

24.2.4 PERCUTANEOUS PENETRATION

Although the SC plays a critical role in the function of the permeability barrier, there are many structures and components that interact before entering the body (3). The influence of water content on the cutaneous permeation of exogenous molecules is of primary importance in physiology and pharmacology (4). Sebum, electrolytes, and cutaneous flora form a relatively simple ecosystem that protects the skin. Chemicals able to dissolve this milieu diffuse through the SC. Kinetic transfer is boosted, according to the rule of five, especially for molecules of small size, low melting temperature, and appropriate partition coefficient (5).

Molecules passively diffuse through the SC, described as a brick-and-mortar model (6). Penetration pathways are essentially intercellular and intracellular. Penetration between SC corneocytes is the path by which most compounds penetrate the intracellular way (proteins), while the lipid bilayer intercellular route favors lipophilic compounds. The intrafollicular pathway is considered a nonpredominant route (7).

Systemic effects resulting from passage across the viable epidermis and dermis are recognizable, and the severity of toxidromes depends on chemical factors (dose, physicochemical characteristics).

24.2.5 SKIN CONTAMINANTS

According to persistence and lethality, skin contaminant chemicals are arranged by families (see tables 1 to 24 in [1]). Variables affecting agent diffusion such as contamination time (residence time surface), temperature, and concentration (surface density per unit of surface area) are essential parameters to estimate potential effects. Dermal penetration increases its duration of contact.

Some chemicals may cause, by dermal absorption, inhalation, cutaneous, and ocular burns exacerbating systemic effects. Therefore, medical and/or surgical treatment may be required to complement decontamination (8, 9). Toxidromes must be considered after chemical events to provide treatment and therapeutics in case of systemic effects (10). In emergency situations, chemicals are considered for short-term toxicity and secondary contamination and the remaining capacity should be considered for long-term contamination risk. Persistence of the chemical agent, in the absence of active decontamination, presents a risk due to remaining capacity (11).

24.2.6 PRIORITIES AND OPPORTUNITIES

Skin decontamination after exposure to contaminants e.g. chemical warfare agents (CWAs), dangerous toxic industrial chemicals (TICs), or fine particles is a priority to save lives from terrorism, criminal attack, accidents, or accidental work exposure. Since the usage of chemical weapons caused as many deaths during wars, not only defense departments and but authorities exhort scientists to explore data on opportunity and risks of remaining contaminants in case of inefficient or inappropriate decontamination processes. The detection of low-level chemical contamination should be an indicator of decontamination efficiency and a way for further studies (12).

24.3 PREVENTION AND PROTECTION

Time post-exposure remains a key factor to prevent health effects. Saving time leads to reduced contact time between the skin and chemical after exposure; therefore individual and collective protection is essential. Collective protection is essentially based on three main principles: time, screen, and distance.

Personal protective equipment (PPE) appropriate for the risk is absolutely required before initiating rescue efforts and working closely with contaminated casualties (13). Security level is defined by the rules applicable in respective countries (14).