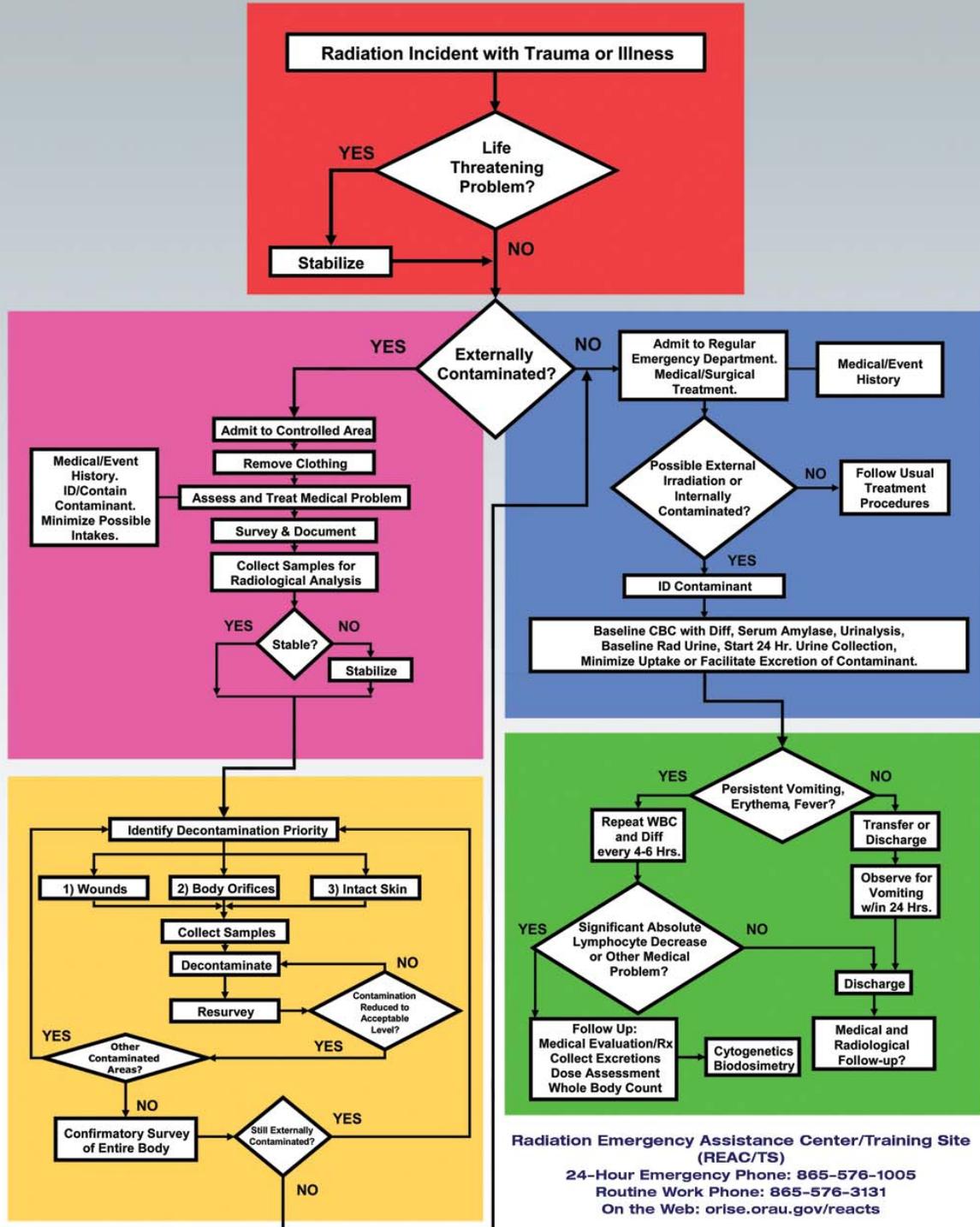




Radiation Patient Treatment



Radiation Emergency Assistance Center/Training Site (REAC/TS)

24-Hour Emergency Phone: 865-576-1005

Routine Work Phone: 865-576-3131

On the Web: orise.orau.gov/reacts



**Radiation Emergency Assistance Center/Training Site (REAC/TS)
Emergency Contact: 865-576-1005 (U.S. DOE Oak Ridge Operations)**

**Emergency Department Checklist for Ionizing Radiation Injuries & Illnesses
Insert into Standing Orders**

- Get incident and medical history from the field – may be unreliable – are victims **contaminated or irradiated (exposed) or both?**
- Activate the Radiological Emergency Reception Team (RERT) and prepare the Radiological Treatment Area (RTA).
- Summon **physics support** previously identified in the Radiological Emergency Response Plan.
- **First priority: stabilize life- or limb-threatening medical and surgical conditions.**
- **Radiological issues are rarely emergencies.**
- **Histories:** medical, nursing and incident. Specifically enquire about nausea/vomiting with time of onset and severity – time-to-vomiting might be used to estimate radiation dose..
- Is patient **contaminated? Disrobe and get on clean water-proof sheets.**
- Carefully contain contaminated clothing – may be used to ID contaminant.
- **Save and double-bag contaminated clothing and dressings** as samples for further radiological analyses. Identify with patient name, identifier, date and time of collection, name and identifier of collector. Suspicious incidents will almost certainly be complicated by the necessity for police involvement and need for collection of forensic samples. Therefore, be aware in advance of the need for scrupulous attention to proper collection, containment and identification.
- Complete medical and nursing evaluation to include vital signs, temperature and weight for baseline.
- Baseline **radiological survey** - in order of priority: open wounds, mouth and nose, normal skin.
- Survey nose and mouth swabs. If positive, try nose blows and expectoration to eliminate.
- **If positive – identify the contaminant** - send to physics laboratory previously identified.
- **Radiological urgency: ID of contaminant, preventing and managing internal contamination.**
- Collect and contain dressings, survey for contamination and send to physics laboratory.
- Medical laboratory and x-ray procedures as required.
- **CBC stat with absolute lymphocyte and absolute neutrophil counts (ALC and ANC)** every six to eight (6-8) hours the first day then every 12 hours for two (2) days then daily thereafter.
- Type blood - do not cross-match unless required for bleeding or trauma.
- Blood products for radiation-related anemia or thrombocytopenia will not be needed for weeks.
- **If irradiated (exposed) - serum amylase (alpha or salivary amylase preferable)** – very high irradiation of salivary glands may cause elevation 5-20 times normal – repeat daily - interpret carefully in the presence of head, face, neck or abdominal trauma.
- **Tissue typing** – draw and hold for HLA typing in case of later need for stem cell transplant.
- Draw lithium-heparin vacuum hematology tube (e.g., **green-top Vacutainer®**) for **cytogenetic biodosimetry** chromosome aberration analysis. Keep at room temperature. Do not refrigerate. Sodium-heparin tube is acceptable but not preferable. Send to laboratory previously identified.
- **Radiological survey a spot urine** for the presence of radiation – if positive, send for physics laboratory for ID of the radioactive material. Some higher energy gamma-emitters might be detected in body fluids. Alpha- and beta-emitters cannot be. The detection of radioactivity in a urine sample confirms internal contamination. Failure to detect radioactivity means nothing. Be aware of confusion from contamination of hands or container.
- **24-hour urine and fecal collections for radioassay** at a physics laboratory.
- Summon expert medical, nursing, surgical and/or psychosocial support staff as previously identified.

Call REAC/TS – 865-576-1005 (24/7 emergency line at U.S. DOE Oak Ridge)

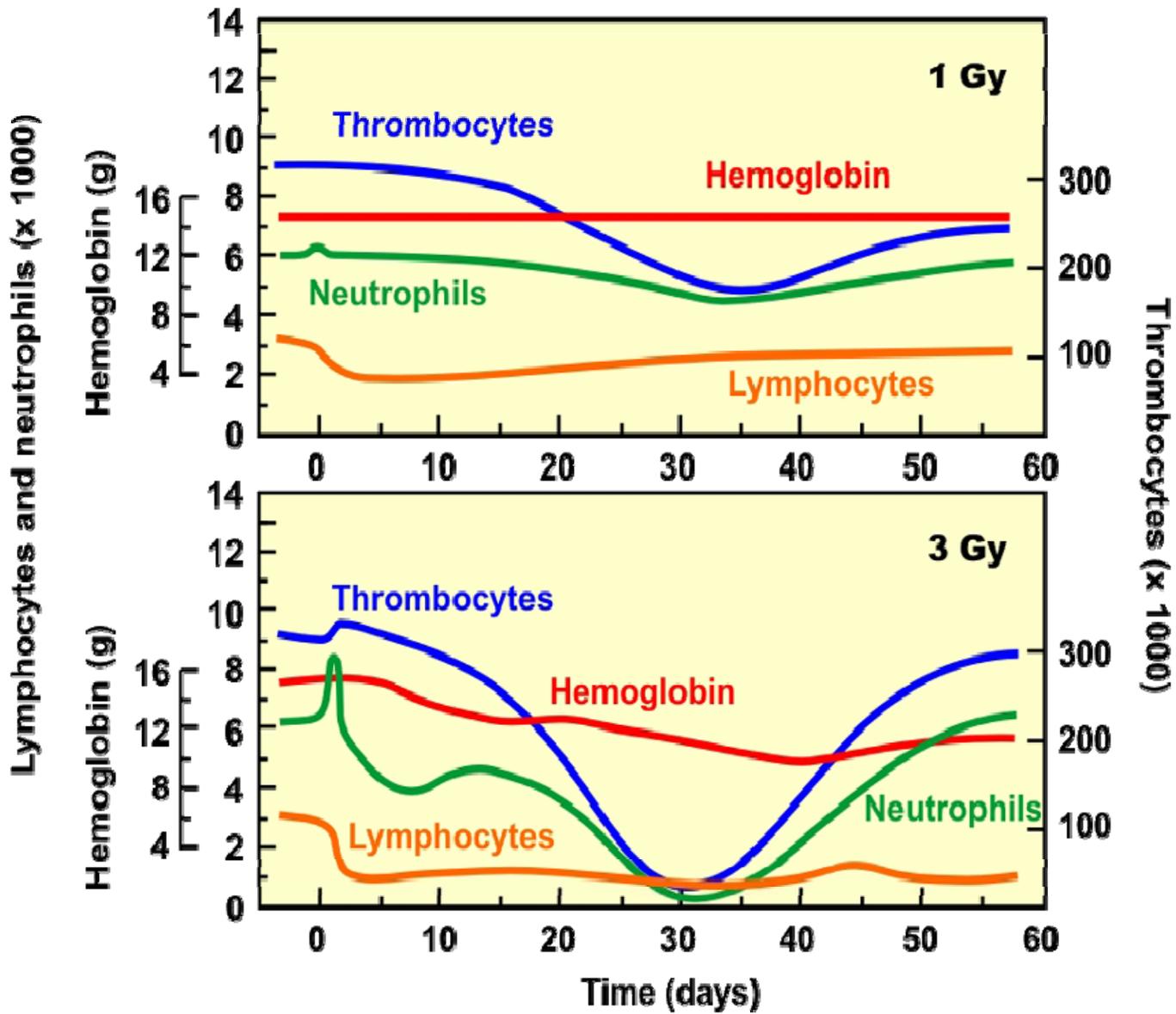
Biodosimetry Based on Acute Photon-Equivalent Exposures

Dose [Gy]	Onset of vomiting		Lymphocyte count (x10 ⁹ /liter) by day						Lymphocyte depletion rate	Number of dicentrics	
	%	Time [hr]	0.5	1	2	4	6	8	Rate constant	Per 50 cells	Per 1000 cells
0	--	--	2.45*	2.45	2.45	2.45	2.45	2.45	--	0.05 – 0.1	1-2
1	19		2.30	2.16	1.90	1.48	1.15	0.89	0.126	4	88
2	35	4.63	2.16	1.90	1.48	0.89	0.54	0.33	0.252	12	234
3	54	2.62	2.03	1.68	1.15	0.54	0.25	0.12	0.378	22	439
4	72	1.74	1.90	1.48	0.89	0.33	0.12	.044	0.504	35	703
5	86	1.27	1.79	1.31	0.69	0.20	0.06	.020	0.63	51	1024
6	94	0.99	1.68	1.15	0.54	0.12	0.03	.006	0.756		
7	98	0.79	1.58	1.01	0.42	.072	.012	.002	0.881		
8	99	0.66	1.48	0.89	0.33	.044	.006	<.001	1.01		
9	100	0.56	1.39	0.79	0.25	.030	.003	<.001	1.13		
10	100	0.48	1.31	0.70	0.20	.020	.001	<.001	1.26		

* The normal range for lymphocytes in human blood is between 1.4 and 3.5 x 10⁹ per liter.

Lymphocyte depletion rate is based on the model $L_t = 2.45 \times 10^9/\text{liter} \times e^{-k(D)t}$ where L_t equals the lymphocyte count (x10⁹/liter), 2.45 x 10⁹/liter equals the a constant representing the consensus mean lymphocyte count in the general population, k equals the lymphocyte depletion rate constant for a specific acute photon dose, and t equals the time after exposure (days).

The Ronald E. Goans MD PhD model from REAC/TS
Radiation Accident Registry data



From Vorobief. Stem Cell: 15 (supplement 2): 269-274

