Research Communication

A Survey on Radon Levels in Local Dwellings.

Ian Mifsud[1] and Michael Sammut[2]
1. Department of Public Health, 15 Merchants Street, Valletta, Malta.
2. Department of Pathology, University of Malta Medical School, Guardamangia, Malta.

Summary. *This survey extends a previous study in which it was not possible to perform long term measurements. Passive detectors were used to determine annual average radon concentrations. International guidelines and standards on recommended intervention levels for radon are expressed as yearly averages. The survey results are within the safety limits stipulated by the World Health Organisation and expressed as a yearly average.*

Keywords: radon, etched-track detectors, extended monitoring, local dwellings.

Introduction
A pilot survey to determine the magnitude of radon levels in local dwellings was carried out between June 1994 and November 1995. The results of this survey were published in a previous issue of Xjenza (Mifsud et al., 1997). During the survey air sampling was carried out over 24 hour periods by means of portable electronic radon monitor. A second survey was carried out between May 1997 and April 1998 in order to determine yearly average radon concentrations.

Materials and Methods
Passive etched-track detectors were used in this survey (Figure 1). Such detectors are composed of a polyallyldiglycol carbamate detecting element enclosed in a polypropylene holder (Hardcastle et al., 1996). Radon and its decay products are electrically charged when formed so that any electrostatic charges inside the holder will influence the radon concentration inside the detector. Thus the holders and element were treated with a dilute detergent solution during the assembly stage in order to impart an antistatic property to the detector. Radon enters the holder by diffusion. The half-life for entry is 25 minutes which is short compared with radon's decay half-life of 3.82 days. Thus the radon level inside the holder quickly approaches that outside.

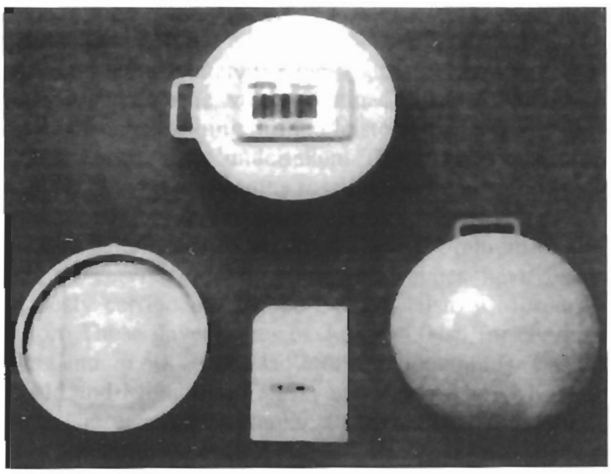

Figure 1. Passive etched-track detectors.

Inclusion Criteria
Participants in this survey were instructed to place the detector in rooms where they spend a considerable time, particularly bedrooms or living rooms, and to use only ground floor locations, where radon gas would be expected to accumulate with respect to higher elevations.
Exclusion Criteria:
Dwellings falling under the following categories were excluded from this survey:
(1) those expected not to be inhabited for an extended period (more than one month),
(2) those expected to undergo structural alteration, and
(3) rooms which were artificially ventilated by means of air conditioners.

Two batches of detectors were distributed to 25 residents in different localities (four localities in Gozo and 21 localities in Malta). Another three detectors were kept as controls during the survey period. The first batch of detectors was exposed between May and October 1997 and the second batch was exposed between November 1997 and April 1998. Three detectors, all from localities in Malta, were lost or damaged at the end of the exposure period. At the end of the survey 21 readings were available corresponding to a 12 month exposure period.

Results and Discussion
The computed geometric mean was 32 Bq m^{-3} with a corresponding geometric standard deviation of 2.0. Figure 2 compares the radon readings for the two batches of detectors. Radon values from the second batch of detectors, which corresponded to the exposure period November to April, were consistently higher than those of the first batch (geomean of 39 Bq m^{-3} compared to 23 Bq m^{-3}) the latter corresponding to the exposure period May to October. The warmer period of the year (May to October) is usually associated with increased room ventilation resulting in the lower radon concentration indoors. During the cooler months room ventilation is often reduced voluntarily in order to minimise heat loss from dwellings. This may contribute to the increase in radon concentration indoors.

The highest level recorded was that in the November/April batch in Kercem, Gozo, with a detected radon level of 117 Bq m^{-3} (corresponding May/October reading 75

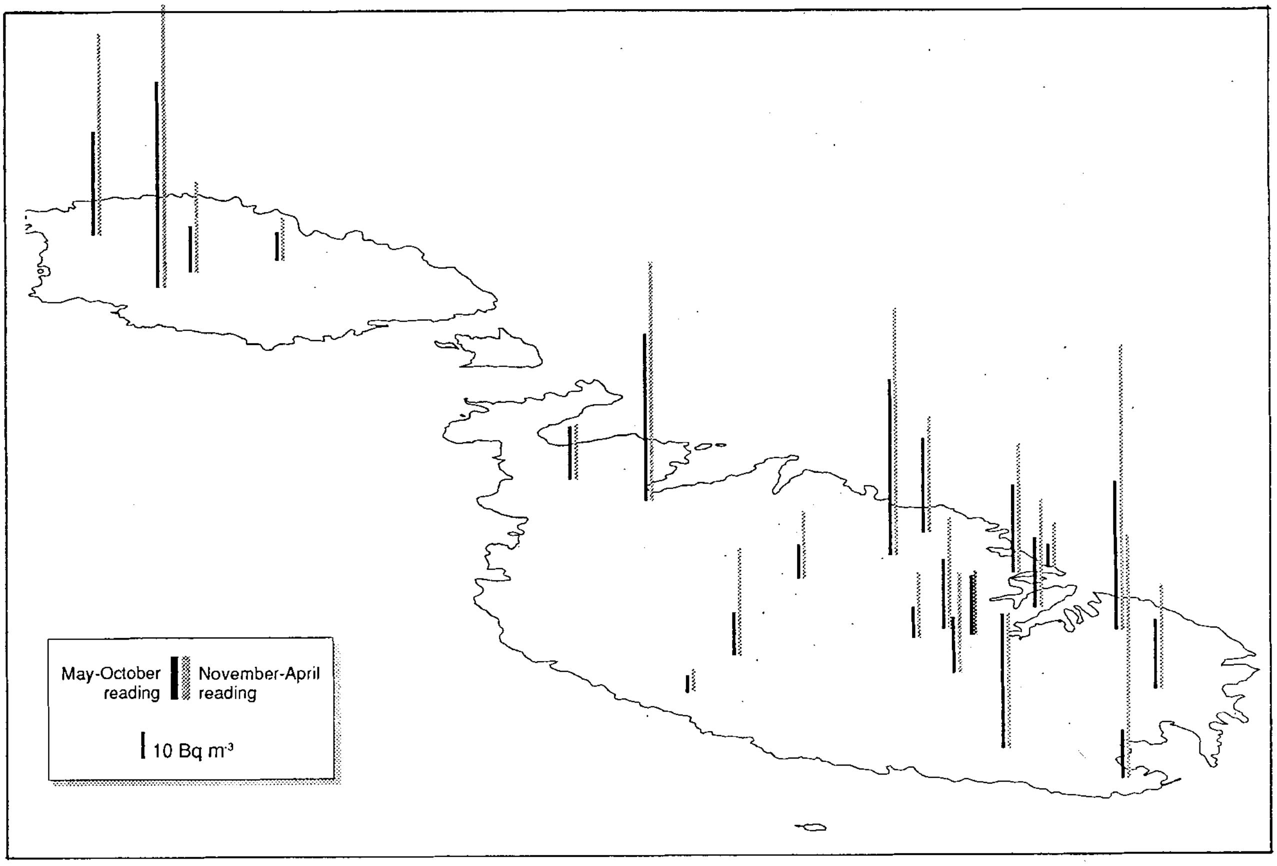

Figure 2. The computed geometric mean.

No. of dwellings sampled	Period and duration of exposure	Type of detector	Arithmetic mean in Bq m^{-3}	Geometric mean in Bq m^{-3}	Geometric Standard deviation
68	1994 - 95 24 hour	electronic radon monitor	55	40	2.3
21	1997 - 98 1 year	passive etch-track detector	40	32	2.0

Table 1

Bq m^{-3}). The lowest value recorded was that in Dingli with 6 Bq m^{-3}) during the May/October period (corresponding November/ April reading 8 Bq m^{-3}).

Conclusions

When compared with the results of the survey carried out in 1994/95 these were lower than that in the original survey (geomean of 32 Bq m^{-3} compared to 40 Bq m^{-3}). This difference may be due to the averaging out effect of long term monitoring which takes into consideration seasonal variations as against 24 hour snapshot readings utilised in the pilot phase of the study.

Acknowledgements

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References

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