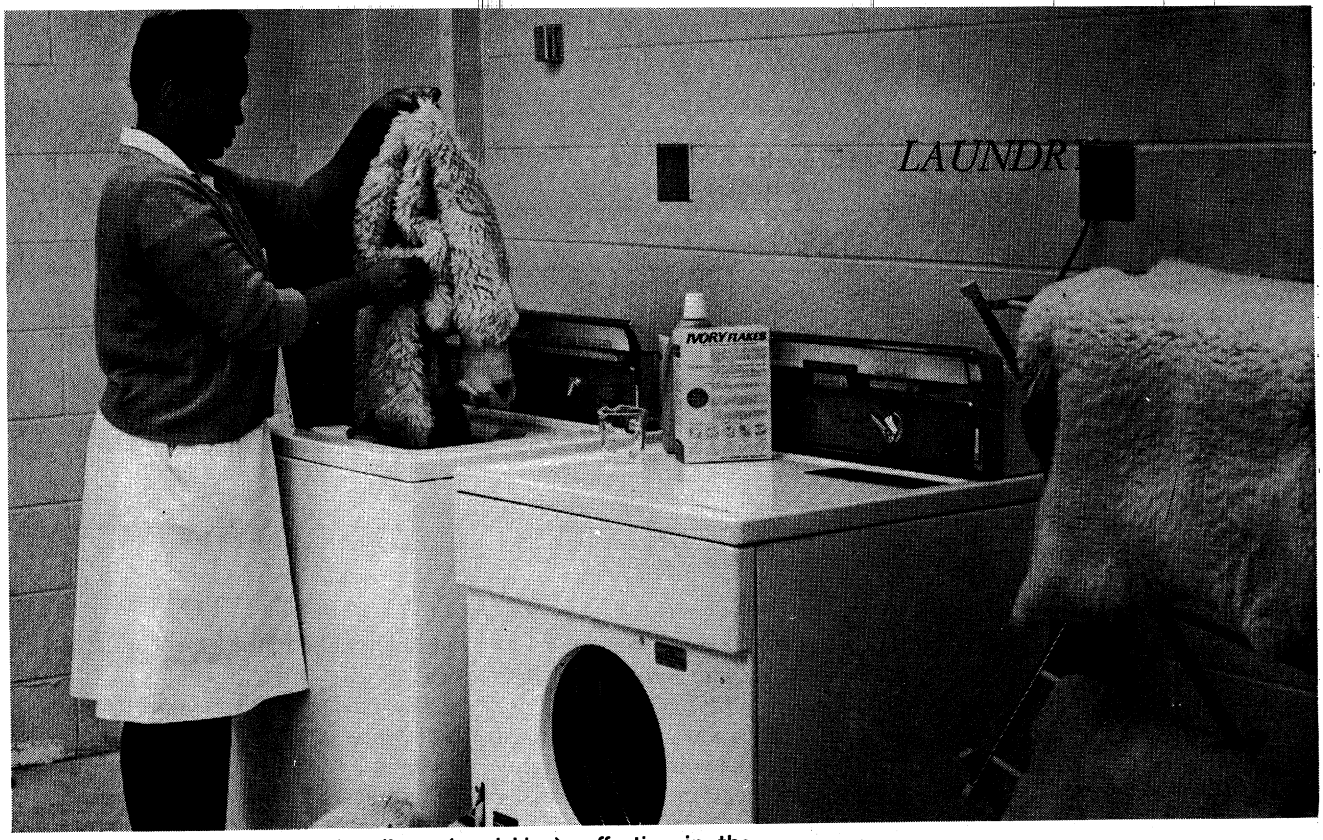

GLUTARALDEHYDE-TANNED shearlings (woolskins), effective in the prevention and healing of decubitus ulcers, are easy to wash, disinfect, and dry.

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Laundering shearling bedpads

Study indicates that proper laundering methods can reduce bacterial and viral contamination of glutaraldehyde-tanned shearling bedpads

by W. F. Happich, G. J. Dixon, L. J. Wilkoff, R. W. Sidwell, and L. Westbrook

THE SUPERIOR launderability of glutaraldehyde-tanned shearling bedpads (sheepskins with wool trimmed but not removed) has expanded their use in hospitals as an aid in the prevention and treatment of decubitus ulcers.[1,2] Their use for this purpose, however, introduces the possibility of cross infection and reinfection of patients, as studies have shown that both bacteria and viruses can persist on wool fabrics for long periods.[3-6] Hospitals and nursing homes currently use a diversity of disinfectants and procedures in laundering shearlings. To develop a standard method for laundering, it was necessary to carry out microbiological studies of shearling laundering and disinfecting procedures.

The bactericidal and viricidal effectiveness of a combination detergent-sanitizer, an anionic and a nonionic detergent, and three disinfectants—a quaternary ammonium disinfectant, a phenolic disinfectant, and alkalinized glutaraldehyde—was tested in separate experiments. Each disinfectant was used at the concentration recommended by the manufacturer or reported in the literature[7-9] and at twice the recommended concentration. Alkalinized glutaraldehyde was also tested at one-half and one-fourth the recommended concentration. The two detergents were tested at concentrations of 265 and 530 ppm, the detergent-sanitizer at 665 and 1330 ppm. A commercial sour at a concentration of 106 ppm was used in the final rinse water.

To determine the effects of laun-

dering, small, sterile swatches of shearlings were exposed, both by direct contact and aerosol methods, either to bacteria (*Staphylococcus aureus* or *Pseudomonas aeruginosa*) or to viruses (poliomyelitis or vaccinia). The swatches then were attached to similarly contaminated whole shearlings and were washed in a domestic-size automatic washer in appropriate combinations of the above detergents and disinfectants, according to procedures presented in Table 1, right. The wool and leather of the washed swatches and the final rinse water then were analyzed for the presence of either bacteria or viruses.

TABLE 1—RECOMMENDED PROCEDURE FOR LAUNDERING OF SHEARLINGS*

Operation	*Temperature (°F.)*	*Time (minutes)*	*Compounds*
Rinse	100	3	None
Wash	120	10	Detergent + disinfectant
Rinse	100	3	None
Rinse	100	3	None
Sour†	100	3	Commercial sour
Spin-dry			
Tumble-dry	130 (stack temp.)		

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†Sour is used to reduce alkalinity to near neutrality.

Test results

Laundering the shearlings in water alone, in water and detergent, and in the detergent-sanitizer caused only slight reductions in bacterial content and in viral titer. The quaternary ammonium compound, the phenolic compound, and alkalinized glutaraldehyde produced a substantial reduction in the *S. aureus* population and in the vaccinia virus titer but had less effect against *Ps. aeruginosa* and the polio virus. Glutaraldehyde—even at 0.5 per cent, one-fourth the recommended concentration—was the most effective of the disinfectants tested. At concentrations below 2 per cent, glutaraldehyde was compatible with the detergents; at 2 per cent or higher concentrations, it precipitated the detergents.

Increasing the concentrations of the disinfectants above those recommended by the manufacturers generally did not increase their effectiveness. The method of exposure (direct contact or aerosol) had no significant effect on the reduction of bacterial population or viral titer produced by laundering, although the samples exposed by aerosol usually were less contaminated than those exposed by direct contact.

Recommended procedures

Recommended washing, disinfecting, and drying procedures are presented in Table 1. Because the presence of protein can inhibit the disinfecting properties of disinfectants, it is recommended that shearlings heavily soiled with protein-containing material, such as blood or feces, be given a prewash or, preferably, be soaked in a 2 per cent concentration of alkalinized glutaraldehyde for at least 30 minutes, then rinsed twice before washing. The shearlings then may be washed with a mild soap or a detergent at a temperature preferably not over 120°F. to prevent shrinkage and hardening of the leather. A disinfectant may be added either during washing or in the first rinse. A quaternary ammonium compound, a phenolic compound, or alkalinized glutaraldehyde can be recommended for routine disinfection of shearling bedpads, provided the pads are rinsed by the recommended procedures to remove any residual detergent and/or disinfectant.

Relatively soft water was used in these studies and is recommended for laundering, as hard water possibly may affect the efficiency of some types of disinfectants. However, the protein-combining property of glutaraldehyde is not affected by hardness of the water.

The disinfectant concentrations that were found to be effective are given in Table 2, page 128. Glutaraldehyde is commercially available as stable 25 per cent and 50 per cent aqueous solutions. Because it is more effective at an alkaline pH, the solution should be adjusted before using to pH 8-9 with sodium bicarbonate (about 0.3 per cent weight per volume for a 2 per cent solution of glutaraldehyde) or with a saturated solution of sodium hydroxide.* Alkalinized glutaraldehyde may be used routinely in the wash water at 0.5 per cent concentration with a compatible anionic or nonionic detergent or with mild soap. The shearlings should be rinsed at least twice, soured with a commer-

*Caution: Glutaraldehyde is irritating, and contact with the skin and eyes and inhalation of vapors should be avoided. The use of rubber gloves, a rubber apron, a safety visor or safety glasses, and adequate ventilation is recommended when handling the concentrated solutions and when washing the shearlings.

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cial sour to a skin pH of near neutrality, spin-dried, and then tumble-dried at a stack temperature of not over 130°F. or hung to air-dry.

A large retailer recently has introduced a biodegradable detergent containing sodium perborate. It should be noted, however, that laboratory tests indicate that laundering shearling bedpads with any product containing sodium perborate will shorten their useful life.[10]

If sterilization is necessary, the shearlings may be sealed in polyethylene bags after washing and drying, then exposed to ethylene oxide. However, this gas is expensive and is hard on shearlings, causing the leather to deteriorate and shortening their useful life.[11] ■

TABLE 2—RECOMMENDED CONCENTRATIONS OF DISINFECTANTS

Compound	Concentration of active ingredient*		
	ppm	oz. avoir./gal.	oz. avoir./18 gal.†
Quaternary ammonium disinfectant	60‡	0.008	0.14
	120	0.016	0.29
Phenolic disinfectant	1,000‡	0.133	2.4
	2,000	0.266	4.8
Alkalinized glutaraldehyde	5,000	1.3§	23.0§
	10,000	2.6§	46.1§
	20,000	5.1§	92.2§

*In wash water or in rinse water.
†Maximum capacity of washing machine used in this study.
‡Concentration recommended by manufacturer.
§Because glutaraldehyde is supplied commercially as a 50 per cent aqueous solution, the values represent the number of fluid ounces of the 50 per cent solution to be diluted to the desired volume. Adjust the pH to 8-9 with sodium bicarbonate (about 0.3 per cent weight per volume for a 2 per cent solution of glutaraldehyde) or with a saturated solution of sodium hydroxide before using.

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