Double Chamber Plethysmograph

Plethysmography for conscious restrained animals

MEASUREMENTS

» Respiratory rates & durations
» Real volumes & flows
» Specific airway resistance and conductance (sRaw, sGaw)

FEATURES & BENEFITS

» For mice, rats and guinea-pigs
» Non-invasive measurements for longitudinal studies
» A head chamber & a body chamber, each one equipped with a pneumotachograph, enabling the measurement of:
  » Nasal flow (flow of air into and out of the nose)
  » Thoracic flow (generated by compression and expansion of air when the thorax rises and falls)
» Regulated ventilation for noise-free air renewal

CONICAL RESTRAINER

For mouse and rat models, a conical restrainer follows the animal's head shape and ensures that no air flows between the 2 chambers.

» Ease of use: simply place the animal in the conical restrainer
» No need to pull the animal's head through a membrane hole
  » The animal is less stressed
  » The animal is less likely to move during the experiment
» Lower dead volume
» Acclimation can be performed in the conical restrainer alone (without the plethysmograph)

Top view (pnt, pneumotachograph; dpt differential pressure transducer; air flows as blue arrows)
HEAD-OUT CONFIGURATION

» Head-out configuration (head part is removed):
  » To measure thoracic flow & study ventilation parameters only (e.g. tidal volume or breathing rate)
  » Allows simultaneous aerosol delivery on multiple subjects, using an inhalation/exposure tower
  » Combines with telemetry implants to measure resistance/compliance parameters in conscious animals

Pressure signal from telemetry implant & flow signal from plethysmograph are synchronized through easyMATRIX device.

AEROSOL DELIVERY

nebulizationCONTROLLER is used in conjunction with the nebulization head (Aeroneb® Lab Nebulizer from Aerogen Inc) to generate a low-velocity fine-droplet aerosol.

» Each nebulizationCONTROLLER drives up to 4 nebulization heads
» Multiple nebulizationCONTROLLER can be linked to drive more than 4 nebulization heads
» Adjustable aerosol generation rate (5% to 100% of the maximum quantity - prevents cannulae obstruction or increase of particle sizes)
» Sequential or simultaneous delivery of aerosol in several plethysmographs

EXPOSURE TO GAS MIXTURE WITH MASS FLOW CONTROLLER

» Evaluate the effect of hypoxia, hyperoxia and hypercapnia.
» Up to 3 gases can be controlled (e.g. O₂ + N₂ + CO₂ or air + CO₂)
» Full automation possible through iox2 protocols

DATA ACQUISITION & ANALYSIS

» iox software: Data recording, real-time analysis & display
  » Specific airway resistance is evaluated from the phase shift between the two signal waveforms
  » Detailed beat by beat calculation control
» datanalyst software: Data post-processing
» GLP compliance: access control, audit-trail, electronic signature