

EFFICACY REVIEW

DATE: IN 10/14/97 OUT 10/27/97

REVIEWER: **KEVIN J. SWEENEY, ENTOMOLOGIST**  
FILE OR REG. NO.: **241-GOE**

PETITION OR EXP. PERMIT NO.:

DATE DIV. RECEIVED: **7/18/97**

DATE OF SUBMISSION: **7/14/97**

DATE SUBMISSION ACCEPTED

TYPE PRODUCT(S): **I, D, H, F, N, R, S**

DATA ACCESSION NO(S). **S527730, DP238686**  
PRODUCT MGR. NO.: **10**

PRODUCT NAME(S): **Chlorfenapyr Termiticide-Insecticide**

COMPANY NAME: American Cyanamid Company

SUBMISSION PURPOSE: **NC-Non-Food/Feed Use Action 115**

CHEMICAL & FORMULATION: **Chlorfenapyr 21.44%**

**CONCLUSIONS & RECOMMENDATIONS:**

Report Title: Chlorfenapyr Termiticide-Insecticide: Summary of Termite Control Efficacy

The report included studies from USDA, American Cyanamid, University of Georgia and the New Orleans Mosquito Control Board. Studies were conducted to evaluate the efficacy of chlorfenapyr against the subterranean termites, *Reticulitermes virginicus*, *R. flavipes*, *R. hesperus*, and the Formosan termite, *Coptotermes formosanus*. The report includes a published article by Black et al. describing the insecticidal mode of action of chlorfenapyr and related pyrroles. Efficacy studies were not submitted for many pests on the label including: wood boring beetles; cockroaches; acrobat ants, Argentine ants, carpenter ants, fire ants, odorous house ants, pavement ants, Pharaoh's ants, pyramid ants; dampwood or drywood termites, and carpenter bees.

The submitted studies show that chlorfenapyr can control subterranean termites at application rates 1000 or more ppm (1 g/l or a dilution equal to 0.1% a.i.). The insecticide appears to have no repellent effects and termites readily invade treated areas. Death is slow, presumably due to type of insecticidal action - uncoupling of oxidative phosphorylation in the mitochondrion. Chlorfenapyr is activated following insect ingestion or absorption by enzymatic action of mixed function oxidases (mfo). The activated form enters the mitochondrion where it disrupts chemiosmosis. ATP synthesis is inhibited indirectly because the chlorfenapyr metabolite alters inner membrane permeability and the mitochondrion fails to establish a proton ( $H^+$ ) concentration gradient. As a result, electrochemical energy (activation energy) is not available to promote the synthesis of ATP from ADP + P by ATP synthetase. This last step represents the uncoupling of oxidative phosphorylation because ADP cannot be phosphorylated to form ATP. Respiration of the insect increases in a desperate attempt to provide the terminal acceptor - oxygen - for the completion of electron transport (Electron transport is important to establishing a proton gradient). Cell death results when ATP is exhausted and metabolic reactions requiring energy can no longer continue.

This mode of action is virtually the same in all organisms. Chlorfenapyr appears most active in insects but affects mammalian liver (rat) cells *in vitro*. Its mechanism for uncoupling phosphorylation is different from the highly toxic 2,4-dinitrophenol, an active ingredient once used for wood preservation. However, it appears that the uncoupling mechanism is irreversible.

Chlorfenapyr's broad spectrum of activity and residual life does not favor above ground use, especially indoors. I was surprised to see such uses on the label because the report summary prepared by B.L. Reid discussed the importance of registering chlorfenapyr as a soil termiticide. The summary stressed the need for an insecticide to control subterranean infestations of the termites, *Reticulitermes spp.* and *Coptotermes formosanus*. No mention was made of the need for above ground treatments or control of other pests. In addition, chlorfenapyr's long half-life, low water solubility and adsorption to soil was applauded and used to support its termiticidal nature.

The efficacy studies support the use of chlorfenapyr as a termiticide and are acceptable. The registrant needs to make label changes. I copied the label and made some changes on it. They are as follows:

1. Page 1: OK
2. Page 2: OK
3. Page 3: Add "For control of the following termite species": . List the pests chlorfenapyr controls. State the species names on the label. The species list included with the EUP must be on the label. Wood injections to control old house borer, powder-post beetles, powderpost termites, carpenter bees and the Western drywood termite will be acceptable only if efficacy data are submitted. They should be controlled outside the structure. The residual nature of this insecticide does not favor its use indoors above the sill. Use of this termiticide for Formosan termites must be on the label. Please follow the directives in 96-7. Discuss them with Ann Siebold and Marion Johnson.
4. Page 4: Insert Paragraph #5 from page 10 under the heading entitled "Mixing directions."
5. Page 5: Add the heading: "Crawl Spaces" followed by the precautionary statement required by 96-7, "When treating crawl spaces, turn off the air circulation system of the structure until application has been completed and the soil has absorbed all termiticide."
6. Page 6: OK
7. Page 7: Under the subheading for "Hollow Block Foundation or Voids" a paragraph instructs applicators to apply to voids behind walls including stud walls. Remove or modify these instructions. They are not well defined. The described sites are all above the sill and border or lie within the structure. A barrier in the soil controls subterranean termites. The termites in wood or in the other areas described may survive without a soil connection if temperature and humidity are adequate. Short lived insecticides can be used to kill them. If this paragraph applies to situations that include Formosan termites, please refer to 96-7 and follow the recommendations for these termites. Application of a residual termiticide to areas above the sill is risky business and not

recommended. Most states discourage such use. I suggest recommending another insecticide for control in the described sites or omit their mention altogether.

8. Pages 7&8 - Plenums: Plenum applications are unique and the directions on the label need to include more discussion about the risks inherent with such a application. The label needs to provide guidance here. Too much is being left up to the applicator. The use of any insecticide in this type of space is difficult. Accessibility can be difficult and applicators cannot always see where they apply the termiticide. Since this space is the source of heating and cooling, it is imperative that the applicators prevent termiticide vapor circulation throughout the structure for a prolonged time. The second paragraph under the subheading entitled "Plenums" discusses surface applications. This is not acceptable. Soil sprays in this situation will only be considered if using the treated backfill method. As stated in 96-7, we will probably require risk data for respiratory exposure if applications are made in this area. We may also require this data for crawl space treatments. Please discuss this with Marion Johnson and/or Ann Siebold.

9. Page 8 cont.: Insert paragraph #4 from page 10 following the heading entitled "Structures with Wells/Cisterns Inside Foundations." Please modify wood injections to include outdoors treatment only due to the residual nature of this product. Other insecticides can be used here instead.

10. Page 9: Change the heading entitled "Corrective Treatment" to: "Retreatments."

Page 9: I cannot support the use of this product in wood by injection if the wood is above the sill or within the interior space of any structure. Applicators should use insecticides that are short-lived but effective.

Many "General Precautions for Termiticide Applications" need to be incorporated into the appropriate subsections under the directions for use. Move follow page 3. This insures applicator review of this material and emphasizes the need to follow these precautions.

Page 9: In the second paragraph of General Precautions for Termiticide Applications PR Notice 96-7 requires the following statement: "Plugs must be made of a non-cellulose material or

covered by an impervious, non-cellulose material." Many applicators do not know what cellulose is. Please add the following: "Plug the hole immediately after injection with a rubber or cork stopper." "When treatment of the structure is completed, seal every hole in the slab with fresh Portland cement to gain an impervious, permanent seal."

Page 9: The General Precautions for Termiticide Applications section discusses plenums as required by PR Notice 96-7. Please add statements that make it easier for an applicator to understand. The National Pest Control Association has a technical release on this subject. Add more information to the label to explain this application better.

Page 10-12: There is no data to support any of these uses. Delete all of them until you can submit efficacy data. The residual nature of this product does not favor indoor uses. I am anxious to see the crack and crevice data for roaches.

Page 13: The tree use is interesting but I do not think this is practical for subterranean termites. If this use is for control of Formosan termites, state it on the label. Follow the instructions in 96-7 concerning Formosan termites. The efficacy data submitted by American Cyanamid was for control of Formosan termites in trees because above ground colonies exist. The Formosan termite is subterranean in its habit. The main or primary gallery is usually found in the soil and the queen resides there. Reports of galleries in attics etc. exist but these are usually secondary galleries. I do not see the need for above ground applications to trees. Injection around or underneath trees is acceptable. Drilling into a tree and injecting chlorfenapyr is not necessary when short-lived insecticides are available. Control of termites in trees is difficult and expensive with any insecticide in this situation.