

an HD simulant, 2-chloroethylethylsulfide (CEES). First, we obtained the ^1H NMR spectra of CEES in d_6 -DMSO (FIG. 3). Next, we added 100 equivalents of D_2O to the NMR tube and obtained ^1H spectra after 18 hours giving us a baseline extent of hydrolysis (FIG. 4). Finally, we prepared a standard solution of CEES in d_6 -DMSO and added a 2.5 wt % solution of polyalkenimine in D_2O (still 100 eq D_2O). Peak at ~ 4.1 ppm is from D_2O , broad peak from 2.5 to 3.0 ppm is from the Lupasol WF (FIG. 5). By comparing the spectra of CEES, CEES/ D_2O and CEES/polyalkenimine/ D_2O , it is evident that significant hydrolysis occurs by the disappearance of CEES signals (3.75, 2.85, 2.55, 1.17 ppm).

[0073] Most of the active TSPs containing polyalkenimines also show excellent efficacy in the weanling pig HD vapor model (Table 2). The best active TSPs containing polyalkenimines almost completely eliminated erythema in this test.

TABLE 2

Weanling pig test results for HD vapor. Erythema as percentage of positive control (% of PC). Positive control has no aTSP applied. SEM is the standard error of the mean. Formulations pass the test if they offer significantly ($p < 0.05$) better protection than un-protected skin.					
Formulations Passing Test			Formulations Failing Test		
ICD No.	% of PC	SEM	ICD No.	% of PC	SEM
3470	56.4	10.5	3004	102	1.8
3718	-9.6	17.5	3471	61.5	11.9
3742	39	10.6	3630	110.6	5.9
3743	41.7	10	3631	103.5	5.4
3771	25.1	7.6	3724	100.4	3.1
3772	30.8	7.2	3725	86.3	7.1
3773	16.3	3.3	3728	93.9	9.5
3778	29	3.2	3729	95.7	7.3
3779	43.3	8.5	3744	117.3	8.2
3780	28.1	3.8	3745	117.2	10.2
3781	39.4	7.3	3809	87.9	8.6
3782	16	3.8	3831	82.7	5.9
3829	61.7	9.4	3900	80.5	10.4
3830	38.9	7.1	4033	104.3	13
3832	26.1	5.7	4037	90.9	12.9
3833	15.7	7.3	4039	91.5	4
3834	11.6	5.9	4040	77.4	11
3884	23.5	10.7	4041	114.7	15.3
3885	70.7	13.1	4043	90.6	6.5
3886	46.9	11.8			
3887	48.3	9.1			
3901	73.6	7.4			
3902	68.5	5.3			
3903	50.5	9.5			
4020	12.4	11.6			
4021	35.9	16.7			
4022	43.4	13.5			
4029	25.5	5			
4032	54.6	7.7			
4034	59.7	7.1			
4036	46.3	7.6			
4038	55.5	6.4			
4042	59.6	10.9			
4044	69.6	7.7			
4046	13.2	4.6			
4047	44.3	6.1			
4048	66.1	7.2			
4049	82.8	6.2			
4050	13.4	5.4			
4051	18.6	7.9			
4052	10.2	8			

[0074] All of the active TSPs containing polyalkenimines tested against HD liquid in the Lesion Area Ratio (LAR) test showed significant ($p < 0.05$) protection compared to un-protected skin (FIG. 12). Lesion Area Ratio is the measure of the protection given by the aTSP and compares the lesion size between sites protected by aTSP with sites not protected by aTSP. Several of the formulations also demonstrate significantly improved protection compared to SERPACWA (ICD3004).

[0075] A limited number of the active TSPs containing polyalkenimines were also tested in the rabbit lethality test for GD vapor. Many show excellent efficacy. Lethality at 1, 2, 3, 4 and 24 hours post exposure from 2 vapor caps each containing 28 mg GD/kg for 4 hrs. (FIG. 13).

[0076] A limited number of the active TSPs containing polyalkenimines were also tested in the rabbit lethality test for VX liquid. Lethality at 1, 2, 3, 4 and 24 hr. post exposure to 0.5 mg VX/kg for 4 hrs. All were significantly ($p < 0.05$) better than no protection (FIG. 14).

[0077] Having now fully described the invention, it will be apparent to one of ordinary skill in the art that many changes and modifications can be made thereto without departing from the spirit or scope of the invention as set forth herein.

What is claimed is:

1. A topical skin protectant formulation for neutralizing chemical warfare agents into less toxic products comprising:

(a) a barrier base cream, said barrier base cream comprising poly(tetrafluoroethylene) resins dispersed in perfluorinated polyether oils; and

(b) one or more active moieties comprising amines, polyalkenimines and its derivatives.

2. The topical protectant formulation of claim 1, wherein said amines, polyalkenimines and its derivatives are selected from the group consisting of: (a) Lupasol P (b) Lupasol WF (c) Lupasol G20 (d) Lupasol SC, (e) Lupasol G20, (f) Lupasol LU, (g) Dytek EP, (h) homopolymer of 2-propen-1-amine hydrochloride (PAA-HCL-3L), (i) homopolymer of 2-propen-1-amine (PAA-10C), and (j) diethanolamine modified.

3. The topical skin protectant formulation of claim 1, further comprising one or more additives.

4. The topical skin protectant formulation of claim 3, wherein said additives comprise one or more of water, surfactants such as Fluorolink 7004, Fluorolink 7005 and perfluoropolyether light surfactant, stabilizers, camouflage paints, and sunscreens.

5. A topical skin protectant formulation for neutralizing chemical warfare agents into less toxic products comprising:

(a) a barrier base cream, said barrier base cream comprising poly(tetrafluoroethylene) resins dispersed in perfluorinated polyether oils;

(b) one or more active moieties comprising: (a) Lupasol P (b) Lupasol WF (c) Lupasol G20 (d) Lupasol SC, (e) Lupasol G20, (f) Lupasol LU, (g) Dytek EP, (h) homopolymer of 2-propen-1-amine hydrochloride (PAA-HCL-3L), (i) homopolymer of 2-propen-1-amine (PAA-10C), and (j) diethanolamine modified.

(c) one or more additives.

6. The topical skin protectant formulation of claim 5, wherein said additives comprise one or more of water,