Improving Worker Health Risk Identification and Protection

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In conjunction with
CRESP Health Hazard Identification and
Worker Health and Safety Task Groups

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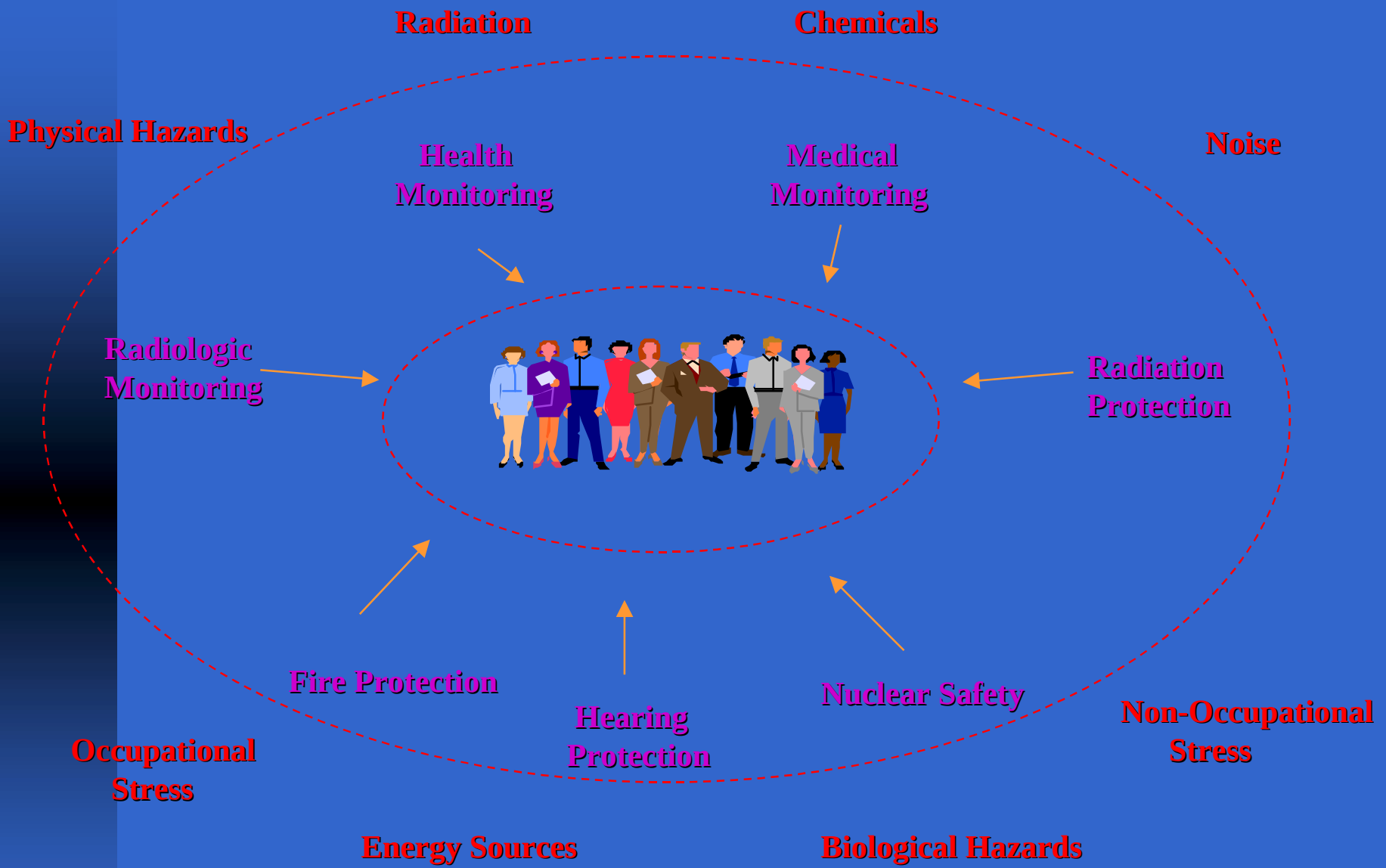
Examples of CRESP Projects that Improve Worker Health

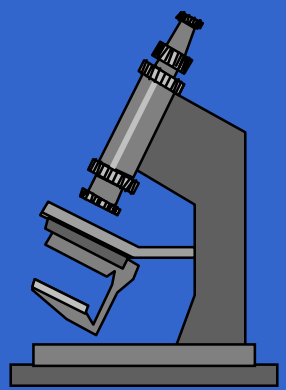
- Cross-Complex Evaluation of Occupational Health & Safety Programs
- Evaluating Worker Risks Using Employee Based Analyses
- Beryllium (Be) Biomonitoring at the Hanford Site
- Reproductive Effects of Solvents in Workers
- Registry of Subcontractor Workers at SRS
- Evaluating Barriers to the Use of Respiratory Protection among Hazardous Waste Workers



Occupational Health *System* Shields DOE Workers from *Hazards*

Improving Worker Health Risk Identification and Protection: Occupational Beryllium Biomarker Studies

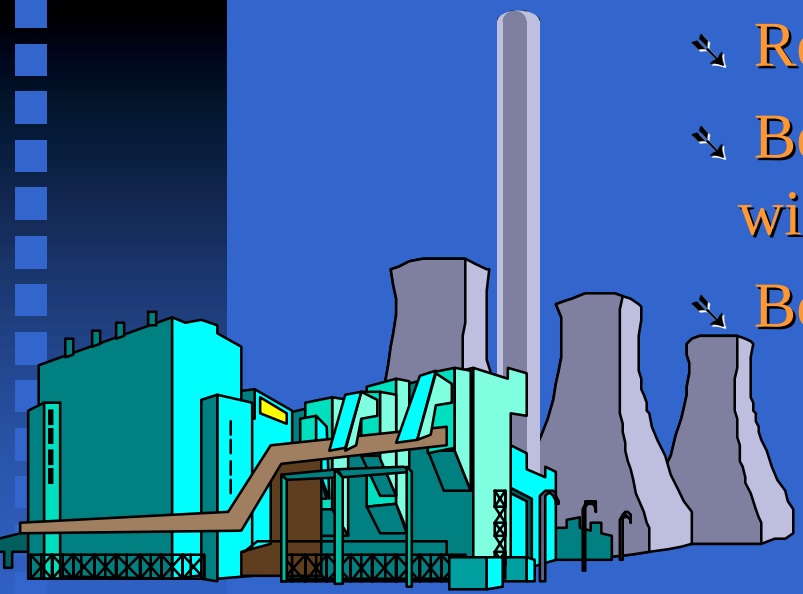
CRESP Research → *Relevant to* → Policy



Why are we interested in Beryllium?

Metal used in ceramics and nuclear industries during last 50 years

- Reactor rod fabrication
- Reactor shielding
- Beryllium operations in buildings complex wide
- Bomb casings



Why are we interested in Beryllium? (cont.)

- Beryllium Can Cause Lung Disease
  - Acute Beryllium Disease
  - Chronic Beryllium Disease (CBD)
    - ⇨ immune system - mediated pulmonary disease involving chronic inflammation / fibrosis
    - ⇨ 1-15% prevalence in exposed workers
    - ⇨ variable latency and response

Why are we interested in Beryllium (cont.)?

- Estimated that up to 10,000 current and former workers have been Be exposed
- Workers had been identified at Oak Ridge 4-12 Plant and Rocky Flats Environmental Technology Site
- How many exposed workers at Hanford?

CRESP Research has Expanded our Ability to:

- Identify workers that are potentially beryllium sensitive
- Improve diagnostic methods for evaluating beryllium worker health
- Develop expanded use of biomarker information for policy decision making

Science → *Policy*

To Identify Potentially Exposed Workers CRESP used:

- Top Down Approach

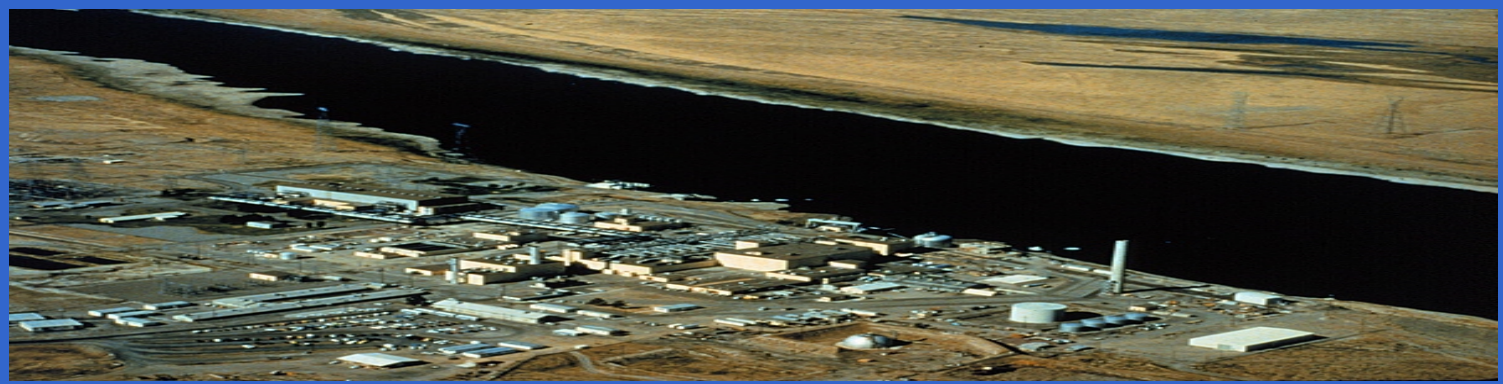
  Evaluated job classification/location- Is it anticipated that worker is exposed?

- Biomarkers
- Bottom Up Approach – Employee Job Task Analysis (EJTA)

  Risk based approach using employee input to identify activities and potential hazards faced by individual workers

To Identify Potentially Exposed Workers CRESP used:

- Top Down Approach
  - Evaluated job classification/location- Is it anticipated that worker is exposed?
  - 53 buildings identified



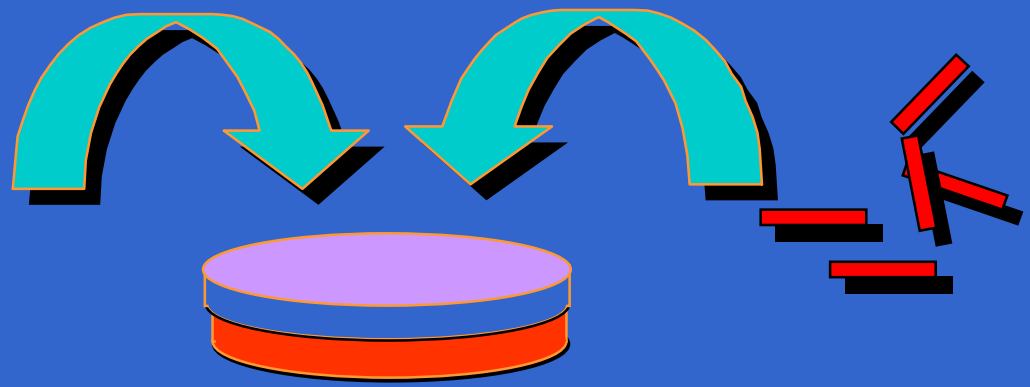
To Identify Potentially Exposed Workers CRESP used:

- Biomarkers
  - Beryllium Lymphocyte Proliferation Biomarker Test

To Identify Potentially Exposed Workers CRESP used:

- Bottom Up Approach – Employee Job Task Analysis (EJTA)
  - Risk based approach using employee input to identify activities and potential hazards faced by individual worker
- Over 800 workers have been identified and tested

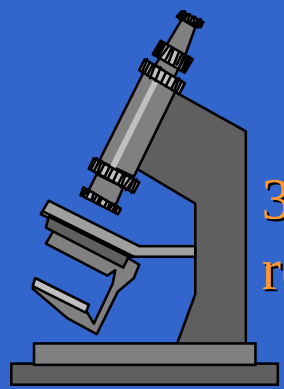
Beryllium Lymphocyte Biomarker: Proliferation Test



1) Lymphocytes isolated from human blood or lung lavage

4-6 days

2) Lymphocytes cultured with beryllium



3) Assess proliferative response to beryllium

Worker Screening Results at the Hanford Site (In Progress)

- Number of current and former Hanford workers evaluated = 800
- Total number of workers identified as sensitized = 59 (7%)

To Improve our Biological Methods for Evaluating Be Exposed Workers CRESP is:

- Improving the Lymphocyte Proliferation Biomarker Test
- Evaluating genetic and functional biomarkers (GCS)
- Expanding the amount of biological information available through lymphocyte sub-population analysis

To Improve our Biological Methods for Evaluating Be Exposed Workers CRESP is:

- Improving the Lymphocyte Proliferation Biomarker Test
  - Standardizing criteria used for positive response
  - Expanding mechanistic information available from each assessment

To Improve our Biological Methods for Evaluating Be Exposed Workers CRESP is:

- Evaluating other genetic biomarkers
  - Glu-69 susceptibility markers (HLA DP-ß1)
  - Other MHC class II genes
  - Other polymorphic immune system genes (eg. glutathione-S-transferase)

CRESP Develops Expanded Use of Biomarker Information for Risk Assessment and Risk Management

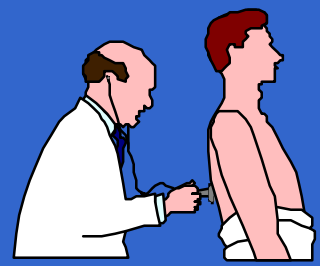
- Developed risk management framework to show “value of biomarker information” for making occupational health decisions
- Provided input and comments on DOE’s proposed rulemaking for Chronic Beryllium Disease Prevention Program

Susceptibility Biomarker Characteristics (HLA DP-ß1)

- Sensitivity high — 97%
- Specificity low — 73%

Challenge is to determine the value of this biomarker information to improve worker risk management decisions

Value of Information



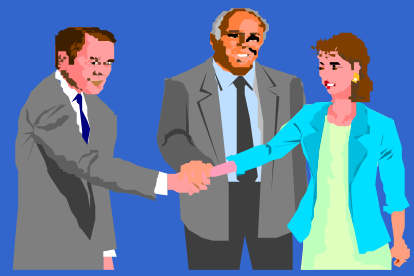
We have designed decision analytic tools to provide risk managers credible scientific information in a format that can allow for transparent decision making and linkage of biomarker information with

- Alternative Occupational Health protection policies
- Clinical testing/intervention
- Cost-effective measures
- Levels of medical surveillance

CRESP Research is Putting

Science

Policy



—Be worker standards

—worker surveillance

- Testified in support of more stringent action levels for worker protection standards.
- Expanded population eligible for Be medical monitoring.
- Participated in national dialogues in use of Be biomarkers for medical surveillance.
- Participated in laboratory biomarker standardization efforts for DOE biomarker use.
- Worked on development of DOE risk communication plans for Be workers.
- Held conferences with workers and other stakeholders on Beryllium Health Effects (eg. Hanford Health of the Site)

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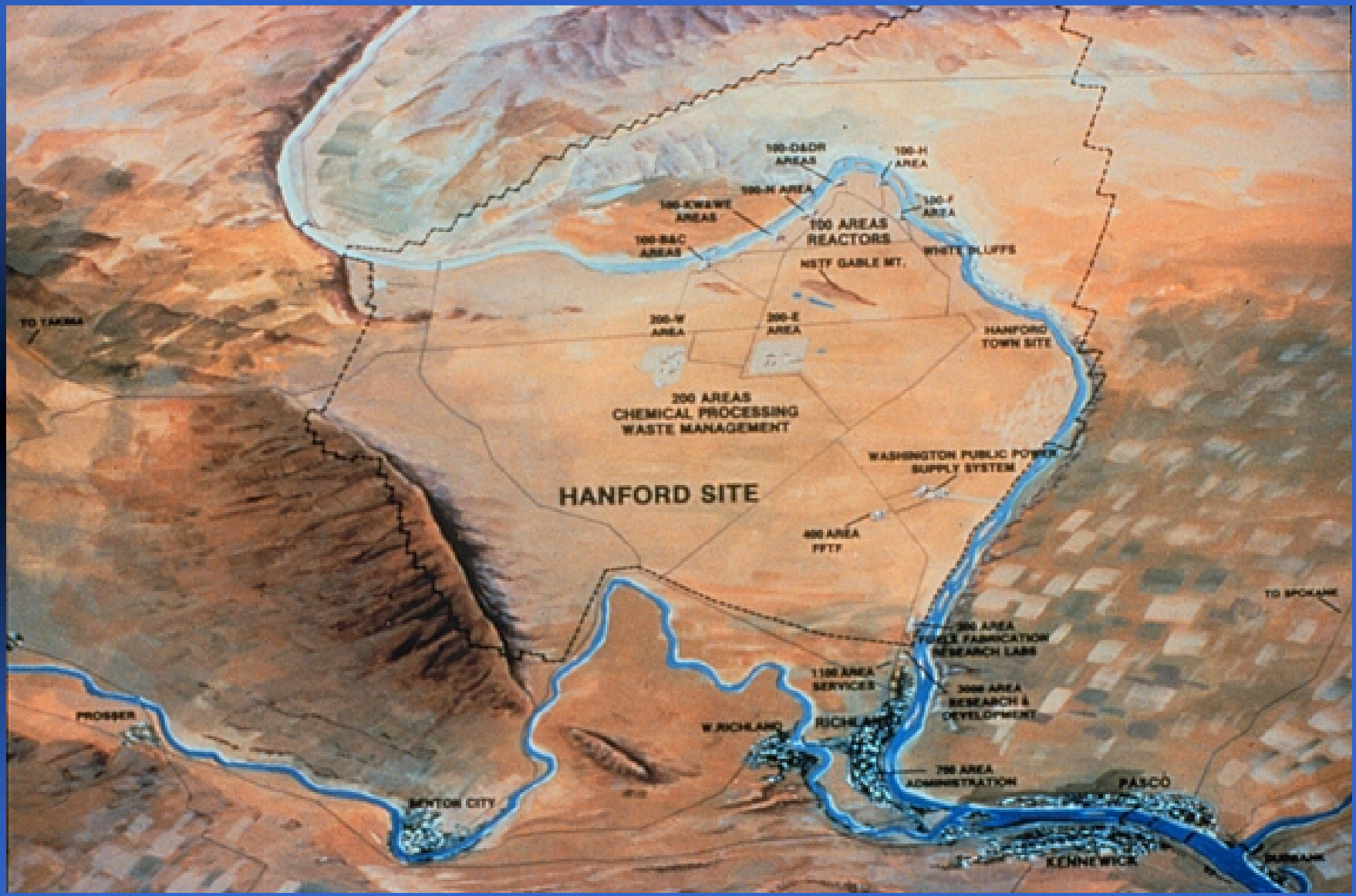
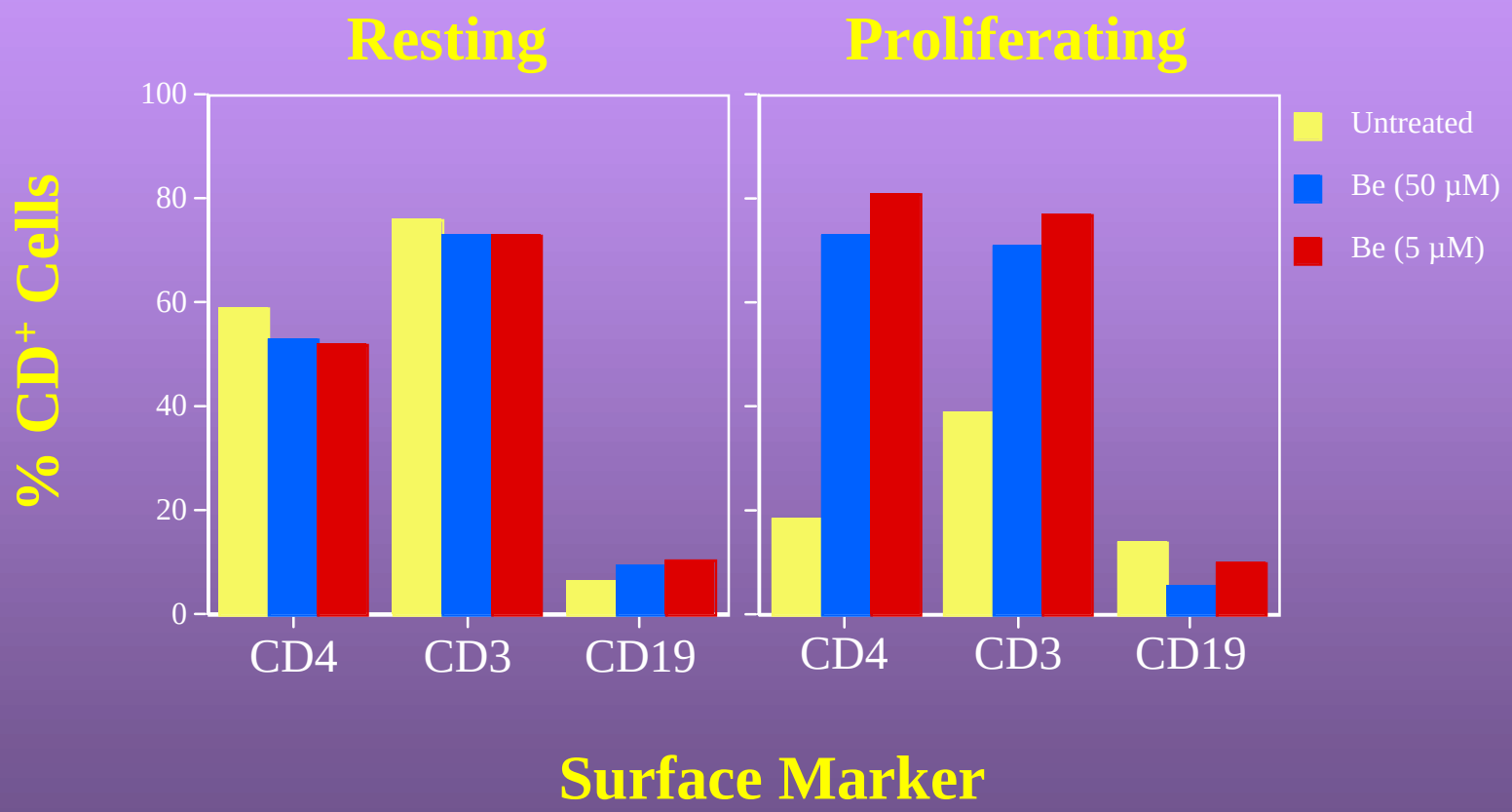
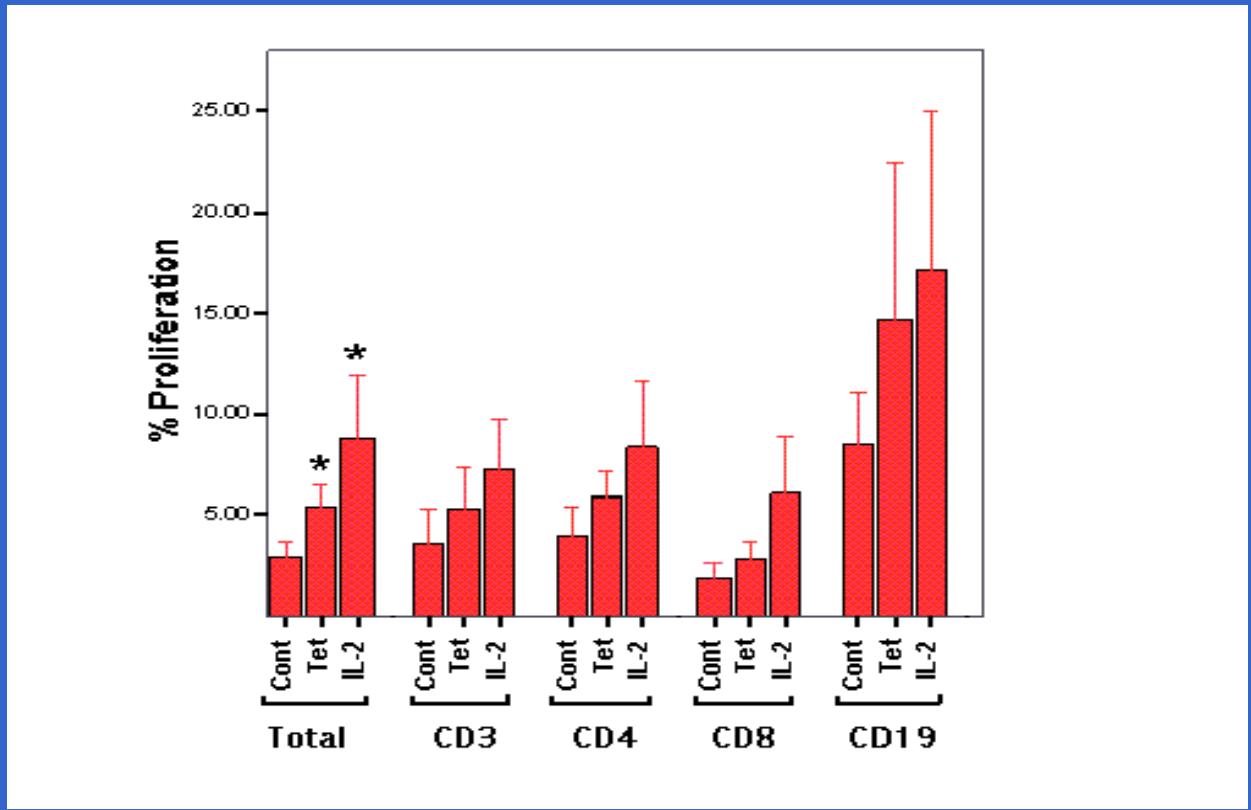

100-D&DR AREAS
100-H AREA
100-N AREA
100-F AREA
100-KW&WE AREAS
100 AREAS REACTORS
100-B&C AREAS
WHITE BLUFFS
NSTF GABLE MT.
TO TACOMA
300-W AREA
300-E AREA
HANFORD TOWN SITE
200 AREAS CHEMICAL PROCESSING WASTE MANAGEMENT
WASHINGTON PUBLIC POWER SUPPLY SYSTEM
HANFORD SITE
400 AREA FFTF
TO SPOKANE
1100 AREA SERVICES
3000 AREA RESEARCH & DEVELOPMENT
PROSSER
W.RICHLAND
RICHLAND
700 AREA ADMINISTRATION
PASCO
BENTON CITY
KENNEWICK

Analysis of lymphocytes from a worker with CBD



Proliferation Among Lymphocyte Subsets in an unexposed healthy worker



Analysis of lymphocytes from a worker with CBD