

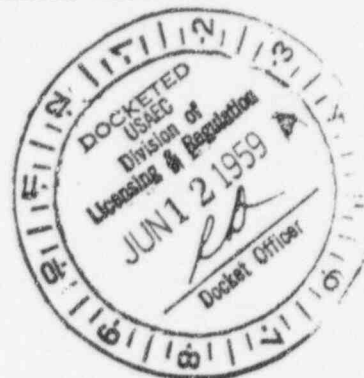
**MALLINCKRODT
NUCLEAR
CORPORATION**

SAINT LOUIS 7, MISSOURI • U.S.A. • CENTRAL 1-8980

PLANT
HEMATITE, MISSOURI

June 5, 1959

Mr. Lyall Johnson,
Chief, Licensing Branch,
Division of Licensing & Regulation,
U. S. Atomic Energy Commission,
Washington 25, D. C.



Dear Mr. Johnson:

The nuclear alarm system referred to in Dr. Leaders' letters to you dated November 28, 1958, and January 22, 1959, has been installed and tested and is now in operation at the Hematite Plant. The nuclear alarm system is tested once a week by applying a radioactive source to one of the radiation detectors in the plant area. Periodic inspections of the detectors are made throughout the week to determine that they are in proper functioning order.

Enclosed you will find a series of instruction sheets which have been given to the personnel of the Hematite Plant. You will notice that the instructions have been sub-divided with one sheet of instructions detailing the emergency procedure to be followed by all personnel on the sounding of the alarm. Detailed instructions for the Emergency Director have not been distributed to all personnel but have been distributed to all persons who might be called upon to perform as Emergency Director. These procedures are presently stored in the evacuation control center, the tiled barn, which is about 500 feet from the nearest processing area.

It is anticipated that routine drills will be conducted in the near future to familiarize the personnel with the procedures to be followed in the event there is a nuclear incident.

If you have any questions concerning this alarm system, please do not hesitate to contact us.

Very truly yours,

MALLINCKRODT NUCLEAR CORPORATION

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Enc.

Information in this record was deleted
in accordance with the Freedom of Information
Act, exemptions 6
FOIA 96-343

E. D. North C/37
E. D. North, Manager,
Hematite Plant

20-36
File by

The two new types of trailers are now in effect.
Attached are some instructions. If you have
any questions, ask your supervisor. If a question arises, he can get the answer.

The trailer will be used to transport itself.

The trailer will be moved by pressing any of the buttons
in the various areas marked "Emergency Stop".

Know your instructions and follow them carefully. It will be too
late to study them after the alarm sounds.

Routine drills will be conducted in the near future.

E. D. North



70-36
File 4



ALARM--

ACTION--

On hearing of alarm, leave building by nearest exit.

Evacuate to safe place, and assemble in safe barn.
Do not delay. Do not re-enter
plant until directed to do so by Emergency Director.

GUARD-- On sounding of alarm, immediately unlock the two
safe gates.

Proceed to safe barn--admit personnel to assembly
area.

If indications of a nuclear incident are observed (blue flash,
tank flashing over, other unusual activity)--leave building
by a path that avoids approach to the center of activity.
Inform Emergency Director of the indication as soon as he or
his representative can be contacted in barn.

If visitors are in the area, see that they are evacuated to barn
with other personnel.

It is of greatest importance that all personnel are evacuated
from the plant. If necessary, personnel will be carried from the
plant. Do not leave anyone behind!

Emergency Director will be person present who is highest on the
following list:

Plant Manager
Acting Plant Manager
Process Engineer, Green Room
Process Engineer, Blue Room
Foreman
Assistant Foreman

The Emergency Director will take full charge until such time as
he is relieved by competent authority. All others will follow
his direction to: (1) protect personnel, (2) protect property.



ALARM--

Initial alarm

ACTION--

Initial alarm. If possible, check alarm and on way out to determine if alarm monitors have been tripped.

See that guard opens main gates for personnel leaving area. Send all personnel to barn.

Post guard at main driveway at highway to prevent anyone entering plant area until "All Clear" has sounded.

Silence alarm, (silencing switch in barn).

Artist on quiet and order.

Determine that all personnel have been evacuated--ask if anybody is missing. All personnel must be removed from plant. If necessary, personnel will be carried out, using proper first aid procedures.

Obtain low level monitoring device (marked LOM) and determine amount of radioactivity in barn area. If reading is above 50 mr/hr, remove personnel to safe location upwind from plant. Do not approach plant. Take monitoring devices along.

Collect all film badges, have the films removed from the metal badge and held for Mr. Miller. Keep separate from badge holder.

It should by now be possible to determine that the alarm was:

A. A true nuclear incident

Indications are high level radioactivity - radioactivity on materials in film badges, knowledge of unusual incident by personnel such as (1) bright, blue flash (2) unusual activity in vessel or tank, etc.

B. A false alarm caused by malfunction in the system.

Signs of a false alarm will be the absence of indications in "A"--no radioactivity in plant or badges and no observed incident in plant.

If it appears that there was a nuclear incident, obtain plan "A" (Nuclear Incident) from assembly point office and put it into effect.

If it appears that there was no nuclear incident, obtain plan "B" (Suspected Malfunction in Nuclear Alarm System) from assembly point office and put it into effect.

70-36
Filey

ST. LOUIS
FBI
Missouri
(Nuclear Incident)
EMERGENCY DIRECTOR



If it appears that a nuclear incident has occurred, call the following persons in order: (Initial)

	Home	Office
T. D. North	[REDACTED]	Hematite 463
L. M. Sauerer	[REDACTED]	242
G. M. Tompkins	[REDACTED]	491
J. W. Miller	[REDACTED]	471
E. M. Holmes	[REDACTED]	

Relate the occurrence to the first person contacted--what happened, radiation detector readings, visual evidence, etc. If the person contacted agrees that an incident has occurred, or if none of the above can be reached, take the following steps:

- (1) Dispatch all personnel to Barnes Hospital, Emergency Entrance on Kingshighway Blvd. Collect all film badges before they leave plant. Ex 6

(Note:-- This procedure will be modified at a later date when Indium foil has been placed in film badges. Then affected personnel only will be sent to Barnes.)

- (2) Notify the following doctors that a nuclear incident has occurred and that _____ persons are on the way to Barnes Hospital, Emergency Entrance:

Dr. H. Haffner	JE-3-9782 (Office), St. Louis, Mo. [REDACTED] (Home), St. Louis, Mo.
Dr. N. P. Knowlton, Jr.	OL-2-4935 (Office), St. Louis, Mo. [REDACTED] (Home), St. Louis, Mo.
Dr. J. B. Shapleigh II	FR-1-3747 (Office), St. Louis, Mo. [REDACTED] (Home), St. Louis, Mo.

- (3) Call for additional manpower by notifying:

George W. Fapp
Bennie Dunn
Louis Schuckebrock
Obie Young



Page Three
Plan 11-1
Nuclear

When the off duty guard is notified to dispatch both mechanics,
one to the open cell and a guard to the plant (report to
Barnes Hospital).

- (4) Notify E. D. North, Waterloo, Ill., 673
R. W. Shearer, St. Louis, Mo., JA-1-1102

Office
Hematite
463

The first person notified will call the WSAEC, Oak Ridge,
Tennessee, 5-6811, extension 7986 or 5-7486 and inform
them of the occurrence. Then see that all persons on the
following list have been notified:

E. D. North
R. W. Shearer
J. W. Miller
F. M. Bellmore

Horn

Office
Hematite
463
491
471

- (5) When the off duty guard arrives, dispatch guard who was on
duty at the time of the occurrence to Barnes Hospital.

When Emergency Director is properly relieved, he will report
to Barnes Hospital.

Ex 6

Miscellaneous Instructions

Do not give information concerning the occurrence to anyone.
If asked for information, state that none is available at
the present time, but that a statement will be made later.



UNITED STATES
ATOMIC ENERGY COMMISSION
DIVISION OF COMPLIANCE
REGION III
799 ROOSEVELT ROAD
GLEN ELLYN, ILLINOIS 60137

C. Buchanan
L. 074:17B
License file

TELEPHONE
(312) 858-2660

December 27, 1971

Gen W. Roy, Chief, Materials and Fuels Facilities Branch
Division of Compliance, Headquarters

MALLINCKRODT CHEMICAL WORKS, MALLINCKRODT/NUCLEAR
ST. LOUIS, MISSOURI - LICENSE NO. 24-04206-01.

Enclosed is an inspection report, for your information, of an announced inspection of the subject byproduct material program conducted on December 6 - 9, 1971.

A total of five items of noncompliance were noted. Three of these items related to the exposure of one individual to an excessive concentration of iodine 131 as evidenced by thyroid gland counting and the failure of the licensee to report this exposure to the Commission and to the individual as required by 10 CFR 20.405.

During routine thyroid counting on the morning of Friday, July 2, 1971, one individual [REDACTED] Ex 6

[REDACTED] showed a thyroid burden of 1.49 x 0.14 microcurie of iodine 131 in the thyroid. Subsequent thyroid counting of this individual on July 6 showed 1.14 x permissible; on July 7, 1971, a thyroid count of 97% was found; and on July 8, 1971, a thyroid count of 90% was found. Subsequent daily thyroid counting showed the thyroid burden to be reduced to 10% by July 28, 1971. [REDACTED] thyroid burden for the seven consecutive days of July 2 through July 8, 1971, was, therefore, an average of approximately 1.24 x 0.14 microcuries. Don Soldan advised during this inspection that Mallinckrodt had interpreted seven consecutive days as taking place in one calendar week rather than any seven consecutive days; therefore, the numerical average, by calendar week, was not excessive and as a result, was not reported as required by 10 CFR 20.405. It was clearly explained to Soldan by E. C. Ashley during this inspection that the thyroid gland does not know of the existence of calendars and the presence of iodine in the thyroid gland in excess of 0.14 microcuries, averaged over any seven consecutive day period, is considered by Region III as excessive thyroid burden, which constitutes noncompliance with 10 CFR 20.103 and is reportable under 10 CFR 20.405(a) and (b).

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The fourth item of noncompliance concerned the failure of the licensee to maintain records of an evaluation of personnel exposure. In this instance, two air samplers in the Quality Control Department showed results of 1.33 and $1.65 \times 9 \times 10^{-9}$ microcuries per ml, respectively, during the week of July 29 to August 5, 1971. Although it was determined by interview with licensee employees in the QC Department and the Health Physics Unit during this inspection that time weighted personnel exposure evaluations were made to show that no one was exposed to excessive concentrations of iodine 131, no records of these evaluations were available for inspection, contrary to 10 CFR 20.401(b).

The fifth item of noncompliance concerned the failure of the licensee to submit reports to the Commission and to individuals who have terminated employment or work assignment, as required by 10 CFR 20.408. The licensee stated during this inspection that a total of 31 persons have terminated employment or work assignment in the licensee's facilities in 1971 up to the date of this inspection, and that failure to submit reports to the Commission or to the individuals was an oversight on their part.

During this inspection, it was noted that the licensee had been steadily reducing the external exposures to individuals. A review of personnel monitoring records showed that during the second and third quarters of 1971, the maximum whole body exposure to any individual has been approximately 2 rem per calendar quarter. Also, with the exception of the one person noted above, thyroid counting data showed that during the period May 1 to December 3, 1971, only two or three persons have exceeded 50% of 0.14 microcuries averaged over any seven consecutive days.

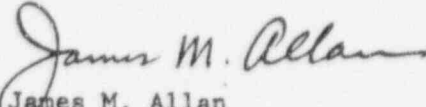
During the Summer of 1971, the licensee made extensive modifications and improvements to their air handling systems which has resulted in significant reductions in air effluents. These modifications also included the construction of one inch thick lead walls around the filter bank housings which serve the hot cell and have resulted in a significant reduction in radiation levels at the boundary of the licensee's facilities.

Gen W. Roy

- 3 -

December 27, 1971

The noted items of noncompliance will be reviewed during our next inspection scheduled for May 1972.


James M. Allan
Senior Radiation Specialist

Enclosure:

Rpt No. 71-02 (orig. & 2 cys)

cc: A. Giambusso, CO
L. Kornblith, CO
R. H. Engelken, CO

U. S. ATOMIC ENERGY COMMISSION
DIVISION OF COMPLIANCE

REGION III

INSPECTION REPORT

CO Report No. 71-02

Subject: Mallinckrodt Chemical Works
Mallinckrodt/Nuclear
Box 10172, Lambert Field
St. Louis, Missouri 63145

License No. 24-04206-01
Priority: I
Category: B

Type of Licensee: Radiopharmaceutical Manufacturer and Distributor

Type of Inspection: Announced Reinspection

Dates of Inspection: December 6 - 9, 1971

Dates of Previous Inspection: May 10 - 14, 1971

Principal Inspector: *James M. Allan*
E. C. Ashley *for*

12-27-71
(Date)

Accompanying Inspectors: None

Other Accompanying Personnel: None

Reviewed By: *James M. Allan*
James M. Allan, Senior Radiation Specialist

12-27-71
(Date)

Proprietary Information: None

SECTION I

Enforcement Action

- A. 10 CFR 20.103(a) - Exposure of personnel to excessive concentrations of iodine 131. (Paragraph 5)
- B. 10 CFR 20.401(b) - Failure to maintain records of an evaluation of personnel exposure. (Paragraph 7)
- C. 10 CFR 20.405(a) - Failure to submit a report to the Commission concerning the personnel exposure noted above in Item A. (Paragraph 6)
- D. 10 CFR 20.405(b) - Failure to submit a report in writing to the exposed individual as noted above in Item A. (Paragraph 6)
- E. 10 CFR 20.408 - Failure to submit reports to the Commission and to individuals who have terminated employment or work assignment as required. (Paragraph 8)

Licensee Action on Previously Identified Enforcement Matters

The last previous reinspection was conducted on May 10 - 14, 1971. The licensee was cited for four items of noncompliance in a letter from the Division of Compliance, Headquarters, dated July 28, 1971. The licensee responded to this letter in a letter dated August 13, 1971. During this inspection conducted on December 6 - 9, 1971, each of the previously noted items of noncompliance were reviewed as to licensee action. These items and corrective actions are noted below:

- A. 10 CFR 20.105(b)(2) - Excessive radiation levels during January and February 1971 on an unrestricted roof of a building across from the licensee's facilities.

This item was corrected by the licensee moving his waste handling area prior to the inspection of May 1971 and the modification of the air handling system on the roof of the licensee's Building 100, including shielding, following the May 1971 inspection.

- B. 10 CFR 20.201(b) - No stack sampling was performed of the Building 300 Dispensing Lab laboratory exhaust during January 11, 1971, to May 11, 1971.

It was noted during this inspection that stack sampling at that location began on May 11, 1971, and stated in the licensee's August 13, 1971 letter.

- C. 10 CFR 20.201(b) - No inplant air sampling was performed in Building 300 dispensing laboratory during January 11, 1971, to May 10, 1971.

The licensee's August 13, 1971 letter advises that air sampling was begun at that location on January 11, 1971, using portable air samplers, and later added to the in-house air sampling system. Records reviewed during the inspection of December 6 - 9, 1971, showed that temporary portable air samplers were used in the Dispensing Laboratory of Building 300 on January 11 and 12, 1971. Also, permanent air sample stations were begun there on January 20, 1971.

- D. 10 CFR 20.201(b) - The licensee performed inadequate evaluation of high TLD results, re Item A above.

The licensee's August 13, 1971 letter advised that the TLD results were received from the supplier too late for them to act on this matter. It is noted that this problem resulted from the licensee's dismantling and moving of their waste handling area and the necessity to make the filter change during the period in question due to a Mo-99 processing problem which caused a high radiation level at the absolute filter on the roof of Building 100.

Unresolved Items: None

Status of Previously Reported Unresolved Items: None reported.

Unusual Occurrences: None

Persons Contacted

The following Mallinckrodt/Nuclear personnel were contacted during the inspection:

Norman E. Drissell, Director of Operations
Donald W. Soldan, Supervisor, Radiological Protection Department
(Health Physics) and Chairman of the Isotope Committee
Ralph Nuelle, Group Leader, Health Physics
Warren Fadling, Group Leader, Health Physics
Robert Wester, Technician, Health Physics
Robert Ament, Special Warehouseman (Building 300 Shipping Area)
Mrs. Diane M. DuVall, Technician, Quality Control Department
Robert Granger, Jr., Technician, Production Department

Management Discussion

The following subjects were specifically discussed with Messrs. Drissell and Soldan on December 9, 1971:

A thyroid burden of greater than 0.14 microcuries of iodine 131 averaged over seven consecutive days to one individual and failure to report this to the Commission and to the individual. It was noted that they interpreted seven consecutive days as taking place in one calendar week rather than any seven consecutive days, therefore, the numerical average by calendar week was not considered excessive and as a result was not reported. (Paragraphs 5 and 6)

Failure to maintain records of results of an evaluation of personnel exposure. It was stated that normally, records of these evaluations are maintained, but somehow this was overlooked this time. (Paragraph 7)

Failure to submit reports to the Commission or to terminated individuals as required. It was stated that this was an oversight on their part. (Paragraph 8)

SECTION II

Additional Subjects Inspected, Not Identified in Section I, Where No Deficiencies or Unresolved Items Were Found

1. Employee Personnel Exposures

- a. Whole body and extremity film badge results, second and third quarters 1971.
- b. Urine samples and thyroid counting results, May 1 to December 3, 1971.

2. Air and Water Effluents

- a. Stack and sanitary sewer discharges, May 6 to December 2, 1971.
- b. Rooftop sampling results, May 6 to December 2, 1971.

3. Inplant and Shipment Surveys

- a. Contamination survey results, 1971 through November 23, 1971.
- b. Radiation level survey results, 1971 through November 17, 1971.
- c. Air sampling results, 1971 through December 2, 1971.
- d. Receiving and shipping packages survey results, 1971 to December 1, 1971.

4. Review of Unrestricted Area Surveys

- a. Unrestricted area survey results, May 1 to December 1, 1971.

Details of Subjects Discussed in Section I

5. Overexposure to Concentrations of Radioactive Material

Routine thyroid counting on the morning of July 2, 1971, one individual showed a thyroid burden of 1.49×0.14 microcurie of iodine 131 in the thyroid. Subsequent thyroid counting of this individual on July 6 showed 1.14 times permissible, on July 7, 1971, a thyroid count of

97% was found and on July 8, a thyroid count of 90% was found. Subsequent daily thyroid counting showed the thyroid burden of this person to be reduced to 10% by July 28, 1971. The thyroid burden of this individual for the seven consecutive day period July 2 through July 8, 1971, was, therefore, an average of approximately 1.24×0.14 microcurie.

This individual was interviewed alone on December 7, 1971, regarding this July 1971 occurrence. It was said that no work was performed before the routine 8 a.m. thyroid counting on July 2. The individual was performing a triolein and oleic acid iodine 131 on July 1, 1971, in a glove box. The individual remembers using hot tap water from a nearby sink to get hot water to be placed in the glove box for part of this prep work. The individual thinks the sink must have been contaminated with iodine 131 when the hot water splashed causing contamination to the face and head. This individual stated that upon leaving the laboratory area, no contamination was detected on feet, hands, or general body area according to this person. On the morning of July 2, 1971, after the high thyroid count, head decontamination was accomplished.

This individual stated that instructions have been issued to prohibit the use of hot water in this method and also that any sink to be used in the laboratory area must have a prior survey.

The individual's statement generally agrees with information gathered from Health Physics personnel.

The exposure of the above referenced individual to excessive concentrations of iodine 131, as evidenced by thyroid gland counting, constitutes noncompliance with 10 CFR 20.103(a).

6. Reports of Personnel Exposures

The licensee had not, up to the date of this inspection, reported the overexposure of the person, noted above in Paragraph 5, to the Commission or to the individual which constitutes noncompliance with 10 CFR 20.103(a) and (b).

The licensee did not consider the individual's high thyroid count as a reportable overexposure because they considered "averaged over seven consecutive days" as meaning seven consecutive calendar days (Monday through Sunday). It was clearly explained to the licensee that the thyroid does not know of the existence of calendars and that the

presence of iodine in the thyroid gland in excess of 0.14 microcurie, averaged over any seven consecutive days, is considered by the Commission as an excessive thyroid burden and is reportable under 10 CFR 20.405 pursuant to 10 CFR 20.103(a).

7. Records of Personnel Exposure Evaluations

During the week of July 29 through August 5, 1971, two air samplers in the Quality Control Department showed results of 1.33 and 1.65 $\times 9 \times 10^{-9}$ microcuries per ml, respectively. Although it was determined during this inspection that personnel exposure evaluations were made to show that no one was exposed to excessive concentrations of iodine 131, no records of these evaluations were available for inspection which constitutes noncompliance with 10 CFR 20.401(b).

8. Reports of Personnel Exposure on Termination of Employment or Work

During this inspection, the licensee advised that a total of 31 persons have terminated employment or work assignment in the licensee's facilities during the year 1971 up to the date of this inspection, but required reports have not been submitted to the Commission or to the individuals which constitutes noncompliance with 10 CFR 20.408.