

this washing/massaging may enhance transfollicular sunscreen absorption [75]. Massaging may also increase the follicular penetration depth of liposomes used as drug carriers [79, 80]. Massaging/rubbing reduces skin barrier function to facilitate penetration [80]. However, this effect differs between hydrophilic and lipophilic substances—lipophilic/organic substances are less affected, if at all.

With regard to rub resistance, this is a term used to describe whether a substance applied topically will still be effective after being rubbed with a textile (clothing, towel, etc.). Rub resistance would be an important factor for a sunscreen or a topical medication to possess, and a Rub Resistance Factor (RRF) can be calculated to allow comparisons between products of the same class (e.g. sunscreens) [81]. Parameters that influence RRF include rubbing pressure, rubbing duration, rubbing speed, and the textile (composition, thickness, etc.) [81]. Obviously, the higher the RRF, the greater the amount of drug or chemical remaining on the skin and the greater the likelihood for percutaneous absorption.

21.2.14 CAN MEDICATIONS OR CHEMICALS BE TRANSFERRED FROM ONE PERSON TO ANOTHER THROUGH SKIN CONTACT, CLOTHING, OR CONTACT WITH AN INANIMATE SURFACE?

As briefly mentioned in [Section 2.3](#), inadvertent drug or chemical exposure can occur via transfer from one person to another—such as a mother wearing sunscreen and holding her baby with bare arms. Drug transfer can sometimes have serious consequences: a father who used testosterone cream without routine handwashing after application transferred enough testosterone over time to his infant son to cause precocious puberty—pronounced virilization in a two-year-old boy [82]. The skin-to-skin contact time need not be lengthy: a controlled 15-minute ventral forearm-to-ventral forearm rub/contact time transferred sufficient estradiol from donor volunteers to recipient volunteers for estradiol to be detected in the recipients' urine [83]. There was also enough estradiol left on the sleeve of the donors for the possibility of transfer from clothing to occur [83]. Using a hair follicle drug screening test, a Department of Health and Human Services study detected methamphetamine in newborns and young children—postulating that “sweat glands glom onto meth which can then be transferred through skin-to-skin contact, like cuddling an infant” [84]. However, besides sweat, other possibilities were children picking it up “from the environment, from the smoke or residue” [84]. Methamphetamine can be readily transferred to skin from inanimate objects such as vinyl tile even with very brief contact times (5 seconds and 5 minutes) [85]. Other examples include additional controlled studies confirming that skin-to-skin drug transfers exist [86, 87]. Skin-to-skin transfer can also occur in the same individual [87].

Practically, what does this mean? Anytime that a topical medication or chemical substance is used, we should be aware that transfer may occur from one person to another, including to infants who may be at greater risk of systemic toxicity, unless the substance is inert. Obviously, the other factors of percutaneous absorption would also apply to the transferred drug or chemical, and those factors would ultimately determine the clinical significance of the drug or chemical transfer.

21.2.15 HOW IS TOPICAL ABSORPTION AFFECTED IF A DRUG OR CHEMICAL IS VOLATILE?

Volatility means that a substance has the ability to spontaneously vaporize into the air, or, in the case of a topical agent applied on skin, to evaporate from skin over time. Medications or chemicals applied to skin are often in product formulations that are a mixture of active and inactive ingredients, some of which may be volatile and others are not. For volatile substances, the degree of volatility may vary from substance to substance and may be affected by other factors such as formulation (pH etc.), environment (humidity, temperature, etc.), and skin characteristics (pH,