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Date December 7, 1945

Subject RADIOISOTOPE PRODUCTION FACILITIES AT CLINTON LABORATORIES

To Memo

From Waldo E. Cohn

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CL-MIC-4

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From: W. E. Cohn

In re: RADIOISOTOPE PRODUCTION FACILITIES AT CLINTON LABORATORIES

Reference is made to memoranda of August 18, 1945, CL-MIC-1 and 2. The first of these outlines uses of radioisotopes and the reactions by which they may be produced; the second summarizes the production experience, principally within Section C-IV, and the capacity of present facilities.

In view of the current discussion relative to production of radioisotopes for general distribution, it is necessary to take stock of C-IV facilities and personnel, which at present constitute the radioisotope production unit at Clinton Laboratories.* This is the subject of this memorandum. Other memoranda relating to the release and control of radioisotopes and the possibilities of other locations being brought into production will appear shortly.

Present Status of C-IV (15 Men)

Section C-IV is concerned with the development of methods and apparatus for the preparation of radioisotopes in forms suitable for direct use. The major item of interest has, of course, been the fission products, particularly the major fission products, and it is in this field that the methods and apparatus have been perfected to the greatest degree. The unit in 706-C is capable of the separation of curie amounts of Zr, Cb, Y, Pr, Ce, Cs, Sr, and Ba, and experimental evidence obtained by ourselves and by others indicates that it can also separate with a fair degree of precision such rare earth isotopes as Nd, 61, and Eu. The apparatus is being operated by the men who designed it and who are developing the apparatus for greater precision; this operation is experimental in nature. Further development of the apparatus is taking place which may result in the replacement of part or all of this unit. The commitment of any part of this apparatus to production will deprive us of the space and ability to develop separation apparatus. If production commitments are contemplated it will be necessary to construct new apparatus in another location for this purpose.

*Ba, C^{14} and service irradiations excepted.

J. Mart
ORO-CC

With regard to radioisotopes produced in the pile by neutron irradiation, few methods are available for the preparation of the active material in as purified a form as is possible with the major fission products. This is largely due to the absence of suitable working space and the continuing necessity for fission product work. This is to say that, while many radioisotopes can be actually produced in the pile, few of these can be separated from the parent substance in carrier-free form and for none of these separations has there been a suitable development of a routine production method.* At present, it does not appear that any large scale advance along these lines will be possible until space and facilities are created. A production set-up in this field will require still further construction.

In planning the release of radioisotopes it is necessary, because of the above facts, to realize the substantial difference between routine production and developmental production. In the course of our development work radioisotopes are produced and purified resulting in usable material but without commitment. In routine production a commitment is made and is an integral part of the production mechanism. With the exception of Ra and C^{14}, there is no routine production of radioisotopes at Clinton Laboratories nor are there space, facilities or manpower for this. In speaking of purified radioisotopes, we must realize that these are only available as the end-products of a research and development program at the present time.

Production

It should be recognized from the above that the production of radioisotopes on a routine basis will require new facilities, space, and personnel independent of the present facilities, which are too small even for the present developmental program. Space must also be provided for training personnel and for the development of the many new methods needed.

The location chosen for the construction of production facilities will depend upon the source of the active material (Clinton Laboratories or Hanford at present), and the timing of such construction. Since it appears that fission products, H^3, C^{14}, P^{32}, and perhaps Fe are more efficiently produced at Hanford and since the time necessary for construction of facilities for production is the same in either case, Hanford would appear the preferable location. This may be altered by a decision to construct a special high flux unit at Clinton exclusively dedicated to radioisotope production. It is not believed advisable to commit the high flux unit contemplated as the first new experimental unit at Clinton to any routine production.

*C^{14} excepted.

Production of radioisotopes in the present 10$ building at Clinton Laboratories would seem, therefore, to be limited to the interim period up to the time when production facilities are in operation at another pile and further limited to what we may call "developmental production without commitment". In view of the necessity of present personnel devoting a large share of effort to writing (PFR and design of new facilities), production of separated radioisotopes in the immediate future will probably be limited to those fission products for which methods are now available and in operation. Other pile product radioisotopes will probably have to be handled by a system in which the recipient will receive the material without processing and will carry out any separation himself.

Recommendations

(1) Immediate expansion of space and facilities for development work here (706-E) of a temporary nature, and of personnel when the space permits.

(2) Reach a decision as to the location of the first routine production plant for both fission product and other radioisotopes.

(3) Following the latter decision, decide upon a location for a large scale process development group and attendant facilities.

W. E. Cohn

WEC/s