Understanding Microcapsules

Microencapsulated formulations consist of dry and liquid pesticide particles enclosed in tiny plastic capsules which are mixed in water and sprayed. After spraying, the capsule slowly releases the pesticide. The encapsulation process can prolong the active life of the pesticide by providing timed release of the active ingredient.

Since there is not full disclosure from the CDFA, EPA, USDA, or Suterra, we do not know exactly what type of micropasule technology is used. However, the industry standard is urea-formaldehyde polymers.

The CDFA, EPA, USDA, owe us the full disclosure of explaining the specific microcapasule technology used. Without such explanation, I can offer you, an educated guess. What is important to understand, is that even though some specifics may be wrong, in general, this information very likely applies to the Checkmate formulations.

Biodegradable, and Biocompatible Capsules

The CDFA brags that their capsule is biodegradable. This is called a controlled release capsule. The Checkmate capsules are designed to release their contents over 30 days. However, this is just a good estimate, as a variety of factors, such as moisture, sun exposure, and the shape of the capsule will affect how long it takes the capsule to fully degrade.

Checkmate is a "formulation of microencapsulated spheres that are colorless. The active ingredients are encapsulated in a biodegradable polyurea."

Now here is the important part, the "average particle size (sphere) of Checkmate OLR-F is 1000 microns.."[i] Chemists analyzing the formulation claim the particle size is approximately 100 to 150 microns. To give you an idea, a human hair is about 70 microns wide.

The microcapsule is made out of a plastic. This plastic while being biodegradable, is not, compatible. Biocompatible is the term used for something that can easily be absorbed by the human body. There are two key reason why the Checkmate capsule is not biocompatible.

#1. It was designed to be sprayed on crops, not humans
#2. If it was biocompatible, then it would clearly be a medicine and not a pesticide; a time release drug formulation.

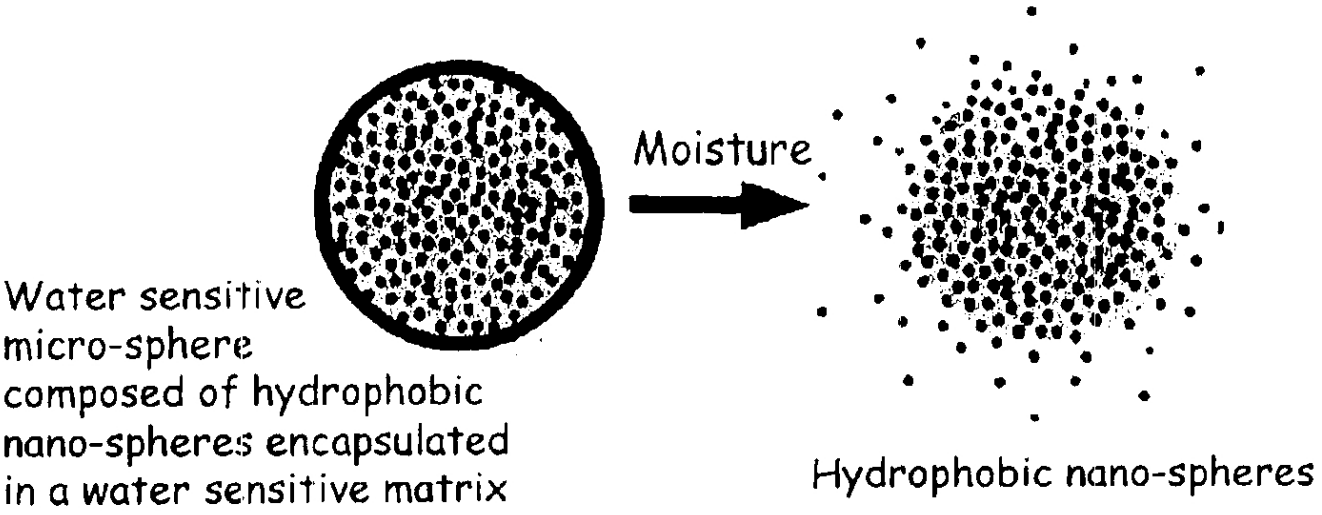
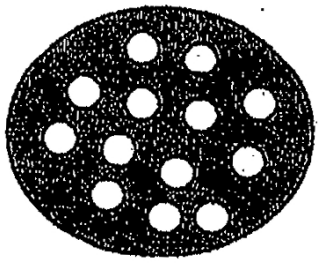


Fig 1. A sample micropasule system, which contains a water repelling membrane, within it, are small sphere's of active ingredient, which in this case would be synthetic moth pheremone.



B – Porous Capsule

Fig 2. The Checkmate Micropasules likely are designed to be porous. When the correct stimuli is applied, which could be heat, or moisture, the capsule breaks apart and releases some of its pheromone contents.

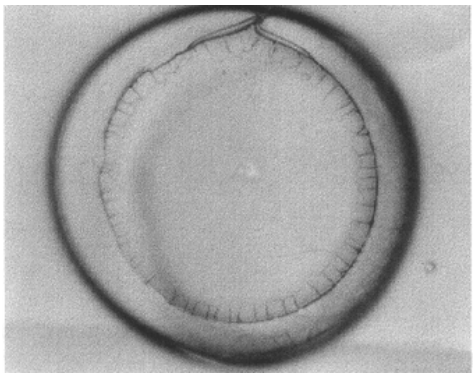


Fig 3. Micrograph of Micropasule (Not Checkmate) with solid membrane, and liquid contents.

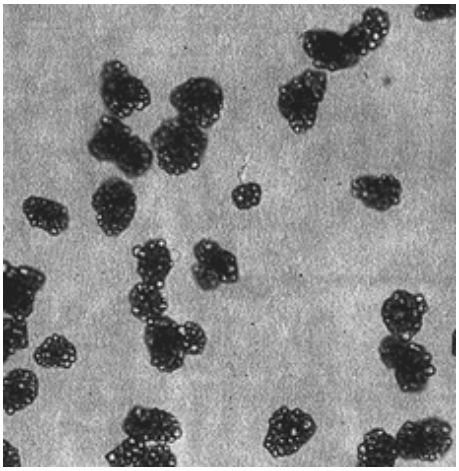


Fig 4. Micrograph of Micropasule (not Checkmate) system that uses small microsphere's to create a membrane that can break apart in little pieces.

Fig 5. Surface Erosion of degradable polymer device, such as Checkmate.

Slow Release Capsules & Microparticles

One method of creating a time release system over a period of 30 days, would be to create a micropore system, such as in figure 2. “This shell wall can have small "particles" of 0.1-25 % of the core diameter that can be 'activated.”[ii]

This means that there can be particles from the size as small as 0.1 micron, to as large as 250 microns depending on the size of the actual microcapsule design.

During the manufacture of Checkmate, broken, abraded, or malformed microcapsules may also form within with Checkmate formula. The formula is then activated prior to the spray. One point of concern, is whether then pesticide testing done by various government organizations used activated, or non-activated Checkmate for their tests.

In the process of the slow release, the microcapsule degrades into smaller and smaller fragments such as in figures 1 and 5. How big are these degraded capsules? Surely some of them are below 10 microns in size, but we do not know for sure because the CDFA deliberately avoided doing particulate matter testing in the aerial spray locations. Is that evidence they are aware of the particulate pollution problem due to microcapsules? Yes, how could it not be?

Small Fragments Equate to Particle Pollution

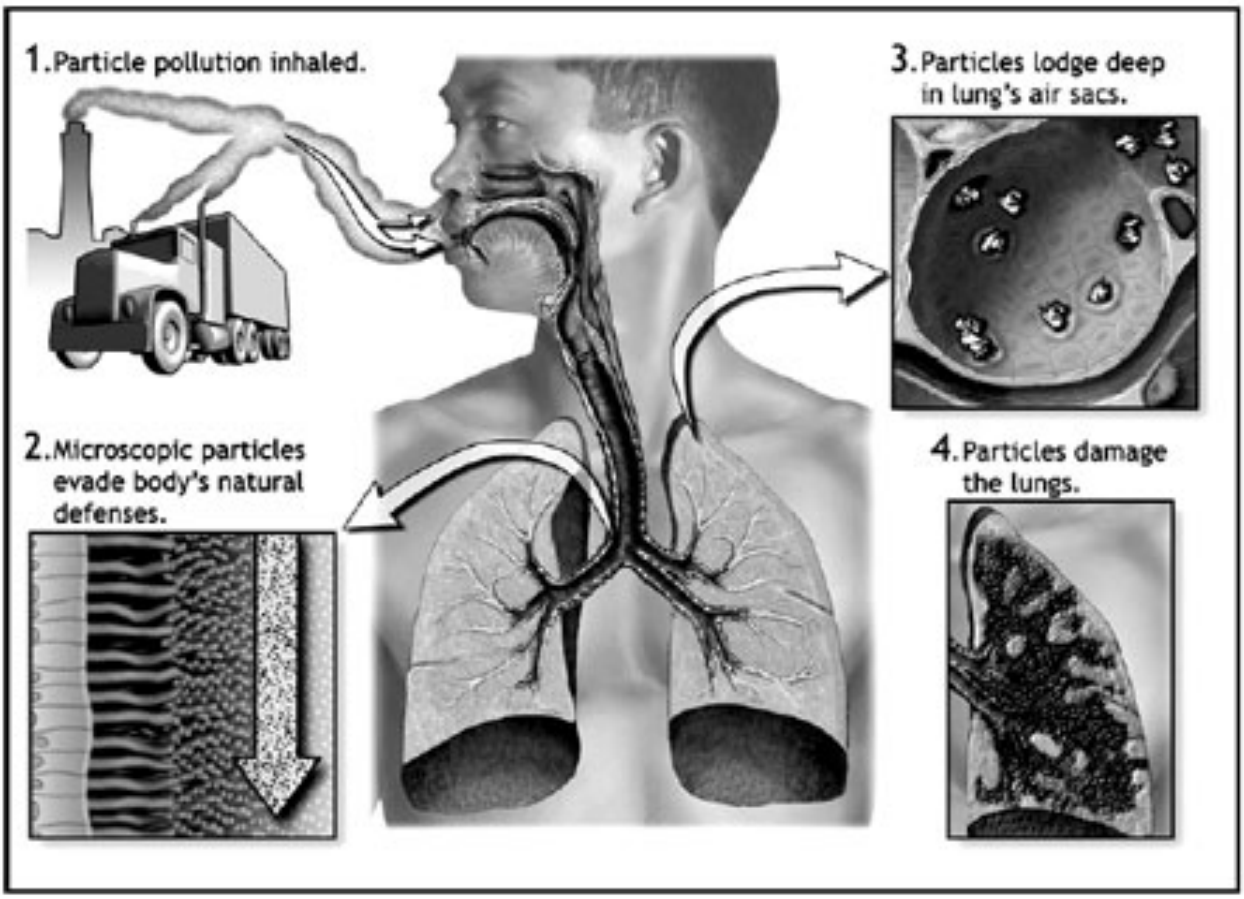


Image Source: American Lung Association, http://lungaction.org/reports/sota04_heffects1.html

Picture Explanation:

1. Particles are inhaled from a polluting source.
2. The particles are too small for the body to defend against
3. Particles become lodged into the microscopic sacs in human lungs
4. Lung damage results from these dangerous particles

What is particle pollution?

According to the American Lung Association[iii], particle pollution happens when synthetic particles of material, between 2.5 – 10 microns in size, are inhaled into the lungs.

The EPA defines particle pollution as "A mixture of mixtures."[iv] Such polluting materials can be "completely liquid aerosols or solids suspended in liquid mixtures."[v] Furthermore, "Larger particles also come from other sources, including agricultural practices.."[vi] All of this sounds convincingly like a Checkmate formulation.

"[P]article pollution can trigger reactions ranging from coughing and wheezing to heart attacks and death. Because of their size, you can't see the individual particles."[vii] These first two symptoms are identical to what has been reported from the biochemical aerial applications on humans. And without a thorough analysis of the health of every individual residing in Monterey County subjected to aerial

treatments, we cannot be too sure, that heart attacks and deaths, are, or, are not caused over time by micro pollution due to aerial spraying of Checkmate.

What are the health effects of particle pollution?

Death

"First and foremost, short-term exposure to particle pollution can cause premature death. Those deaths can occur on the very day that particle levels are high, or within one to two months afterwards. Unfortunately, particle pollution does not just make people die a few days earlier than they might otherwise: these are deaths that would not have occurred without the pollution"[viii]

Short-term Exposure to Particle Pollution

"[I]ncreases in particle pollution have been linked to:

- Death from respiratory and cardiovascular causes, including strokes – (14,15,16) (The numbers correspond to footnotes from the quoted report, footnotes are copied at the end of this article)
- Increased numbers of heart attacks, especially among the elderly and in people with heart conditions - (17)
- Inflammation of lung tissue in young, healthy adults - (18)
- Increased hospitalization for cardiovascular disease - (19)
- Increased emergency room visits for patients suffering from acute respiratory ailments (20)
- Increased hospitalization for asthma among children - (21, 22, 23)
- Increased severity of asthma attacks in children - (24)

Year-round Exposure

Chronic exposure to particle pollution can shorten your life by one to three years.(25) Other symptoms range from premature births to serious respiratory disorders -- even when the particle levels are very low.

Year-round exposure to particle pollution has also been linked to:

- Increased asthma hospitalization for children living within 200 meters of roads with heavy truck or trailer traffic - (26)
- Slowed lung function growth in children and teenagers -(27, 28)
- Significant damage to the small airways of the lungs - (29)
- Increased risk of dying from lung cancer - (30)
- Increased risk of death from cardiovascular disease - (31)

Who is Affected?

Anyone living in an area with a high level of particle pollution is affected (you can take a look at levels in your state in this report.). People who are at the greatest risk from particle pollution exposure are: those with lung disease such as asthma and chronic obstructive pulmonary disease (COPD), which includes chronic bronchitis and emphysema; people with sensitive airways, where exposure to particle pollution can cause wheezing, coughing, and respiratory irritation; the elderly; people with heart disease; and children."

Excerpted From State of the Air, American Lung Association 2004[ix]

The CDFA plans to carry out this biochemical experimentation beginning again in March 2008, on a monthly basis. Thus creating ideal grounds for intensive, long term exposure to particle pollution.

What Happens to Children Exposed?

"Infants and children age 14 and younger may be especially susceptible to the health effects of ozone and particle pollution, because their lungs are still developing. Children have greater exposure to air pollution because of their faster breathing rates and the amount of time they spend playing outdoors. Ozone and particle air pollution can aggravate asthma, wheezing, coughing and may reduce lung function in children. Over the long term, some studies have indicated that pollution may stunt lung function growth."[x]

The Glove Fits!
Part by Part Comparison of Checkmate Formulation with Reported Symptoms

An 11 month old child nearly died from breathing difficulties from aerial spray.
" Children have greater exposure to air pollution because of their faster breathing"

A child who did not have asthma, got asthma from the spray.
Particulate pollution causes "increased severity of asthma attacks in children" - (24)

Formaldehyde has been linked to causing or aggravating asthma in children.[xi] Remember this is likely a urea-formaldehyde polymer.

When it rained a citizen described that her lungs got inflamed.
"Rain water or irrigation of the treated area can be used to release the core material."[xii] (Core material refers to the pheromone)

A child in the aerial spray zone played on the school playground several days after the aerial treatment and had severe rashes all over her arms.
"The microcapsules can also be applied to animal skin surfaces as a dry powder for release of the core material to the animal skin as the animal sweats and dissolves the plasticizer in the outer shell."[xiii]

It is likely in this case that the sweat from the child, caused a rapid release (not over 30 days) and degradation of the pheremone and other "inert" (toxic) ingredients from the microcapsules on her arm.

The Birds and the Bees

The CDFA claims that aerial applications have no harmful effects on the ecosystem. Think again!

Citzens saw an unusual amount of large dead birds on the road in sprayed locations.
"Birds flying overhead in search of food could still see the granules and would mistakenly them as food."[xiv]

Citizens report a metallic taste in their mouths.
"The [buffalo gourd root powder] powder has a strong bitter taste that will deter consumption of the capsules by birds during the day."[xv]

The bees will think that the microcapsule is pollen.
"[Microencapsulated formulations] may, however, pose a significant hazard to bees. Microcapsules are about the same size as pollen grain and bees may mistakenly carry these capsules back to their hives."[xvi]

Executive Order 13045
"Protection of Children from Environmental Health Risks and Safety Risks."

1-101. A growing body of scientific knowledge demonstrates that children may suffer disproportionately from environmental health risks and safety risks. These risks arise because: children's neurological, immunological, digestive, and other bodily systems are still developing; children eat more food, drink more fluids, and breathe more air in proportion to their body weight than adults; children's size and weight may diminish their protection from standard safety features; and children's behavior patterns may make them more susceptible to accidents because they are less able to protect themselves. Therefore, to the extent permitted by law and appropriate, and consistent with the agency's mission, each Federal agency:

(a) shall make it a high priority to identify and assess environmental health risks and safety risks that may disproportionately affect children; and

(b) shall ensure that its policies, programs, activities, and standards address disproportionate risks to children that result from environmental health risks or safety risks."[xvii]

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