The Investigation of Occupational Exposure on Taiwan (1967–1969)

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In the authors' previous paper, the occupational exposure on Taiwan from 1961 to 1966 was reported. This paper is intended to give the result of the continuation of this investigation and to provide the experience gained during this period from 1967 to 1969.

During 1961 through 1966, our gamma film calibration relied heavily on radium, 60Co, and X-rays with known effective energy. Exposure dosage was measured with a Victoreen Condenser \( r \)-meter. Neutron film calibration was resorted to a 5 Ci Pu–Be neutron source with a 40-cm radius cylindrical shape paraffin as the moderator. As for beta calibration, the equivalent radium exposure density under the badge lead filter was used.

The introduction of thermoluminescent dosimeter (TLD) to Taiwan in early 1967 has shifted our interest toward this new personal dosimeter.

Intercalibration between our film badge and TLD manufactured both by EG&G and Harshaw showed a consistent result for gamma radiation.

Sulfur pellet and gold wire have long been considered to be added to our film badge for emergency monitoring. With an aid of the IAEA standard sulfur pellet and gold foil, we have developed a reliable method to evaluate the accidental exposure by means of these two monitors which can be incorporated with our film badge if necessary. A recently procured vibrating reed meter was also used for gamma film calibration purpose.

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參考文献
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The prolonged periods of high humidities at high temperature which exists on a semi-tropical island as Taiwan rapidly affect the function of our unprotected film badge. The humidity problem is more serious for some badge wearers working in factories installed with radioactive thickness and density gauges. Oil fume is continuously injected into the surface of the rolling aluminum sheet passing through the thickness gauge in the aluminum refining plant for example, and the high temperature steam vapor comes out from the polyethylene vessel where density or level gauge is installed. In both cases the operators who wear film badge are exposed to the high humidity in addition to the humid climate. The film is likely to lose its function completely within a very short period.

To solve the humidity problem we have to encapsulate and to well seal the films with plastic bag. We also keep our unused films in refrigerator that is placed in an air-conditioned room.

Neutron film fading and the effect of gamma radiation on neutron film have also been studied during this period. The gamma radiation does have some effect on neutron film though this effect is tolerable as far as neutron dose measurement is concerned. Thirty-four per cent fading will occur within one week when the neutron film is without plastic encapsulation under 75% humidity condition, while for the plastic encapsulated film, the fading can reduce to 16%.

In case of over-exposure as indicated in our film readings, we usually report to the Chinese Atomic Energy Council (AEC). This procedure of handling over-exposure has been aroused different opinion from the World Health Organization (WHO). The WHO strongly recommends that the reports of film dosimetry should be channeled to the users through the Public Health Administration which should take appropriate action when needed. The AEC should act as the coordinator and set up a Council on Radiation Protection which groups government agencies and institutions concerned as well as professional groups.

Table 1 lists the annual accumulated dose of Taiwan occupational personnel during 1967 through 1969.

### Table 1. Annual accumulated dose of Taiwan occupational personnel

<table>
<thead>
<tr>
<th>Number of accumulated exposures in ranges (mrem)</th>
<th>1967</th>
<th>1968</th>
<th>1969</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undetectable</td>
<td>4881</td>
<td>7581</td>
<td>10575</td>
</tr>
<tr>
<td>~15</td>
<td>401</td>
<td>668</td>
<td>638</td>
</tr>
<tr>
<td>16~50</td>
<td>1649</td>
<td>2539</td>
<td>1612</td>
</tr>
<tr>
<td>51~150</td>
<td>638</td>
<td>883</td>
<td>659</td>
</tr>
<tr>
<td>151~500</td>
<td>106</td>
<td>203</td>
<td>125</td>
</tr>
<tr>
<td>501~1500</td>
<td>10</td>
<td>46</td>
<td>25</td>
</tr>
<tr>
<td>1501~5000</td>
<td>1</td>
<td>12</td>
<td>10</td>
</tr>
<tr>
<td>&gt; 5000</td>
<td>1</td>
<td>8</td>
<td>1</td>
</tr>
</tbody>
</table>

Average Annual Dose (mrem/year) | 82.75 | 65.717 | 388.35 |
Max. Dose (mrem)                | 45,000| 170,000| 13,000 |

### REFERENCES