Stoughton (10). Occlusion has also been reported to increase the percutaneous absorption of various other topically applied compounds (11–17). However, as shown later, short-term occlusion does not necessarily increase the percutaneous absorption of all chemicals.

15.2 PERCUTANEOUS ABSORPTION OF PHENYLENEDIAMINE (PPDA) IN GUINEA PIGS

The *in vivo* percutaneous absorption of *p*-phenylenediamine (PPDA) from six occlusive patch test systems was investigated by Kim et al. (18). The extent of absorption was determined using ^{14}C radiotracer methodology. The ^{14}C-PPDA was formulated as 1% PPDA in petrolatum (U.S. Pharmacopeia [USP]) and applied from each test system at a skin surface dose of 2 mg/cm^2. Thus, the amount of PPDA was normalized with respect to the surface area of each patch test system (and, hence, to the surface area of treated skin). A sixfold difference in the level of skin absorption ($p < 0.02$) was found between the patches (Table 15.1). It should be noted that a nonocclusive control was not included in this study.

The rate of ^{14}C excretion following topical application of the radiolabeled PPDA in the various patch test systems is shown in Figure 15.1. Clearly, the rate and extent of PPDA absorption were dependent upon the patch test system employed. The mechanism responsible for differences in PPDA percutaneous absorption from these patch test systems is unknown. However, the magnitude of occlusiveness of each dressing is hypothesized to correspond to enhanced absorption.

15.3 PERCUTANEOUS ABSORPTION OF VOLATILE COMPOUNDS

The effect of occlusion on the *in vivo* percutaneous absorption of two fragrances (safrole and cinnamyl anthranilate) and two chemical analogs (cinnamic alcohol and cinnamic acid) in rhesus monkeys was evaluated by Bronaugh et al. (19). Each compound was applied at a topical dose of 4 µg/cm^2 from a small volume of acetone. Occlusion was achieved by covering the site of application with plastic wrap (Saran Wrap, a chlorinated hydrocarbon polymer) after the acetone had

TABLE 15.1
Percutaneous Absorption of PPDA from Patch Test Systems

Patch Test System	Mean % Dose Absorbed (SD)
Hill Top chamber	53 (21)
Teflon (control)	49 (9)
Small Finn chamber	30 (9)
Large Finn chamber	23 (7)
AL-Test chamber	8 (1)
Small Finn chamber with paper disc insert	34 (20)

Source: Data from Reference 18.

Note: The rate of ^{14}C excretion following topical application of the radiolabeled PPDA in the various patch test systems is shown in Figure 15.1. The extent of PPDA absorption was dependent upon the occlusive patch test system employed. It should be noted that a nonocclusive control study was not conducted. The test system used 2 mg/mm^2 PPDA for 48 hours on the dorsal mid-lumbar region of the guinea pig.