

TABLE 11.9
Percutaneous Absorption of Fenitrothion, Aminocarb, DEET, and Testosterone in the Rhesus Monkey and Rat

Chemical	Species	Applied Dose Absorbed (%) Skin Site		
		Forehead	Forearm	Back
Fenitrothion	Rhesus	49	21	
	Rat			84
Aminocarb	Rhesus	74	37	
	Rat			88
Testosterone	Rhesus	20.4 ^a	8.8	
	Rat			47.4
DEET	Rhesus	33	14	
	Rat			36

^a Scalp.

Skin absorption in the rhesus monkey is considered to be relevant to that of humans. Table 11.9 shows the percutaneous absorption of testosterone (13), fenitrothion, aminocarb, and diethyltoluamide (DEET) (14) (Moody et al., personal communication, 1988) in the rhesus monkey compared with the rat. What is interesting is that for the rhesus monkey there is regional variation between forehead (scalp) and forearm. If one determines the ratio of forehead (scalp/forearm for the rhesus monkey) and compares the results with humans, the similarities are the same (Table 11.10). Therefore, the rhesus monkey probably is a relevant animal model for human skin regional variation.

11.4 APPLICATIONS TO HUMAN RISK ASSESSMENT

Chemical warfare agents (CWAs) are easily and inexpensively produced and are a significant threat to military forces and to the public. The most well-known CWAs are organophosphorus compounds, a number of which are used as pesticides, including parathion. This study determined the in vitro percutaneous absorption of parathion as a CWA stimulant through naked human skin and uniformed skin (dry and sweated). Parathion percentage dose absorbed through naked skin (1.78 ± 0.41) was greater than dry uniformed skin (0.29 ± 0.17 ; $p = 0.000$) and sweated uniformed

TABLE 11.10
Percutaneous Absorption Ratio for Scalp and Forehead to Forearm in Humans and Rhesus Monkey

Chemical	Species	Percutaneous Absorption Ratio	
		Scalp/Forearm	Forehead/Forearm
Hydrocortisone	Human	3.5	6.0
Benzoic acid	Human		2.9
Parathion	Human	3.7	4.2
Malathion	Human		3.4
Testosterone	Rhesus	2.3	
Fenitrothion	Rhesus		2.3
Aminocarb	Rhesus		2.0
DEET	Rhesus		2.4