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**DEPARTMENT OF HEALTH AND HUMAN SERVICES**

**and**

**CENTERS FOR DISEASE CONTROL AND PREVENTION**

**convene the**

**SAVANNAH RIVER SITE  
HEALTH EFFECTS SUBCOMMITTEE**

*Charleston, South Carolina  
January 10-11, 2002*

**FINAL RECORD OF THE PROCEEDINGS**

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## EXECUTIVE SUMMARY

### List of Acronyms

|        |   |
|--------|---|
| ATSDR  | Agency for Toxic Substances and Disease Registry      |
| CDC    | Centers for Disease Control and Prevention            |
| DFO    | Designated Federal Official                           |
| DOE    | Department of Energy                                  |
| HES    | Health Effects Subcommittee                           |
| NCEH   | National Center for Environmental Health              |
| NIOSH  | National Institute for Occupational Safety and Health |
| SRSHEs | Savannah River Site Health Effects Subcommittee       |

During the **opening session** of the SRSHEs meeting on January 10-11, 2002, the March 15-16, 2001 meeting minutes were unanimously approved with changes as noted in the record; status reports were provided for current action items; personnel changes were announced for SRSHEs and NCEH staff members; and administrative issues were reviewed.

The **NIOSH update** covered SRS research, other studies nearing completion, administrative activities, and outreach mechanisms. DOE workers participating in the studies were examined for leukemia, lung cancer and lung fibrosis. Research findings can be reviewed in the NIOSH 2001 program book on the Web site. NIOSH now distributes user-friendly one-page summaries of final reports and also collaborates with a point of contact at each DOE site to disseminate research findings to additional worker populations.

ATSDR's report of **toxicity of heavy metals and radionuclides** focused on potential health effects from exposure to lead, arsenic, cadmium, mercury and uranium. These heavy metals can cause kidney problems, gastrointestinal effects, central nervous system dysfunction, pain in extremities, or death at high chronic doses. Previous studies of heavy metals have not linked toxicity and adverse health effects, but making a causal association is extremely difficult with existing evidence.

The **Scenario Workgroup status report** covered activities completed since the previous meeting: review the six scenarios, appoint lead reviewers, select locations, identify required actions and make recommendations. The workgroup expects to submit an initial draft of the scenarios to CDC within two weeks. Individual doses will not be generated during the screening process, but SRSHEs pointed out that screening level calculations require dose to be estimated before risk.

The **Epidemiologic Data Workgroup status report** covered activities completed since the previous meeting: define frequently used terms in epidemiologic research; identify sources and limitations of existing data; list challenges in implementing epidemiologic studies; and conduct searches to locate relevant studies on SRS workers, populations

contiguous to SRS and non-human subjects at and around SRS. The workgroup hoped the data would help CDC to determine whether an epidemiologic study or risk assessment needs to be conducted in the future. SRSHEs noted the lack of race-specific data collected for black SRS workers prior to 1979. Other epidemiologic data sources were suggested for the workgroup's consideration.

The **Community Summary Workgroup status report** covered activities completed since the previous meeting. The existing 935-word summary was decreased to 629 words. The document was revised to be more user-friendly and understandable to communities, but the meaning was not changed. SRSHEs will provide comments and reach consensus on the final version that will be distributed to communities.

The **Outreach Workgroup status report** covered tasks that will be completed in the near future. SRSHEs materials will be distributed to the public, particularly the updated brochure. Communities will be actively recruited to participate in SRSHEs activities. NCEH will make every effort to provide funding for the workgroup to update and distribute the brochure. SRSHEs recommended that high school students and local civic organizations be considered as additional target audiences for outreach initiatives.

A **DFO/chair meeting** was held in May 2001 to discuss the evaluation report. The need for each HES to establish ground rules to govern its operation was one of the key evaluation findings. SRSHEs agreed that a modified version of Roberts Rules of Order will serve as its ground rules.

**ATSDR's training program for health professionals** is implemented through grand rounds, peer-reviewed publications and cooperative agreements. ATSDR grantees are currently conducting the SRS environmental health education needs assessment. Data for the target counties were collected and community leaders were identified during the initial phases of the project. Community input on SRS was recently obtained through focus group meetings in the target counties. This process will help to strengthen capacity building and networking at the local level.

The **Proactive Workgroup status report** covered the draft SRSHEs long-range plan. Workgroup roles and responsibilities were proposed for several activities: the Phase III dose reconstruction, health-related research, and education and outreach initiatives. The evaluation recommendations and milestones would be addressed by the full SRSHEs. The document will serve as the SRSHEs plan for the next four to five years after approval by SRSHEs and CDC.

The **update on the SRS former production worker health project** focused on the 25,580 former workers located to date. Retirees represent the largest portion of the study population, but the list is still incomplete. None of the clinical evaluations showed chronic beryllium disease, but work-related hearing loss and respiratory problems were frequently detected. Overweight conditions, cardiovascular disease and musculoskeletal problems were the most common non-occupational health effects found among SRS

former production workers. SRSHER emphasized the need for testing to be conducted by an outside group since DOE is responsible for worker exposure and is also funding the project.

During the **SRSHER open discussion**, assignments and future directions for the Scenario, Outreach and Epidemiologic Data Workgroups were clarified. During the deliberations on **new SRSHER business**, the action and agenda items were reviewed. Consensus recommendations were unanimously approved for NIOSH and NCEH to examine health effects from exposure to SRS radionuclide and chemical releases among female and black workers and offsite populations. The beginning of plant operations to the present should serve as the time period for the worker study.

The Chair opened the floor for public comment at all times as designated on the agenda. The next SRSHER meeting is tentatively scheduled for the first week in June 2002 in Augusta, Georgia; the following meeting is tentatively scheduled for the second week in September 2002 in Savannah, Georgia.

## CENTERS FOR DISEASE CONTROL AND PREVENTION SAVANNAH RIVER SITE HEALTH EFFECTS SUBCOMMITTEE

### Summary of the Meeting

#### List of Acronyms

|        |   |
|--------|---|
| ATSDR  | Agency for Toxic Substances and Disease Registry      |
| CDC    | Centers for Disease Control and Prevention            |
| DFO    | Designated Federal Official                           |
| DOE    | Department of Energy                                  |
| FACA   | Federal Advisory Committee Act                        |
| HES    | Health Effects Subcommittees                          |
| HHS    | Department of Health and Human Services               |
| NCEH   | National Center for Environmental Health              |
| NIOSH  | National Institute for Occupational Safety and Health |
| SRSHEs | Savannah River Site Health Effects Subcommittee       |

HHS and CDC convened an SRSHEs meeting on January 10-11, 2002 at the Charleston Riverview Hotel in Charleston, South Carolina. The March 15-16, 2001 meeting minutes were unanimously approved with the changes as noted in the record. Current action items were reported as completed through agenda items or workgroup assignments. Personnel changes were announced for SRSHEs and NCEH staff members. New administrative issues were outlined.

NIOSH summarized research involving SRS; listed studies expected to be completed or communicated in FY'02; described administrative activities; and outlined mechanisms to disseminate information to the public. The studies focus on occupational exposures that may be associated with health effects among DOE workers, such as leukemia, lung cancer and lung fibrosis. The research findings can be reviewed in the NIOSH 2001 program book on the web site.

NIOSH has enhanced its communication strategy by distributing one-page summaries of final reports that outline the background, findings, recommendations, limitations and advantages of each study. NIOSH also collaborates with a point of contact at each DOE site to obtain assistance in reaching organized labor representatives, retirees, public relations personnel or site contractors.

ATSDR reported on potential health effects from toxicity of heavy metals and radionuclides. The kidney is particularly targeted by toxins due to its extremely high blood flow of 25% of cardiac output. The five most common heavy metals in the environment are lead, arsenic, cadmium, mercury and uranium. In addition to kidney problems, these heavy metals can cause gastrointestinal effects, central nervous

system dysfunction, increased calcium and protein in the urine, pain in extremities, or death at high chronic doses.

Site-specific research on heavy metals has been conducted at SRS and other DOE sites, but causal associations between toxicity and adverse health effects were not reported. Linking mercury exposure to kidney disease is extremely difficult with existing evidence. ATSDR hopes epidemiologic studies of mercury in blood, hair and urine will be conducted in the future to detect elevated levels and increases in kidney disease.

The Scenario Workgroup reported on its activities since the previous meeting. The six scenarios proposed by CDC were reviewed, lead reviewers were appointed, locations for each scenario were selected, required actions were identified, and recommendations were made. Chemical source terms and scenarios should be evaluated with the same level of rigor in terms of health effects in offsite populations. Synergistic effects of radiological and chemical scenarios should be considered.

Onsite workers should be better represented in the scenarios. Limitations of computer models that may impact the scenarios should be clearly stated. The workgroup expects to submit an initial draft of the scenarios to CDC within two weeks. CDC will not generate doses during the screening process, but SRSHERS pointed out that screening level calculations require dose to be estimated before risk.

The Epidemiologic Data Workgroup reported on its activities since the previous meeting. Frequently used terms in epidemiologic research were defined; agreement was reached on sources to use; limitations of these data were noted; challenges in implementing epidemiologic studies were acknowledged; and searches were conducted to locate three types of relevant data: SRS workers, populations contiguous to SRS and non-human subjects at and around SRS.

The focus areas of the studies include cancer morbidity and mortality, congenital hypothyroidism, and SRS radionuclide releases. The workgroup hoped the data would assist the Scenario Workgroup and help CDC to determine whether an epidemiologic study or risk assessment will need to be conducted. SRSHERS noted the lack of race-specific data collected for black SRS workers prior to 1979 and suggested other epidemiologic data sources the workgroup should consider.

The Community Summary Workgroup reported on its activities since the previous meeting. The existing full two-page summary with 935 words was decreased to less than 1.5 pages with 629 words. The meaning of the document was not changed, but deletions, clarifying words, simpler terms and sentence combinations were included to make the summary more user-friendly and understandable to communities. SRSHERS was asked to provide comments because consensus must be reached on the final version that will be distributed to communities.

The Outreach Workgroup reported on its activities since the previous meeting. The workgroup's roles were reinforced; mechanisms to circulate information were defined;

specific tasks were outlined; information needs were identified; and recommendations were made. The workgroup will disseminate SRSHEs materials to the public, update the SRSHEs brochure, and actively recruit communities to participate in SRSHEs activities.

NCEH has not set aside dollars specifically for the brochure, but will most likely be able to fund revision and distribution of the document. SRSHEs suggested other target audiences for materials, such as high school students and local civic organizations. SRSHEs was asked not to circulate the current brochure because the membership, telephone number and other information are outdated.

HES DFOs, chairs and senior agency staff members held a meeting in May 2001 to review the evaluation findings and recommendations. Areas where SRSHEs disagreed with the evaluation report were noted, such as insufficient data, an inaccurate sample population, and inconsistency between the findings and SRSHEs responses. SRSHEs extensively discussed the evaluation recommendation to establish ground rules governing its operation. Agreement was reached to continue to use a modified version of Roberts Rules of Order as the SRSHEs ground rules with no additional written guidelines; apply the rules with more vigor during meetings; and modify the rules to incorporate suggestions by SRSHEs.

These recommendations focused on mutual respect, adherence to agenda schedules, clarification of the SRSHEs mission, the process to reach consensus, and the need to make presentations more understandable to persons with any level of education or knowledge about SRSHEs. NCEH confirmed that it will make stronger efforts in the future to define the role of SRSHEs and clearly identify areas for which consensus advice is needed.

ATSDR's training program for health professionals was developed because only a minimal amount of environmental health training is provided to physicians who do not specialize in occupational or environmental medicine. ATSDR conducts health care provider education through grand rounds in hospitals, cooperative agreements with partners and states, and publication of environmental health materials. ATSDR grantees are currently conducting the SRS environmental health education needs assessment.

For this project, demographics were researched for the target counties. Community leaders and other key contacts at federal, state and county levels were identified. Focus group meetings were held to obtain input from communities about SRS, such as perceptions of the site, perceived health concerns, desired information, credible sources and preferred channels. The focus group process will help to strengthen capacity building and networking at the local level. A draft document of these findings has been distributed to ATSDR and community leaders for review and comment.

The Proactive Workgroup reported on its activities since the previous meeting. The SRSHEs long-range plan was drafted. Roles and responsibilities for specific workgroups were identified for the Phase III dose reconstruction; past, current and



future health-related research; continuing education to SRSHEs; and public education. The full SRSHEs would be involved with implementing appropriate evaluation recommendations as well as developing and prioritizing milestones.

Based on SRSHEs comments on the draft, the document will be revised, presented at the next meeting and submitted to CDC for approval. The final version will serve as the SRSHEs plan for the next four to five years. Agreement was reached for the workgroup, SRSHEs Chair and DFO to jointly prioritize the items and develop a time-line. NCEH confirmed that the draft is consistent with the FACA charter and CDC's perspective of SRSHEs roles and responsibilities.

The SRS former production worker health project has identified 25,580 former workers to date, but the list is still incomplete. A decision was made to focus on retirees because this group is more accessible, can be more easily located, has the longest latency period post-exposure and will probably present more health effects than other former workers. The most significant hazards to former workers were predicted to be noise, chlorinated solvents, asbestos, hydrogen sulfide, hydrazine, external ionizing radiation and beryllium. Test results among the examined population are as follows.

None of the clinical evaluations showed chronic beryllium disease; 156 workers had either restricted or obstructed breathing; 39 workers had both pleural and parenchymal abnormalities; 402 workers had material hearing impairment; and 44% had cardiovascular disease. Overall, SRS former production workers enrolled in the health project clearly exhibit hearing loss and respiratory problems related to employment at the site. The most common non-occupational health effects were found to be cardiovascular disease, overweight conditions and musculoskeletal problems. SRSHEs emphasized the need for testing to be conducted by an outside group, since DOE is responsible for worker exposure and is also funding the project.

SRSHEs revisited agenda items that were unfinished or unclear. Agreement was reached for the Scenario Workgroup to design a risk-based exposure ranking, identify future activities needed and provide input to the Proactive Workgroup on the SRSHEs long-range plan. The Membership Workgroup urged CDC to make every effort to officially appoint the nominees as soon as possible. The Outreach Workgroup will move forward in updating the SRSHEs brochure. The Epidemiologic Data Workgroup was asked to assist CDC in collecting additional health data and information on demographics, characteristics, lifestyles and other confounding factors of SRS populations.

SRSHEs reviewed the action and agenda items raised during the meeting. Consensus recommendations to the agencies were unanimously approved as well: (1) NIOSH to undertake studies examining effects from exposure to radionuclide and chemical releases from SRS among female and black workers from the beginning of plant operations to the present; and (2) NCEH to examine female and black offsite populations as distinct groups rather than with the general population during the dose reconstruction project.

The Chair opened the floor for public comment at all times as designated on the agenda. The next SRSHES meeting is tentatively scheduled for the first week in June 2002 in Augusta, Georgia; the second or third week in June 2002 was selected as the alternate date. A one-day tour of SRS will be held the day before the meeting. The following meeting is tentatively scheduled for the second week in September 2002 in Savannah, Georgia.

**DEPARTMENT OF HEALTH AND HUMAN SERVICES  
CENTERS FOR DISEASE CONTROL AND PREVENTION**

**SAVANNAH RIVER SITE HEALTH EFFECTS SUBCOMMITTEE  
*January 10-11, 2002*  
*Charleston, South Carolina***

**Final Minutes of the Meeting**

The Department of Health and Human Services (HHS) and the Centers for Disease Control and Prevention (CDC) convened a meeting of the Savannah River Site Health Effects Subcommittee (SRSHES). The proceedings were held on January 10-11, 2002 at the Charleston Riverview Hotel in Charleston, South Carolina. The following individuals were present to contribute to the discussion.

**SRSHES Members**

Dr. Sergio Bustos, Chair  
Dr. William Adams  
Mr. Cyril Banick  
Dr. Rebecca Dawson  
Mr. Gerald Devitt  
Ms. Mary Drye  
Mr. Curtis Graves  
Ms. Emily Guess  
Mr. Charles Hill  
Dr. Thomas Hinton  
Mr. James Lockridge  
Dr. Mildred McClain  
Mr. Charles Riley  
Mr. Thomas Sanders, III  
Ms. Dolly Still  
Dr. Warren Umansky  
Mr. Wade Waters  
Mr. William Wills

**SRSHES Liaison Representative**

Ms. Jane Perry (GDPH)

**Designated Federal Official**

Mr. Paul Renard, SRSHES Executive Secretary

**Federal Agency Representatives**

Dr. Steven Ahrenholz (CDC/NIOSH)  
Ms. Elizabeth Donnelly (CDC/NCEH)  
Ms. Yolonda Freeman (ATSDR)  
Ms. Natasha Friday (CDC/NCEH)  
Mr. Philip Green (CDC/NCEH)  
Ms. Judy James (CDC/NCEH)  
Mr. Thomas Johnson, Jr. (DOE)  
Ms. Marsha Lawn (DOE)  
Dr. Karl Markiewicz (ATSDR)  
Ms. Teresa NeSmith (ATSDR)  
Ms. Leslie Todorov (CDC/NCEH)  
Dr. Robert Whitcomb (CDC/NCEH)

**Presenters and Guests**

Dr. David Adcock (USC)  
Mr. Mike Barry (ACPM)  
Ms. Jessica Cafarella (ACPM)  
Dr. Todd Crawford (Nominee)  
Mr. Joe Guess (Public Member)  
Dr. James Heffner (WSRC)  
Mr. Warren Hills, Sr. (Nominee)  
Ms. Linda Hodges (ORISE)  
Ms. Jeanne Kato (Nominee)  
Dr. Patricia Lee (Nominee)  
Ms. Lenda Morris (AAOHN)  
Dr. Sandy Rock (ACPM)  
Dr. Michael Wilson (Nominee)

***Opening Session.*** Dr. Sergio Bustos, the SRSHEs Chair, called the meeting to order at 8:52 a.m. on January 10, 2002. He welcomed the attendees to the proceedings that had originally been scheduled for September 20-21, 2001. During the orientation session for nominees on the previous day, he announced that background materials for SRSHEs and the agencies were reviewed. He commended the speakers for making comprehensive presentations and the nominees for providing valuable input. Dr. Bustos was pleased that the agencies are making efforts to streamline and enhance communications with the public.

**Review of Meeting Minutes.** Dr. Bustos entertained a motion to approve the minutes of the previous meeting; the following corrections were noted for the record:

- Page 1/Executive Summary: Change “November 2-3, 2001” to “November 2-3, 2000”.

- Page 1/Meeting Summary: Change “November 2-3, 2001” to “November 2-3, 2000”.
- Page 1: Change “Jan” Kato to “Jeanne” Kato.
- Page 6: Add the sentence “Ms. Jeanne Kato suggested that fetal exposures be considered in the screening scenarios.” Move the sentence and the response by Ms. Elizabeth Donnelly to the Discussion section.
- Page 7: Delete “Jan” Kato.
- Global: Change “Mr. Utterback” to “Dr. Utterback”.

Dr. Umansky moved to accept the minutes as corrected; Mr. Waters seconded the motion. There being no further discussion, the March 15-16, 2001 Draft SRSHES Meeting Minutes were unanimously approved with the changes outlined above.

Review of Current Action Items and Administrative Issues. Mr. Paul Renard, the SRSHES Executive Secretary, noted some personnel changes that occurred since the previous meeting. Ms. Jane Perry, of the Georgia Division of Public Health, will now serve as the SRSHES liaison for the State of Georgia. Ms. Natasha Friday, Mr. Phillip Green and Ms. Judy James are new staff members in the Radiation Studies Branch. Mr. Renard announced the third personnel change with mixed feelings. While he was pleased about his new position in the National Center for Environmental Health (NCEH), he regretted that he will no longer serve as the SRSHES Executive Secretary. He mentioned that his involvement with SRSHES has been one of the most significant milestones in his career. Mr. Green will begin serving as the SRSHES Executive Secretary at the next meeting.

Mr. Renard's status report of the current action items is outlined below.

- In May 2001, SRSHES reviewed, provided comments and submitted the evaluation report questionnaires to Dr. Bustos. The responses were presented during a meeting with all Health Effects Subcommittee (HES) chairs and Designated Federal Officials (DFOs).
- In May 2001, the DFO convened a conference call with the Membership Workgroup to discuss new and existing SRSHES nominees. A follow-up conference call was held with an SRSHES quorum and consensus was reached on the list of candidates that was forwarded to the CDC Director.
- The Proactive Workgroup drafted a long-range plan for SRSHES. A status report of this activity is scheduled on the agenda.
- In September 2001, the Scenario Workgroup compiled a list of scenarios to be included in the radionuclides screening project. A status report of this activity is scheduled on the agenda.
- In September 2001, the Community Summary Workgroup simplified the Phase II Community Summary. A status report of this activity is scheduled on the agenda.
- In September 2001, the Epidemiologic Data Workgroup began collecting existing information for SRS. A status report of this activity is scheduled on the agenda.

Mr. Renard also described several administrative changes that have occurred to operate HESs. First, priorities have dramatically changed in all government agencies since the September 11, 2001 terrorist attacks and subsequent anthrax outbreaks, but NCEH still hopes SRSHER nominees will be officially appointed by the next meeting. The hiring freeze in HHS agencies has been lifted. Second, time cards for members were processed at the division level, but Committee Management will now undertake this task within the branch. Consultants were required to submit supporting documentation to CDC and wait for payment, but Ms. James will now distribute checks to consultants at the end of each meeting.

If members encounter problems with the new system, the following persons should be contacted: Committee Management staff initially; Mr. Green after two weeks; and Ms. Cindy Ellis, the Technical Services Chief of the CDC Human Resource Management Office after two additional weeks. Committee Management staff can be reached through the toll-free telephone number, while Ms. Ellis can be contacted at 770/488-1574. Third, CDC must now obtain permission from HHS for five or more persons to travel to meetings. The new rule requires CDC to submit requests far in advance of meetings and estimate the exact number of travelers. Substitutions can be made, but new names cannot be added after a request has been submitted.

Fourth, the following ground rules are being proposed to operate SRSHER meetings, but members are welcome to make changes. No safe zone exists. No rank exists during meetings. Participants should freely give of their experiences. All attendees may participate because no individual can dominate a meeting. Discussions should remain on track. All attendees should be active listeners. All attendees should maintain the self-esteem of others by disagreeing with an issue rather than an individual and disagreeing without being disagreeable. One speaker shall be heard at a time. Attendees should have fun.

Dr. Bustos acknowledged Mr. Renard's instrumental role in establishing and leading SRSHER. His technical knowledge of SRS and expertise in federal activities has been invaluable to the members. Dr. McClain added that Low Country communities applaud Mr. Renard's advocacy and support of the public involvement process. She recalled that during an early community meeting, he provided Savannah residents with an opportunity to actively participate in defining the mission, composition, decision-making role and purpose of SRSHER. She urged Mr. Renard to continue to advocate for the community involvement process and view progress made by SRSHER as one of his finest accomplishments. The members agreed that Mr. Renard's leadership of SRSHER will be greatly missed. The attendees recognized his contributions with a standing ovation.

***Update by the National Institute for Occupational Safety and Health (NIOSH).***

Dr. Steven Ahrenholz first reviewed the agency's current activities that involve SRS. The first group of multi-site studies are internal activities being funded by NIOSH and

implemented by staff. A leukemia case-control study is being conducted at SRS, Hanford, Los Alamos, Oak Ridge National Laboratories and the Portsmouth Naval Shipyard to identify an association between leukemia mortality and cumulative external radiation exposures. The study participants include workers who were monitored for external radiation for at least 30 days. Investigators are currently completing the study roster, merging exposure and work-history files, selecting cases and controls, and evaluating the best method to summarize radiation exposure data across sites.

A lung cancer case control study is being conducted at SRS, Hanford, the Oak Ridge X10 facility and the Idaho National Engineering and Environmental Laboratory (INEEL). The study participants are limited to reactor operators who would have primarily encountered external radiation exposures, but had minimal opportunities for exposures from chemical processing activities, internal radionuclide depositions and other sources. Investigators are currently developing the study roster, coding dosimetry data and assessing the availability of smoking and asbestos exposure data. NIOSH will submit the SRS roster to the National Death Index File and Social Security to determine the vital status of all workers in the study.

A cohort mortality study is being conducted at SRS and Oak Ridge to evaluate cause-specific mortality among Department of Energy (DOE) chemical laboratory workers; identify differences in mortality between the cohort and the U.S. population; and analyze dose-response relationships between cancer mortality and exposures to the cohort. Study participants include workers who were employed at least one day between January 1, 1943 and December 31, 1984; vital statistics will be analyzed through 1985. Personnel shortages resulted in significant delays in FY'01, but progress has been made in data collection efforts at Oak Ridge. In FY'02, NIOSH will continue data management activities at SRS and analyze the Oak Ridge mortality data. A draft report of the Oak Ridge findings is expected to be developed later in the year, but NIOSH plans to eventually conduct a combined analysis of workers from both sites.

The second group of studies are those that NIOSH anticipates completing or communicating in FY'02. A study of heat stress and performance among carpenters at DOE sites is being conducted at Hanford and Oak Ridge. A model may be developed from the study to assess physiological and psychological variations among workers because of hot work environments. Heat stress is a major concern due to the full chemical protective clothing worn by the majority of these workers. The cohort mortality study of the Pantex Plant in Amarillo, Texas was originally published in 1985, but findings were limited because of the small number of deaths in the study population during the short follow-up period. Although the results have now been updated through 1995, an exposure assessment was not included. NIOSH is currently reviewing the report of the updated study.

A lung fibrosis study is being conducted among plutonium workers at the Rocky Flats site. After receiving the final revisions for the report, NIOSH will formulate a strategy to communicate results. A cancer incidence and mortality study among current and former

Rocky Flats workers is designed as an epidemiologic evaluation of cancer and occupational exposures. An ionizing radiation and mortality study is being conducted among Hanford workers. New methods are being applied to re-estimate doses previously assumed to be zero; reconsider internal doses in the health risk analysis; and reanalyze cancer and non-cancer mortality data among those workers who encountered chronic low-level external radiation exposures.

The INEEL mortality study is being conducted because this site has never been analyzed. Dosimetry data provided by the site are currently being updated and will be incorporated into NIOSH's existing dosimetry file for INEEL. Investigators are now completing vital status and demographic profiles for the workforce of 68,000 persons. Additional dosimetry data have been requested and two more years of vital status follow-up will be conducted with the National Death Index File. NIOSH encountered significant delays with the study in FY'01 due to personnel shortages, but activities have now resumed in epidemiology and the initial cohort mortality analysis. This component of the study is expected to be completed in the fall of 2002.

In terms of administrative activities, the NIOSH 2001 program book highlights several areas, including internal projects conducted by staff; external studies conducted through grants and cooperative agreements; points of contact for principal investigators; NIOSH involvement in DOE worker surveillance projects; and completed NIOSH studies. The program book has not been widely distributed to date, but the document can now be accessed on the NIOSH web site. A map is also displayed on the web site that provides links to final reports or peer-reviewed journal articles resulting from a particular site study. NIOSH has enhanced its communication strategy by distributing one-page summaries of final reports. The document outlines a study's background, findings, recommendations, limitations and advantages. Technical terms are also defined and points of contact to obtain additional information from DOE, NIOSH or the site are provided as well.

The one-page summaries are widely disseminated in both paper and electronic formats, but the executive summary or entire report can also be requested. To ensure that findings are clearly communicated and questions about a study are answered, NIOSH asks labor representatives, investigators and other grantees to participate in telephone calls to the site. However, responses to these requests are not required. For SRSHER members with an interest in obtaining more information, Dr. Ahrenholz pointed out that copies of documents were displayed on the table of meeting materials that summarized conclusions, cited references and listed funding sources for current occupational studies. He also distributed DOE and NIOSH points of contacts, web site addresses and other relevant resources.

**Discussion.** Mr. Wills inquired whether NIOSH has conducted studies among chemical workers who breathe organic fumes for an eight-hour day/40-hour week. Dr. Ahrenholz indicated that this group of workers may have been included in other studies of chemical operators, but he planned to review the Oak Ridge and SRS data for



confirmation. However, chemical workers with eight-hour exposures have not served as an exclusive population in previous studies because of significant data gaps in chemical exposures, industrial hygiene and dosimetry. Defining exposures for chemical workers with eight-hour exposures is also challenging because this group primarily worked in the technical support, analysis or bench chemistry fields. These workers differ from chemical laboratory workers in the study.

Dr. McClain asked about NIOSH's process to communicate study results to the general public, particularly small communities or other SRSHERS groups excluded from NIOSH mailing lists. Dr. Ahrenholz replied that a communication point of contact DOE identifies for each site provides NIOSH with names of organized labor representatives, retirees, public relations personnel or site contractors with media contacts for press releases. The one-page summary is also circulated in a variety of mechanisms, including newsletters to workers and retirees, reading rooms, local web sites, e-mails, time cards, and mass mailings. NIOSH has a longstanding practice to simultaneously communicate study results to management and labor to ensure that the same messages are conveyed to both groups. These efforts appear to be successful, because NIOSH has received feedback from audiences that were not intentionally targeted to receive materials, such as survivors of deceased workers. Dr. Bustos recessed the meeting for a break from 9:50-10:33 a.m.

***Toxicity of Heavy Metals and Radionuclides.*** Dr. Karl Markiewicz, of the Agency for Toxic Substances and Disease Registry (ATSDR), explained the meaning of "the dose makes the poison". Too little of an essential metal in the body can lead to a deficiency; the appropriate amount will allow the body to function properly; and too much can result in adverse health effects. Heavy-metal exposures are not limited to site-related activities; instead, exposures to individuals occur on a daily basis through food, soil, water and air. Of all heavy metals, lead has been in use for the longest period of time followed by mercury and arsenic. Efforts to gather toxicology data for heavy metals began during the Industrial Revolution, but lead has generated the most information to date. Although heavy-metal usage in the United States has increased over time, environmental laws caused a reduction in emissions.

In general, heavy metals are attracted to sulfur, often have charged ions that easily bind to other molecules, and result in various oxidation states. The kidney serves as a target organ for toxins due to its extremely high blood flow of 25% of cardiac output. As a result, heavy metals that enter the blood stream will travel to the kidney. The primary function of the kidney is to concentrate waste products, including heavy metals. Transport and binding sites in the kidney are present in proximal tubules and metals may alter the structure of the protein and membrane. These changes may result in long-term residual effects. Waste products filter through the nephrons of the kidney, collect in a duct, travel to the urine and are eventually excreted. The majority of heavy metals elicit adverse effects in proximal tubules. Uranium and mercury cause toxicity in the same portion of the proximal tubules.

In general, heavy-metal toxicity differs among individuals based on age, dose and genetic predisposition to disease. In particular, effects from the five heavy metals most commonly in the environment are outlined as follows:

Lead toxicity primarily causes nausea, vomiting and other gastrointestinal (GI) effects in adults, but more serious impacts of central nervous system (CNS) dysfunction and IQ deficits occur in children. Epidemiologic studies that demonstrated effects to children were the main reason lead was removed from gasoline in the United States. Lead toxicity also causes anemia in both adults and children, but this condition probably affects females more frequently than males. High-dose chronic exposure will produce kidney toxicity in the proximal tubules, but these impacts are not immediately seen at low enough doses. Regeneration can occur in approximately 30-90 days; however, effects can appear 20-50 years post-exposure. Persons on farms and other rural areas typically receive lower exposures of lead than those in urban areas. High-level exposures primarily result from smelting and other occupational sources, but children who consume paint chips can receive high doses as well. Effects to the kidney can be seen with a blood lead level of 50-65 µg/dL. In addition to age, dose and genetics, lead toxicity also differs by form. For example, tetraethyl lead in gasoline has an extremely high bioavailability rate and will cause more adverse effects than inorganic lead on wheel weights.

Arsenic toxicity causes increased pigmentation and thickening of the skin, facial swelling as well as nausea, abdominal pain, diarrhea and other GI upsets at high doses. Arsenic in drinking water can cause increased skin cancer, but high-dose acute poisoning can result in death to the kidney tubules, other cells or the exposed individual. All U.S. regulatory limits for non-cancer effects from arsenic are based on a study completed in Taiwan several decades ago. However, these data are controversial due to the age, methodology and population of the study.

Cadmium toxicity primarily impacts the proximal tubule in the kidney. This effect results in increased calcium and protein in the urine, which may have implications for people with osteoporosis. At high doses of cadmium, GI disturbances occur and regeneration is possible. The most common sources of exposure to persons are from Nickel-Cadmium (Ni-Cad) batteries.

Mercury toxicity primarily impacts the kidney, but CNS dysfunction, excessive excitement, intention tremors, and other behavioral abnormalities are more common. Mercury toxicity is also associated with pain in the feet and hands and can contribute to kidney disease. Depending on the dose, the kidney may regenerate. Mercury is primarily excreted in the urine, but it can be detected in the urine and blood depending on the time interval between exposure and biological sampling.

Uranium toxicity can injure or cause death to proximal tubules in the kidney. For a 150-pound adult, depending on the dose the kidney may regenerate, ATSDR uses 0.002 mg/kg/day as the minimum risk level for uranium.

Exposure limits of heavy metals established by regulatory agencies are considered to be safe because modifying and safety factors are incorporated into models to account for sensitive populations, racial/ethnic groups or other differences among persons. Examples of site-specific research on heavy metals are outlined as follows. A study was completed at Fernald that found statistically significant elevations of both kidney and bladder disease in 8,496 persons, but evidence of excess diabetes mellitus was not detected. A study was conducted among 2,627 individuals at the Oak Ridge Reservation to determine potential effects from mercury to the community. Of the 2.4 million pounds of mercury released, 500,000 pounds were discharged to a waterway that runs through the site. Data showed no statistical differences in the mean adjusted urinary mercury levels between exposed and non-exposed groups and no evidence of excess mercury in hair between consumers and non-consumers of fish. Although hair analysis was used for the Oak Ridge study and research at other sites, the American Medical Association opposes this methodology in determining the need for medical therapy.

Chelation is another controversial area because the therapy should only be used to treat heavy-metal poisoning. For example, an elevated blood lead level in children is defined as 10 µg/dL and above, but chelation therapy should not be administered unless the level is 100 µg/dL and higher. Dr. Markiewicz encouraged SRSHERS to contact him by telephone at 404/498-0335 or e-mail at [kvm4@cdc.gov](mailto:kvm4@cdc.gov) to obtain web site addresses for studies or additional information on heavy metals. In the meantime, however, he raised the possibility of making a follow-up presentation that would more narrowly focus on effects from heavy metals most frequently detected at SRS. More details on the Fernald and Oak Ridge studies could be included in the presentation.

**Discussion.** Mr. Renard appreciated Dr. Markiewicz's offer to present mercury toxicity data from other sites in the future, but he noted that fish advisories and other information on mercury have already been collected for the SRS region. He explained that SRSHERS was most interested in mercury toxicity due to the high rates of kidney dialysis in the region. In addition to these data, Dr. Markiewicz hoped epidemiologic studies of mercury in blood, hair and urine would be conducted in the future to detect elevated levels and increases in kidney disease. Associating mercury exposure and kidney disease is extremely difficult with existing evidence. Dr. Wilson added that heavy metal toxicity is not the cause for virtually any of the kidney disease cases among his patients in the SRS region. Diabetes has been found to be the major culprit of kidney disease, particularly among blacks.

Dr. McClain followed up on this comment and asked for more details about the relationship between genetic predisposition and heavy-metal toxicity. Dr. Markiewicz confirmed that the race/ethnicity or genetic composition of an individual can cause heavy metals to react differently. The Human Genome Project, genetic markers, and other advances in molecular biology will eventually allow scientists to analyze an

individual's genetic composition and estimate the probability of disease development from heavy metal exposure.

Dr. Umansky questioned whether access to care could play a role in toxicity differences among racial/ethnic groups. For example, persons of color generally seek care at a later time in the disease progression than whites. As a result, preventive strategies would be less effective in these populations. Dr. Markiewicz agreed that lack of access to care is a concern in the United States, but improper diagnosis of heavy-metal poisoning is a common occurrence as well. In an effort to address this issue, ATSDR is educating physicians and emergency room personnel about the importance of taking an environmental history on patients. Ms. Leslie Todorov of NCEH noted that research on detoxification systems among different racial/ethnic groups is new and cutting-edge. She pointed out that more solid data need to be collected before assumptions can be made.

**Status Report by the Scenario Workgroup.** Mr. James Lockridge, the Workgroup Chair, announced that the workgroup plans to achieve three objectives in collaboration with CDC: develop exposure scenarios, design a risk-based exposure ranking, and identify future activities needed. However, he pointed out that the workgroup is unclear about its role in the second and third activities. The workgroup will also focus on CDC's previous request for SRSHEs to provide guidance in (1) determining the appropriateness of the proposed scenarios; (2) identifying locations of residences, schools, milk and other food sources, jobs, churches and other activities to be used for each scenario; and (3) developing other scenarios of potential importance to SRS populations.

Since the last meeting, the workgroup reviewed the scenarios proposed by CDC, appointed lead reviewers, selected locations, identified required actions and made recommendations. For all six scenarios, location templates will need to be completed and scenario assumptions will need to be reviewed. Mr. Lockridge asked SRSHEs to provide comments on the scenarios as soon as possible because the workgroup is attempting to complete these tasks within the next two weeks and submit an initial draft to CDC. Other actions that will be required are outlined in the appropriate scenario.

The rural family would have lived in the closest downwind area where farms could have been located in 1955. Adults as well as infants born in 1955 and 1964 will be considered since 1964 was the year of the highest radioiodine release. Reasonable and high default consumption values will be used. Persons would have spent a lot of time outdoors, extensively worked in the soil, consumed fresh milk from a backyard cow, and had crops irrigated from the Savannah River. The workgroup selected farms near the junction of Route 125 and the SRS southeast boundary as the scenario location and made two recommendations: include resuspension of soil contaminants in the breathing zone for the "working in soil" assumption; and include a nursing mother for one of the existing two infants.

The urban/suburban family would have lived just downwind of the site boundary where urban/suburban families could have lived in 1955. Adults, infants and consumption values will be the same as those for the rural family. Persons would have worked at the nearest downwind industrial location in 1955 and consumed fresh milk from the nearest dairy or rural neighbor. The workgroup selected Augusta, Georgia as the scenario location and made two recommendations: assume the adult worked onsite at SRS instead of the "nearest industrial location" and assume the onsite work location was associated with higher radiological exposures, such as SRS Canyons.

The houseboat family would have lived at the nearest docking location downwind where persons could have lived on houseboats in 1955. Adults, infants and consumption values will be the same as those for the rural family. Persons would always have been outdoors, in contact with the Savannah River, and obtained food from local farms or grocery stores. The workgroup selected New Ellenton, South Carolina as the scenario location and identified two additional actions that will be required. The plausibility of the houseboat scenario will need to be confirmed with the Citizen's Advisory Board (CAB). A location will need to be identified if the scenario is plausible, but the houseboat family should be replaced with a site construction worker living in a trailer if the scenario is not realistic. The workgroup recommended that Savannah River activities of the outdoors person be increased if the houseboat scenario is deleted. These key elements would include eating fish and living on the water.

The migrant worker family would have lived in the nearest downwind location where migrant workers could have lived and worked in 1955. Adults, infants and consumption values will be the same as those for the rural family. Persons would always have been outdoors and in contact with the soil; had crops irrigated by the Savannah River; and obtained food from local farms or grocery stores. The workgroup will identify a Georgia location near the SRS site boundary at a later date and will conduct additional research on SRS migrant workers and their lifestyles from 1955-1992. A delivery person scenario has the same assumptions as the urban/suburban family, but spends eight hours per week onsite. The workgroup selected Barnwell, South Carolina as the scenario location and has identified a factory worker who made routine deliveries to SRS and spent eight hours per week on site.

The outdoors person would have lived in camps at the nearest downwind location that was appropriate for the season, *i.e.*, hunting or fishing. Consumption values will be the same as those for the rural family. Persons would always have been outdoors; spent eight hours per day on the Savannah River in the summer; spent eight hours per day onsite during hunting or fishing season; and obtained food from nearby grocery stores. The workgroup selected Jackson, South Carolina as the scenario location and recommended that the individual who obtained food from nearby grocery stores be replaced with the "poacher". This individual would have legally or illegally obtained fish, deer, game birds, turtles and other meats from hunting and fishing onsite.

In addition to specific recommendations for each scenario, the workgroup also made general observations about the overall process. First, chemical source terms and scenarios should be evaluated with the same level of rigor in terms of health effects in offsite populations. The dose reconstruction scenarios are only radiological. Second, synergistic effects of radiological and chemical scenarios should be considered. Third, modifications suggested by the workgroup to better represent onsite workers should be considered. Fourth, limitations of computer models that may impact the scenarios should be clearly stated. For example, the rural family scenario would need to be evaluated if the model has no soil resuspension capacity.

The workgroup noted that it could provide further assistance to CDC after the radiological dose scenarios are completed. These activities would include developing and reviewing chemical scenarios; reviewing and ranking dominant radionuclides by risk; and reviewing screening analysis results in terms of community presentation. However, the workgroup acknowledged the need to first participate in a tutorial of the risk-ranking process.

**Discussion.** Ms. Elizabeth Donnelly of NCEH joined the meeting by conference call and reminded SRSHER that the default values for the scenarios are based on the International Atomic Energy Agency (IAEA) model. However, she indicated that SRSHER is welcome to select another data source. Ms. Kato raised the possibility of including a gestating female working onsite in one of the scenarios. Mr. Lockridge confirmed that this suggestion and additional scenarios proposed by SRSHER will be included in the workgroup's report to CDC. Two members expressed support for the workgroup's modifications to the scenarios. Ms. Guess noted that some onsite workers lived near the plant with their families and may have transported exposures home.

Dr. Hinton pointed out that data from the Savannah River Ecology Laboratory show resuspension as important pathways for both ingestion and inhalation. He confirmed that he would provide this information to the workgroup. He inquired whether the final scenarios would be reviewed by outside experts before being piloted. Dr. Robert Whitcomb of NCEH remarked that the scenarios will undergo CDC's usual peer review process for dose reconstruction research. After the scenarios are completed, CDC anticipates that the radionuclide-screening phase will be completed in one year. Ms. Perry offered to identify points of contact who can assist the workgroup in gathering historical data. She raised the possibility of assigning values to combine scenarios. For example, a delivery person could also be an outdoors person.

Dr. Markiewicz offered to provide existing data that may be of use to the workgroup. An expert review panel held multiple meetings to discuss pathways, limitations, risk ranking and other key elements of the Oak Ridge dose reconstruction project. The majority of the technical presentations were videotaped. For chemical screening and risk ranking, ATSDR developed a one-page flowchart outlining the screening process for past and present exposures. Ms. Todorov confirmed that after data from the exposure scenarios are incorporated into risk models, NCEH will explain the risk ranking process to the

workgroup. Since age, race/ethnicity and other factors can cause heavy-metal effects to vary among individuals, Mr. Graves raised the possibility of including a minority, child and adult in each scenario.

Dr. Whitcomb pointed out that a child and adult are represented in each scenario, but race/ethnicity will play a more important role after the screening process has been completed. The default consumption values incorporated into each scenario will attempt to maximize potential outcomes and rank health effects for radionuclides released at SRS in order of importance. The risk-based screening criteria proposed by CDC will be shared with SRSHEs. Dr. Whitcomb clarified that doses will not be generated during the screening process.

Ms. Donnelly added that attempts are not being made to determine dose in this phase of the project because the screening calculations are extremely conservative. For example, an assumption is made for each scenario that the wind blows 25% of the time toward the scenario site. Dr. Hinton disagreed with this approach since screening level calculations require dose to be estimated before risk. SRSHEs commended the workgroup because the comprehensive presentation reflects an extensive amount of time and energy devoted to enhancing the scenarios.

**Public Comment Period.** The Chair opened the floor for public comments; no attendees responded. Dr. Bustos recessed the meeting for lunch from 12:45-1:45 p.m.

**Status Report by the Epidemiologic Data Workgroup.** Dr. Warren Umansky, the Workgroup Chair, explained that the members are charged with exploring sources of potential outcome data and reviewing relevant studies on the effects of radionuclide releases to humans and the environment at or around SRS. To fulfill its charge, the workgroup first defined several terms:

- "Epidemiology" is the study of specific health effects or diseases and their distribution in a population as well as a determination of potential causes of observed health effects.
- A "dose reconstruction" project is research and analysis of historical data regarding contaminant releases from a facility and an estimation of doses or amounts of contaminants received by an exposed population.
- An "epidemiologic study" is an investigation to identify the types and frequencies of specific diseases in a population.
- A "risk assessment" is a project that analyzes contamination sources, assesses toxicity or potential effects on humans, estimates potential exposures in a population, and may predict the types and frequencies of diseases to be expected from such exposures.
- "Morbidity" is an adverse health condition, while "mortality" is death from these conditions.

The workgroup also noted barriers that must be considered to conduct an epidemiologic analysis: locating all potentially exposed persons; designing a study with a sufficient number of cases to analyze using statistical techniques; estimating toxic exposures for all persons in a study; and controlling for potential confounders.

The workgroup then reached agreement on sources that would be used to identify studies and also noted limitations with these data. For cancer morbidity, the Surveillance, Epidemiology and End Results database maintains information on cancer incidence and survival rates for approximately 14% of the U.S. population. Metropolitan Atlanta and ten rural Georgia counties were included in the database in 1975 and 1978, respectively, but no South Carolina counties have been added to date. The National Program of Cancer Registries collects data on cancer occurrences, including incidence, type, body site location, stage of disease at diagnosis, treatment, and outcome. Both Georgia and South Carolina are grantees of the CDC enhancement program.

The Savannah River Regional Health Information System is a cancer registry of 22 counties near the SRS in both Georgia and South Carolina. The registry is no longer in operation, but data collected from 1991-1995 can be accessed on the web site. The primary limitation with cancer morbidity data is time gaps. Most SRS releases occurred in 1950-1960, but exposed persons typically have a ten-year latency period before health effects are seen. Ideally, cancer registries should maintain data from the 1970s to capture populations exposed during this time, but most databases begin at a much later date.

For birth defects morbidity, the CDC National Center on Birth Defects and Developmental Disabilities supports surveillance systems in Atlanta and South Carolina by helping states to overcome barriers in monitoring these health outcomes. The Greenwood Genetics Center in South Carolina maintains nine years of data on neural tube defects and is currently collecting other birth defects data from multiple sources. Additional information on low birth weight and other adverse birth outcomes can be obtained from state health departments. In particular, the web-based South Carolina database is extremely detailed and provides information on prematurity rates, gestational age and demographics of the mother and infant, *i.e.*, age, race/ethnicity and socioeconomic status. The primary limitation with birth defects morbidity registries is the lack of studies specific to SRS. Similar to cancer morbidity databases, however, birth defects registries also contain gaps between time of exposure and adverse health effects.

For other health outcome sources, the state of Georgia maintains data on asthma, hospital discharges, heart disease, stroke, mastectomies, lymph node dissections and other conditions. The South Carolina Department of Health collects information on chronic diseases, cardiovascular disease, diabetes and other conditions. The CDC National Center for Chronic Disease Prevention and Promotion maintains health risk prevalence data for the United States as a whole and for individual states. Georgia and South Carolina both collect developmental morbidity data for the respective states that



describe special and remedial educational placements, standardized test scores, and report cards for school-aged children in each county.

The CDC National Center for Health Statistics collects death rates from state health departments that are submitted as annual vital statistics reports. The web sites for all data sources were listed in the handout. After the workgroup defined terms, noted challenges and identified sources for the epidemiologic studies, searches were conducted to locate data that would be relevant to SRS. The studies were grouped into three categories; Dr. Umansky summarized the data as follows:

For SRS workers, the first study examined approximately 10,000 white male workers from 1952-1986. The data showed less all-cancer mortality among SRS workers than the general U.S. population and slightly elevated leukemia rates related to radiation dose levels. The investigators noted the “healthy worker effect” in this study because SRS employees as a whole were found to be healthier than the general U.S. population. The second study examined multiple myeloma rates among workers hired from 1979-1990 at SRS and three other nuclear facilities. The cases were disproportionately black males hired before 1948. Although SRS was not in operation in 1948, the study population included workers who were involved in the construction of the plant.

The data showed that age played a significant role in exposure to tritium, plutonium and whole-body-penetrating ionizing radiation. The investigators suggested that the higher incidence of cancer among older workers who were exposed for longer periods of time may be related to a decrease in immune system function as the body ages. However, the data are difficult to interpret because only nine deaths were reported among SRS workers. As a result, caution must be taken in making definitive conclusions about the relationship between radionuclide exposure and cancer among SRS workers. The third study examined mortality among female nuclear weapons workers. The data found increased risks for all cancers per rem, radiosensitive tumors, breast cancer for all females, blood and lymph cancers for SRS workers, leukemia, and death from mental disorders. The female workers were not compared to a control group.

For populations contiguous to SRS, the first study monitored the prevalence of congenital hypothyroidism for 20 years near SRS and investigated the prevalence of this disease in health districts throughout Georgia from 1979-1998. The data showed no differences in rates of the disease between health districts near SRS and the state overall. The second study examined cancer in populations near nuclear facilities and served as a follow-up to previous research conducted in the United Kingdom that found an excess of leukemia deaths around nuclear facilities in children less than 10 years of age. Since the older data showed no clear increase in other cancer deaths in the same areas, the follow-up study focused on childhood leukemia rates for all ages separately, all cancers combined, and 16 classes of cancer.

The SRS data showed slightly elevated rates of leukemia among persons 20-39 years of age; trachea, bronchus and lung cancer among persons 40-59 years of age; and all

cancers except leukemia and bladder cancer among persons 60 years and older. These rates were compared to data collected before and after SRS operations, but no differences were seen. As a result, the investigators did not indicate a causal relationship between SRS and cancer rates. The third study analyzed cancer data for residents in 20 Georgia and South Carolina counties that are contiguous to SRS. These data were compared to various control areas, such as other counties in the two states and U.S. cancer rate statistics. The data showed significantly increased risks of invasive cervical cancer among black women, esophageal cancer among black men, and lung cancer among white men. Cigarette smoking and other confounding factors were not reported in the study. SRS rates for other cancers were similar to or lower than the control areas. The entire study has been published and can be accessed at <http://www.musc.edu/srrhis>.

The fourth study compared leukemia cases near the vicinity of SRS and another nuclear facility that released tritium in Germany. This investigation was undertaken because a leukemia cluster was detected near the German plant in 1991, but tritium releases at SRS were found to be in excess of those at the German site. Based on previous data, the rates in counties surrounding SRS were lower than expected. The investigators concluded that no relationship exists between the leukemia cluster in Germany and tritium releases. The fifth study examined survey data that suggested blacks consume more wild-caught meat and fish than whites, while whites consume more deer than blacks.

For non-human subjects at and around SRS, the first study reported findings of interviews with sportsmen on consumption advisories, information sources, and fishing behaviors. The results showed that persons with lower incomes and less education eat fish more often; blacks eat more fish than whites; non-SRS employees eat more fish than workers; and women and children in families eat fish as often as males. Since workers tend to be more knowledgeable than residents about adverse health effects from site-related exposures, SRS/HES may want to consider implementing an outreach project to inform communities surrounding SRS about potential harm from consuming too much fish.

The second study examined all radionuclide releases from SRS; the history of each release from the beginning of plant operations to the present; and air, water or other transport mechanisms for the releases. Doses to the most exposed persons 80 kilometers from SRS were estimated as well. The investigators concluded that SRS releases of plutonium, radiocesium and radiostrontium were insignificant in terms of contributing to adverse health effects. However, SRS/HES may want to consider comparing these data to the SRS dose reconstruction project completed by the Risk Assessment Corporation (RAC).

The third study examined cesium-137 elimination in chronically contaminated largemouth bass, biological half-times of SRS bass and other research estimates for acutely and chronically contaminated fish. The data showed that the half-times were

longer at lower temperatures. Elimination from skeletal muscle was not found to be different than elimination from other soft tissues. The fourth study examined the ecological half-lives of cesium-137 from whole fish samples collected from two reservoirs and three streams at SRS from 1972-1996. The data showed that largemouth bass had the highest concentrations, while sunfish had the lowest. Levels were found to decline after 1970. An increase in one pond after 1990 was most likely due to draining and refilling. This activity caused a resuspension of cesium that was buried in the sediment.

The fifth study examined radiocesium in white-tailed deer on SRS because cesium-137 deposited in soils and sediments are absorbed by plants and eventually eaten by these animals. Hunters participating in shoots on SRS property are potentially at risk for adverse health effects, but investigators concluded that the probability of contracting fatal cancer from consumption of SRS deer is no higher than other human activities. The sixth study examined technetium-99, iodine-129 and tritium in SRS waters. These radionuclides can concentrate in the thyroid or GI tract of humans and mammals; releases into seepage basins occurred from 1954-1988. Water beneath seepage basins migrates with the flow of groundwater into Four Mile Branch and eventually into the Savannah River. The data showed elevated levels in Four Mile Branch, but concentrations were well below regulatory guidelines after the three radionuclides mixed with the Savannah River. However, sampling errors in the study have been noted.

The seventh study examined radiocesium in Pond B and found that 99% of cesium-137 was retained in pond sediment, but only a minimal amount traveled from the pond to the Savannah River. The eighth study examined differences between offsite tritium oxide levels in air estimated with three computer models and actual measured concentrations in 13 locations from 1985-1994. The predictions were higher than the actual measured values, but data from the two sources were generally consistent. A follow-up paper focused on a prediction model that included ingestion pathways from contaminated foodstuff since traditional models of radionuclide releases address inhalation, ground shine, and plume shine pathways. The data also estimated tritium vegetation contamination.

The ninth study examined a three-variable model to estimate atmospheric tritium doses at SRS and compare full versus reduced prediction models. An accurate reduced prediction model was developed using wind direction frequency, downwind distance, and physical stack height. The tenth study examined differences between agricultural data from county statistics and satellite photographs to predict foodstuff production in the SRS area. The satellite images were determined to be the better of the two data sources because county statistics under-reported agricultural foodstuff production within the vicinity of SRS. Data showed that the majority of locally raised foodstuff was distributed regionally and not retained for local consumption.

Dr. Umansky clarified that the workgroup is aware of other relevant data for SRS, but copies or abstracts of these studies could not be obtained in time for the meeting. He

hoped the data would assist the Scenario Workgroup in fulfilling its charge and help CDC in determining whether an epidemiologic study or risk assessment needs to be conducted. He asked SRS/HES to provide guidance in defining the future direction of the workgroup.

**Discussion.** Mr. Waters questioned whether the workgroup discussed public perception of epidemiologic data, particularly worker studies. For example, citizens are often skeptical about reports of onsite SRS workers being healthier than the general population. Ms. Todorov replied that the studies are consistent with findings of workers being healthier than average persons in the population. Active workers tend to have a lower incidence of cancer, heart disease and other health outcomes. Mr. Graves inquired about the rationale for not examining black workers prior to 1979 in the myeloma study. He noted that black workers were hired at SRS as early as 1950. Dr. Umansky indicated that race-specific data may not have been collected before this date. The workgroup was unable to locate these types of studies, but Ms. Todorov planned to follow up with NIOSH.

Ms. Kato was unclear about the basis of comparison for the increased risk of mortality found among female nuclear weapons workers. She acknowledged that no control group was used. Dr. Umansky recalled that the increased risk was based on population estimates, but he planned to reexamine the study for confirmation. Mr. Lockridge pointed out that 1979-1998 was the period for the congenital hypothyroidism prevalence study, but significant releases of iodine occurred prior to this date. No differences were found between rates of the disease in SRS and Georgia overall, but this conclusion should be viewed with caution, since the pre-1979 time period was not reflected in the study.

Mr. Wills was unclear about the purpose of the eating-habit surveys among populations contiguous to SRS. Dr. Umansky clarified that these data are significant because local meat and fish may be contaminated by radionuclides or chemicals released from SRS. As a result, consumers of wild-caught game could have an increased risk of adverse health effects than persons who purchase meat and fish from grocery stores. Suggestions were made for the workgroup to consider additional sources of epidemiologic data. Dr. Crawford conveyed that deep-frying methods to cook fish were determined to be a larger source of carcinogens than radionuclides in the fish-eating habit survey. Although tritium is the major radionuclide released from SRS and a wealth of tritium data has been collected, this information was excluded from studies the workgroup presented on historical SRS radionuclide releases. Dr. Crawford committed to providing these references.

Dr. McClain noted that, first, Dr. Alice Stewart completed a series of studies around federal facilities. Some of these data focus on childhood leukemia cases. Second, Physicians for Social Responsibility collect information on adverse health effects related to nuclear facilities. The database may contain a bibliography of studies that would be relevant to SRS. Dr. Umansky explained that the workgroup narrowly focused its

searches on site-specific data, but future literature reviews can be broadened at the request of SRSHEs. He requested that the sources suggested by Drs. Crawford and McClain be provided to the workgroup for consideration during the next literature review. Ms. Perry remarked that efforts are underway to develop a comprehensive cancer registry for Georgia that will eventually contain cancer data for every year in every county. The registry has not been completed, but data that have already been entered can be accessed on the Georgia Division of Public Health web site.

Ms. Kato acknowledged that not all agencies and physicians report morbidity data. She questioned whether standards have been developed or an oversight body has been formed to establish policies for consistently collecting this information. She also requested details about stakeholders for this information. Ms. Todorov explained that cancer and infectious disease reporting is required throughout the country, but the collection of surveillance data for other adverse health conditions is not mandatory. Consequently, policies or an oversight body would not be necessary to monitor non-required reporting. Mr. Riley inquired whether the NIOSH studies distinguished between operations and construction workers. Since the duties of these two groups differed, he pointed out that exposures and potential adverse health effects would vary as well.

Dr. Umansky confirmed that he would review the NIOSH data to more clearly define the worker populations. To avoid duplicating existing efforts, Mr. Renard emphasized that SRSHEs previously made a recommendation for NIOSH to clearly define worker populations in terms of duties, race/ethnicity and other factors. He pointed out that this effort is underway. Dr. Hinton acknowledged that SRSHEs has primarily focused on RAC data. Research presented by the workgroup and other studies have been virtually ignored. This lack of knowledge places SRSHEs in a precarious position with respect to answering questions from the public about SRS health effects data beyond the RAC dose reconstruction project.

In response to Dr. Umansky's request for guidance in defining the workgroup's future direction, Dr. Hinton raised the possibility of the workgroup educating SRSHEs about other studies in general and summarizing research for the Outreach Workgroup in particular. Ms. Todorov recalled that potential confounding factors for cancer, diabetes and other adverse health outcomes were not reported in several studies. As a result, an additional role of the workgroup could be to assist CDC in identifying these types of variables. If CDC decides to conduct an epidemiologic study in the future, these data could be used to identify lifestyles of SRS residents. SRSHEs commended the workgroup for completing an exhaustive literature review in a short amount of time.

**Status Report by the Community Summary Workgroup.** Dr. Sergio Bustos, the Workgroup Chair, conveyed that the members were charged with simplifying the SRS Phase II Summary. He pointed out that the meeting packets contained both the RAC and workgroup summaries for comparative purposes. The workgroup decreased RAC's full two-page summary of 935 words to less than 1.5 pages with 629 words. The meaning of the document was not changed, but deletions, clarifying words, simpler

terms, and sentence combinations were included to make the summary more user-friendly and understandable to communities. Nevertheless, the workgroup is still open to suggestions from SRSHES to further simplify the document.

Mr. Renard urged SRSHES to thoroughly review the draft summary because consensus must be reached on the final version that will be distributed to communities. He explained that nominees are welcome to provide comments, but only SRSHES members can vote on the document. Dr. Lee noted that NCEH conducted a similar activity by issuing a one-page community summary when the Phase II report was released. To avoid duplicating existing efforts, she suggested that the workgroup review this document on the CDC web site.

***Status Report by the Outreach Workgroup.*** Dr. Mildred McClain, the Workgroup Chair, described the five major topics of discussion during the workgroup's conference call in 2001. First, the workgroup's roles were reinforced. The members will help to disseminate information to the public on SRSHES scheduled meetings and other activities; periodically update the SRSHES brochure; and identify opportunities to distribute information to the general public. Second, several mechanisms to circulate information were identified. SRSHES members are active in their respective communities and states and should serve as the primary source to disseminate brochures, fact sheets or other SRSHES information. Workshops and other organized events should be viewed as opportunities to distribute information on the SRSHES purpose, responsibility and public interaction. Resources can be displayed on tables of meeting materials and included in conference packets for these functions.

The SRSHES brochure or other literature can be incorporated into regular mailings by the CAB. Reading rooms, libraries and depositories in both Georgia and South Carolina should be contacted to ensure that SRSHES materials are always displayed. Community leaders identified in ATSDR's environmental health education needs assessment should be asked to more widely distribute SRSHES literature to constituents and other target audiences. Third, specific tasks were outlined. The workgroup will develop a comprehensive mailing list in Georgia and South Carolina, such as the 3,000 persons on the Environmental Justice database. The existing SRSHES mailing list will be reviewed to eliminate duplications, and key points of contacts will be identified to assist in disseminating materials to the broader public.

The workgroup will update and distribute the revised brochure as soon as possible because the current brochure is outdated in terms of the SRSHES membership and other items. The workgroup will actively recruit communities to attend SRSHES meetings scheduled for 2002 and 2003. Leaders participating in ATSDR's environmental health education needs assessment will be asked to assist in this effort. Fourth, information needs were identified. The budget for the brochure should be provided in terms of revisions, dissemination to stakeholders, and publication in media outlets. SRSHES members who also serve on the CAB should determine the

organization's interest in partnering with the workgroup on outreach activities. These members include Dr. Dawson, Mr. Devitt and Mr. Waters.

Fifth, recommendations were made. Each SRSHEs member should be encouraged to serve as an ambassador by using the "Curtis Graves hands-on" model. For example, social events, business functions and other opportunities should be used to notify the public about SRSHEs, its ongoing activities, community involvement process, and future goals. The SRSHEs brochure should be updated and improved by adding pictures of current members; reflecting the correct number of members; changing the reference to NIOSH if necessary; modifying the cover page to reflect the growth of SRSHEs; using a professional for the design and layout; and decreasing the size of the document.

**Discussion.** Mr. Renard commented on the workgroup's activities. First, NIOSH should be referenced in the updated brochure because SRSHEs is still chartered to provide consensus advice to this agency. Second, NCEH has not set aside dollars specifically for the brochure, but the probability of implementing the recommendations is high. Third, groups must be extremely cautious in sharing mailing lists with names and other personal identifiers due to confidentiality and privacy issues. Fourth, CDC staff members with expertise in layout and design should be considered as a resource before outside professionals are approached. Fifth, SRSHEs should reach consensus on pictures to include in the updated brochure as soon as possible. Indecision about this issue caused a significant delay in publishing the current brochure.

Overall, Mr. Renard was pleased that many of the workgroup's suggestions are economical and can be conducted with existing resources, such as SRSHEs members, the CAB and community events. As another dissemination tool, Ms. Perry raised the possibility of linking non-CDC web sites to the SRSHEs brochure. Ms. Drye inquired whether SRSHEs materials are appropriate for high school seniors since she has access to 1,250 students per day. Dr. McClain replied that young persons have expressed an interest in serving as SRSHEs members and participating in other activities. She agreed that outreach initiatives should be targeted to high school and college students to develop a new pool of community leaders and SRSHEs members for the future. She also urged teachers to incorporate SRSHEs activities into existing curricula.

Mr. Lockridge pointed out that the Aiken Chamber of Commerce and other local organizations would be interested in receiving the brochure. Since civic groups are frequently in need of speakers for meetings, he raised the possibility of the workgroup making a presentation in the future. He questioned whether the current brochure could be distributed while revisions are being made. Mr. Renard asked SRSHEs not to circulate the current brochure because much of the information is outdated or incorrect, such as the membership and telephone number. Dr. Bustos recessed the meeting for a break from 3:55-4:15 p.m.

**Report on the DFO/Chair Meeting.** Dr. Bustos announced that a meeting was convened in May 2001 with all HES DFOs, chairs and senior agency staff members to review the evaluation findings and recommendations. He presented comments SRSHES made on the evaluation report and particularly pointed out areas of disagreement to the attendees. For example, several evaluation findings did not apply to SRSHES; the data were insufficient; some evaluation findings were inconsistent with SRSHES responses; and the sample did not accurately represent SRSHES membership. However, the other HES chairs agreed with the evaluation findings.

The attendees extensively discussed the evaluation recommendation for each HES to establish ground rules to govern its operation. Dr. Bustos announced that he would appoint a workgroup to undertake this task. The SRSHES ground rules would specifically focus on responsibility, inter-communication, and the process to reach consensus. However, he first opened the floor for each member and nominee to provide feedback on this issue. The deliberations are outlined below:

- Continue to allow Roberts Rules of Order and general rules of civility to govern the SRSHES operation, behavior, decision-making, mutual respect, process to reach consensus, and implementation of activities; no other written guidelines are necessary.
- Provide an open forum for SRSHES to speak freely due to the diversity of members.
- Eliminate distractions while meetings are in session, such as extraneous conversations and cellular telephones.
- Adhere to agenda times for presentations, discussion periods, breaks, and lunch recesses; use an internal parliamentarian or facilitator to ensure that meeting schedules are followed.
- Consider expanding meetings from 1.5 days or decreasing the number of presentations to provide ample time for discussions of important issues.
- Clearly define the mission, purpose and expectations of SRSHES in relation to CDC; ensure that agendas are developed to focus on and be consistent with these goals; provide regular refresher courses on these issues for current members.
- Clearly define “consensus” from the agencies’ perspective and outline the process for SRSHES to provide consensus advice.
- Allow SRSHES members with more institutional memory to serve as mentors to new members.
- Make presentations and structure discussions to ensure that new members, guests or other members of the public can understand the material regardless of educational background or level of knowledge about SRSHES, *i.e.*, provide a brief history, define acronyms and distribute background materials.
- Ensure that members provide consistent information when communicating with the public or allow the chair or another member to serve as the voice for SRSHES.



- Reserve afternoons prior to SRSHES meetings for workgroup meetings.

Mr. Renard made some follow-up comments to the deliberations. Of the 17 evaluation recommendations, nine were addressed to the agencies. NCEH will make stronger efforts in the future to define the role of SRSHES and clearly identify areas for which consensus advice is needed on a more frequent basis. NCEH will also attempt to facilitate logistical arrangements for workgroup meetings prior to SRSHES meetings when requested. Overall, Mr. Renard was proud that the members have shown respect to each other and the agencies. In this area, SRSHES serves as a model for all HESs. He was confident that SRSHES would continue to make progress. He asked the nominees to complete the evaluation forms for the orientation session.

Dr. Bustos summarized the deliberations as follows: Roberts Rules of Order will continue to serve as the SRSHES ground rules with no additional written guidelines. However, Roberts Rules of Order will be applied during meetings with more rigor and modified to incorporate suggestions made by the members and nominees. Since the members generally agreed with these key points, Dr. Bustos saw no need to appoint a new workgroup.

**Public Comment Period.** The Chair opened the floor for public comments; no attendees responded.

There being no further discussion, Dr. Bustos recessed the SRSHES meeting at 4:53 p.m. on January 10, 2002.



**ATSDR's Training Program for Health Professionals.** Dr. Bustos reconvened the SRSHES meeting at 8:36 a.m. on January 11, 2002 and yielded the floor to the first presenter. Ms. Theresa NeSmith of ATSDR pointed out a major dilemma between two groups. On the one hand, community residents have become more knowledgeable and aware of environmental health issues. On the other hand, these concerns have not been adequately addressed because only a minimal amount of environmental health training is provided to physicians who do not specialize in occupational or environmental medicine. To address this issue, ATSDR conducts several activities to ensure that both health care providers and community residents are educated in environmental health.

First, ATSDR convenes grand rounds for health care providers at sites where contaminants of concern have been detected. These sessions are held in hospitals to educate physicians about contaminants, potential health effects and questions patients may ask. Second, ATSDR has developed cooperative agreements for partners and 31 states to conduct health-care-provider education activities on a wider basis. Third, ATSDR publishes *Case Studies in Environmental Medicine* that describe contaminants of concern. These documents are available to doctors, nurses and other health care

professionals. Pre- and post-tests are included in the case studies for providers to complete, submit to ATSDR, and obtain continuing medical education credits.

Fourth, ATSDR's *Medical Management Guidelines* provide guidance to hospitals and health-care providers on symptoms, decontamination and other issues that may arise during a chemical exposure to a large population or other hazardous waste emergency. For community health education, Ms. NeSmith introduced Mr. Mike Barry, Ms. Jessica Cafarella and Dr. Sandy Rock of the American College of Preventive Medicine (ACPM). The organization is an ATSDR grantee that is conducting health education on iodine-131. She hoped ACPM could be placed on the next SRSHEs agenda to discuss its activities in more detail. Ms. NeSmith asked other ATSDR partners in attendance to describe ongoing community-based initiatives.

Dr. McClain was pleased to announce that ATSDR incorporated recommendations by Citizens for Environmental Justice into the SRS environmental health education needs assessment. In particular, community leaders who were previously excluded from federal initiatives now serve as partners in the project. ATSDR empowered grassroots organizations by providing a friendly and open forum for local residents to participate in focus groups, attend meetings, provide input, and share community-based expertise.

The Oak Ridge Institute for Science and Education (ORISE) is another ATSDR partner that is conducting community-based health education activities in general and the SRS environmental health education needs assessment in particular. Ms. Linda Hodges of ORISE provided an update on this initiative. In 1999, Phase I of the project was completed by researching the demographics of the target counties, such as major employers and social infrastructure. In 2000, Phase II was completed by locating key contacts at federal, state, and county levels and identifying previous outreach activities. Phase 3 is currently underway. Meetings were held with 20 community leaders from 11 target counties in Aiken, South Carolina and Savannah, Georgia in February and June 2001, respectively. Participants were also trained in conducting community-level focus group meetings.

In July and August 2001, ORISE held 18 focus group meetings in ten target counties with 110 participants to obtain input from communities about SRS in five major areas. Preliminary data show the following results: For "perceptions of SRS", respondents generally lacked knowledge and information about the site. Some noted that discussions in communities about SRS are minimal, while others acknowledged the contribution of SRS to contamination of air, water, soil, fish and wildlife. For "perceived health concerns", respondents primarily focused on respiratory illness and cancer. For "desired information", chemicals, contaminants, human health effects and environmental impacts from releases, spills, generated wastes and other SRS activities were the major areas for which data were requested.

For "credible sources", respondents placed the most amount of trust in medical journal and web-site self-studies as well as personal physicians, nurses, pharmacists, and

other health care providers. For “preferred channels”, respondents were most interested in receiving brochures, fliers, newsletters, and other printed materials in the mail or a public location, *i.e.*, doctor’s office, library or church. Overall, the focus group process resulted in two significant outcomes that will help to strengthen capacity building and networking at the local level. Community leaders actively participated in project planning and recruiting activities, while focus group participants were provided a forum to express views. However, ORISE cautioned that the needs assessment is not a quantitative scientific-based study. The sample may not represent the full target population due to the large number of college-educated black females in the focus groups.

Before and during the focus group meetings, ORISE did not provide explanations, distribute information or clarify comments by the participants, such as distinguishing between contaminants and radionuclides. After the sessions, however, ORISE informed participants about the SRS web site and other information resources. The next steps in the project will be to continue to analyze data and develop a final report. A draft document has been distributed to ATSDR and community leaders for review and comment. Follow-up activities will be conducted to fill gaps in information that communities know versus do not know and want versus need to know. Ms. Hodges conveyed that the American Association of Occupational Health Nurses (AAOHN) is partnering with ORISE in conducting the needs assessment and has asked SRSHEs to provide guidance in contacting health-care providers in the target counties. Telephone solicitations in this effort proved to be an ineffective approach.

**Discussion.** Dr. Crawford mentioned that a South Carolina educational television station broadcast a panel discussion on health perceptions by small-town residents. The program was supported by the Medical University of South Carolina and may serve as a useful data source for ORISE and the Outreach Workgroup. Ms. Still urged ORISE to make strong efforts to recruit persons for the needs assessment who represent the target population. For example, the large number of college-educated participants in the focus groups excludes community members with less education.

Dr. McClain confirmed that Citizens for Environmental Justice translate SRS data into laymen’s terms and present this information in community-based workshops. In response to AAOHN’s request, Ms. Drye committed to contacting the Georgia Nurses Association and American Nurses Association; Dr. Wilson will contact the South Carolina Medical Association and podiatrists in Orangeburg County.

**Status Report by the Proactive Workgroup.** Dr. Hinton explained that the workgroup drafted the outline of the SRSHEs long-range plan under three guiding principles. First, the SRSHEs mission is to provide advice to CDC on the adequacy of health research and public health activities associated with SRS. Second, SRSHEs is accountable to CDC and the general public. Third, time and budget constraints were disregarded. The workgroup then identified roles and responsibilities for SRSHEs major tasks. For the Phase III dose reconstruction, the Scenario Workgroup would take the lead. Guidance

would be provided to CDC on screening-level calculations, scenario descriptions and screening results. Information would be requested on sources and uncertainties of risk factors. Independent reviewers would be recommended for screening results and completed Phase III findings.

For both past and current health-related research, the Epidemiologic Data Workgroup would take the lead. For both tasks, a list of published studies by NCEH, ATSDR, NIOSH, DOE, universities and other groups would be compiled. The Outreach Workgroup would then design fact sheets for the public or other constituents. For previous studies, researchers and other experts would present data to SRSHER for clarification when needed and findings would be summarized. For ongoing research, principal investigators would be asked to provide a current status of studies and SRSHER would provide input to CDC and researchers. For future health-related research, the full SRSHER would make recommendations to CDC about future research needs based on outcomes of the previous tasks.

For continuing education to SRSHER, the Agenda Workgroup would take the lead. Presentations would be made and readings would be assigned. For public education, the Outreach and Phase II Community Summary Workgroups would take the lead. Information about SRSHER would be issued through press releases, the web site and other outreach mechanisms. Proactive relationships would be developed with the CAB and other groups chartered under the Federal Advisory Committee Act (FACA). The full SRSHER would be involved with activities to strengthen its function and improve interaction with the agencies. Appropriate recommendations from the evaluation report would be implemented; milestones would be developed and prioritized; and a time-line would be created for the long-range plan.

Mr. Curtis Graves, the Workgroup Chair, asked SRSHER to submit comments on the initial outline to Ms. James as soon as possible. Efforts will be made to revise the document based on this input and present the first draft at the next meeting. After CDC approves the final version, the document will serve as the SRSHER plan for the next four to five years. Although the workgroup described the initial outline as an extremely rough draft, Mr. Renard was impressed with the level of detail and thought in developing the document. He advised the workgroup to include previous dose reconstruction activities rather than focus solely on Phase III.

In response to Mr. Lockridge, he confirmed that the draft is consistent with the FACA charter and CDC's perspective of SRSHER roles and responsibilities. Mr. Lockridge was pleased this effort was undertaken because the long-range plan will provide SRSHER with a clear direction and purpose. Dr. Bustos suggested that a time line and the process for SRSHER to reach consensus be included in the next version of the document. Dr. McClain clarified that the workgroup, SRSHER Chair and DFO will need to jointly prioritize the items and develop a time line.

**Update on the SRS Former Production Worker Health Project.** Dr. David Adcock, of the University of South Carolina School of Medicine, reported on the progress of this initiative. He mentioned that a notice is initially distributed to SRS former production workers to explain the program and provide an opportunity to participate. Other workers are referred by the Building and Trades screening program or learn about the project through newspaper and television announcements. Building and Trades focuses on construction workers, but Social Security numbers and other unique identifiers have never been compared to those in the production-worker project. As a result, the two programs may contain some of the same participants. Any individual who is a former but not current SRS employee is eligible for the production-worker health project; enrollment has not been denied to any interested worker to date.

Several tasks were completed during the initial phase of the program: site records were evaluated; contacts were made; major health hazards were identified; the capacity to contact a large group of former workers was demonstrated; and the number of former workers who would have adverse health effects from exposures were estimated. The project was originally designed to scientifically evaluate current health status and determine a relationship between adverse health effects and work-related exposure. Since that time, however, the study has radically changed and now focuses on creating data to allow participants to submit compensation claims. This shift has caused fewer resources to be allocated to assessing and comparing the SRS worker data with other populations.

The list of all SRS former workers is still incomplete, but 2,084 of the 25,580 former workers who have been located to date are deceased. This finding resulted in a decision to focus on retirees. From the perspective of time and resources, this group is more accessible and can be more easily located. From the perspective of the study methodology, retirees have the longest latency period post-exposure and would probably present more health effects than any other group of former workers. However, former workers other than retirees are enrolled in the project as well. Examination data show that the population is 95% male with a mean age of 70 years and 32 mean years of employment. The most significant hazards were predicted to be noise, chlorinated solvents, asbestos, hydrogen sulfide, hydrazine, external ionizing radiation, and beryllium. Testing is performed at two Georgia and two South Carolina sites.

Self-reported exposures by the examined population varied from the predictions to some degree, but the major difference related to ionizing radiation; 67% of the population reported this hazard. However, self-reported data are associated with major uncertainties. The rigid protocol that was developed for beryllium screening has been a source of debate among investigators due to the large number of false positives, but the standardized consensus test is being used in all DOE former-worker health projects. Of 453 workers tested for this exposure, seven had two positive beryllium lymphocyte proliferation tests. Of those, four were clinically evaluated and three are undecided about undergoing a follow-up examination.

Of the seven workers with two positive tests, one had a chest x-ray that showed diffuse pleural thickening and one self-reported beryllium exposure. However, none of the clinical evaluations showed chronic beryllium disease. Overall, adverse health effects from beryllium exposure among former SRS production workers are not expected to a significant degree, but the selection process for testing will continue based on best estimates of credible exposure. Factors that will be considered in the selection process include location, job title and self-reported data. Pulmonary function test results among 400 workers showed 189 to be normal and 156 to have either restricted or obstructed breathing. The abnormal findings are most likely due to the majority of the study population being fairly old and overweight. A control group was not used, but results are based on a normal population estimate for age and body size.

Of the chest radiographs completed for 697 workers, 74 had pleural abnormalities, 50 had parenchymal abnormalities and 39 had both. Although results were higher than expected, completed topographic examinations indicate that the majority of pleural abnormalities among former SRS production workers are not related to asbestos. Each test is evaluated by two certified B readers and a non-certified radiologist, but differences in interpretation frequently occur. Similar to the pulmonary function test, audiograms also depend on full participation and compliance by the subject to yield the most accurate results. Of 540 audiograms, 402 workers showed material hearing impairment. For non-occupational health problems, chest x-rays revealed cardiovascular disease in 44% of SRS former production workers.

According to 457 self-reports on medical forms, 41% of former workers have arthritis, 81% regularly take either aspirin or heart disease medication, and 9% currently smoke. However, this figure represents a dramatic decrease from the 64% of workers who "ever smoked". Overall, SRS former production workers enrolled in the health project clearly exhibit hearing loss and respiratory problems related to employment at the site. The most common non-occupational health effects are overweight conditions, cardiovascular disease and musculoskeletal problems. Dr. Adcock reported that the clinical evaluation component of the study is currently underway and an additional year of the study is expected to begin in August 2003. He encouraged SRSHER to access <http://www.srsformerworkers.org> because data on the web site are updated every two weeks.

**Discussion.** Mr. Lockridge pointed out that the SRS project does not focus on mercury, but this exposure is included in former worker health projects at other DOE sites. Dr. Adcock explained that mercury was not identified as a major hazard at SRS during phase 1 of the study and has not been reported by former SRS production workers to a significant degree. Ms. Guess was appalled that DOE is responsible for worker exposure and is also funding the project. She emphasized the need for testing to be conducted by an outside group.

Mr. Graves followed up on this comment and raised the possibility of chest radiograph results being independently evaluated since interpretations among readers differ. Dr.

Adcock explained that very few laboratories have expertise to test samples for heavy-metal exposure. Ms. Kato did not agree that retirees would present more adverse impacts than other worker groups due to employee loyalty, the healthy worker effect, quality of life, long employment history, and genetic predisposition.

Dr. Whitcomb asked for clarification on whether or not study participants were enlisted upon "calling in", *i.e.*, self-enlisting, and whether or not these participants were also included in the study analyses currently seen. He noted that persons who call in may have different characteristics than those called by researchers since "call-ins" may be sick. Dr. Adcock confirmed that this observation was accurate. Dr. Bustos recessed the meeting for a break from 10:30-10:45 a.m.

***SRSHEs Open Discussion.*** Dr. Bustos opened the floor for deliberations on any unfinished or unclear agenda items. He returned to the workgroup status reports and recalled that the Scenario Workgroup expressed uncertainty about its role in collaborating with CDC to design a risk-based exposure ranking and identify future activities needed. Agreement was reached for the workgroup to undertake these activities and also provide input to the Proactive Workgroup on the SRSHEs long-range plan. As the Membership Workgroup Chair, Mr. Waters applauded the diligence of the members in selecting the nominees. He urged CDC to make every effort to officially appoint the nominees as soon as possible because their contributions will be extremely valuable to SRSHEs.

Dr. McClain reported that no members expressed opposition to the Outreach Workgroup's recommendations on the brochure. She confirmed that the document would be revised based on these suggestions and others submitted by the members. The updated brochure will be presented to SRSHEs for review and comment. The remainder of the deliberations focused on the direction of the Epidemiologic Data Workgroup. Dr. Umansky reiterated his previous question about additional information that may benefit CDC in determining whether an epidemiologic study will be feasible after the scenarios have been completed.

Ms. Guess followed up on this comment and questioned whether data on the large SRS minority population should be reviewed. Ms. Todorov replied that CDC needs the workgroup's assistance in collecting more available health data and information on demographics, characteristics, lifestyles and other confounding factors of SRS populations. She responded to Ms. Guess that the workgroup's data collection efforts will cover the racial distribution in SRS. This type of information will be particularly important if CDC decides to conduct an epidemiologic study in the future. Ms. Todorov planned on having a discussion with NCEH staff to clarify other tasks for the workgroup and deadlines for these activities. To avoid duplicating existing efforts, Mr. Renard reported that demographics on the SRS region have already been collected by NCEH and ATSDR.

To examine potential adverse health effects on a broader scale, Ms. Kato raised the possibility of the workgroup reviewing epidemiologic data from other sites that have the same 12 radionuclides and 22 toxic chemicals of potential importance as SRS. Dr. Lee advised the workgroup to maintain the dosimetry studies Dr. Umansky cited during his presentation for use in future phases of the dose reconstruction project. Mr. Lockridge pointed out that a summary of the research findings would be extremely helpful for the Scenario Workgroup to identify common themes, characterize data gaps, and provide more focused recommendations to CDC. Ms. Todorov and Dr. Umansky confirmed that this effort will be undertaken and a report will be developed for the Scenario Workgroup.

***New SRSHEs Business.*** The action and agenda items raised during the meeting were reviewed by SRSHEs. For the consensus recommendations, motions were entertained by the Chair, properly moved and seconded by voting members, and unanimously approved by SRSHEs with no opposition. The items are outlined below:

#### Action Items

- The DFO to distribute a legible copy of ATSDR's slide illustrating kidney function.
- The Epidemiologic Data Workgroup to follow up on suggestions for additional data sources, *i.e.*, studies by Dr. Alice Stewart and the Physicians for Social Responsibility database.
- The DFO to identify and provide an update to SRSHEs on the governing body responsible for determining morbidity data reporting requirements.
- SRSHEs to review its current brochure and submit comments to Dr. McClain, the Outreach Workgroup Chair.
- SRSHEs to review and vote on the Phase II summary revised by the Community Summary Workgroup.
- The DFO to obtain a list of the IAEA default values from Ms. Donnelly or Dr. Whitcomb for distribution to SRSHEs members and nominees.
- The DFO to locate and distribute SRS demographics collected by NCEH and ATSDR.
- The Agenda Workgroup to identify agenda items that were previously recommended and report outstanding issues to SRSHEs.
- Mr. Banick to serve on the Agenda Workgroup; Mr. Devitt to serve on the Epidemiologic Data Workgroup; Mr. Sanders to serve on the Membership Workgroup.

#### Agenda Items

- Presentation on SRSHEs workgroups in terms of mission, purpose, organization, operation, coordination, expectations and end-product.
- Presentation by Mr. Gary Lawhead of the Energy Employees Compensation Resource Center.



- Update by Dr. Whitcomb on screening calculations, IAEA recommendations and dosimetry.
- Status report on the NIOSH worker-exposure study.
- Progress reports by the SRSHERS workgroups.
- Update on ATSDR activities, *i.e.*, heavy-metal toxicity studies and American College of Preventive Medicine initiatives.

### Consensus Recommendations

- SRSHERS recommends that NIOSH undertake studies examining effects from exposure to radionuclide and chemical releases from SRS among female and black workers from the beginning of plant operations to the present.
- SRSHERS recommends that NCEH examine female and black offsite populations as distinct groups rather than with the general population during the dose reconstruction project.

**Public Comment Period.** The Chair opened the floor for public comments; no attendees responded.

**Closing Session.** The next SRSHERS meeting is tentatively scheduled for the first week in June 2002 in Augusta, Georgia; the second or third week in June 2002 was selected as alternate dates. A one-day tour of SRS will be held the day before the meeting. The following meeting is tentatively scheduled for the second week in September 2002 in Savannah, Georgia.

There being no further discussion, Dr. Bustos adjourned the SRSHERS meeting at 11:30 a.m. on January 11, 2002.

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I hereby certify that to the best of my knowledge, the foregoing minutes of the proceedings are accurate and complete.

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Sergio E. Bustos, D.D.S., Ph.D.  
SRSHERS Chair