TABLE 11.11
VX Systemic Absorption and Toxicity to Uniformed Military Personnel

		Calculated VX Systemic Dose[a]	
Exposure time (hr)	**Body Exposure**	**Compromised[b] (mg)**	**Protected[c] (mg)**
1	Head/neck[d]	4.16	4.16
	Arms and hands[d]	0.52	0.52
	Trunk	4.07	1.35
	Genital-s	0.45	0.15
	Legs	0.68	0.22
	Total	9.87	6.40
8	Head/neck[d]	33.26	33.26
	Arms and hands[d]	4.16	4.16
	Trunk	32.52	10.77
	Genital-s	3.61	1.2
	Legs	5.42	1.8
	Total	78.98	51.18
96	Head/neck[d]	399.16	399.16
	Arms and hands[d]	49.90	49.90
	Trunk	390.29	129.25
	Genital-s	43.37	14.36
	Legs	65.05	21.54
	Total	947.76	614.21

Note: Estimated systemic LD50 of VX is 6.5 mg (human, 70 kg). Systemic concentration is more than 50% lethality dose.

[a] Dose: 4 µg/cm^2 on whole body area (1.8 m^2).

[b] Compromised: uniform with perspiration.

[c] Protected: dry uniform.

[d] Head/neck and arms and hands are unprotected.

skin (0.65 ± 0.16; p = 0.000). Sweated and dry uniformed skin absorption was also different (p = 0.007) (Table 11.11). These relative dry and sweated uniformed skin absorptions were then applied to VX skin permeability for naked skin (head, neck, arms, and hands) and the remaining uniformed skin over the various regions of the human body. Risk assessment shows VX 50% lethality within the first hour for a soldier wearing a sweated uniform. By eight-hour postexposure to naked skin plus trunk area, lethality was predicted for both dry and sweated uniform, and at 96-hour postexposure, all body regions individually exposed would produce lethality (15).

A second example of human regional variation application is that of permethrin bioavailability and body burden for the uniformed soldier. Permethrin is embedded in military uniform material and is available to the soldier in spray cans for unprotected skin. Permethrin repels insects that could be carrying disease. Permethrin, by design a pesticide, is also toxic. Table 11.12 summarizes predicted permethrin human bioavailability from uniformed and exposed skin at 1.24 mg/kg body burden. The NOEL estimates from animal studies were? at 5 mg/kg, giving a fivefold safety margin.

11.5 CONCLUSION

This chapter outlines 30 years of progress. Careful review of the data shows some general trends; however, most parts of various animal skins have not been explored, and many possible special areas in humans remain unstudied, i.e., finger and toe nails, eyelids, perirectal skin, upper versus lower arm, thigh versus leg, and so on. It is hoped that as more complete maps are available that