

A POTENTIAL CANDIDATE FOR STUDYING LUNG CANCER RELATIVE TO DOMESTIC RADON EXPOSURE

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Anhui Province is in the southeast of China. The southern part of the province is famous for its beautiful scenery and rich traditional Chinese culture. Some counties in this region have one kind of resource called Stone Coal, because of the poor quality it can not be used as fuel. However, Stone Coal is widely applied in lime-making industry for hundreds of years and the cinder left from lime-making was heaped near the factories in the past. From early fifties, however, more and more people began to use the cinder to manufacture carbide brick.

Stone Coal and, therefore, carbide brick contain high values of natural radionuclides, particularly uranium and radium. The average specific activities of ^{238}U , ^{232}Th , ^{226}Ra and ^{40}K are listed in Table 1. The average specific activities of ^{238}U and ^{226}Ra in carbide brick samples are 890 Bq/kg and 905 Bq/kg, respectively. These values are significantly high. For comparison, the ^{226}Ra content, on average, is 36 times higher than that of the world average value.

The gamma exposure rates in carbide brick dwellings were measured with a portable exposure meter and checked with the HpGe-in-situ-spectrometer. It ranged from 34 uR/h to 230 uR/h, 45 uR/h on average. It is about 5 times higher than the world average. The estimated annual average indoor dose equivalent contributed by gamma is about 2 mSv.

The high radium concentration of carbide brick suggests that radon concentrations in carbide brick dwellings are high. If we use UNSCEAR's 1977 model and assume that the indoor air exchange rate is h^{-1} , the radon emanation rate of the building materials is 0,1, and taken 900 Eq/kg as the average specific activity of ^{226}Ra , the estimated radon concentration will be 250 Bq/m^3 .

A pilot investigation of indoor radon has been carried out by using home made environmental radon monitors (with scintillation flask as detector). The results indicate that radon concentration in carbide brick dwellings is significantly high even under "open condition", windows and doors opened, simulating the living habit of the local residents during the period from May to November, the range is from 27– 1240 Bq/m^3 with an average of 80 Bq/m^3 . Under "close condition", windows and doors closed, simulating the living habit in winter and spring, radon

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level would be about 3 times higher than that under the open condition. If we consider both conditions, the annual average radon in carbide brick dwellings would be about 160 Bq/m³.

If the assumption is made that the radon equilibrium factor is 0.5 and that the UNSCEAR's occupancy factor and effective dose equivalent conversion factors, 0.061 and 0.031 mSv (Bq m⁻³)⁻¹a⁻¹ for indoor and outdoor are used ⁽¹⁾, then the absorbed dose to T-B region and P region and effective dose equivalent for carbide brick dwellings in some counties caused by ²²²Rn daughters can be calculated, as given in Table 2. The accumulated T-B area dose equivalent during 20 years in Taiping, on average, would be about 920 mSv, and the estimated lung cancer risk would be 1.8X10⁻³. For comparison the local standardized lung cancer mortality rate is about 6–11/10⁵. Since the history of using Stone Coal can be traced back to 100 years ago, and the manufacture of carbide brick was started 16 years ago, and the region covers several counties, there must be a lot of people having been exposed to high radon plus high gamma exposure. It may be a potential candidate for dose-effect study of low level ionizing radiation.

TABLE 1:
SPECIFIC ACTIVITIES OF NATURAL RADIONUCLIDES
IN CARBIDE BRICK SAMPLES

County	Specific activity (Bq/kg)			
	²³⁸ U	²³² Th	²²⁶ Ra	⁴⁰ K
Xiuning	592 ± 16	12.7 ± 6.3	588 ± 4	394 ± 27
She	618 ± 14	8.7 ± 6.5	582 ± 4	379 ± 22
Taiping	1340 ± 18	9.8 ± 2	1350 ± 4	355 ± 29
Jixi	1050 ± 20	14.4 ± 6.7	1042 ± 4	475 ± 38
Yi	886 ± 20	5.2 ± 2.0	926 ± 4	244 ± 29
Shitai	855 ± 20	24.3 ± 10.1	942 ± 4	791 ± 32

TABLE 2
ESTIMATION OF ANNUAL DOSE CAUSED BY ²²²RN
DAUGHTERS IN CARBIDE BRICK DWELLINGS

Counties	EEC Concentration (Bq m ⁻³)	dose equivalent (mSv)	
		T – B area	P area
Xiuning (A. V.)	45	28	3.6
Taiping (A. V.)	70	44	5.6
(Max.)	620	380	7.6

ZOBODAT - www.zobodat.at

Zoologisch-Botanische Datenbank/Zoological-Botanical Database

Digitale Literatur/Digital Literature

Zeitschrift/Journal: [Berichte der Naturwissenschaftlich-Medizinischen Vereinigung in Salzburg](#)

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