

# Armed Forces Radiobiology Research Institute Biodosimetry Worksheet

(Medical Record of Radiation Dose, Contamination, and Acute Radiation Sickness Response)

## Reporting Authority (person(s) creating this page of the report)

Last name: \_\_\_\_\_ First name: \_\_\_\_\_ Country of origin: \_\_\_\_\_  
 Unit: \_\_\_\_\_ Phone: \_\_\_\_\_ Fax: \_\_\_\_\_ Email: \_\_\_\_\_  
 Location: \_\_\_\_\_ Date (yymmdd): \_\_\_\_\_ Time: \_\_\_\_\_

## Casualty

Last name: \_\_\_\_\_ First name: \_\_\_\_\_ Rank: \_\_\_\_\_  
 Country of origin: \_\_\_\_\_ Parent unit: \_\_\_\_\_ Parent unit location: \_\_\_\_\_  
 Parent unit phone: \_\_\_\_\_ Unit e-mail: \_\_\_\_\_ Unit fax: \_\_\_\_\_ Casualty location: \_\_\_\_\_

History of presenting injury (conventional and/or radiation): \_\_\_\_\_

History of previous radiation exposure: \_\_\_\_\_

Past medical history (general): \_\_\_\_\_

Medical countermeasures (e.g., antiemetics, transfusion), specify: \_\_\_\_\_

Administered (where, when, route): \_\_\_\_\_

## Exposure conditions

Date of exposure (yymmdd): \_\_\_\_\_ Exposure location: \_\_\_\_\_ Time of exposure: \_\_\_\_\_  
 Weather conditions (at time of exposure): \_\_\_\_\_

## Exposure results

Describe incident: \_\_\_\_\_

### External exposure overview

Body exposure:  Total  Partial  Uncertain  
 Shielding confounder:  Yes  No

### Contamination overview

External contamination:  Yes  No  
 Internal contamination:  Yes  No  
 Contaminated wound:  Yes  No

If wound(s) are radiation contaminated, please provide details here: \_\_\_\_\_

## Biodosimetric assays overview

	Sampling date, time yymmdd (time)	Estimated time post-exposure (h)	Dose (Gy)	Reference radiation quality and dose rate (Gy/min)
Time onset of vomiting:	_____	_____	_____	_____
Lymphocyte counts or depletion kinetics:	_____	_____	_____	_____
Urine bioassay:	_____	_____	_____	_____
Cytogenetic biodosimetry:	_____	_____	_____	_____
Other:	_____	_____	_____	_____

## ARS response category overview (maximum grading 0-4; see pages 4 through 6 for guidance)

N: \_\_\_\_\_ C: \_\_\_\_\_ G: \_\_\_\_\_ H: \_\_\_\_\_ = RC: \_\_\_\_\_ days after radiation exposure: \_\_\_\_\_

**Contamination: Dose Assessment** (person(s) creating this page of the report)

Last name: \_\_\_\_\_ First name: \_\_\_\_\_ Unit: \_\_\_\_\_

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_ E-mail: \_\_\_\_\_ Country: \_\_\_\_\_

Date dose assessed (yymmdd): \_\_\_\_\_ Time dose assessed: \_\_\_\_\_ Place: \_\_\_\_\_

**Contamination: external/internal**

Substance trademark (if applicable): \_\_\_\_\_ Solid:  Yes  No

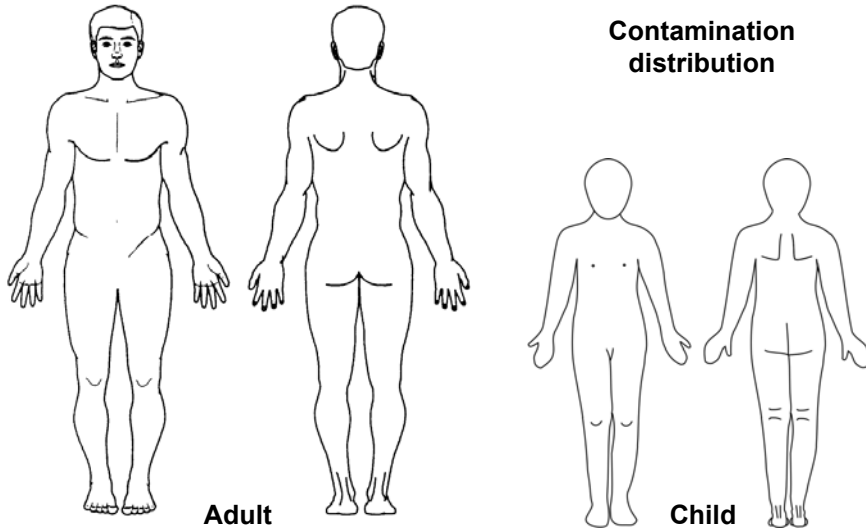
Particulate (P):  Yes  No Gaseous (G):  Yes  No

Liquid (L):  Yes  No Aerosol (L/G):  Yes  No

Radionuclide(s): \_\_\_\_\_ Aerosol (P/G):  Yes  No

Activity (Bq): \_\_\_\_\_ Chemical compound(s): \_\_\_\_\_

Comments:



**Route of intake** (in case of internal contamination)

Inhalation:  Yes  No Ingestion:  Yes  No Other:  Yes  No

Cutaneous:  Yes  No Injection:  Yes  No If yes, specify: \_\_\_\_\_

**Contamination assessment**

Contamination measurement: \_\_\_\_\_ Detection device: \_\_\_\_\_

Counts per minute: \_\_\_\_\_ Estimated activity: \_\_\_\_\_

Decontamination measures: \_\_\_\_\_ Residual contamination: \_\_\_\_\_

Measures taken to prevent uptake: \_\_\_\_\_

Measures taken to increase excretion: \_\_\_\_\_

Measures taken to minimize re-absorption: \_\_\_\_\_

**External Exposure: Dose Assessment** (person(s) creating this page of the report)

Last name: \_\_\_\_\_ First name: \_\_\_\_\_ Unit: \_\_\_\_\_

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_ E-mail: \_\_\_\_\_ Country of origin: \_\_\_\_\_

Date dose assessed (yymmdd): \_\_\_\_\_ Time dose assessed: \_\_\_\_\_ Place: \_\_\_\_\_

**Nature of exposure: radiation source**

Alpha ( $\alpha$ ):  Yes  No      Beta ( $\beta$ ):  Yes  No      Neutron (n):  Yes  No

Gamma ( $\gamma$ ):  Yes  No      X-ray (x):  Yes  No      Mixed (n/ $\gamma$ ):  Yes  No

Dose rate (at distance measured from): \_\_\_\_\_ Distance to source: \_\_\_\_\_

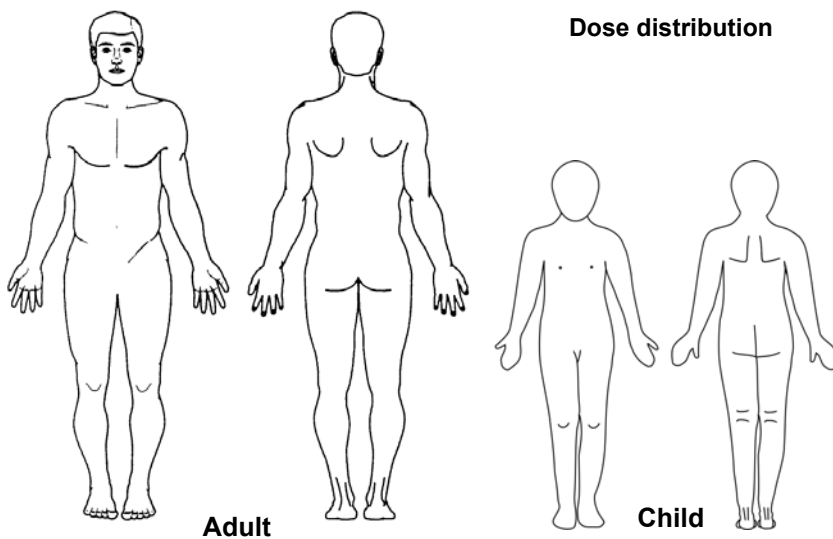
Activity of source (if known): \_\_\_\_\_ Duration of exposure: \_\_\_\_\_

Confounding factors used in dose reconstruction (e.g., shielding):  Yes  No

Type of dosimeter (if applicable): \_\_\_\_\_ Body location of dosimeter: \_\_\_\_\_

Facility where dosimeter was read: \_\_\_\_\_ Dosimeter reading: \_\_\_\_\_

Biological dosimetry type and facility where performed (if applicable): \_\_\_\_\_



Comments:

Blood chemistry analysis	First	Second	Third	Fourth
Data collected (yymmdd):	_____	_____	_____	_____
Time collected:	_____	_____	_____	_____
Data analyzed (yymmdd):	_____	_____	_____	_____
Time analyzed:	_____	_____	_____	_____
Serum amylase (U/L): (reference value: 21-160 U/L)	_____	_____	_____	_____
Serum C-reactive protein (mg/L): (reference value: ~1 mg/L)	_____	_____	_____	_____
Other:	_____	_____	_____	_____

**ARS Responses Assessment: (person(s) creating this page of the report)**

Last name: \_\_\_\_\_ First name: \_\_\_\_\_ Unit: \_\_\_\_\_ Country of origin: \_\_\_\_\_  
 Phone: \_\_\_\_\_ Fax: \_\_\_\_\_ E-mail: \_\_\_\_\_ Place: \_\_\_\_\_

**Signs and Symptoms**

Date assessed (yymmdd): \_\_\_\_\_  
 Time assessed: \_\_\_\_\_

**Neurovascular system Degree of severity 1 (mild) to 4 (severe); none=0; see page 6 for degrees of severity**

Nausea: \_\_\_\_\_  
 Vomiting: \_\_\_\_\_  
 Headache: \_\_\_\_\_  
 Anorexia: \_\_\_\_\_  
 Fever: \_\_\_\_\_  
 Hypotension: \_\_\_\_\_  
 Tachycardia: \_\_\_\_\_  
 Neurological deficits: \_\_\_\_\_  
 Cognitive deficits: \_\_\_\_\_  
 Fatigue/weakness: \_\_\_\_\_  
 Maximum grading N: \_\_\_\_\_

**Cutaneous system Degree of severity 1 (mild) to 4 (severe); none=0; see page 6 for degrees of severity**

Erythema: \_\_\_\_\_  
 Pruritis (itching): \_\_\_\_\_  
 Edema: \_\_\_\_\_  
 Bullae (blisters): \_\_\_\_\_  
 Desquamation: \_\_\_\_\_  
 Ulcer or necrosis: \_\_\_\_\_  
 Hair loss: \_\_\_\_\_  
 Onycholysis: \_\_\_\_\_  
 Maximum grading C: \_\_\_\_\_

**Gastrointestinal system Degree of severity 1 (mild) to 4 (severe); none=0; see page 6 for degrees of severity**

Diarrhea: Frequency: \_\_\_\_\_  
 Consistency: \_\_\_\_\_  
 Melena (bloody stools): \_\_\_\_\_  
 Abdominal cramps or pain: \_\_\_\_\_  
 Maximum grading G: \_\_\_\_\_

**Hematopoietic system Blood cell counts and degree of severity (see page 6 for degrees of severity)**

(C=cell count; D=ARS degree) C D C D C D C D C D C D C D  
 Lymphocytes (× 10<sup>9</sup>/liter): \_\_\_\_\_  
 Granulocytes (× 10<sup>9</sup>/liter): \_\_\_\_\_  
 Neutrophils (× 10<sup>9</sup>/liter): \_\_\_\_\_  
 Platelets (× 10<sup>9</sup>/liter): \_\_\_\_\_  
 Blood loss: \_\_\_\_\_  
 Infection: \_\_\_\_\_  
 Maximum grading H: \_\_\_\_\_  
 Response category (RC) = \_\_\_\_\_  
 Days after exposure: \_\_\_\_\_

**ARS Responses Assessment** (continued from page 4)

Date format: yymmdd (time)	Onset (date/time)	Duration (hours)	Comments:
Nausea:	_____	_____	
Vomiting:	_____	_____	
Headache:	_____	_____	
Anorexia:	_____	_____	
Fever:	_____	_____	
Hypotension:	_____	_____	
Tachycardia:	_____	_____	
Neurological deficits:	_____	_____	
Cognitive deficits:	_____	_____	
Fatigue/weakness:	_____	_____	
Maximum grading N:	_____	_____	
Erythema:	_____	_____	
Pruritis (itching):	_____	_____	
Edema:	_____	_____	
Bullae (blisters):	_____	_____	
Desquamation:	_____	_____	
Ulcer or necrosis:	_____	_____	
Hair loss:	_____	_____	
Onycholysis:	_____	_____	
Maximum grading C:	_____	_____	
Diarrhea: Frequency:	_____	_____	
Consistency:	_____	_____	
Melena (bloody stools):	_____	_____	
Cramps or pain:	_____	_____	
Maximum grading G:	_____	_____	
Lymphopenia:	_____	_____	
Granulopenia:	_____	_____	
Neutropenia:	_____	_____	
Thrombopenia:	_____	_____	
Blood loss:	_____	_____	
Infection:	_____	_____	
Maximum grading H:	_____	_____	

Adapted from:

- 1.NATO Standardization Agreement (STANAG 2474). Determination and Recording of Ionizing Radiation Exposure for Medical Purposes. Appendix 1, 2003.
- 2.Fliedner TM, Friesecke I, Beyrer K, eds. Medical Management of Radiation Accidents: Manual on the Acute Radiation Syndrome.Oxford: British Institute of Radiology; 2001. p. 1 -66.
- 3.Gorin N-C, Fliedner TM, Gourmelon P, *et al.* Consensus conference on European preparedness for haematological and other medical management of mass radiation accidents. *Ann Hematol.* 2006;85(10):671 -679.
- 4.Radiation Event Medical Management (REMM). Guidance on Diagnosis & Treatment for Health Care Providers. Accessed 24 Oct 2007, from <http://www.remm.nlm.gov/ars.htm>.
- 5.Waselenko JK, MacVittie TJ, Blakely WF, *et al.* Medical management of the acute radiation syndrome: recommendations of the Strategic National Stockpile Radiation Working Group. *Ann Int Med.* 2004;140:1037 -1051.

## APPENDIX

### Grading System for Response of Neurovascular, Gastrointestinal, Cutaneous, and Hematopoietic Systems

Symptom	Degree 1	Degree 2	Degree 3	Degree 4
<b>Neurovascular system</b>				
Nausea:	Mild	Moderate	Intense	Excruciating
Vomiting:	Occasional (one per d)	Intermittent (2–5 times per d)	Persistent (6–10 times per d)	Refractory (> 10 times per d)
Headache:	Minimal	Moderate	Intense	Excruciating
Anorexia:	Able to eat & drink	Intake decreased	Intake minimal	Parenteral nutrition
Fever:	< 38°C	38–40°C	> 40°C for < 24 h	> 40°C for > 24 h
Hypotension:	Heart rate >100 beats/m; blood pressure > 100/70 mm Hg	Blood pressure < 100/70 mm Hg	Blood pressure < 90/60 mm Hg: transient	Blood pressure < 80/? mm Hg; persistent
Neurological deficits:	Barely detectable	Easily detectable	Prominent	Life-threatening, loss of consciousness
Cognitive deficits:	Minor loss	Moderate loss	Major impairment	Complete impairment
Fatigue/weakness:	Able to work	Interferes with work or normal activity	Needs assistance for self care	Prevents daily activities
<b>Cutaneous system</b>				
Erythema:	Minimal, transient	Moderate (< 10% body surface area)	Marked (10–40% body surface area)	Severe (> 40% body surface area)
Pruritis (itching):	Sensation of itching	Slight and intermittent pain	Moderate and persistent pain	Severe and persistent pain
Edema:	Persistent, asymptomatic	Symptomatic, tension	Secondary dysfunction	Total dysfunction
Blistering:	Rare, sterile fluid	Rare, hemorrhage	Bullae, sterile fluid	Bullae, hemorrhage
Desquamation:	Absent	Patchy dry	Patchy moist	Confluent moist
Ulcer or necrosis:	Epidermal only	Dermal	Subcutaneous	Muscle/bone involvement
Hair loss:	Thinning, not striking	Patch, visible	Complete, reversible	Complete, irreversible
Onycholysis:	Absent	Partial	Partial	Complete
<b>Gastrointestinal system</b>				
Diarrhea:				
Frequency, stools/d:	2–3	4–6	7–9	≥ 10; refractory diarrhea
Consistency:	Bulky	Loose	Very loose	Watery
Melena (bloody stools):	Occult	Intermittent	Persistent	Persistent; large amount
Abdominal cramps/pain:	Minimal	Moderate	Intense	Excruciating
<b>Hematopoietic system</b>				
Lymphocyte changes: (reference value, 1.4–3.5 × 10 <sup>9</sup> cells/L)	1–2d: ≥ 1.5	1–2d: 1–1.5	1–2d: 0.5–1	1–2d: < 0.5
	3–7d: ≥ 1	3–7d: 0.5–1	3–7d: 0.1–0.5	3–7d: < 0.1
Granulocyte changes: (reference value, 4–9 × 10 <sup>9</sup> cells/L)	1–2d: ≥ 2	1–2d: 4–6; mild	1–2d: 6–10; moderate	1–2d: > 10; marked
	3–7d: ≥ 2	3–7d: > 2	3–7d: > 5	3–7d: > 5
Thrombocyte (platelets) changes: (reference value, 140–400 × 10 <sup>9</sup> cells/L)	1–2d: ≥ 100	1–2d: 50–100	1–2d: 50–100	1–2d: 50–100
	3–7d: ≥ 100	3–7d: 50–100	3–7d: 20–50	3–7d: < 20
Blood loss:	Petechiae, easy bruising, normal hemoglobin level	Mild blood loss with < 10% decrease in hemoglobin level	Gross blood loss with 10%–20% decrease in hemoglobin level	Spontaneous bleeding or blood loss with > 20% decrease in hemoglobin level
Infection:	Local, no antibiotic therapy required	Local; only local antibiotic therapy required	Systemic; p.o. antibiotic treatment sufficient	Sepsis; i.v. antibiotics necessary