

3. Nuclear Data, Optimum Cyclotron Parameters

Chairmen: I. Trevena (Vancouver) and G. Wolber (Heidelberg)

S.M. Qaim's review, "Nuclear Data Relevant to Cyclotron Produced Short-Lived Medical Radioisotopes" (Radiochimica Acta, 30 147-162, 1982) was provided as a working document at the beginning of the session. The chair presented a condensed version (attached) of the data on pages 154-158. This version included reactions with references not listed in the review. Omitted from the summary were references to products which would be best purchased commercially (it was noted that the commercial route to ^{111}In was absent from Qaim's data).

The chair suggested to the group that we did not want data for its own sake but only if it could be used to help us be more effective in the production of isotopes for medical applications.

There were not strong feelings about the need for any nuclear data but eventually the chair extracted from the group the need for better data on the following reactions:

1. $^{13}\text{C}(p,n)^{13}\text{N}$
2. $^{16}\text{O}(p,pn)^{15}\text{O}$
3. $^{40}\text{Ar}(p,3n)^{38}\text{K}$
4. $^{54}\text{Fe}(d,n)^{55}\text{Co}$
5. $^{79}\text{Br}(p,n)^{79\text{m}}\text{Kr}$
6. $^{120}\text{Te}(p,n)^{120}\text{I}$
7. $^{124}\text{Xe}(p,2n)^{123}\text{Cs} \rightarrow ^{123}\text{Xe} \rightarrow ^{123}\text{I}$
8. $^{124}\text{Xe}(p,pn)^{123}\text{Xe} \rightarrow ^{123}\text{I}$

Data on <3> will be available soon and AECL plan to do measurements on <7> during 1986.

For the purposes of planning the first production runs of an isotope, the use of codes such as ALICE and CASCADE (programme available from GSI, Darmstadt, FRG) was suggested. Cross sections for p,2n reactions are generally well known and in these cases good estimates may be made by considering targets of similar mass.

There was limited discussion on small and big machines. The observation was made that the use of high energy machines (200 - 800 MeV) such as those at LAMPF, Brookhaven and TRIUMF results in costly product available on an irregular frequency. The group suggested that now pure iodine-123 could be made with a compact commercial cyclotron, there was no need for more 70 MeV machines in the future.

There were differences of opinion with regard to an optimum cyclotron for PET.

An 11 MeV machine may be good enough but 16 MeV has more capability. It was suggested that perhaps 25-30 MeV was best for certain locations because of the wider range of products that could be made. However, in this regard a word of caution was interjected - co-operation between users becomes a problem without a dedicated program and in the case of say a 40 MeV machine there would probably be too many user groups.

Y. Jongen made a short presentation on a novel 30 MeV cyclotron. It will be a high current machine with an external ion source and his current estimate of the cost of such a machine is very low.