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Susceptibility of *Legionella pneumophila* to Ultraviolet Radiation

STEPHEN C. ANTOPOL AND PAUL D. ELLNER*

Departments of Pathology and Microbiology, Columbia University College of Physicians and Surgeons, New York, New York 10032

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Distilled water suspensions of *Legionella pneumophila* were found to be sensitive to low doses of germicidal ultraviolet radiation.

Recent studies (1) have revealed that the cooling tower water of air conditioning systems may be the source of *Legionella pneumophila* organisms causing Legionnaires disease. It has been shown that this organism may survive in tap water for 364 to 369 days (2). Since germicidal ultraviolet radiation is widely used as a method of water treatment, the present study was undertaken to determine the level of susceptibility of this unique microorganism to ultraviolet radiation.

L. pneumophila (Philadelphia 2 strain) was grown on the surface of chocolate agar plates (Scott Laboratories, Inc.) for 4 to 7 days and harvested with sterile distilled water. A suspension was prepared by adding 0.2 to 0.25 ml of the harvested organisms to 5 ml of sterile distilled water. The suspension was adjusted with an Autobac photometer to be within the acceptable range. Colony counts performed just before irradiation revealed that such suspensions contained 4×10^6 to 2×10^8 colony-forming units/ml.

A 25-ml amount of the suspension to be irradiated was placed in a 100-mm glass petri dish. The depth of the suspension was 0.3 to 0.4 cm. The ultraviolet source was a G15T8 lamp which gave an intensity of 50 $\mu W/cm^2$ at a distance of 62 cm. The radiation intensity was measured with a Blak-Ray ultraviolet meter, model J-225. During the irradiation experiments, the suspension was constantly mixed by manually rotating the petri plates at a rate of 20 times per min. Samples were removed at various time intervals, diluted with distilled water, and spread over the surface of duplicate chocolate agar plates. Incubation was for 4 to 5 days in a CO_2 incubator at 35°C.

Colonies were counted, and the fraction of survivors was calculated and plotted against the ultraviolet dosage.

The results of five experiments are shown in Fig. 1. It can be seen that 50% of the organisms were killed by approximately 380 μW-s/cm^2, and 90% were killed by 920 $\mu W/cm^2$. Kills of 99 and 99.9% were obtained by 1,840 and 2,760 μW-s/cm^2, respectively.

Ultraviolet doses reported to produce 90% inhibition of growth of *Escherichia coli, Salmo-*

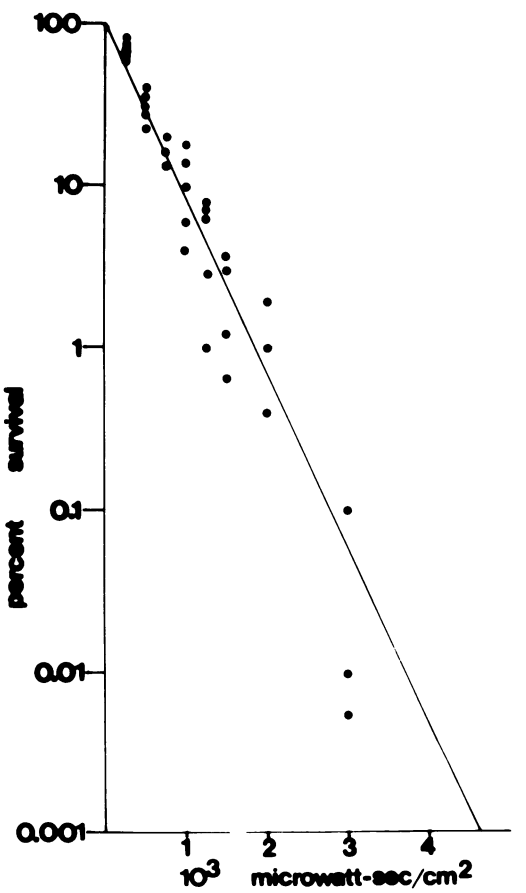

FIG. 1. *Ultraviolet inactivation curve for L. pneumophila.*

nella typhi, Serratia marcescens, and *Pseudomonas aeruginosa* were 2,110, 2,140, 2,200, and 5,500 μW-s/cm^2, respectively (3).

The sensitivity of *L. pneumophila* to ultraviolet radiation suggests the feasibility of this modality for the treatment of water contaminated with this organism. It would be reasonable to hypothesize that ultraviolet irradiation of air within ventilating systems would also be useful in controlling Legionniares disease in hospital facilities.

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