



DEPARTMENT OF THE AIR FORCE  
ARMSTRONG LABORATORY (AFMC)  
WRIGHT-PATTERSON AIR FORCE BASE, OHIO

MEMORANDUM FOR AL/CD  
AL/AOE  
IN TURN

AIR1.941130.048c

FROM: AL/CF

SUBJECT: Human Radiation Research Reveiw - ACTION MEMORANDUM

1. Dr Welch AL/CC on 14 Jan (and later Col Merritt AFMOA/SGPT on 26 Jan) directed a study be conducted to determine what human research involving radiation exposure was preformed by AL or predecessor units. This direction was focused by Col Jones AL/CV in a phone conversation with Lt Col Morton AL/CF to look for exposures involving injection, swallowing or inhalation of the radiation source. Despite this additional focus information on exposures to external radiation was also included. This is a report of the extensive search done from 14-31 January 1994 to determine if Armstrong Laboratory, Crew Factors Directorate (AL/CF) or any of the predecessor organizations including the Harry G. Armstrong Aerospace Medical Research Laboratory, The Air Force Aerospace Medical Research Laboratory, and The 6570th Aerospace Medical Research Laboratory (all collectively referred to in this paper by AL/CF), conducted human research using radioactive substances. The report is presented in two parts: First the findings and then a somewhat detailed outline of the search. The latter is presented to afford the reviewer the data on which a determination, as to the adequacy of the effort, can be made.

2. The search revealed the following conclusions:

a. There were four isotope licenses issued to the 6570th Aerospace Medical Research Laboratory in 1968 in what is now the Combined Stress Branch (AL/CFBS). Licenses for the isotopes (Xenon-133, Iodine-125, and Chromium-51) were issued to the 6570th AMRL for use in what appears to be one or at most two studies (Attachment 1). The Xenon license issued in June 1968 and again in March 1972 both have as the stated use, "to study the effects of gravitational stress in... 40 subjects." The other two licenses issued at the same date, October 1968, for Iodine and Chromium were for, "the determination of blood and plasma volumes in 20 individuals during exercise and heat exposure, in 10 individuals during application of negative pressure to the lower body, and in 20 individuals in a space flight environment." No technical report or publication has been found reporting the results of this work; however, both John Fraizer, and past division director Dr. Henning von Gierke remember a Capt Anthony R. Dowell, USAF MC and Capt Spencer Shropshire, Jr., USAF, MC working on a device to use the Xenon-133 gas to measure pulmonary gas exchange. They both thought that the device was never perfected enough to be used in a study. Publications authored by Dr. Dowell from the time period in question were

reviewed and contain no mention of the use of any isotopes (Attachment 7). He does cite British references to this kind of work, some of which was contracted for by AMRL and conducted in England (attachment 3). It is also reassuring that in Dr. Dowell's paper on Ventilation and Pulmonary Gas Exchange During Headward (+Gx) Gradient Acceleration from the same year, he states that informed consent was obtained from all subjects involved. This was at least two years after the Human Use Review Committee was established in the lab. There is no specific information on the use of the other isotopes I-125 and Cr-51, but it is likely these would have been used by the same investigators if they were used at all. A search of the DTIC and branch files did not turn up any references to this work nor has it turned up in a Med-Line search of the open literature done by AL/AOE. The use of I-125 and Cr-51 for the stated purposes was a well established technique, and when used as described these substances are well within established safety standards for human exposure.

b. The lab generated several technical reports using some of the data generated by some of the now well-known tests using groups of military personnel exposed to nuclear weapon effects in Nevada. The lab did not conduct these tests but did analyze some of these data in several different technical areas and produced several different technical reports (Attachment 2). Also included is a memo by Mr. Brinkley from notes on a discussion with Mr. Charles Dempsey who began his work with our lab from circa 1950 and had knowledge of these activities (Attachment 4).

c. Although the breath of the search by direction from Dr. Jones AL/CV was to exclude x-rays, several studies of this nature turned up during the various searches. Most were contracted efforts performed at other institutions and at Holloman AFB and used no greater exposure than standard medical imaging x-rays. These exposures consisted of standard x-ray films or low-level cineradiographs. Several articles were obtained and are included (Attachment 5).

d. Despite the extensive search, a negative is difficult to prove; however, no other information was obtained indicating that the lab caused exposures beyond what has been discussed above. Additionally, where data from separate sources overlaps, it is in agreement.

3. The scope of the search as noted in paragraph 1 was established by AL/CC. The details of accomplishing this were provided by Col Jones and Col Wright, AL/CV and AL/AOE respectively. Col Jones focused the search to collect only isotopes injected, swallowed or inhaled. Any information discovered on exposure to x-rays could also be collected and submitted as appropriate. He also identified Col Wright, AL/AO, 240-2604, as the POC for the AL who would help with some parts of the search. Col Wright AL/AOE identified the project officers Maj Susan Mitchel and Maj Liu who are working the effort in AL/AOE. He stated that they would handle the entire search for work done by units at Brooks AFB as well as provide some support

for the parts of our directorate at Wright-Patterson AFB. Also reviewed were the points of his "talking paper" on the approach to the search. Based on the talking paper, the search has included a number of people, reviews of several technical publication databases in the lab, talking to several past directors of the various divisions (covering back to the 40's and 50's), talking to a number of "old hands" in the lab, and Human Use Research Committee Documents. The following items were identified as potentially useful search targets:

- a. Medline search - To be conducted by AL/AOE
- b. DTIC search
- c. Talk to old hands
- d. HURC notes
- e. NRC and AEC isotope license records - From AFMOA/SG
- f. Review any relevant books
- g. Review any bibliographies

#### 4. Actions on listed search targets:

a. Medline search: This is being conducted by AL/AOE. As of this report no articles relating to radiation research done by AL/CF have been identified.

b. DTIC Search: The Wright Laboratory Technical Library maintains our report products in a computer data base going back to 1953 with some stuff from the 40's included. Dan Self, one of the professional reference librarians, conducted an extensive DTIC search. Broad search parameters consisting of any reference to "isotopes", "radiation", "radioactive" plus any of the "Armstrong Lab or predecessor organizations" plus "Human" were used. He also opened up the search to drop out "Human" on the specific isotopes of Xenon, Iodine and Chromium and included this additional material that was found. About 100 pages of identified records were generated. No work done by AL/CF was identified that indicated exposure of humans to isotopes. The only relevant citation was a contracted effort conducted in England at Guy's Hospital using Xenon133 to measure cerebral blood flow. As noted above, there are some technical manuals produced by AL/CF that include human performance data from the nuclear weapons tests. But the tests were conducted by the Equipment Laboratory.

c. Talk To Old Hands: Also, all three divisional directors were asked if they would talk with the "old hands" that came to mind and past directors who were alive. A starting standard question was provided to the directors (Attachment 6) as well as some suggestions for people to ask about any research involving radiation. The results are attached from Dr Moore's and Dr. Boff's efforts (Attachment 8).

d. HURC Notes: The Declaration of Helsinki was adopted in 1964 for the protection of human subjects. The Human Use Review Committee was established in AL/CF circa 1966 based on AFR 169-8. Since then it has been a requirement in the lab that all research involving human subjects be approved by the HURC. When AMRL became AL/CF, all of the older HURC records were boxed and sent to the Archives in Washington DC. Years of interest, such as 1968 and 1972, will be requested to be returned and reviewed upon receipt. This was not possible within the suspense for this report. It must be remembered that the protocols could be approved, but that the research might not have been carried out. Even with the record, what was actually done might still be unknown.

e. Nuclear Regulatory Commission Isotope License Records: Maj Mitchel AL/AOE Faxed information from Col Merritt AFMOA/ SGPT listing Atomic Energy Commission and the Nuclear Regulatory Commission isotope licenses issued to AL components. This list showed four isotope permits for AMRL 6/68, 10/68, 10/68, 3/72 for Xenon-133, Iodine-125 and Chromium-51 (Attachment 1). These include the organization, date, isotope and use approved. Not listed in the report are amount of isotope and investigator's name.

f. The following bibliographies were reviewed:

(1). The bibliography for the Human Engineering Division (CFH) from 1947 to 1985 was reviewed by hand. Several studies using x-rays and none using isotopes were found. The studies using x-rays were in no case conducted in-house. Most were contracted efforts and were done in various radiology departments and used standard medical x-ray imaging exposures.

(2). Pat Lewandowski, the Directorate manager for technical reports and publications, had conducted an extensive review in 1984 of all the sources she had at that time looking for any radiation exposure to isotopes in response to a Freedom of information Act request. Pat was interviewed at length about the results and scope of the above search. The scope was extensive and included the review of both everything in the DTIC data base as well as all the special and one of a kind books and reports that are not in DTIC. She found no evidence of any research of this type being done. She did not have the isotope licenses information that triggered the only findings as noted above. Again, no actual report or publication for this use has been discovered.

(3). Ms Kathreen Robinette reviewed the Anthropometry Data Base. Several articles using standard x-rays for constructing data bases of bone sizes were discovered (Attachment 5). No work with isotopes was detailed.

(4). Mr. Brinkley recently reviewed the AL/CFB Bibliography of Technical Reports in the impact area going back to circa 1949. He knew of no reference to the use of any isotopes in any experiment.

5. The final conclusion is that there is no evidence that AL/CF exposed human subjects to radiation without proper informed consent and safeguards.



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**Attachments:**

1. Isotope Licenses
2. TR List From Nuclear Tests
3. Isotope Related Articles
4. Mr. Brinkley's MEMORANDUM
5. X-Ray Related Articles
6. Question asked old hands
7. Dr Dowell's Article
8. Dr Boff and Dr Moore's results



Atch 2. List of possible radioactive experiments

(Collected by Chuck Dempsey)

1. TR 55-16, Negherbom, Handbook of toxicology, vol.3. Project 7165 Task 71836, ASTIA AD-216529
2. TR 57-118, Barbieri R., Radiobiology guide, vol.1. Project 6335 Task 63614, ASTIA AD-118082
3. TR 57-118, Kay D., Radiobiology guide, vol.2. Project 7165 Task 71838, ASTIA AD-226672
4. TR 57-142, McGuire, T., Health physics procedures for aeromedical radioisotope lab, Project 7160 Task 71812, ASTIA AD-118113
5. TR 58-352, Dittmer, Handbook of respiration, Project 7158 Task 71801, ASTIA AD-155823.
6. TR 58-154, Ashe WF, Historical survey of artificial atmospheres, Project 6350 Task 63112, ASTIA AD-155901.
7. AMRL TR 64-100, Heim JW, Biological data book, Project 7164 Task 716406.

According to Chuck, there used to be an "Annual bibliography of aeromedical research with abstracts" published by Joan Robinson. He will try and find one from the period of interest.