

# CARES Ongoing Enhancements

Sponsor: PWG

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# Topics

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- ◉ Update On Ongoing PWG Sponsored Cumulative Module
- ◉ New CARES Enhancements for the Pyrethroids Cumulative Minute Exposure Assessment

# Cumulative Module

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- ***MODULES / TASKS currently being addressed***
  - **Dietary Cumulative**
  - **Dietary PDP**
  - **Water Cumulative**
  - **Residential Cumulative**
  - **REJV (Residential)**
  - **Chemical/Toxicology**
  - **Cumulative Module**
  - **Case Studies**

# Cumulative Module

## ○ Dietary, Water, and Residential Modules

- QA acute cumulative dietary exposure calculations using standardized test protocol.
- Update list of outputs to reflect individual and multiple chemical dietary exposures.
- Include moving average cumulative dietary exposure calculations.

## ○ Dietary PDP

- Connect output from PDP module to Dietary Cumulative module from prior PWG PDP data files (most recently available, funded by PWG).

# Cumulative Module

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## ○ Residential Cumulative (non-dietary)

- Add contribution analysis components to determine product and chemical contributions to total exposure.
- QA REJV module using standardized test protocol
- Connect output from CARES REJV module to updated Residential Wizard.
- QA event allocation import feature for importing product use data from other data sources (i.e. REJV).

# Cumulative Module

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## ● Chemical/Toxicology

- Expand capabilities of Chemical/Toxicology module to accommodate cumulative assessments.
- Refine/update toxicology module to address common mechanism of effect for multiple ion channel pathways.
- QA acute cumulative toxicology calculations using standardized test protocol.

# Cumulative Module

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## ○ Cumulative Module

- Develop a module that cumulates outputs from Dietary Cumulative, Water Cumulative, and Residential Cumulative modules.
- Add contribution analysis components to determine pathway and chemical contributions to total exposure.
- Include moving average cumulative exposure calculations.

# Pyrethroids Cumulative Minute Exposure Module

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## Objectives

- Prepare CARES for PWG Cumulative Minute Exposure Assessments
  - Update CARES Dietary and Drinking Water Minute Modules
  - Create a CARES Residential Minute Module

# Objectives (continued)

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- Prepare Minute Modules to
  - Generate exposure outputs to interact with PBPK models (e.g., EPA's ERDEM)
  - Generate exposure outputs at user-specified time scales (e.g., 5 min, 10 min, 30 min, 1 hr, etc.)

# CARES Current Status

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## ○ Dietary & Drinking Water

- Modules that generate minute exposures exist
- Drinking water: Temporal water consumption data may have to be approved by EPA
- Updates needed to average data across different time scales
- Updates needed to estimate cumulative exposures

## ○ Residential

- Minute module yet to be implemented
- Most complex of all exposure categories

# Residential Minute Module

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## ○ Components

- Product use event allocation
- Human Activity Patterns (will be added)
- Exposure algorithms
- Minute exposure calculations
- Cumulative minute exposure calculations

# Product Use Event Allocation

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- Estimate Time of Day for Products Use
- Determine Post-Application Scenario for Receptor of Interest based on Activity Patterns
  - Locations in Residence (Indoor or Outdoor)
  - Exposure Duration in Each Location
- Update current Event Allocation Procedure in the Residential Wizard

# Human Activity Patterns

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- Add CHAD (EPA's Consolidated Human Activity Database) to CARES
- Organize data in CHAD to be compatible with Residential Modules in CARES
- Determine activity patterns for different subpopulations (gender and age) based on three locations (residence-indoor, residence-outdoor, and "other")

# Exposure Algorithms

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- Modify exposure algorithms to estimate minute exposures (instead of daily)
- Connect CHAD to relevant exposure algorithms
- Determine “Exposure Duration” parameter based on Activity Patterns for Exposure Receptor of Interest

# Minute Exposure Calculations

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- Generate exposures minute-by-minute
- Add tools to generate exposures for any time scale (5 minutes, 10 minutes, 30 minutes, 1 hour, etc.; time-weighted averages)
- Add tools to determine contribution from products and exposure routes

# Cumulative Minute Exposures

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- Update minute modules to accommodate multiple chemicals
- Update minute exposures based on
  - Requirements of PBPK model
  - Time scale of interest (1 min, 5 min, 10 min, 30 min, 1 hr, .....)
  - Chemical-specific and Pathway-specific Absorption Factors and Potency Factors

# Exposure → Dose

