Need To Know

- Straight talk for professionals about pests and pest control products

Caretaker Behavior and the Domino Effect® from Premise®

Termite Behavior 101

Termites are social insects. Their highly evolved, behavioral system for communication, coordination and mutual defense operates through the interactions of individual termites (Fig. 1). When termites meet in a darkened gallery of their subterranean world, they instinctively "check each other out" by a series of antennae touching and mutual grooming (known as "allogrooming"). This serves a defensive role, by identifying intruders, but more importantly these encounters transmit subtle messages among colony members.

Fig 1: Termites interact with each other as they work within the subterranean environment.

One "message" transmitted this way is the health of nest mates. Research at the University of Florida and Boston University found that interactions between individuals detect fungal spores or other microbes and trigger allogrooming to remove the pathogens before they kill termites. This "cooperative care" amongst individual termites is a central feature in the group's ecological success and dominance of the terrestrial landscape.

Healthy termites go out of their way to tend to or care for sick or dying termites; they will even interact with dead termites, if only to bury the carcass within the earthen works of the termite colony.

Why is this "caretaker" behavior important to pest management professionals?

Once exposed to Premise, termites go through a progression of symptoms. It may take several minutes to a few hours before symptoms are manifested. Poisoned termites first become restive, moving less and, over time, their movements become severely uncoordinated (known as ataxia). Ultimately, this will progress to an outright absence of movement. Yet, throughout this progressive intoxication, the termite has not yet died! In fact, at low doses, death may not occur for days.

All the while, these intoxicated termites continue to exist in the presence of other termites, either because they moved away from the Premise Treated Zone® to enter other areas in the subterranean network of tunnels, or because other termites have moved into the area. These unexposed, normal-behaving termites will – as their behavior dictates – interact with the other termites they encounter, including termites that have been exposed to Premise. It is here that active ingredient transmission between termites - known as the Domino Effect® - occurs.

Healthy termites are responsible for spreading Premise residues by engaging in natural, instinctive behaviors. When they probe a Premise-exposed termite with their antennae, when they groom a Premise-exposed termite, when they cannibalize a moribund termite, and when they carry away and entomb the dead, all of these interactions transfer Premise from poisoned termites to the attending "caretaker" termites.

Researchers continue to investigate this phenomenon, especially the mechanisms involved in "remote kill" of termites far removed from the

Premise Treated Zone. Bayer is sponsoring advanced research at North Carolina State University using radiolabeled imidacloprid and DNA genotyping to definitely prove both the destruction of termite colonies and the mechanisms by which Premise is spread through the colony. However, already published research makes one thing clear … **The Domino Effect of Premise is a powerful force in killing termites**.

Independent Research

Scientists at Bayer were the first to discover the movement of soil-applied active ingredient between termites. Trials conducted in 1995 demonstrated the Domino Effect® operates over a wide concentration range, and that exposure to treated soil for as little as 1 hour can induce the effect (Fig. 2).

Finally, Drs. Osbrink and Lax (USDA) found that for months after injecting Premise foam into infested trees, Premise-intoxicated termites were collected from monitors dispersed throughout the study areas. Termites collected from monitors *"… showed latent mortality attributed to imidacloprid intoxication… "* and they report *"The occurrence of imidacloprid-intoxicated termites 46-m* (ca. 150 ft.) *from the treatment site ... is remarkable."* Their observations – made in the field, with no laboratory manipulations – offer proof of the Domino Effect.

The Domino Effect helps Premise to work fast and give Immediate Structural Protection. It's a combination that's been working for Pest Management Professionals for 8 seasons now, and with an unrivaled, documented success rate of greater than 99%.

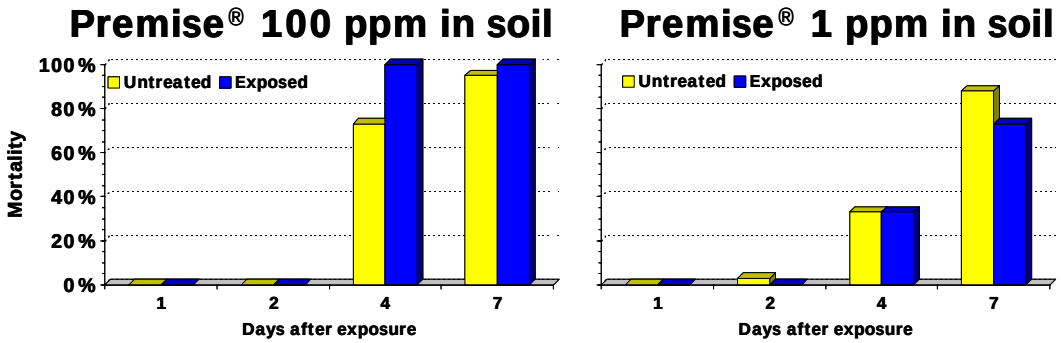

Fig 2: Termites were exposed to PREMISE treated soil for 1 hour, then five exposed termites were placed on untreated soil with 100 termites (marked blue) that were not exposed to Premise. Mortality in both groups monitored over time. [Bayer Corporation, Vero Beach Labs, 1995]

More recently, a number of publications in by independent researchers have confirmed this earlier work.

Drs. Barbara Thorne and Nancy Briesch of the University of Maryland, while studying the effects of Premise exposure on tunneling behavior in subterranean termites, found *"… evidence that termites that are indirectly exposed to imidacloprid through contact with exposed nestmates also may have their health and behavior affected by imidacloprid. Onset of symptoms and, in some cases, death among naive termites … suggests that residues of imidacloprid are being transferred between termites …"*

Drs. Guy Shelton, with USDA Forest Service, and Ken Grace (University of Hawaii) published a study that confirms the Domino Effect of Premise in Formosan termites, concluding *"…our results document lethal transfer of toxicants from exposed to unexposed C. formosanus workers when donors were exposed to 100 ppm imidacloprid … for 1 h."*

To learn more about Premise and the Domino Effect in termites, consult the following publications:

B. L. Thorne and N. L. Breisch. 2001. Effects of sublethal exposure to imidacloprid on subsequent behavior of subterranean termite Reticulitermes virginicus (Isoptera: Rhinotermitidae). *J. Econ. Entomol. 94: 492 – 498.*

W. L. A. Osbrink and A. R. Lax. 2003. Effect of imidacloprid tree treatments on the occurrence of Formosan subterranean termites, Coptotermes formosanus Shiraki (Isoptera: Rhinotermitidae), in independent monitors. *J. Econ. Entomol. 96: 117 – 125.*

T. G. Shelton and J. K. Grace. 2003. Effects of exposure duration on transfer of non-repellent termiticides among workers of Coptotermes formosanus Shiraki. *J. Econ. Entomol. 96: 456 - 460.*

D. G. Boucias et al. 1996. The effect of imidacloprid on the termite *Reticulitermes flavipes* and its interaction with the mycopathogen Beauveria bassiana. *Pflanzenschutz Nachricten Bayer* 49: 103 - 145.

J. F. A. Traniello, et al. 2002. The development of immunocompetence in a social insect: evidence for the group facilitation of disease resistance. *Proc. Natl. Acad. Sci. USA 99: 6838 – 6842.*