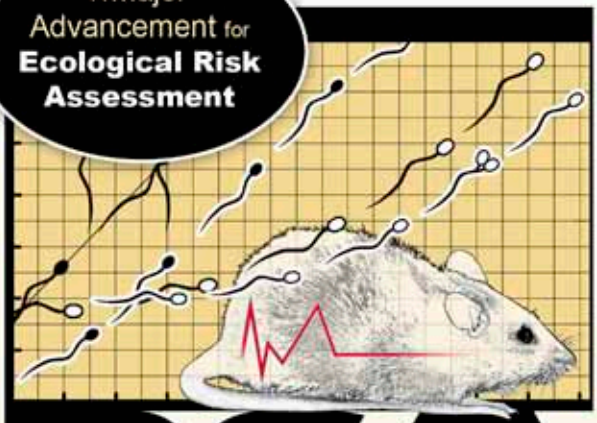
A Major Advancement for **Ecological Risk Assessment**



RSA

U.S. Patent No. 7,627,434

Rodent Sperm Analysis

You've calculated your Hazard Quotients and not surprisingly you've got several that exceed a value of 1.0, and . . . not for just one of your site mammals...

Now what?

With the work you've done, you surely don't know that site mammals are experiencing any health issues, and you're surely not in a position to recommend a cleanup. You might loosely suspect that site mammals are experiencing health effects, but are they? Now you can know. Now there's

Rodent Sperm Analysis

or

RSA!

A patented method of the U.S. Army Public Health Command, Army Institute of Public Health, RSA advances the field of ecological risk assessment (ERA) by introducing the novel concept of **direct health status assessment** for the very animals that populate a contaminated terrestrial site. With contaminated sites having had decades of opportunities to elicit serious health effects in ecological receptors, it's really far too late to be asking about the potential for effects to crop up. **Instead, it's a most appropriate time to investigate whether or not site animals actually present with the effects that concern us**. In rendering as definitive ecological assessment determinations as are currently possible, RSA cleverly spotlights the most exposed mammalian receptor (the small rodent) and evaluates the most sensitive endpoint (reproduction). With RSA, if site rodents do not have their reproduction impaired, by extension, we know that the larger, wider-ranging mammals that we care about so much are also reproductively fit, and healthy too in an overall sense.

RSA's Humble Beginnings

More than a decade ago, ecologists and ecological risk assessors at the Public Health Command's Institute of Public Health (Formerly the U.S. Army Center for Health Promotion and Preventive Medicine) were working on adding on a new dimension to limited and inconclusive desktop ERA efforts, namely a sorely-needed field-truthing element. In 2000, they stumbled onto a most meaningful piece of informatiton: the conventional sperm parameters -- *sperm count,*

sperm motility, and sperm morphology are all barometers of reproductive capability. In other words, it is rather precisely known how much these sperm parameters need to be offset (as in the sperm count becoming reduced) in order to trigger compromised reproductive success (e.g., animals bearing smaller-sized litters). A highly valuable ecological health status assessment scheme, RSA was built around specialized reproductive toxicity information that was cautiously assembled.

The novelty of RSA is that the very animals living at contaminated sites serve as the assessment subjects. RSA's creation heralds a major leap forward from the more traditional ERA efforts that don't involve venturing to the out-of-doors, and that only evaluate hypothetical organisms. RSA has been an extremely useful assessment tool for the Army since its first application. RSA outcomes have prominently figured into the remedial decision-making process. RSA constituted the dominant ERA element of the Army's Range XXI initiative completed a few years ago.

RSA: How it Works

RSA has only one prerequisite: that a contaminated terrestrial site of interest supports rodents. Typically a preliminary site visit will establish this in addition to allowing the field team to identify a proper reference location, i.e., a nearby habitat-matched site that is free of contamination. The field team saturates both the site and the reference location with baited, spring-loaded live traps, and aims to collect about 15 adult male rodents of a species that occurs at both trapping sites (termed "keepers"). It might only take a few days to do this. Keepers are processed shortly thereafter. Within minutes, computer-assisted sperm motility analysis begins. Sperm count and sperm morphology can be analyzed right away, or at a later time. When the sperm parameter data are all assembled, site and reference location population means are carefully compared. Where the count or motility is less at the contaminated site, or where the percentage of abnormally-shaped sperm is greater at the contaminated site, we look to see if established thresholds have been exceeded.

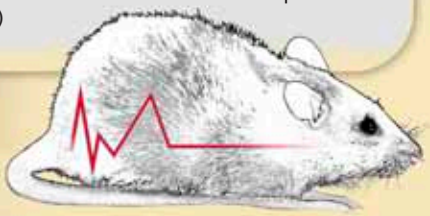
Can you guess how much lower a contaminated site's sperm count needs to be (relative to that of a non-contaminated reference location) in order to constitute a reproductive problem?

About **RSA**

- the only direct health status ecological assessment method of its kind
- a matured method; first applied in 2000
- **fully consistent with USEPA's "Ecological Risk Assessment Guidance for Superfund" & "Guidelines for ERA"**
- "the strongest weight-of-evidence tool in terrestrial ERA" (U.S. EPA's Environmental Response Team)
- provides definitive determinations about mammalian receptor health (considering all 3 contaminant uptake routes, and addressing chemical mixtures)
- been applied at National Priorities List sites
- presented at the Smithsonian Institution
- published in the peer-reviewed literature; described in the Encyclopedia of Ecology
- **a patented method**
  (U.S. Army Public Health Command. Rodent Sperm Analysis. Patent 7,626,434, (2009)
- **less expensive than conventional Hazard Quotient-based ERAs**

RSA highlights & features

- applicable at virtually any terrestrial site (in any part of the country, in any habitat)
- deliverable in as little as a month: complete data turn-around (in a Male Reproductive Assessment Report) and a clear finding
- unlike other ERA approaches, there's no need to recommend follow-on assessment studies with RSA
- a very sensitive method; likely nevertheless to demonstrate that contaminated sites are protective of mammals
- provides the exit strategy that conventional ERAs cannot
- has saved the Army thousands of dollars (through showing that additional studies and cleanups were unnecessary)



Got Questions?

The Army's Public Health Command can provide technical assistance on RSA . . .

- For Army sites (CONUS/OCONUS), we are available to support RSA for you in the field.
- For non-federal entities, **Licensing Arrangements** for use of the patented methodology are available.

Would you like a copy of the Public Health Command's 2012 Technical Guide 330? -- "The Rodent Sperm Analysis Method in Terrestrial Health Risk Assessment"

Please contact us with your queries, comments, or requests for services or publications:

Call us: 410-436-2953

-- or --

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