FROM THE NORWEGIAN RADIUM HOSPITAL, MONTEBELLO, NORWAY.

REDUCTION OF PERSONNEL EXPOSURE IN THE NORWEGIAN RADIUM HOSPITAL 1954—1963

by

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The Norwegian Radium Hospital has more than three hundred beds and treats only malignant disease. Norsk Hydro's Institute for Cancer Research is an associated research centre.

The radiation sources most commonly used during the period 1954—1963 were 10 to 250 kV roentgen units, one betatron with maximum energy of 31 MeV, one 50 curie ^{137}Cs unit, radium for interstitial moulds and gynecologic treatment and radioactive isotopes, mainly ^{131}I and ^{198}Au.

A full-time protection physicist was appointed in 1954, and a film service was started in August of the same year. The radiation exposure to personnel, now presented, refers to the results of the work in health physics.

The energy distribution of the radiation being known, a simple film badge with only one filter is used for differentiating between soft and hard radiation; Ilford PM 1 is used as the monitoring film.

The old French radium moulds for the treatment of carcinoma mammae were still in extensive use at the hospital in 1954. The working conditions in the

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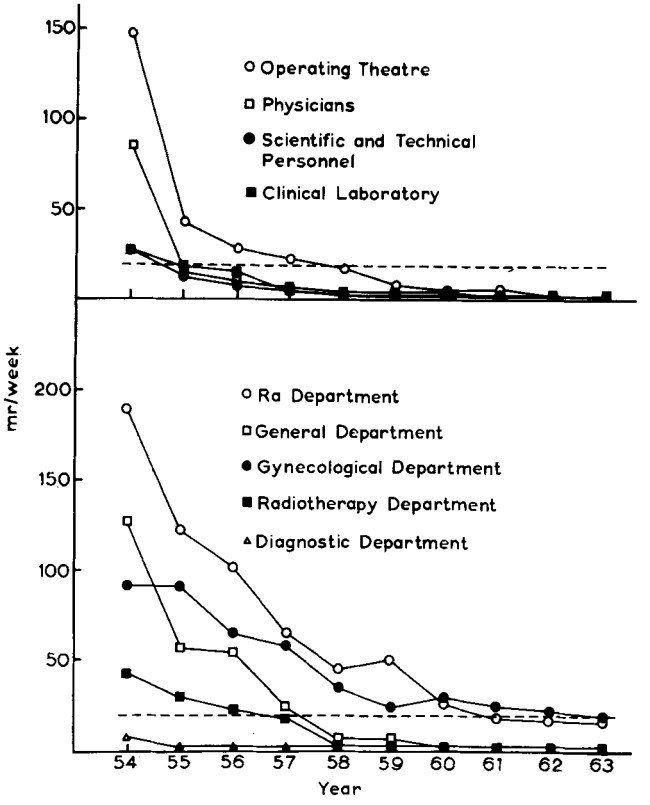

Fig. 1. Average weekly exposure for different groups during the period 1954—1963. The trend is a definite reduction with time, resulting from a better radiation hygiene. The sensitivity of the PM 1 film is rather low for gamma rays, and doses less than 20 mr can hardly be measured. The values under the dotted line (20 mr) could be as high as this, except in the roentgen departments where the limit should be as low as 5 mr.

radium department were the main problem in health physics, as may be recognized from a study of Fig. 1. The average exposure of the staff in 1954 amounted to 190 mr/week, and the nurses received more than 200 mr/week.

The introduction of remote handling of the moulds, and a generally improved technique for the handling of appliances considerably reduced the exposure to the personnel in the radium department already during the first year. The improved radiation hygiene moreover resulted in a significant reduction of exposure to staff in the other departments.

The distribution of the radiation load over the entire staff is shown in Fig. 2, in which the percentages of personnel exposed to certain doses are given.

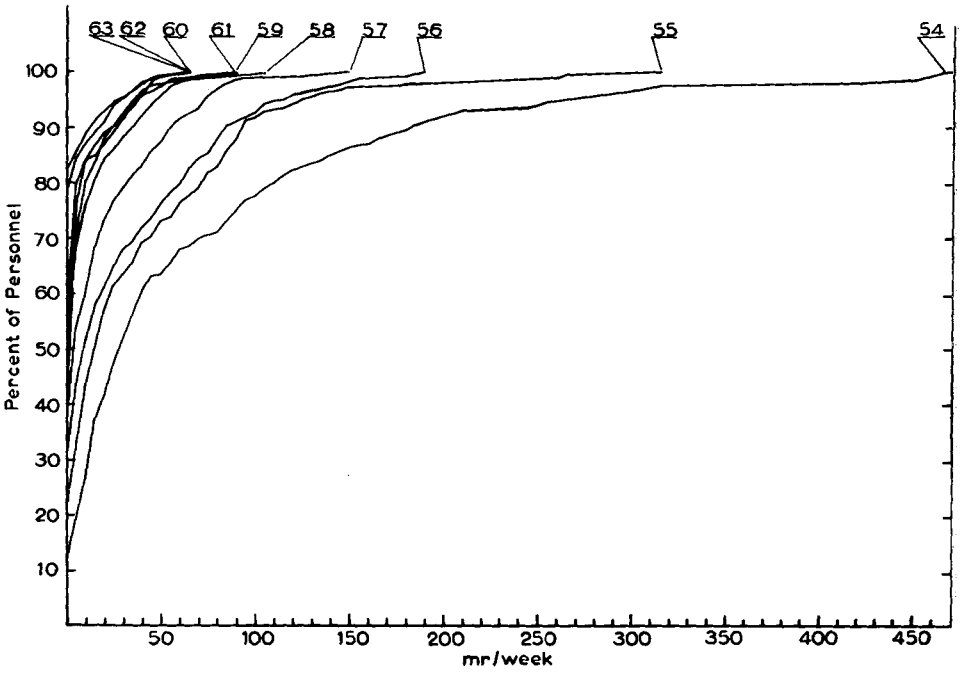

Fig. 2. Percentage of staff exposure for the period 1954—1963. The curves indicate the percentage of personnel exposed to a certain dose or less (cumulative distribution). In 1954, 37 % of the personnel received more than 50 mr/week; in 1963 only 2 % were exposed to more than 50 mr/week.

The amount of radium (mg) used for interstitial moulds and gynecology is evident from Fig. 3. This also reveals that the employment of moulds has decreased with time, and a comparison with Fig. 1 indicates that the reduction of the exposure of the personnel has followed the same trend. The total use of radium was reduced by a factor of approximately 2 during the whole period 1954—1963. The radiation exposure of the heaviest exposed group decreased however by almost one order of magnitude.

The hospital was moved in 1957 to a new building, with more space and better working facilities with consequent further exposure reduction (Fig. 1).

As the use of moulds decreased it meant less work for the radium department. More effective employment of this group was obtained by reorganizing the gynecologic use of radium. This work was formerly carried out in the operating theatre but was transferred to the radium department in 1959. The staff of this department, being most experienced in the handling of radium applicators, would thus be of great help to the gynecologists and it was hoped that its care

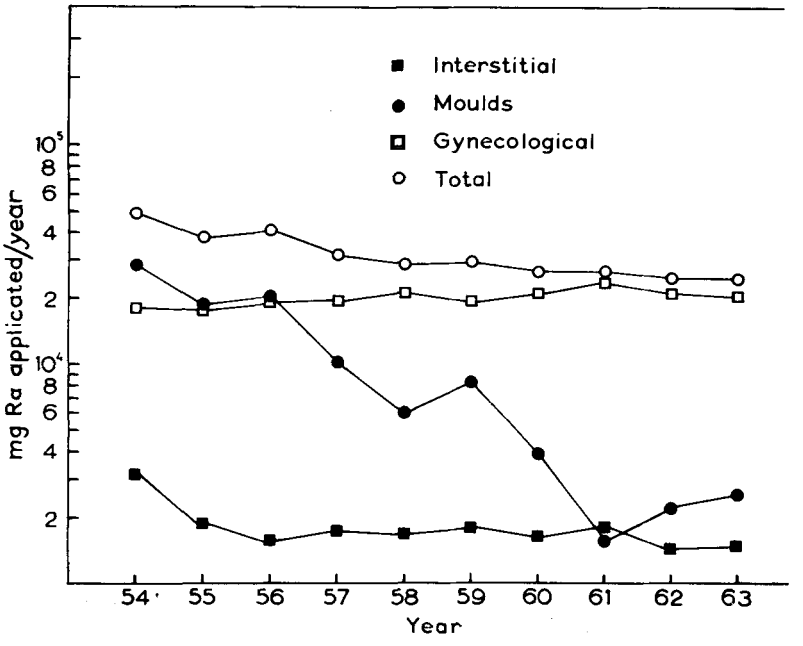

Fig. 3. Radium in milligrams, used yearly for interstitial moulds and gynecologic treatments in the period 1954—1963. The gynecologic use of radium slightly increased while that of radium for moulds decreased during the same period. The total amount of radium employed has decreased by a factor of approximately 2 from 1954 to 1963.

and skill would justify the change. The falling trend of the exposure curve for the staff of the radium department (Fig. 1) indicates that this assumption was correct. It now seems that the exposure doses in the radium and gynecologic departments have reached a level where further reduction would necessitate a radical improvement in the working conditions.

The gynecologic ward patients stay with implanted radium in relatively small rooms for approximately 5 days so that the nursing staff is subjected to quite intense radiation. The planning of hospital wards where radiation therapy is to be administered by sources on or implanted in patients should ensure that the rooms are large enough for the purpose.

SUMMARY

Exposure curves for the personnel at the Norwegian Radium Hospital for the period 1954—1963 are presented. The progressive improvement in radiation hygiene, and the means by which it was attained, are discussed.

ZUSAMMENFASSUNG

Die Expositionskurven für das Personal des Norwegischen Radium Hospitals für die Periode 1954—1963 werden unterbreitet. Der Fortschritt in der Strahlenhygiene und die Massnahmen, die hierzu führten, werden besprochen.

RÉSUMÉ

Les auteurs présentent les courbes d'exposition aux radiations du personnel de l'Hôpital du Radium Norvégien pour la période 1954—1963. Ils étudient les améliorations progressives de la protection contre les radiations et les moyens qui y ont conduit.