Medema

Date: Tue, 19 Nov 2002 21:28:21 +0100
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Subject: Dusty Agent,

[Part 1, Text/PLAIN (charset: ISO-8859-1 "Latin 1 (Western Europe)")]
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Dear Forum

Several contributions to the forum mention the hazards of Dusty agent in particular Mustard and VX adsorbed on small particles that can float in the air. For one thing it would penetrate the protective clothing that is presently used by the US and other NATO forces. Here is some historic and scientific information on Dusty agents. The conclusion is that they are not a hazard to soldiers in full protective gear unless a Boeing 747 would release its full load on a small area.

History: (Military Intelligence on Italian CW untill 1941, declassified).The original idea to use dusty agent goes back to Italy in the 1935 - 1940 time frame. The idea was to spray the dust in the desert areas of what is now Libya and when vehicles would pass through they would make a cloud dust which would be hazardous to the crews in vehicles. Every one who has driven through a dry desert would know that it works.As fine dust the Italians used Bentonite a fine dust mineral found in Italy. They were so certain that it would work that they even sold the idea to the Germans.
However, there was something wrong with the calculations. When you would make a chemical minefield in this way, say 8 km in one direction and 1.25 km in the other direction at a contamination density of 10 g per meter squared, you have to use 100 tons of dusty agent. The actual contamination density with agent would be 2.5 grams per meter squared because the Bentonite was difficult to load with agent, 25% by weight was the maximum, without having the particles glued together. It was tried in Porton without much success. A vehicle passing through the chemical minefield would take about 2 minutes and bring a few percent of the agent into the air. If the dust cloud would not be higher than 2.5 m one would reach a concentration of 100 mg per cubic meter (assuming that a high percentage of 10 would get airborn just in the vicinity of the vehicle. In practice only the small surface areas of the tracks or tires would bring agent into the air and the percentage is much smaller). So the soldiers would be exposed in a very worst case scenario to a Ct dosage of 200 mg.min/m3. Not something to worry about if it was Dusty Mustard. The Mustard would be adsorbed to the Bentonite and only a fraction would be released in the body or to the skin. So the Italian way of using Dusty Mustard was not very effective to say the least. Some would say but what if the troops would walk alongside the vehicles and take 15 min to pass the terrain. True the dosage inhaled would be higher but they certainly would wear a peace of cloth to protect from the dust. An effect that often is forgotten is that the fine particles adhere to larger particles on the ground. These large particles will be thrown up in the air but will not reach the lungs in significant quantities. So the idea seemed nice but wouldn''t work.
The Germans (Hirsch report declassified US version) continued working on the idea of Dusty Mustard in the Kaiser Wilhelm Instute in Berlin (I am not sure wheter it still carried that name in the forties). They found that the Bentonite (they bought 25 tons from Italy) did not work well and started to work with a certain type of silica close to what is now known as Aerosil (Degussa). This could be loaded with H upto around 40-50% without having the particles sticking together. The test on humans in chambers showed that the product was very effective. Also to researchers in impermeable protective outfit.They got blisters around the wrists. Most likely is that small amount of dust leaked into the opening of the suit and adheared to the sweaty skin. From that time on the Dusty agent

story pops-up every ten years or so. During my active carrier in the field in the seventies, eighties and nineties. Because the respiratory system was now well protected by the mask, the skin and penetration through the suit was supposed to form the hazard. The first experiments that I am aware of looked at aerosol penetration through skin of an aerosol released into the air. The results were alarming sometimes 90% penetrated the clothing. But soon somebody raised the real question how much is deposited onto the skin underneath a protective overgarment, a combat suit and under wear. The way to express this was as a deposition linear velocity in m/min When multiplied by the outside dosage in mg.min/m3 a deposition in mg/m2 would result. From many experiments with human volunteers exposed to harmless aerosols it appeared that the deposition velocities for the small particles were very small. In the order of 0.01m/min or less. So when exposed to a Ct of 10.000 (imagine what you have to do to release such a cloud on the battle field) the dosage received would be 100 mg./m2. The latter figure might raise some eyebrows but remember only 50 % of it is agent and it is absorbed onto silica and certainly not all available, sweating underneath the suit migh do some harm here. The actual contamination density is 10 microgram per cm2. A drop of ten microgram HD when locally applied did not do much harm. Sometimes mistakenly the criteria of 4 microgram/cm2 is mentioned here but that holds for vapour exposure of bare skin. For VX the total amount on a one side exposed man (1 m2) equals100 mg. This is certainly too much according to known standards.(National Research Council Review of Human toxicity estimates of some CWA (1993)) But again the VX is absorbed and because of the lower vapour pressure even more difficult to remove from the aerosil. A sweat extraction of VX loaded on silica showed low recoveries. Anyhow the conclusion was that it would only form a problem in extreme cases of a extremely high field dosage with low wind speeds The problem could not be completely disregarded but it was highly unlikely that significant numbers of casualties would occur through deposition of dusty agent on the skin. You would expect this to be the end of the story but in the eighties new analysts found the old information and generated new research with a similar conclusion. In the nineties the story popped up again and a few research institutes checked there earlier findings with the same conclusion. Now in the one hundreds or double zero''s the story appeared again and you wonder who is going to make money out of it.

This time they added a new question about biologicals, but which biologicals are a hazard to intact skin? The recent yellow rain incident in India (see this forum in the June time frame, I think it was Tucker who came with a complete explanation) makes it clear that we do not have to fear thrichothecene mycotoxins.Is there another pathogen than Anthrax which can act percutaneously? For most of the pathogens the respiratory effective dosage is many orders of magnitude lower than the effective dosage to the skin. So the respiratory exposure even when masked would form a hazard before the skin deposition would be hazardous. Sometimes it is argued that this reasoning does not hold when the soldier has a broken skin because of small wounds and cuts. This is true but it would be most of the time on his hands and he is wearing impermeable gloves. The only thing we can learn from it is that if the soldier has a chance of experiencing exposure to biological agents he should check his body and tape off all broken skin. If he is wounded during the operation and then exposed to a biological aerosol it just wasn''t his day.

Will this be the end of the story, I don''t think so every decade we will see new analysts appearing and they think they can make a carrier by finding new challenges, which are by now 65 years old and so they deserve retirement and the research money should be spent on the real problems .