ELECTRICAL PROPERTIES OF SILVER-NYLON

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We previously reported the *in vitro* antimicrobial activity of a_commercially-available silver-coated nylon fabric (HRS), using a test system in which the ability of silver ions to spontaneously migrate from the fabric (oligodynamic action) and kill or inhibit bacteria or fungus was measured. Here, we report data concerning unusual electrical characteristics of several silver fabrics, and, data regarding the actual silver levels produced *in vitro*.

The silver-nylon fabrics studied (HRS, SN, R, 4H, IT, LRS) were of different meshes and weaves, and were coated with varying amounts of silver. Our test system consisted of two beakers, each containing 50 ml of either normal saline or trypticase broth, connected by a salt bridge. The anode was an annular ring of the fabric under study (7 cm diameter, 1 cm thick) with a 1-cm wide tail to permit electrical connection. The tail was insulated to prevent wick action of the fabric, thereby insuring that the location at which the current changed from electronic to ionic (junction) was well defined. Pure silver wire (0.5 mm diameter) anodes in the form of 7-cm diameter rings were also studied. Similar silver-wire electrodes were used as cathodes in all measurements. Silver concentration was measured by Atomic Absorption Spectrophotometry.

The current through HRS exhibited a sharp drop-off (CD) to near zero after about 10 hours. We found that the CD was a general property of the silver-nylon fabrics, and that its quantitative aspects depended on many factors: in saline at 1 volt, 20°C, it occurred after 2–48 hours for current densities of 1–20 μA/cm. By making systematic measurements of the surface electrical conductivity of the fabrics, we were able to show that the CD occurred because of a preferential depletion of silver in the region of the junctional zone.

The relative efficiency in releasing silver ions, both oligodynamically or electrolytically, depended on the fabric (Table 1). The results suggested that a strong bactericidal effect would occur in the test medium, and this prediction was confirmed experimentally. The range of electrical and mechanical characteristics of the presently available fabrics provides flexibility in the choice of optimum conditions for particular clinical problems.

FABRIC	SILVER CONCENTRATION (μg/ml)				
	1 Hour	2 Hours	4 Hours	8 Hours	24 Hours
Silver Wire	–0–	–0–	–0–	–0–	–0–
	1.1	2.1	4.4	7.0	21.3
	1.6	3.2	6.5	9.4	26.6
HRS	0.8	1.0	1.4	1.8	2.6
	1.4	2.2	3.9	7.3	14.0
	3.1	5.3	10.2	13.2	*20.9
SN	2.3	3.0	4.4	5.8	11.5
	3.2	4.7	8.3	12.1	21.6
	3.4	6.4	11.2	15.2	25.0
R	1.4	1.9	3.0	4.0	8.0
	2.3	3.5	7.2	10.6	23.4
	4.2	7.9	15.4	20.7	29.6
LRS	0.4	0.5	0.7	1.1	1.1
	1.64	2.8	6.0	10.2	21.8
	NM	NM	NM	NM	NM
4H	0.7	0.9	1.4	1.9	3.0
	2.5	4.3	7.9	11.8	31.6
	4.6	8.6	17.6	*23.6	NM
IT	0.5	0.6	1.0	1.4	2.6
	2.6	4.4	7.9	12.9	*33.2
	4.8	9.4	19.3	*24.5	NM

Silver levels in both at 37°C. From top to bottom in each data group, 0 volts (control), 1 volt, and 2 volts. NM, not measured. *, CD observed.