

carbon layer with granular or spherical activated carbon particles (88). Relatively new classes of crystalline solids with tunable properties such as porosity and pore size, known as metal organic frameworks (MOFs) may have great potential in future applications (89) and destruction of CWAs (90).

24.7.3 SELF-CARE DECONTAMINATION

Self-care includes casualties moving away from the contamination source, wiping the contaminant off exposed skin and hair, and disrobing in order to stop the contaminant from penetrating into the skin and thereby limit percutaneous penetration (19).

24.7.4 DISROBING

Disrobing is widely recommended. In contrast, there will be a delay between initial chemical exposure and decontamination setup for civilians compared to the military response (20). It is a challenge to reduce the time required to deploy decontamination processes after chemical exposure and limit potential health impacts. Therefore, removing clothing is considered a simple and highly effective action to remove external contaminants in the first minutes after the incident and is highly recommended. Disrobing can remove 80% to 90% of contamination (21). Nonetheless, it needs an ethical approach beforehand, organized both on the crime scene and in the hospitals (91).

24.7.5 DECONTAMINANTS

Which decontaminants and application processes are interchangeable depends on their mechanism of action: adsorption added or not of adsorbed toxics degradation. Components in most cases are powders that might settle in gloves or be included in pads. Skin decontaminants must not be corrosive, so that skin surfaces are not damaged by decontaminants. Therefore, decontamination of eyes and wounds are treated separately. Depending on the magnitude of the change(s) in components and composition, mechanism of action and/or method of application, tests should prove the intended skin decontamination. Criteria tools and level of decontamination could be expected to improve and standardize systematically before approval of both decontaminants and decontamination processes (application and removing); thus information is necessary for each one in terms of the necessary contact time to adsorb (1) liquid at the surface, (2) more or less in the first layers of SC depending on kinetics of adsorbents, (3) define the appropriate rate of decontamination efficiency, and (4) methods to detect low-level residual contaminant.

24.7.6 CONSTRAINTS IN DECONTAMINATION

Analysis and evaluation of decontamination methods require evaluation in safety and in decontamination efficiency. Even if *in vivo* human skin is considered the best model, ethical, financial, and safety considerations require testing with animal models, the most common of which are pigs, monkeys, rats, and rabbits (92).

Propositions are limited to decontaminants attested to or in progress, when applied on skin, to treat military and civilian mass casualties exposed to CWA or very dangerous TICs. Nevertheless, powders, which inappropriate for the decontamination of mucous membranes and wounds, may cause serious damage (30). New products intended for topical application to the skin must be proven safe and effective before marketing. Some are approved as medical devices, boosting user confidence. Therefore, the establishment of principles and test procedures to ensure safe manufacture and use of nanomaterials in the marketplace is urgently required and achievable. Quality means features and characteristics of a product, in this case to be applied to skin. Define a degree of confidence for the test outcome and demonstrate interchangeability for their products during the developmental process or after approval (93).