CEM Questions and Answers

Q: How Does CEM Work?

A: CEM is a user-friendly software product that estimates inhalation, oral, and dermal exposures.

. Allows you to tailor your exposure scenario, based on the chemical, consumer product, receptor, and environment of interest.

. Estimates acute and chronic exposures and provides a variety of exposure metrics.

Q: What Do I Need to Use CEM?

A: Data on the chemical, consumer product, receptor, and environment to be modeled in the exposure scenario of interest.

. Defaults are generally available. However, the use of measured values informed by current and robust collection of exposure data is preferred.

Q: How Are CEM Data Used?

A: You can use CEM to estimate inhalation, oral, and/or dermal exposures to chemicals released from products or materials in indoor environments.

Q: What Type of Hardware and Software Requirements are required for CEM?

A: CEM was developed using Microsoft Access and Visual Basic for Applications (VBA), and it is compatible with 2007 and 2010 versions of Microsoft Office. A freely-available Microsoft Access runtime environment is available on the Microsoft website for users that do not have Microsoft Access installed on their computer.

Q: What Is CEM's Status and Availability?

A: CEM 2.1 is available as a stand-alone draft version available for download as a zip file on EPA’s website. The previous version of CEM 1.2 is available as part of EPA’s E-FAST model.

Q: Where can I find information about how CEM calculates acute and chronic doses and other exposure metrics?

A: The model documentation is contained in the help screens within the model and within the user’s guide.

Q: Has CEM been peer reviewed?

A: An external (i.e., by scientists outside of EPA) peer review of CEM version 1.2 was conducted in 1999. Revisions to the model in response to the peer reviewers' comments were completed. CEM version 1.4 was peer reviewed and CEM version 2.1 incorporates feedback from this peer review.

Q: Is there a user's guide available for CEM?

A: A user's guide for CEM is currently available.

Q: What updates occurred between version 1.2 and 2.1?

A: In the previous version (1.2) of CEM, six modules were available to estimate inhalation and dermal exposure. In version 2.1, fifteen modules are available to estimate inhalation, dermal, and oral exposure. Other major changes include:

- Additional of a near-field option for inhalation exposure scenarios

- Addition of mouthing exposure pathway

- Addition of SVOC emission from building materials

- Addition of Dermal absorption from Vapor pathway and dermal contact with articles (solids), in addition to dermal contact with products (liquids)

- Ability to use measured monitoring values and/or emission rates as opposed to model estimated values

- Addition of additional exposure scenarios for both consumer products and articles/building materials

Q: What updates occurred between version 1.2 and version 2.1?

A: CEM was updated in stages. Version 1.3 was a beta test version. Version 1.4 was peer reviewed. Version 2.0 was released publicly following peer review in 2017. Version 2.1 is a further refinement based on additional feedback. Alternative suggestion. "Refer to user guide for summary of changes made to CEM based on beta testing and peer review.

Based on the feedback of the Beta reviewers, the following changes have been implemented in CEM:

1. Activity patterns were revised to capture mostly stay-at-home, part-time out-of-the home (daycare, school, or work), and full-time out-of-the-home residents.
2. A model considering ingestion of inhaled particles that are trapped in the upper airway was added.
3. An option to use products outdoors was added.
4. The dermal exposure from articles model was revised to reflect CONSEXPO approach and data from the OPP Residential Scenarios.
5. The product applied to the ground outdoors model was revised to account for multiple product applications.
6. The dermal exposure model for air-to-skin transport was revised to include a steady-state flux from the air to the skin.
7. The option to specify a fraction absorbed, in addition to an absorption constant, was added to the dermal exposure models.
8. Multiple options to increase the user-friendliness of the model and decrease model run-time were added, including additional help screens, default parameters, parameter estimators, search functions, and code refinements.
9. Multiple options for naming, outputting, formatting, and saving reports were added.

Following incorporation of peer review comments, Version 2.1 of CEM is completed. Based on the feedback of the peer reviewers, the following changes have been implemented in CEM:

1. Product and article categories were harmonized with OECD categories. Ten new product and article categories were added to CEM. To allow for greater flexibility, five generic product categories and five generic article categories were added.
2. New dermal models were added: A_DER2 Dermal Dose from Article where Skin Contact Occurs, P_DER3 Dermal Dose from Soil where Skin Contact with Soil or Powder Occurs. In addition, the existing dermal models were improved. The permeability coefficient, K_p of P_DER2b was revised and a fraction absorbed estimator was incorporated into P_DER2b. The existing A_DER3 Dermal dose from skin contact with dust was also modified to more accurately model exposure to a chemical in dust residing on the surface of an article.
3. An abrasion term was added to the SVOC article model.
4. Functionality to account for background drinking water and soil concentrations was added.

5. The ability to report Lifetime, in addition to Chronic, Average Daily Dose, was added.
6. Maximum limits were added to restrict users from entering values beyond a reasonable value for certain inputs.
7. Model names were updated to more clearly indicate the model's function.
8. Models within CEM were ground-truthed against existing monitoring data, where available.
9. A sensitivity analysis was completed.
10. The reports in CEM have been refined and reorganized.
11. Users can now access the User's Guide from within CEM.

Additional changes were made to CEM and the User Guide based on peer review and user feedback:

1. The dermal article contact (A_DER3) model was updated based on stability tests.
2. A vapor to skin for products (P_DER1) model was added.
3. The fraction of chemical removed was added to the fraction absorbed product dermal model (P_DER2a).
4. The average molecule diffusion per contact estimator was corrected.
5. Stability tests for all product/scenario combination were conducted.
6. Prepopulated scenarios were added.
7. Additional product/scenario combinations that were not in previous versions were added.
8. Terminology and terms used within the model and User Guide were clarified and added to the glossary.
9. Some defaults for certain products and articles were updated.
10. Some surface area to body weight ratios were changed for certain product scenarios.
11. The reports from CEM were updated.