone, O₃ is polymerized oxygen produced by the passage of air or oxygen over high-energy electrodes within an ozone

generator or by ultraviolet light (18). Ozone is one of the most powerful oxidants available and has many applications in industry and medicine (2). Ozone's strong oxidative action is very useful for killing of bacteria, fungi, and viruses (15). It is currently used as the active ingredient in disinfectants for storing of fruits and vegetables, water and wastewater treatment, and decontamination in hospitals (9,17). Ozone can be administered in various ways, including intravenous injection, intramuscular injection, and intrarectal insufflation. Ozone therapy has been used for the treatment of various human diseases, including acute hepatitis, chronic hepatitis, herpes simplex, and human immunodeficiency disease (1,8). In addition, Ogata and Nagahata (10) report that 60% of cows with acute clinical mastitis that were treated with ozone therapy, did not require any antibiotics for recovery.

In this study we tested the therapeutic potential of ozone for the treatment of contagious ecthyma in Korean native goats.

Materials and Methods

Experimental Animals

Experiments were performed to assess the potential of ozone as a therapeutic for the treatment of contagious ecthyma,

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which occurs naturally in Korean native goats. Contagious ecthyma was observed in 130 of 150 Korean native goats reared on a farm in Gongju area of Korea. Goats appeared restless, nervous and excessive licking on the lips and nostrils, and scratching of the head. Sixteen goats, ranging from 2 months to 2.5 years old, were selected for our initial experiment. The experimental goats had moderate to severe skin lesions such as erythema, abscess and ulceration of the skin. The experimental goats were divided into a control group (5 goats), an ozonated water group (6 goats), and an ozonated oil group (5 goats).

Ozonated Solutions

Ozonated oils were made by bubbling ozone gas (200 ppm) from an ozone gas generating apparatus (Corea Co., Korea) into vegetable oils for 3 days. The ozonated oils were transferred into plastic bottles and kept refrigerated. Ozone gas (200 ppm) from an ozone gas generator was bubbled into water daily for 1 hour during the experimental period to produce the ozonated drinking water (0.1 ppm). The ozonated drinking water was given *ad libitum*.

Treatment

The infected goats were divided into three groups in the first experiment. The initial treatment was made one week after it occurred. The control animals were not treated for contagious ecthyma during the experimental period. The ozonated oil treated animals were treated directly with the ozonated oil to the lesions daily for 2 weeks. The ozonated water treated group were given ozonated water *ad libitum* for 2 weeks. The second experiment consisted of treating 121 goats with severe contagious ecthyma treated with ozonated oils daily for 30 days after 3 weeks from the first occurrence.

Results

The therapeutic rates of the first experiment were 20% (1/5 goats) in the control group (Fig 1, A and B), 66.7% (4/6 goats) in the ozonated water group (Fig 1, C and D), and 80% (4/5 goats) in the ozonated oil group (Fig 1, E and F) after treatment of 2 weeks, respectively. Based on the results from the first experiment, a second experiment was performed involving a total of 121 Korean native goats with contagious ecthyma. Ozonated oil was applied once a day for 30 days on the lesions of the infected goats. The severe skin lesions caused by contagious ecthyma were completely absent on all goats treated with the ozonated oil applications.

Discussion

Contagious ecthyma is a viral disease caused by the orf virus, which belongs to the Parapox viral family, and is commonly found in sheep and goats. It is a zoonotic disease. The viral transmission is predominantly via direct contact. The most

serious cases occurred in 4 to 5 month old sheep and goats. The early stage lesions appeared on the skin of the mouth and spread to the oral mucosa (12,13).

Ozone therapy has been used for the treatment of various human diseases. The therapeutic effects of ozone therapy on viral diseases, such as acute hepatitis, chronic hepatitis, and herpes simplex, have been previously investigated. Shumiya (16) described the use of major autohemotherapy with 9 mg of ozone injected into the venous blood of human patients with hepatitis twice per week. Approximately half of the patients showed a dramatic improvement. Similar beneficial results of ozone treatment were described for human herpes simplex patient. The mechanism behind the viricidal action of ozone appears to be the oxidative destruction of viral RNA and DNA (5).

Similar results have been obtained for the veterinary use of ozone. Ogata and Nagahata (10) examined the therapeutic effect of ozone gas on bovine mastitis and reported that ozone therapy was useful for the treatment of bovine mastitis. We obtained favourable results with ozone therapy for contagious ecthyma commonly found in Korean native goats. Our results were similar to those found with human viral patients (16). The results in the ozonated oil treated group were better than those in the ozonated water group. However, this may have been due to the instability of ozone in water (19).

It is well known that the lesions of contagious ecthyma are usually resolved during 3-8 weeks depending on the age of the animal (12). The second experiment consisted of treating 121 goats with severe contagious ecthyma treated with ozonated oils daily for 30 days after 3 weeks from the first occurrence. It is not clear whether recovery of contagious ecthyma lesions were caused by natural recovery or by ozonated oil in the second experiment. However, considering the results of the control group in the first experiment, it was thought that ozonated oil played a role in treatment of orf.

Conclusion

We investigated possible therapeutic approaches to treat the naturally occurred contagious ecthyma in Korean native goats in the Gongju area of Korea. Contagious ecthyma was found in 130 of 150 Korean native goats.

The results obtained were as follows. The therapeutic rates of the first experiment in ozonated oil treatment group was 80% (4/5), in ozonated water group was 66.7% (4/6) and in the control group was 20%. Based on these results, a secondary experiment was performed that included a total of 121 Korean native goats with contagious ecthyma. Ozonated oil was applied daily for 30 days. All of the lesions on the goats with contagious ecthyma were completely cured by application of the ozonated oil.

We concluded that ozone therapy was an effective treatment for contagious ecthyma in goats.



Fig 1. The change of lesions of the goats with orf by ozone therapy. A: Animal from the control group before treatment, B: Animal from the control group 7 days after treatment (lesions still remained), C: Animal from the ozonated water group before treatment, D: Animal from the ozonated water group 7 days after treatment (lesions still remained), E: Animal from the ozonated oil group before treatment (severe lesions), F: Animal from the ozonated oil group 7 days after treatment (lesion cured)

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한국재래 산양에 자연 발생한 전염성 농포성 피부염에 대한 오존의 치료효과

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요 약 : 본 연구에서는 충남 공주근교에서 사육중인 한국재래산양에서 자연 발생한 전염성 농포성 피부염에 대하여 오존의 치료효과를 조사하였다. 전염성 농포성 피부염은 한국재래산양 150두 중 130두에서 발생하였다. 16두(2개월-2년)를 선발하여 대조군(5두), ozonated oil군(5두) 및 ozonated water군(6두)으로 구분하였다. 대조군에서는 실험기간 중 아무런 치료를 하지 않았으며, ozonated oil군은 식물성유에 오존가스(200 ppm)로 3일간 bubbling 한 ozonated oil을 환부에 1일 1회 2주간 도포하였고, ozonated water군은 수도물에 오존가스(200 ppm)로 1시간 동안 bubbling 한 ozonated water(0.1 ppm)를 2주간 자유로이 음수토록 하였다. 그 결과, 치료율은 ozonated oil군이 80%(4/5두), ozonated water군이 66.7%(4/6두)로, 대조군(20%, 1/5두) 보다 양호하였다. 이 결과를 근거로 전염성 농포성 피부염에 이환된 한국재래 산양 121두를 대상으로 ozonated oil을 1일 1회, 30일간 환부에 도포하였다. 그 결과, 환축의 모든 병변부는 완치되었다. 이상의 결과를 종합해 볼 때, 오존요법은 산양의 전염성 농포성 피부염의 치료에 유효한 것으로 판단되었다.

주요어 : 치료효과, 오존요법, 전염성 농포성 피부염, 산양