

Materials and Methods

A vapor generation system using a Miller-Nelson Instruments, Flow Temp Humidity Control System (Assay Technologies, Livermore, CA), connected to house air and de-ionized water, was used to control and condition air for the experiment. The model of Miller-Nelson used had an airflow ranging from 0 to a maximum of 20 L/min and a temperature range from ambient ± 2 °C to 35°C. The minimum humidity of the supply air, compressed then filtered, was 10% relative humidity (RH) and the maximum capacity of the Miller-Nelson was 95% RH. An environmental chamber from the Darwin Chambers Company (St. Louis, MO) allowed the experiment to be contained in a temperature-controlled environment. The environmental cabinet could maintain constant temperatures in a range from 10 to 60 °C. A flow of headspace vapors from a vial of PAA were mixed with the conditioned air to generate atmospheres of PAA. A series of glass mixing chamber and a sampling manifold were used to contain and direct the flow of the conditioned atmospheres.

Dataset 1. Temperature, flow rate and pressure were measured with a TSI Incorporated (Shoreview, MN), Model 4043 flowmeter. Additional temperature and humidity measurements were made with an Onset Corp (Bourne, MA) sensor inside the chamber. An electrochemical PAA sensor SafeCide™ Portable Monitoring from ChemDAQ Incorporated (Pittsburgh, PA) was used to measure PAA concentration.

Dataset 2. PAA concentration measured at time intervals by impinger.

Temperature was held at 20 °C and the flow rate of the carrier was 18 liters per minute. At specified time points, measurements of the PAA concentration were made. Two glass impingers were connected in a sampling train followed by a critical orifice (1 L/min) connected to a vacuum. The impingers were filled with 15 mL of deionized water. A Dry-Cal flowmeter from Mesa Labs was used to verify the flow rate of the air through the impinger inlet before and after sampling. The solution in the impinger was analyzed using a Chemetrics DPD test kit as previously described in Stastny, Doepke and Streicher (Analytical Methods 2021) for PAA concentration. The PAA concentration in solution was used to calculate an atmospheric PAA concentration.