

FAST for OC Spray Report (updated)

OC (oleoresin of capsaicin) spray has a long history of use as a chemical weapon in the United States. The formulation and tactical deployment patterns, however, have continued to evolve. The potency of OC spray formulations has risen. The variety of branded formulas has increased. Most disturbingly, the way OC spray is deployed has changed. Not only has the size of canisters issued to cops increased, but the expected number of targets those canisters will be deployed against has decreased. It is becoming common practice to drench one target with 10 oz or more of spray. This has led to multiple cases of extensive chemical burns.

Success in combating these changes has been limited, not for lack of trying, but study and a willingness to put our bodies on the line for science and our comrades has finally yielded results. We put forward for your consideration Fixitive Antacid Surfactant Treatment (FAST), and an overview of its underlying theory, development, and testing.

What are we up against: Understanding OC Formulation

Capsaicin, both natural and synthetic, derives its effective power from its hydrocarbon tail which selectively activates polymodal nociceptive neurons, flooding the cell with calcium and activating the same pain response as extreme heat. Tails in natural capsaicin vary between four and nine hydrocarbons long. Synthetic molecules have been developed that contain as many as thirteen hydrocarbons. Increasing hydrocarbon tail length corresponds to increased pain reported by those exposed.

Current OC spray are either entirely naturally derived from a variety of pepper cultivars, or are a blend of natural and synthetic capsaicins. We ask why that is. If the longer synthetic molecules are most effective at inflicting pain, why would manufacturers continue to use a complex molecular blend? We know that these manufacturers are driven by the capitalist paradigm. Either this is the most inexpensive way to operate or there is a functional difference in formulation that their clients are willing to pay for.

Current Available Treatments

Lots of people have tried lots of things to deal with OC spray. Some medic collectives have even gone so far as to spray themselves and report on the efficacy of various potential treatments. The most common treatments considered to have any efficacy are Liquid Antacid Wash (LAW) and mild detergents like baby shampoo. Multiple studies confirm that application of antacid reduces dermal pain caused by exposure to capsaicin. Unfortunately, these studies do not explore the mechanism by which pain reduction is achieved. Pain reduction by this treatment is also relatively slow (T + 30 min). Baby shampoo has no direct action on capsaicin. Instead it acts as a surfactant, allowing water to wash away significantly more of the surface OC spray than it would by itself. Milk has not proven particularly effective on OC spray, but has a long history of being used to ameliorate the effects of spicy food. The theory is that milk fats attract the lipophilic end of the capsaicin molecule. Once in the milk emulsification the capsaicin is then entangled and encapsulated by casein proteins.

Sudecon, a chemical decontaminate wipe developed by Fox Labs, has proven more effective than either of the above modalities, however it has significant drawbacks. First, it is ineffective if the directions are not followed. In the moment, reading directions and enacting them precisely can be difficult or may seem unnecessary. Second, there have been reports (roughly estimated at 3% of users) that ingredients contained in the wipes cause irritation, especially to contact wearers. Third, the formula is proprietary and the ingredient list unknown. Fourth, the product is made by a company that manufactures pepper spray. Buying it means putting money in the pockets of the same people that manufacture the chemicals the police are using to assault people. Fifth, the owners of Fox Labs are openly part of the Christian Right and use their company website to proselytize. Sixth, while definitely an improvement, Sudecon fails

several important metrics. It takes two wipes to decontaminate one face. It has a high cost, making further decontamination prohibitive. It is intended for decontamination situations where OC spray has been used as directed rather than the enthusiastic application that has become common practice. And it requires the user to be still with eyes closed for upwards of five minutes.

Hypothesis and Development:

(NB: Several other less likely avenues were tested before this path of reasoning was followed, not listed here for brevity. Additionally, the reasoning outlined may seem naïve to persons with advanced degrees in fields that incorporate organic chemistry. The authors of this paper are not here to argue about whether or not a stupendous misunderstanding of chemical processes occurred. The misunderstanding, if there was one, yielded results. You are welcome to note corrections as much as you like. The final formula still works. Besides, if you have a better idea of why, you might have some ideas for improving the current formula!)

Ingredient 1

Starting from the one proven modality, we looked at the formulas for liquid antacid. The amount of aluminum hydroxide varied, as did simethicone. In a couple of cases it was not present. Magnesium hydroxide was listed in all formulas investigated at a concentration of 200 or 400 mgs/5ml. Magnesium hydroxide is an effective buffering agent, and while capsaicin acts as neither an acid nor a base, there is the possibility that OC spray contains preservatives, many of which are acidic. Magnesium hydroxide became our first ingredient.

Ingredient – Magnesium Hydroxide

Amount per liter of FAST: 80g

Bulk purchase amount: 5Kg

Bulk purchase price: \$136.96

Cost per Liter: \$2.19

Ingredient 2

The next ingredient required far more thought. We began with the question that occupied much of the above section on OC formulation, namely, what benefit to the goals of the police could be derived from blending natural and synthetic capsaicins? There must be a reason that a wide variety of hydrocarbon lengths is preferable to a single or very limited variety. If capsaicin behaves similarly to other substances containing a variety of hydrocarbons, (crude oil, tar, etc.) fractions of the whole (gasoline, kerosene, etc.) are easier to wash off, with different emulsifiers having more or less efficacy on different fractions.

Was there a substance that contained a wide variety of emulsifiers and was readily available on the consumer market? There is. Lecithin, a common food additive also found in some prescription eyedrops, is referred to by a single name, but is actually a compound of many chemicals, predominantly a variety of phospholipids. Lecithin also retains a significant amount of oil from the material it was extracted from. With enough different emulsifiers that are highly reactive with enough different hydrocarbons would it be possible to attract capsaicin into a mixture that could then be washed off?

Ingredient – Sunflower Lecithin (Fearn Lecithin Granules) *SEE *UPDATE FOR IMPROVED FORMULA*

Amount per liter of FAST: 50g

Bulk purchase amount: (8) 16oz cans

Bulk purchase price: \$80

Cost per Liter: \$1.10

First test: Magnesium Hydroxide, Lecithin, Water

Our tests used the following methodology:

- 1) Apply a capsaicin containing substance to a human hand.
- 2) Wait for the person attached to the hand to report a burning sensation.
- 3) Apply the experimental solution.
- 4) Wash the hand in cold water.
- 5) Test for remaining capsaicin using the most sensitive readily available detector. (Lick the test spot)

After applying the juice of thai hot chili peppers to a willing subject, the test solution was applied. Subject reported a cooling sensation. The solution was allowed to sit for 5 minutes. Subject washed with cold water until they reported that their skin felt clean. The initial lick test appeared negative for capsaicin, with no burning sensation or unusual taste reported. After roughly 30 seconds, however, faint burning of the tongue was reported. A second lick detected definitive amounts of capsaicin. The more time passed, the stronger the burning grew. Apparently, the test formula had picked up the capsaicin from the hand, but had not washed completely away. Something in human saliva was breaking down its ability to hold the capsaicin.

Ingredient 3

Reasoning that additional surfactant was necessary, we turned to the well tested baby shampoo as an eye safe detergent.

Ingredient – Johnson & Johnson No-More-Tears Baby Shampoo

Amount per liter of FAST: 30mL

Bulk purchase amount: 20 oz

Bulk purchase price: \$5

Cost per Liter: \$0.09

Second test - Magnesium Hydroxide, Lecithin, Tearless Baby Shampoo, Water

Test methodology was the same as previous. Thai hot chili juice was followed by application of the test solution, a five minute wait, and rinsing. First, second, and third lick tests yielded no burning sensation or taste of peppers.

Third test - Magnesium Hydroxide, Lecithin, Tearless Baby Shampoo, Water

Test methodology was the same as previous. Hot sauce made with Trinidad Scorpion peppers was substituted for thai hot chili juice. The first test was negative for burning or pepper flavor. A different tester was used for the second test to verify the first, as human perception of taste varies. The second test was also negative.

Fourth test - Magnesium Hydroxide, Lecithin, Tearless Baby Shampoo, Water

Test methodology was modified. Wait time between application of the test solution and cold water rinse was reduced to 2 minutes. Consumer pepper spray was substituted for the hot sauce. Three consecutive testers were engaged. None reported detecting capsaicin on the test site.

“Live” Test - Magnesium Hydroxide, Lecithin, Tearless Baby Shampoo, Water

Three people defending a crowd against attacking Proud Boys were pepper sprayed and arrested. They were held in custody for 10 hours. Two out of the three were given no option but to continue wearing the clothes they had been arrested in. The third was given a clean change of clothes, but no opportunity to wash or otherwise decontaminate themselves. Upon release, all three requested the support team help them to immediately access whatever means of decontamination were available. All three were told that there was an experimental decontamination mixture available, informed of the ingredients, and given the option between the experimental solution and conventional methods. All three chose to try the experimental solution. The given reasoning was that there was nothing in the solution that could make the situation worse.

At T+11 hours from application, each subject was supplied with roughly 7.5L of experimental solution. Subjects were instructed to apply solution to their entire bodies, then lather, wait five minutes, apply all remaining solution, rinse in cool water until no residue appeared to remain, and towel dry. Subjects were then asked how they felt, if they had any remaining burning, if there was a point that they noticed any difference in their condition, and for any further feedback they wished to give.

Subjects One and Three used the experimental solution as directed. Subject Two skipped step four, apply all remaining solution. All three subjects reported nearly identical results:

- 1) Change in sensation was nearly immediate upon application of the solution.
- 2) OC spray appeared to be gone from their hair as well as skin.
- 3) Solution diminished the burning of areas containing high densities of affected nerves, but burning continued.
- 4) Getting covered in OC spray really, really sucks.

Follow up interviews with the subjects confirmed these results. All three subjects recommended the recipe for dissemination.

Conclusions

The experimental formula appears to succeed on several fronts. It acts quickly. It appears to suspend the action of capsaicin while present, allowing time for the victim to find a means of rinsing themselves (barring contact with live enzymes, human saliva, etc). It removes surface capsaicin, lowering reported subjective distress and neutralizing the potential for transfer from the victim to other surfaces. Per liter it is roughly half the price of LAW, assuming a 50% dilution rate of LA:W.

Afterword:

Yes, this probably sounds like a bad science fair project. But if you've ever been pepper sprayed, chances are that you too would like a better alternative to the pain and possible chemical burns OC spray causes. Even with the evidence we have, we're not medical professionals and we know our sample sizes are tiny. Nothing in this paper should be is or is implied to be medical advice. You probably shouldn't take medical advice from people who think it's a good idea to pepper spray themselves.

We're not claiming this is a perfect solution to the problem. But being covered in OC spray, according to people who've experienced it "really, really sucks." So we're sharing what our current understanding and knowledge is, hoping that it will help rather than harm and that others may find ways to improve theory, praxis, or both.

***Update! FAST 1.2**

Powdered lecithin requires a blender to mix, clumps, and falls out of solution. Liquid sunflower lecithin can be mixed into the soap and magnesium powder, then add water. It blends and stays blended. 3 Tbsp to one L of water seems to be sufficient.