FIGHTING FIRE WITH LEMONS AND FLOUR

Why is yoghurt the best extinguishing agent when your tongue is on fire with chili peppers?

That was the question that Swedish inventor Mats Nilsson asked himself when he was looking for a healthy alternative for flame retardants. For decades, these chemicals have been added in many consumer products to protect people from fire and minimise damage as much as possible.
Of course, we do not want the cushions of our sofas, the mattresses of our beds, our curtains, our airline seats, or the toys of our children to easily catch fire.

But that understandable concern has created a new problem:
Massive numbers of chemical cocktails have been and are still being released into the environment.

The annual value of the global flame-retardants market alone is 7 billion dollars and grows by 7 percent per year.
There are chemicals in the air we breathe, in the dust on the floor, and in the water we drink.

Toxic flame-retardants can be found in human breast milk and in fish.
Research shows that the quantities are dramatically increasing.
According to some reports, the concentration of toxins doubles every two to five years.
A growing body of evidence shows that many of these chemicals are associated with serious adverse health effects in humans.
They can impact sexual function and fertility as well as neurologic function.
They can cause cancer. Bromine compounds from poly-brominateddiphenyl ethers (PBDEs)—the main flame-retardant category—in the blood and tissue of children are being associated with permanent brain damage and movement dysfunctions.

There is also the risk that our bodies mistake chemicals as hormones.
The structure of the pentabrom-diphenyl-ether molecule resembles the structure of the thyroid hormone Thyroxine.
When pentabrom-diphenyl-ether was forbidden some years ago, clever chemists replaced penta (5) with deca (10) to create decabrom-diphenyl-ether.

However, when that molecule decomposes, it releases similar toxic bromine gas.
It is not for lack of an alternative. Nature has been containing fire for millennia.
In nature, the exchange between thermal heat and energy exchange is managed through the balance between acidity and alkalinity measured in the pH value.
That is why you want to 'cool' your mouth with yoghurt after eating a chili pepper.

Mats Nilsson learned how to manage fires as a child. His grandfather was a welder at a shipyard. He always had to be careful that he did not burn his shirt while he was working. Grandfather used to drink apple cider during his lunch breaks. He noticed that, when he had spilled the cider on his shirt and let it dry, that spot would never get burn marks. Mats' grandfather began experimenting with extinguishing fires and involved his grandchildren in his investigations. Mats learned to put out fires shaking a **Coca-Cola** can and spraying the gas—carbon dioxide—on the fire.
The experiment taught him the basics of a modern fire extinguisher that takes away the oxygen and removes the heat of a fire through spraying carbon dioxide on it.

His childhood experiences with his grandfather inspired Mats to get his fireman license as a smoke diver, while he was studying at university. He worked as a fireman for a few years, in mission to financing his studies, before taking the step to his first laboratory being a product developer.

Years later, some guys from the American company P&G (Proctor & Gamble) visited Mats at the laboratory asking about his opinion regarding developing an absolute non-toxic chemical product development of safe and eco-friendly alternative to existing flame-retardants in synthetic plastic materials.

Mats, who had studied subjects in science at universities (mathematics, physics, chemistry, technology, electronics, and physiology, remembered his grandfather's fire lessons, began researching citrus fruit. Mats knew that lemons have the same cooling effect as yoghurt and stomach acid. Mats also knew that people have been eating lemons forever, without any negative side-effects.
Working with natural acids that people have been used to, for thousands of years, seemed a much better idea than gambling with inorganic chemicals compositions.

Mats experimented and developed a product. However, the invention ended up on a shelf. That is where it was in 2003, when Nilsson's wife in media noticed an invitation to the "Nordic Environmental Competition 2003" - an ability to present the first generation of the MHE environmentally friendly product invention.
MHE - the Molecular Heat Eater - made it to the finals. More praise followed and that led to participation in the **BBC World Challenge**, a competition for ideas that "really make a difference for the world." To his surprise, Mats also reached the finals of that competition. From there, it went fast. Mats refined and completed the MHE product and filed for a patent.

The Molecular Heat Eater comes in a powder, a liquid, and a gel. The exact chemical composition is a trade secret, but Mats is clear that his product is basically a mix of berries, citrus fruits, grapes, flour, and cellulose. The mixture of alkaline bases and organic acids that the human body can easily manage, absorbs the thermal energy, extinguishes the flames, and cools the burning material. Mats' invention is, in scientific terms, a combination of carboxylic acids and inorganic alkalis that produces a sustainable salt that does not begin to decompose uncontrollably.

The Molecular Heat Eater is used to treat synthetic materials like plastics. Later on Mats continued to developed another flame-retardant product line, **Bio-Eco TT-products**, which is used to treat natural fiber materials. This type pf products are very successful in preventing and containing forest fires, without polluting the environment with harmful chemicals (PFAS).
It can also be sprayed on buildings to protect them from fire attacks.

In tests, Mats natural flame retardants perform as well—if not better—than conventional toxic chemical products.

The best news is that Mats healthy alternative flame retardants are less expensive to manufacture in bulk volumes compared with the toxic chemical cocktails that pollute the environment and endanger public health, because they are inorganic chemical composition in contrast to the organic chemicals made from the waste of plants, that easily meet the human nutrition and metabolism without harm.

Moreover, according to Mats, existing chemical flame-retardant production facilities can be adjusted to new natural substances for a one-time investment of only thousands of dollars. Finally, the use of plant waste also means that a natural flame-retardant industry will contribute to reducing carbon emissions.

Despite these clear benefits and advantages, Biomimetic's products are not yet sold on a large scale. Why not ?

Primarily, it depends on a most weak legislation. There are not many politicians that had study Chemistry enough, to understand what the environmental scientists claim about the health risks, based on all the frequently used hazardous chemicals applied into consumer products, that migrate into air, as well as polluting ground water and arable land i.e.

Secondly, "The flame-retardant market is in the hands of a few large corporations, that together form an oligopoly and are in no way open to change," Mats says. They also claim that their products are not harmful to anyone. It does not help that health regulations are set by parliaments that have very few members with a scientific background in Chemistry. These representatives of the people are easy targets for lobby groups of industries.

Mats stands ready to assist any new owner of the IP product developments of additives and standalone products by sharing the inventions with any company that wants to produce the absolute non-toxic chemical products, ideally in local production facilities, close to the required cellulose/lignin waste materials. As global warming seems to lead to an increase in fires in nature around the world, awareness about opportunities for natural flame retardants and fire protection should grow. And humans may ultimately learn that nature has the best and most healthy answers for almost every challenge. [JK]

More information: **www.trulstech.com** **www.trulstech.org**

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Awards: World Challenge Finalist