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# Managing Routine Bioassay Requirements

Prepared for the U.S. Department of Energy  
Assistant Secretary for Environmental Management

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Project Hanford Management Contractor for the  
U.S. Department of Energy under Contract DE-AC06-96RL13200

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# **Managing Routine Bioassay Requirements**

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## MANAGING ROUTINE BIOASSAY REQUIREMENTS.

B. L. Baumann (Fluor-Daniel Hanford, P.O. Box 1000, Richland, WA 99352)

### Introduction

The Hanford Site is a very diverse Department of Energy (DOE) Nuclear Site in Eastern Washington State that includes: retired reactor facilities, spent fuel storage facilities, chemical separations facilities, laboratories, and plutonium separations facilities. As a result worker routine bioassays requirements may include routine whole body counting for mixed fission products, chest counting for uranium or plutonium, and/or urinalyses for plutonium, uranium, strontium-90, and tritium depending on work assignments. In such a situation it is easy to perform unnecessary bioassays and incur unnecessary cost.

### Program Implementation

Fluor Daniel Hanford has been working with the Pacific Northwest National Laboratories to reduce the number of routine bioassays in the internal dosimetry program while ensuring the program is compliant with regulatory requirements. This has been accomplished by:

1. Clearly identifying what work requires routine bioassay
2. Clearly identifying what routine bioassay is required
3. Having a system in place to make sure personnel who need routine bioassay get it and
4. Taking measures to ensure that workers who don't need routine bioassay don't get it.

**Identify What Work Requires Routine Bioassay** A good technical basis identifies when routine bioassay is needed. 10 CFR 835 requires routine monitoring of workers who "under typical conditions" are likely to receive over 1 mSievert (100 mrem) Committed Effective Dose Equivalent (CEDE) or 50 mSieverts (5 rem) Committed Dose Equivalent (CDE) to any organ in a calendar year. At Hanford practical criteria were identified to implement this requirement.

Work situations that require routine bioassay include the following:

- Work involving the use of respiratory protection
- Work in High Contamination Areas
- Work with Specific Quantities of Unencapsulated Material
- Job tasks with low-level airborne activity that may total greater than 40 DAC/hours in a year.

One important aspect of this process is to also define what work activities don't require routine bioassay. Tours and inspections activities where no "hands-on" work takes place do not require routine bioassay. Therefore most engineers, management, and dignitaries are able to have "hands-off" access to most areas without a routine urinalysis or in vivo count unless an area is posted for airborne contamination.

**Identify Required Routine Bioassays** A good technical basis identifies routine bioassay types and frequencies for specific radioactive materials. Routine bioassay programs require a baseline bioassay or evaluation, periodic routine bioassays at a frequency determined by technical requirements (usually annually or quarterly) and finally a termination bioassay at the conclusion of work activities that required routine bioassay.

At Hanford there are facilities where a routine whole body count is the most economical and sensitive way to detect an intake that is a mixture of mixed fission products and transuranic radioactive material. A recent upgrade to our technical basis identified clear-cut criteria allowing a reduction in some unnecessary bioassays.

For example, with the whole body counters and urinalysis specific to Hanford if there is more than 20 times as much cesium-137 as plutonium a routine whole body count is the most sensitive routine bioassay. If, there is less than 20 times as much cesium-137 as plutonium then a whole body count and plutonium urinalysis are required.

**Implementing Bioassay Requirements** A system has to be put into place to make sure that workers who need routine bioassay get it and workers who don't need bioassay don't. Failure to ensure workers get required bioassays can put the contractor in violation of regulatory requirements, but failure to have enough workers in routine bioassay programs can stop work. In order to make sure all workers who need a routine bioassay get one, it's easy to schedule too many workers for the routine bioassay program, which increases program costs. Routine urinalysis costs of \$250 dollars per sample and *In Vivo* count costs of \$100 to \$200 per count are typical, so it is prudent to give bioassay only to those workers who need it.

At FDH a computerized access control system verifies workers are scheduled for the appropriate bioassay prior to starting a job. Bioassay requirements for routine bioassay are identified in Radiation Work Permits (RWPs). The access control system compares the worker's current routine bioassay schedule with requirements in the RWP. When a worker doesn't have the

minimum bioassay requirements for a work situation, the access control system denies the worker access until the worker is scheduled for the needed routine bioassay. Unfortunately, this system ensures that workers who only occasionally require routine bioassay are also placed on routine schedules to get bioassay.

A computerized access control system that insures workers obtain required bioassays can also be a mechanism to determine when routine bioassay is not needed. A computer query just before a routine bioassay is performed can determine if the worker has performed any work requiring routine bioassay since the last routine count or sample. If the worker has performed no radiological work which requires a bioassay since the previous routine bioassay, there is no need collect a urine sample or perform an in vivo count. That conclusion is documented in the worker's radiation exposure history file and no bioassay is scheduled. At FDH we are finding 1/3 to 1/2 of routine scheduled samples can be waived because the worker did no work which required the routine bioassay. A good example, is a fire-system maintenance worker who performed hands-on work for a month in a contaminated plutonium facility one year but did not visit the facility the next. For the year the worker didn't visit a plutonium facility no plutonium urinalysis is needed. This review process is especially effective if the routine bioassay frequency is short (monthly or quarterly) or if many workers sporadically perform certain tasks that require routine bioassay.

## Results

The attached table shows that the number of *In Vitro* bioassays, chest counts and whole body counts has decreased significantly in the last three years. FDH has performed 23% as many *In Vitro* bioassays in 1996 as were performed in 1994. The number of chest counts and whole body counts in 1996 were approximately 50% and 60% of their respective 1994 levels. These savings have been accomplished primarily by better identification of when and what routine bioassays are required and reviewing workers bioassay schedules.

<u>Calendar</u>	<i>In Vitro</i>	Whole Body	Chest
<u>Year</u>	<u>Bioassay</u>	<u>Counts</u>	<u>Counts</u>
1994	6733	7785	2306
1995	3192	5568	1474
1996	1605	4626	1156

Recently we have begun doing computer work history reviews to determine when routine bioassays are not needed. This new review has achieved additional savings which are not yet reflected in these numbers.