

In some implementations, the subject matter disclosed herein provides for automatic control of the inhalant concentration in the inhalant chamber. Generally, other static inhalant systems require the user to repeatedly initiate and terminate inhalant dissemination manually and do not incorporate a method for continuously and automatically maintaining the inhalant concentration at user-defined levels. In one implementation, the inhalant generation and static cycle innovations described previously provide for automatically and continuously controlling the inhalant concentration in a static inhalant system.

In some implementations, the subject matter disclosed herein provides for automatically accounting for changes in the number or respiratory minute volumes of the test animals. Generally, static inhalant systems require complete system recharacterization if the number or respiratory minute volumes of animals in the system changes. Generally, static inhalant systems rely on pre-determined cycle times that are a function of the number and respiratory minute volumes of the test animals. In one implementation, the subject matter disclosed herein varies the inhalant generation and static cycle times based on near real-time inhalant concentration measurements rather than on predetermined cycle durations. This feature, in conjunction with the near real-time dose calculation function, eliminates the need to recharacterize the subject matter disclosed herein when changing the number or species of the test subjects.

In some implementations, the subject matter disclosed herein provides for the exhausting of carbon dioxide, ammonia, and other animal byproducts from the inhalant chamber. Generally, static inhalation systems generate environments rich in carbon dioxide and ammonia near the end of each exposure cycle. Such systems do not provide processes or methods for automatically exhausting and regenerating the inhalant environment when carbon dioxide loading becomes too severe. In one implementation, the inhalant concentration control innovation in the subject matter disclosed herein provides a process by which the user can ensure that carbon dioxide loading is limited. The near real-time inhalant concentration measurement provides an indirect measure of carbon dioxide loading. Each animal breath results in inhalant being removed from the inhalant chamber and carbon dioxide being added. Thus, carbon dioxide concentration varies inversely with inhalant concentration. The user, therefore, indirectly limits carbon dioxide loading by choosing an appropriate inhalant concentration lower limit.

In another implementation, the carbon-dioxide concentration is measured directly with a sensor, and the environment is controlled in response thereto. In yet another implementation, the ammonia concentration is measured directly with a sensor, and the environment is controlled in response thereto.

5. Non-Exhaustive List of a Few of the Differences between the Subject Matter Disclosed Herein and Other Systems

A listing of a few of the differences between the subject matter disclosed herein and other methods and systems follow. Those having ordinary skill in the art will recognize that such differences constitute a non-exhaustive listing.

One difference between the subject matter disclosed herein and other methods and systems is that in one implementation the subject matter disclosed herein generates a preferred exposure atmosphere by cycling between a dynamic and static state.

Another difference between the subject matter disclosed herein and other methods and systems is that in one implementation of the subject matter disclosed herein the atmosphere in an exposure chamber is controlled to achieve a

desired inhaled dose in an animal housed in the exposure chamber without reliance on a continuous atmospheric concentration.

Another difference between the subject matter disclosed herein and other methods and systems is that in one implementation of the subject matter disclosed herein a presented dose to an animal is determined based on the individual respiration of the animal and the constantly fluctuating exposure concentrations using both dynamic and static states.

Another difference between the subject matter disclosed herein and other methods and systems is that in one implementation of the subject matter disclosed herein a preferred inhaled dose is delivered to a test subject in a static exposure chamber regardless of the concentration of the starting material in the aerosol generator.

Another difference between the subject matter disclosed herein and other methods and systems is that in one implementation of the subject matter disclosed herein a preferred inhaled dose is delivered to a test subject in a static chamber regardless of the respiratory minute volume of said subject.

Another difference between the subject matter disclosed herein and other methods and systems is that in one implementation of the subject matter disclosed herein automated, user-defined, concentration-based removal of gaseous animal byproducts from a static exposure chamber is provided.

Another difference between the subject matter disclosed herein and other methods and systems is that in one implementation of the subject matter disclosed herein the quantity of material under testing required to deliver a desired dose to a test animal is reduced.

From the foregoing it will be appreciated that, although specific embodiments of the invention have been described herein for purposes of illustration, various modifications may be made without deviating from the spirit and scope of the invention. Accordingly, the invention is not limited except as by the appended claims.

The invention claimed is:

1. A method comprising:
 - starting a flow of an inhalant having at least one non-ambient constituent through an exposure manifold;
 - determining an inhalant concentration of the inhalant in the exposure manifold;
 - stopping the flow of the inhalant through the exposure manifold when the inhalant concentration is in a first specified inhalant-concentration range;
 - determining a metabolic waste product concentration in the exposure manifold; and
 - repeating said starting, determining, and stopping when the metabolic waste product concentration is in a first specified range.
2. The method of claim 1, wherein the first specified inhalant-concentration range comprises:
 - an inhalant concentration greater than or equal to a specified threshold concentration.
3. The method of claim 1, wherein said repeating occurs when the inhalant concentration is in a second specified inhalant-concentration range, the second specified inhalant-concentration range comprises:
 - an inhalant concentration less than or equal to a specified threshold concentration.
4. The method of claim 1, wherein the metabolic waste product concentration comprises:
 - a biological waste product concentration greater than or equal to a specified threshold concentration.
5. The method of claim 1, wherein the metabolic waste product comprises: