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We have previously shown that the medium surrounding a silver anode is bacteriostatic at nominal current densities as low as 20 nano-amperes/mm² (1,2). This effect occurs with a wide variety of bacterial species commonly encountered in orthopedic cases, even those resistant to antibiotics. The minimal inhibitory concentration of silver for *Staphylococcus aureus*, for example, is less than 50 nano-grams/ml. While the mechanism of this effect is not yet completely understood, it is associated with selective binding at the membrane, abnormal mesosomes, and inhibition of protein synthesis in the bacterial cell. The silver is effective without being complexed to an organic moiety, such as sulfadiazine, or associated with an anion.

We describe here the clinical use of the silver anode effect in the treatment of (a) infected dermal ulcers (including pressure *leucobiti* and open tracts from deep infections) and (b) infected non-unions and other infections in long bones. These wounds were generally not responsive to antibiotic therapy, debridement and antiseptic washes. In the cases of dermal ulcer, treatment consisted in packing the wound with silver-impregnated nylon which became the anode. Constant current generators were used to produce 1 micro-ampere/cm² of wound surface area, applied for 3-4 hours per day. Typically, such wounds became bacteriologically sterile by 3 days and could be maintained so by daily anodic silver therapy if necessary.

Most of the bone infections, some of which had existed for more than 2 years, were treated as part of a larger protocol, preceding electrical stimulation of bone growth at the non-union site. Here, the treatment involved the surgical implantation of a pure silver wire anode at the infected site. 1 micro-ampere/cm of exposed silver was delivered continuously using a carbon-silicone surface electrode as a current return.

Results are summarized in Table I. In all six cases of cutaneous ulcers control or elimination of the infecting organisms was achieved within a few days as observed by the clinical appearance and quantitative bacteriology. In four of these, the wounds were healed without additional surgery, etc. These included 2 patients with poor vascular supply in the region of the wound.

TABLE I

	Cutaneous Ulcers	Bone Infections
Total cases	6	6
Anode	Ag-Nylon	Ag wire
Infection Controlled	6	5
No further Surgery Req'd.	4	4

In the cases of deep bone infection, control of the infection was judged by clinical signs. In 5 cases no sign of infection persisted at 6 months to 1 year post-treatment. In two cases the bone did not heal solidly as of this writing.

With experience in 12 cases, not selected for uniformity, limited conclusions can be drawn. First, control of infections in cutaneous ulcers, can be obtained in a short time with low-current, positive silver electrodes with no apparent impairment of the subsequent healing process. Secondly, the use of a silver anode implanted into an infected non-union site did not appear to exacerbate the infection and in most cases reduced it so as to permit the subsequent healing of the bone itself, with or without cathodic stimulation. Thirdly, this modality seems to be free of the side effects which sometimes accompany the use of systemic or local antibiotic therapy.

1. S.D. Barranco, *et al*, Clin. Orthop. Rel. Res. 100, 250 (1974).
2. J.A. Spadaro, *et al*, Antimicrob. Ag. and Chemother. 6, 637 (1974).

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