CHROMIUM - 51
\[^{51}\text{Cr}\]

PHYSICAL DATA

Gamma Energy: 320 keV (9.8% abundance) *
X-ray Energy: 5 keV (22% abundance) *

* [Percent of disintegration resulting in this radiation being emitted]

No Betas Emitted

Specific Gamma Constant: 0.017 mR/hr per mCi at 1.0 meter

Physical Half-Life: 27.8 days
Biological Half Life: 616.0 days
Effective Half-Life: 26.6 days (whole body)

Specific Activity: 92,000 Curies/gram
Specific Activity (microspheres): 63.56 mCi/gram

RADIOLOGICAL DATA

• Critical Organ: Lower large intestine (LLI)
• Routes of Intake: Ingestion, inhalation, skin contact
• External & internal exposure and contamination are radiological concerns.

Committed Dose Equivalent (CDE): 0.15 mrem/uCi (ingested/gonad)
(gonad & lung) 1.41 mrem/uCi (inhalation/lung/Class W)

Committed Dose Equivalent (CDE): 1.20 mrem/uCi (ingested/GI tract/LLI)
0.22 mrem/uCi (inhaled/LLI Wall/Class D)

Committed Effective Dose Equivalent (CEDE): 0.107 mrem/uCi (ingested)
0.211 mrem/uCi (inhalation/Class D)
0.211 mrem/uCi (inhalation/Class W)

Annual Limit on Intake (ALI)*: 20 mCi (inhalation/Class W & Y)
52 mCi (inhalation/Class D/soluble)
40 mCi (ingestion)

*[1.0 ALI = 40 mCi \(^{51}\text{Cr}\) ingested) = 5,000 mrem CEDE (Whole Body)]

SHIELDING

• Use 1/4" - 1/2" lead shielding for \(^{51}\text{Cr}\)

Half - Value Layer (lead): 2.0 mm = 0.07"
Half - Value Layer (concrete): 2.8 cm = 1.10"
Half - Value Layer (Plexiglas): 4.8 cm = 1.90"

Tenth - Value Layer (lead): 5.6 mm = 0.22"
Tenth - Value Layer (concrete): 9.3 cm = 3.66"
Tenth - Value Layer (Plexiglas): 17.2 cm = 6.80"

Maximum range in lead: 7 mm. = 0.5"
Maximum range in Plexiglas: 65 cm. = 22.0"
SURVEY INSTRUMENTATION

- Survey meter equipped with a NaI scintillation probe is recommended.
- Survey meter equipped with a G-M pancake/detector or standardized cylindrical probe is very inefficient for the detection of $^{51}$Cr (very low counting efficiency).
- Smears or wipes counted in a liquid scintillation counter (indirect) is best for the detection of removable $^{51}$Cr surface contamination.

PERSONAL RADIATION MONITORING DOSIMETERS

Whole body & extremity badges required.

REGULATORY COMPLIANCE INFORMATION

- Derived Air Concentration (DAC):
  
<table>
<thead>
<tr>
<th>Derivation</th>
<th>Concentration (uCi/cc)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inhalation</td>
<td>2.0E-5 (Class D)</td>
</tr>
<tr>
<td></td>
<td>1.0E-5 (Class W)</td>
</tr>
<tr>
<td></td>
<td>8.0E-6 (Class Y)</td>
</tr>
</tbody>
</table>

- Airborne Effluent Release Limit*:
  
<table>
<thead>
<tr>
<th>Consequence</th>
<th>Concentration (uCi/cc)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>6.0E-8 (Class D)</td>
</tr>
<tr>
<td></td>
<td>3.0E-8 (Class W &amp; Y)</td>
</tr>
</tbody>
</table>

* Applicable to the assessment & control of dose to the public (10 CFR 20.1302). If this concentration was inhaled continuously for over one year the resulting TEDE would be 50 mrem.

- Urinalysis: Not required; however, may be requested in the event of a spill of $^{51}$Cr.

- Whole Body Bioassay: May be prudent in the event of a suspected intake of $^{51}$Cr through ingestion, inhalation, skin absorption, or a wound.

- Gamma (photon) exposure rates from 1.0 mCi $^{51}$Cr point source:
  
<table>
<thead>
<tr>
<th>Distance</th>
<th>mrad/hr.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0 cm</td>
<td>160.0</td>
</tr>
<tr>
<td>5.0 cm</td>
<td>6.4</td>
</tr>
<tr>
<td>10.0 cm</td>
<td>1.6</td>
</tr>
<tr>
<td>100.0 cm</td>
<td>0.016</td>
</tr>
</tbody>
</table>

- Inherent Volatility (STP): Insignificant/Negligible