



Fludora[®]
CO-MAX▶▶

*The latest generation in
space spray technology*

Combine. Control. Protect.





We fight resistant mosquitoes *with a new approach*

Insecticide resistance is recognized as one of the biggest threats in the fight against vector-borne diseases. This is largely a consequence of the reliance on a limited number of insecticide classes for vector control. Therefore, there is an urgent need for new modes of action in dengue vector control as well as new strategies to preserve the effectiveness of both existing and newly available insecticide classes.

Given the resistance challenge, all new insecticide classes for public health are precious and their effectiveness needs to be preserved for as long as possible. That is why we have undertaken a new approach that addresses the challenge of resistance management. Fludora® Co-Max introduces a brand new insecticide class for vector control. Flupyradifurone belongs to the butenolide class, which has never before been used in vector control or public health. It is combined with the novel pyrethroid transfluthrin to provide reliable control of a wide variety of different mosquito strains, including those showing resistance to pyrethroids and organophosphates.

Our overall aim is to support the capacity of vector control programs to achieve significant impact on diseases by providing highly effective solutions that protect more lives.

Fludora® Concept

Our combination

approach for effective vector control

The approach of using combinations of different modes of action is well-recognized and practiced in urban pest management, public health and crop protection where such combinations can significantly improve the efficacy against resistant pest groups compared to solo insecticides. When introducing new modes of action, we also consider it best practice to introduce them in combinations in order to preserve their effectiveness for as long as possible.

We developed Fludora® Co-Max based on this principle. Our main objective is to offer new alternatives for integrated mosquito management as part of an overall insecticide resistance management strategy.



Fludora® Co-Max

An innovative tool for resistance management in vector control

Our combination approach for effective vector control: Fludora® Co-Max combines two unrelated modes of action that offer greater potential for sustainable insecticide resistance management.

Product basics

- // **Active ingredients:** Flupyradifurone and transfluthrin
- // **Target:** Adult mosquitoes: *Aedes spp.*, *Culex spp.*
- // **Formulation type:** Water-based insecticide for space spray (EW - Emulsion, oil in water)
- // **Indoor dose rate:** max. 0.394 g/1,000 m³
- // **Outdoor dose rate:** max. 7.5 g/ha

Key features and benefits

- // Introduces a brand new insecticide class (butenolide) and mode of action for mosquito control combined with transfluthrin - a fast acting pyrethroid that help overcome certain metabolic pyrethroid resistance mechanisms.
- // Broad spectrum activity against disease transmitting and nuisance mosquitoes: *Aedes spp.*, *Culex spp.*
- // High mortality rates against susceptible and resistant wild strains in trials performed in various sites under different conditions.
- // Easy to handle and mix.
- // FFAST® Technology: Our Film-Forming Aqueous Spray Technology reduces the evaporation of droplets upon delivering spray solution prepared by diluting a pesticide concentrate in water.
- // Flexible product which can be applied via cold and hot fogging, handheld and truck-mounted, outdoor and indoor.



Flupyradifurone

- // Slower-acting flupyradifurone (a butenolide) binds to nicotinic acetylcholine receptors on the post-synaptic membranes.
- // This keeps sodium channels open and contributes to hyper-excitation of the nervous system.



Transfluthrin

- // Faster-acting transfluthrin (a pyrethroid) binds to sodium channels.
- // This keeps them from closing and causes hyperactivity of the nervous system.



Complementary activity

- // Based on the acute toxicity package generated with Fludora[®] Co-Max, along with the acute toxicity studies carried out with both active substances individually, it is demonstrated that the combination of both insecticides: flupyradifurone and transfluthrin did not show any unexpected acute toxicity compared with the individual active substances.
- // The combined modes of action cause a general hyperexcitation of the nervous system via two different target sites and modes of action.
- // This makes it more difficult for mosquitoes to overcome the effects of both combined compounds.

The complementary effects of *two unrelated modes of action*

Considering the ongoing challenges of insecticide resistance; the design of a new insecticide product must take into account the particular features of the compounds available.

Fludora[®] Co-Max has an particular active ingredient: Flupyradifurone, a new mode of action in vector control and an unique member of the IRAC subgroup 4D, combined with the pyrethroid transfluthrin, which is a pyrethroid with unique properties. Even though pyrethroid degradation by P450 enzymes is the most common type of metabolic resistance to pyrethroids, transfluthrin is atypical. Its unique structure makes it difficult for P450 enzymes to bind properly to the molecule, preventing degradation and enzymatic resistance development.

As a selective agonist of insect nicotinic acetylcholine receptors (nAChRs), flupyradifurone causes hyperexcitation of the nervous system and therefore, over-stimulation of the voltage sensitive sodium channels (Na-channels). At the same time, it enhances the activity of transfluthrin that preferentially binds to the activated Na-channels. Where transfluthrin shows a fast knock-down activity, flupyradifurone is slower-acting and has a non-recovery effect/killing effect. The combination of both modes of action is therefore more robust and reliable compared to when applied alone. Together, they improve overall performance and significantly slow down the development of resistance.



Our focus on
*evidence-based
decision making*

In recognition of the importance of evidence-based decision making and taking into account the diversity and variability which is inherent in dealing with biological systems, we recognized that results from just a few field trials may not give a complete picture of the likely range of Fludora® Co-Max on continents as large as Asia or South America.

To that end we have invested in a range of field trials across 5 different continents to test and support this position. Fludora® Co-Max has been part of a program with 17 field trials in 13 countries and been screened across different resistant strains to confirm efficacy against known resistance mechanisms.

This trial data set has supported a position of greater robustness and reliability in performance of the Fludora® Co-Max combination and often improved performance compared to current existing products.

■ Countries where trials have been completed

How does Fludora® Co-Max contribute to the sustainability of your program?

- // Contains two unrelated modes of action for sustained impact.
- // Helps to slow down the development of insecticide resistance.
- // Dilute with water only - eliminating need for hydrocarbon diluent; reducing carbon footprint of application.
- // Use of water as diluent reduces environmental air pollution compared to use of diesel or kerosene.

Explore the latest insights from our field trials

A large number of trial data has been generated for Fludora® Co-Max but only a small selection of that can be represented here. For a more comprehensive view of trial results, please contact one of our company representatives to gain access to our online data sharing platform.

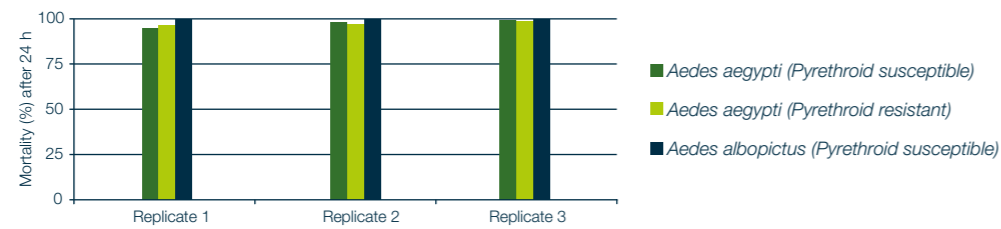


Mexico

Fludora® Co-Max provides a consistent level of efficacy against different mosquito species and strains.

Bioassay results of Fludora® Co-Max against three Aedes strains

Indoor thermal fogging trial



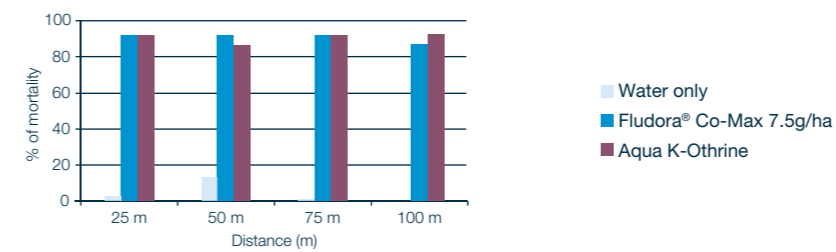
Source: Instituto Nacional de Salud Pública (INSP) / Centro Regional de Investigación en Salud Pública (CRISP), Tapachula, Chiapas, México



Kuwait

Fludora® Co-Max provides strong activity against pyrethroid susceptible Culex mosquitoes, equivalent to a high performing standard

Outdoor cold fogging trial



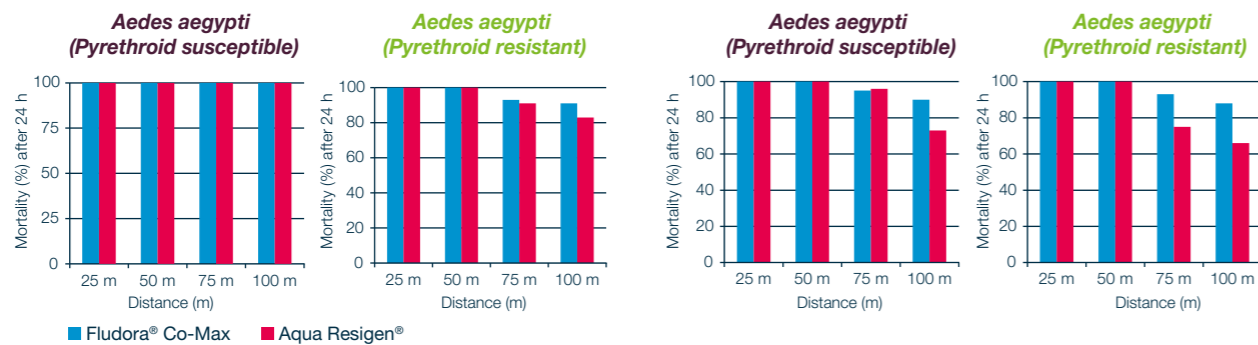
Malaysia

Fludora® Co-Max provides improved results against resistant strains compared to synergised-pyrethroid-based products.

This effect can be seen at distances of up to 100 metres.

Outdoor cold fogging trial

Outdoor thermal fogging trial



Source: Universiti Sains Malaysia (USM), July 2018

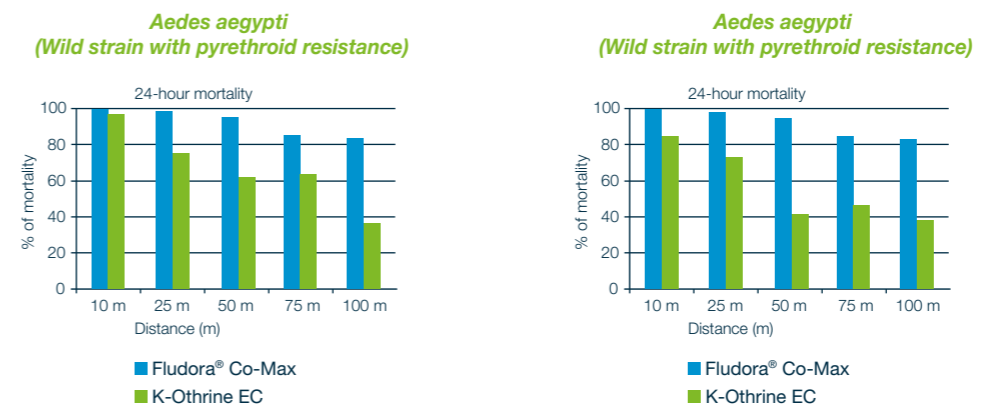


Côte d'Ivoire

Fludora® Co-Max provides improved results against resistant strain compared to pyrethroid-only products.

Outdoor cold fogging trial

Outdoor thermal fogging trial

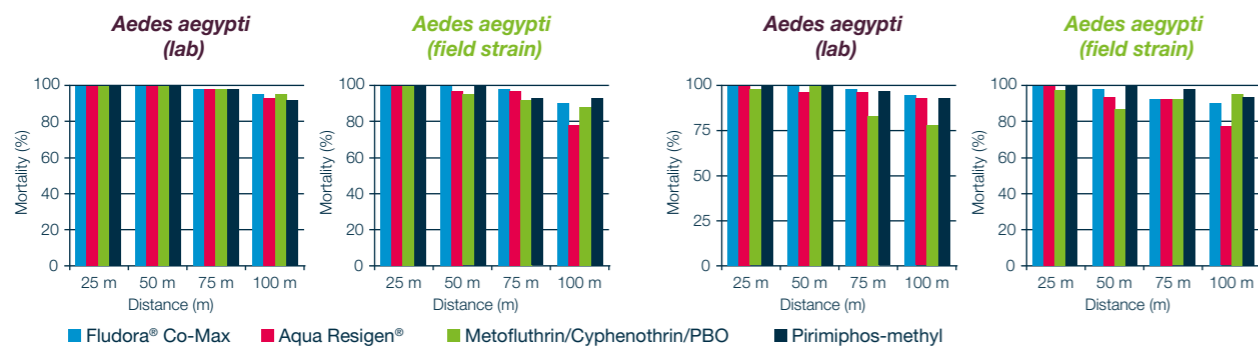


Vietnam

Fludora® Co-Max provides equivalent or improved results compared to other organophosphates or synergised-pyrethroids.

Outdoor cold fogging trial

Outdoor thermal fogging trial



Source: NIMPE June 2019

Fludora® Co-Max

- // **Combine** two modes of action to better tackle resistance
- // **Control** dengue with a more effective approach
- // **Protect** communities with a sustainable solution



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