

January 13, 1958

MR. R. A. SAN SOUJI

Dear Bob,

As you know we have had considerable difficulty counting low level samples during the past year. Since April 1957, when we moved our scintillation well counters from room 330 to 214-216, we have been confronted by a highly variable background counting rate. We realized this was due to the Crocker Radiation Lab cyclotron, but hoped that the intermittent and variable increase in our background counting rate would occur rather infrequently. On the contrary, as the year wore on we realized that we could do low level counting of plasma radioiron samples on the average of only two days a week. This was also true of our low level counting of C^{14} samples in continuous flow counters both on the second and third floors. In order to monitor the background continuously a continuous recorder was attached to an unshielded iron chamber in room 310. It was found that on the average, large variations in background counting rate occurred three out of the five working days during the week as well as on weekends. The background counting rate was found to vary from a base line level of 12 to approximately 100. Average increases during the week would be 25-50. A test beam during the latter part of December of deuterons on a beryllium target increased the counting rate of the ionization chamber from 12 to 96, simultaneously increasing the counting rate of our scintillation well counter (shielded with six inches of lead) from 70 cpm to 220 cpm. With additional shielding of 3 inches of boron and paraffin the background counting rate varied from 63 counts per minute with the beam off to 102 counts per minute with the deuteron beam on. Since our low level plasma radioiron samples average approximately only 15 counts per minute it is obvious that this shielding is completely inadequate. In fact, an intermittent variation of 2-3 counts per minute due to the cyclotron would be the maximum amount tolerable.

While the test beam of the deuteron on beryllium was being run at Crocker, a radiation survey was made of the freshman chemistry laboratory. It was found that the radiation on the second and third floors varied from 2.1 mr per hour to 3.3 mr per hour, thought to be due mostly to slow and fast neutrons. Since the relative biological effectiveness (RBE) for neutrons is 2-3 and approximately 10 for fast neutrons with regard to cataract formation and gonadal sterilization, it is evident that effective radiation could be as much as 33 mr per hour. This represents a health hazard which is not negligible and is being discussed at the present time with Lowry Dobson and Wade Patterson. At the present time Wade Patterson and our group are conducting a continuous monitor of the scintillation well counter to determine the effect upon it of average day-to-day Crocker cyclotron runs while the scintillation well counter is surrounded with boron and paraffin.

This counting problem is extremely urgent because we are averaging 1 patient per week for radioiron studies, each of which necessitates counting 10 to 15 low level plasma radioiron samples in addition to approximately 20 other samples. Fe^{59} has a 46 day half life so that there can be no appreciable delay in counting. In addition, results are often needed urgently to guide immediate therapy in severely ill patients.

Sincerely,

Myron Pollycove, M.D.

MP:gk

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