

## TECHNICAL NOTES

# Skin Decontamination of Commonly Used Medical Radionuclides

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**The increasing use of radionuclides in medical diagnosis raises the possibility of accidental spills and skin contamination. This study was performed to evaluate the effectiveness of several decontaminating agents. Most nuclides were easily removed to levels of less than 5% of their original activity. Sodium pertechnetate (Tc-99m) was the most difficult compound to remove. Little difference was found between the effectiveness of tap water, soap and water, and two commercially available decontaminating agents.**

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The likelihood of direct skin contamination by radionuclides will increase as use of these agents increases. This study was undertaken to evaluate the efficacy of several decontaminating agents with various commonly used radionuclides.

### MATERIALS AND METHODS

Small amounts (1.0 cc) of several commonly used radioagents were applied in amounts ranging from 10.0  $\mu$ Ci (0.370 MBq), for the iodine preparations, to 1.0 mCi (37.0 MBq) for the other nuclides. The area of application measured approximately 20 square centimeters and was either on the dorsal surface of the hand or forearm. The agent was spread evenly with a plastic needle container. A gamma camera was used to determine the activity (in cpm) of the contaminated area at 10 min after application (which permitted drying) and again after each of three 30-sec washes with four readily available cleaning agents (tap water, soap\* and water, Radiacwash with EDTA<sup>†</sup> and Isoclean<sup>‡</sup>). All counts were adjusted for background and decay. Washing was performed with the volunteer's other hand and without the use of a washcloth or brush. The water used was municipal tap water. In addition, the value of prophylactic administration of a commercial hand cream,<sup>||</sup> followed by soap and water wash, was determined following the direct exposure to the various nuclides. Those volunteers on whom iodine was used received 500 mg of potassium iodide orally 3 hr before the application of the nuclide to block thyroid uptake in the event of absorption.

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### RESULTS

The summarized results after 90 sec of gentle washing are indicated in Table 1. Most of the technetium compounds were easily removed from the skin with the exception of sodium pertechnetate. The only tested material that appeared to be more easily removed by the commercially available agents and to benefit from the moistening cream was the sodium I-131 solution<sup>§</sup>. Tc-99m DTPA, Tc-99m sulfur colloid, sodium iodohippurate (I-131), and In-111 DTPA were essentially removed within 90 sec with plain tap water. The remaining percentage activity of the various nuclides was reproducible on all volunteers, and the results did not vary significantly from one volunteer to another.

### DISCUSSION

The efficacy of skin decontamination has been studied before. In 1960, Felton and Rozas performed a similar study on the decontamination of skin exposed directly to sodium I-131 and P-32. They concluded that cleansing with an abrasive skin cleanser removed up to 99% of applied activity (1). Norwood (2) indicates that, in addition to commercially available agents, a saturated solution of potassium permanganate may be of some value in decontamination. In general, however, these agents are meant for use with long-lived alpha emitters rather than technetium.

Normal human skin has been shown to be a barrier to small quantities of iodine. However, skin penetration by radioactive material is increased if the outer layer of the skin is damaged (3). For this reason, scrubbing the skin with subsequent abrasion might well hinder the decontamination process. Furthermore, moistening agents might be expected to reduce skin abrasion, but may increase permeability.

The present study does not evaluate the possibility of radionu-

TABLE 1. REMAINING PERCENT ACTIVITY

	After 90-sec wash with water	After 90-sec wash with soap and water	After 90-sec wash with soap and water on pretreated area	After 90-sec wash with Radiacwash	After 90-sec wash with Isoclean
Tc-99m DTPA	1	0	1	1	2
Tc-99m MDP	7	1	3	5	1
Tc-99m as Na pertechnetate	5	7	5	7	5
Tc-99m sulfur colloid	<1	<1	<1	<1	<1
I-131 as Na Iodohippurate	<1	<1	<1	<1	<1
I-131 as NaI	8	5	<1	2	4
Ga-67 citrate	3	1	4	1	3
In-111 DTPA	<1	<1	<1	<1	<1

clide absorption through the skin or sweat glands into the blood stream. Also, the present study was designed to deal with an average to worst-case situation. The nuclide was allowed to dry on the skin for 10 min before decontamination, which would be unusual in actual cases of known contamination. Although commercially available decontaminating agents may be of benefit in washing contaminated counter tops and glassware, they appear to be of little value with human skin. Furthermore, pretreatment of the skin with moistening agents also appears to be of no significant benefit.

## CONCLUSION

For the cleansing of skin contaminated by the short-lived nuclides used in diagnostic nuclear medicine, commercially available decontaminating agents appear to have little to offer over soap and water. In general, 90 sec of gentle washing with soap and water will remove 95-99% of radionuclide activity present on intact skin.

## FOOTNOTES

\* Ivory Soap.

† Atomic Products Corporation of Center Moriches, Long Island, NY.

‡ Isolab, Inc., Akron, OH.

§ Silicone Glove, Avon.

‡ Carrier-free, Mallinckrodt, St. Louis, MO.

## ACKNOWLEDGMENT

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## REFERENCES

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2. NORWOOD WD: *Health Protection of Radiation Workers*. Springfield, IL, Charles C Thomas, 1975, p 210
3. HARRISON J: The fate of radioiodine applied to human skin. *Health Phys* 9:993-1000, 1963

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