



{In Archive} FW: Rad BPRG...more comments from Dennis

Wolfe, Alison

to:

Stuart Walker, Carol Bass

06/12/2006 08:12 AM

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From: "Wolfe, Alison" <Alison_Wolfe@sra.com>

To: Stuart Walker/DC/USEPA/US@EPA, Carol Bass/DC/USEPA/US@EPA

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Stuart,

I received these from Pautsenbach this morning. I am going to include them in the matrix that I will put together for you.

Alison

From: Dennis Paustenbach [<mailto:DPaustenbach@ChemRisk.com>]

Sent: Friday, June 09, 2006 4:05 PM

To: Wolfe, Alison

Cc: Tom Widner

Subject: FW: Rad BPRG...more comments from Dennis

Alison:

Here are a few more comments to add to my file.

Dennis

Upon further review, it looks like the format of this calculator is very similar to the already public soil screening guidance calculator for radionuclides. <http://risk.lsd.ornl.gov/rad-ssg/radssl1.shtml>

It is still my view that this calculator has a low level of transparency. One of the things that seems unfortunate is that it seems like a technical support document (like is available for soil screening guidance) should have been prepared and peer reviewed prior to programming the calculator. For example, maybe it could explained why it is best to use pCi/g to estimate hand to mouth dust/soil ingestion risk in the radionuclide soil screening guidance calculator (already public) and pCi/cm² in the indoor calculator.

It would be better if EPA would have presented the equation for dose for each scenario because it is always difficult to work backwards from a remediation goal to understand how the calculation is put together. I am not familiar with radiological risk assessment and how slope factors are applied (as would be true for many people browsing to this calculator page). So a basic review of how one uses dose and slope factor in radiological assessments to get risk would be very helpful. For example, in industrial scenario there is time – worker (tw) and exposure duration - worker (EDw). I think tw is used to estimate the decreasing activity over the exposure history due to decay – so I think it has to equal EDw. Is there ever a time where it would be correct to have different time-worker and exposure duration worker? Understanding these issues would be easier if the dose equation was explained.

I have to say that it was very difficult to understand how EPA is estimating incidental ingestion from hand to mouth contact – the specific equation I chose to focus on. It is an important one when trying to understand house dust risk. The dust ingestion risk equation is in terms of activity per area, so it is impossible to compare to these inputs to physical amounts – i.e. mass of dust ingested per day – unless you assume some kind of typical dust loading and do the calculation yourself.

The EPA 2003 document Table 2 indicates that the range of dust loading is 5 to 700 ug dust / cm² for hard surfaces and < 100 to 6300 ug dust / cm² for rugs

For an age 2 child at the upper bound of these literature values for dust amounts, we'd have:

CARPET:

6300 ug/cm² dust x 15 cm² of hand x 9.5 events per hour x 10 hours per day carpet x 10% carpet factor x 50% saliva factor x 0.001 mg/ug = 450 mg/day

HARD SURFACES:

700 ug/cm² dust x 15 cm² of hand x 9.5 events per hour x 6 hours per day hard surf. x 50% hard surf. factor x 50% saliva factor x 0.001 mg/ug = 150 mg/day

Total indoor dust ingestion from hand to mouth contact in very dusty environment = ~600 mg dust ingestion/day

At the lower end we have a total of about 5 mg dust ingestion per day so the range of dust ingestion rates corresponding to the approach selected by EPA is roughly 5 to 600 mg/day of dust ingestion from hand to mouth contact. To be fair, if you look at typical dust levels based on that Table 2, the EPA approach corresponds to about 15 mg/day of dust ingestion from indoor surfaces for the 2 year old child. I think the essence of the issue this: is it better to know dust amount (grams) and concentration on dust (pCi/g) and get dose by using concentration and mass of dust incidentally ingested or is it better to know (pCi/cm²)?

If you use pi/cm² for incidental ingestion, you don't really know whether the risk was caused by poor housekeeping (dirty floors, etc.) or by very high dust radiation levels that cause risk despite good housekeeping. Does it make sense to give users the option of using dust mass concentration OR dust area concentration? It almost seems like if they are going to use the pCi/cm² approach, they should give a list of recommended sampling methods... I think the pCi/cm² approach is acceptable for ingestion as long the sample collection method is consistent with a method that would be used to understand transfer of dust to hand... and not something like an aggressive wipe method to prove that you've properly cleaned up after a tritium radiolabel experiment.

To understand the dust ingestion equation, I typed a simplified version of the dose equation for indoor worker incidental dust ingestion below:

Dose = EFW X EDw X Decay X "Concentration" X Dust Ingestion Rate

Dose = days/year x year x pCi/cm² x cm²/day = pCi

Where

Decay is a factor giving the average activity over the work tenure and

Default dust ingestion (cm²/day) =

1 event per hour x 45 cm² hand area x 50% transfer to skin from hard surfaces x 50% saliva extraction factor x 4 hours per day

+

1 event per hour x 45 cm² hand area x 10% transfer to skin from hard surfaces x 50% saliva extraction factor x 4 hours per day

=

Default of 54 cm²/day

It would be good if EPA would make it easier to view the master table of PRG's. If you click on link and rename the extension to .xls and relogin it will open. It has 800+ isotopes. If I were trying to look out for the best interests of a client, I might look at this table to see how many times a PRG exceeds normal background levels or how close the PRGs are to background levels. This table needs to be disclosed— but you can essentially get the same thing if you pick all isotopes and ask for a comma delimited file on the calculator.