

Decontamination of Skin Using a Scientifically Acceptable Dermatologic Model (DM)

Pee Dee Isotopes, Myrtle Beach, SC

By John Kuperus, Ph.D.

Test #1 Decontamination of skin contaminated with Tc-99m pertechnetate or Tl-201 Thallous chloride.

Materials and Methods:

Fresh D.M. was sectioned into four 2" x 2" sections. Two sections were contaminated with Tl- 201 and two sections were contaminated with Tc-99m. Contamination was measured with a Ludlum thin window pancake detector on a counts per minute scale (cpm). Measurements were made initially and after each cleaning step. Raddecon (approved for use on intact skin) solution TM (Transition Metal) and solution A (Actinides) were used in series on one section of skin contaminated with Tc-99m (A) and one section of skin contaminated with Tl-201 (B). For comparison a leading decontamination agent was used (use on skin is not recommended by manufacturer) on the second section of skin contaminated with Tc-99m (C) and the second section of skin contaminated with Tl- 201 (D).

Solutions were sprayed onto skin section and wiped off with a new 4 x 4 gauze. Due to the amount of fat or oil on the skin it was decided to do a final spray with 70% isopropyl alcohol which was wiped off with a new 4 x 4 gauze.

Results:

Raddecon Solutions

	Section A	Section B
Initial cpm	10,000	20,000
TM	4,000	14,000
Solution A	3,500	8,000
70% alcohol	2,500	1,000
Total reduction	75%	95%

Other decontamination agent

	Section C	Section D
Initial cpm	4,000	8,000
Wash	2,600	6,000
70% alcohol	2,000	3,000
Total reduction	50%	62.5%

April 4, 2008

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Test #2 Decontamination of D.M. contaminated with Tc-99m pertechnetate or Tl-201 Thallous chloride.

Results Summary: This test documents removal of 40 to 96% of radioactive contamination on pigskin using minimal amounts of Raddecon solutions (Safe for Human skin) with no scrubbing, compared to a well-known Commercial wash (not approved for use on Human skin) containing chelating agents and caustic agents that, at best, only removed 20% of the radioactive contamination.

Materials and Methods:

Fresh D.M. was sectioned into eight approximately 2" x 2" sections. All eight sections were rinsed with 70% isopropyl alcohol to remove grease. Four sections were contaminated with Tl-201 and four sections were contaminated with Tc-99m. Contamination was measured with a Ludlum thin window pancake detector on a counts per minute scale (cpm), a plastic spacer was used to ensure consistent spacing of detector window from skin surface. Measurements were made initially and after each cleaning step. Raddecon solutions (approved for use on intact skin) Iodowash (Halogens), solution TM (Transition Metal) and solution A (Actinides) were used separately on each of three sections of skin contaminated with Tc-99m and each of three sections of skin contaminated with Tl-201 . For comparison a leading commercial decontamination agent was used (use on skin is not recommended by manufacturer) on the fourth section of skin contaminated with Tc-99m and the fourth section of skin contaminated with Tl-201 .

Solutions were sprayed onto skin sections and wiped off with a new 4 x 4 gauze. Approximately one milliliter of each solution was used. Activity was measured and each skin section was rinsed with 5 to 10 ml. de-ionized water, dried and measured again. Each section of skin washed with a Raddecon solution was washed with a different Raddecon solution, activity measured, rinsed and activity measured again. The sections which were washed with commercial solution and rinsed, were washed again with commercial solution, activity measured, rinsed, and measured again.

A third application of Raddecon solutions was used so that each of the three skin sections was washed with each Raddecon solution in series with a different starting solution. A rinse was performed between each application. Counting was performed after each application of agent or rinse.

A third application of commercial solution to the sections previously washed with this solution, were washed a third time, counted, rinsed, and counted again.

Results:

RDS Iodowash	Tl-201	Tc-99m
-Initial cpm	40,000	100,000
-post Iodowash	30,000	100,000
-post rinse	20,000	80,000
-p Group II	10,000	80,000
-p rinse	2,000	80,000
-p Actinides	2,000	60,000
-p rinse	1,500	60,000
DF	26.6	1.6

RDS Actinides	Tl-201	Tc-99m
-Initial cpm	50,000	60,000
-post Actinides	43,000	50,000
-post rinse	20,000	50,000
-p Iodowash	20,000	40,000
-p rinse	15,000	20,000
-p Group II	15,000	20,000
-p rinse	15,000	15,000
DF	3.3	4

RDS Group II	Tl-201	Tc-99m
-Initial cpm	60,000	80,000
-post Group II	50,000	60,000
-post rinse	25,000	60,000
-p Iodowash	25,000	50,000
-p rinse	25,000	50,000
-p Actinides	25,000	20,000
-p rinse	15,000	20,000
DF	4	4

Commercial wash	Tl-201	Tc-99m
-Initial cpm	100,000	90,000
-post wash	90,000	90,000
-post rinse	85,000	90,000
-post wash	85,000	90,000
-p rinse	80,000	90,000
-post wash	80,000	90,000
-p rinse	80,000	90,000
DF	1.25	0

Conclusions:

Test #1 illustrated the need for degreasing of D.M. prior to contamination in order to accurately simulate human skin contamination.

Test #2 shows decontamination factors of 3.3 to 26.6 for the Raddecon solutions. This test documents removal of 40 to 96% of radioactive contamination on skin using minimal amounts of skin-safe Raddecon solutions with no scrubbing. Commercial wash, not approved for use on skin, containing chelating agents and caustic agents at best only removed 20% of the contamination.

The succession of Raddecon solutions does seem to affect overall efficiency of decontamination. Use of the Iodowash agent as the initial decontamination agent for the group II contaminant Tl-201 appears to be most effective, 96% removal. This same order of cleaning did not produce the same result for the actinide Tc-99m with only 40% removal.

Additional testing will be done to establish the preferred order of use for these agents. Regardless of which order the Raddecon solutions were used, the Raddecon solutions performed significantly better than the currently available commercial decontamination agent.