Supplementary Information (SI) for Analytical Methods.

Supplementary Material

Impact of Air Conditioning Environments on Human Comfort through Exhaled Breath and Physiological Assessment in Middle-aged Women

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Table S1. Summary of Environmental Data for Thermal Comfort Project

Test Condition	Number	Indoor Temperature (°C)	Indoor Humidity (%)	Wind Speed (m/s)	Globe Temperature (°C)	Floor Temperature (°C)	Outlet Temperature (°C)	Wall Temperature (°C)	Ceiling Temperature (°C)	PMV
Cooling	n=2	24.07	55.74	0.05	26.42	25.72	11.32	24.47	25.33	0.60
	n=3	23.85	55.51	0.08	26.31	25.64	8.08	24.66	25.83	0.58
	Average	23.96	55.62	0.07	26.34	25.83	9.70	24.66	25.83	0.59
Refreshing	n=1	23.85	50.56	0.08	25.97	25.07	15.99	23.76	24.29	0.54
	n=2	24.02	50.65	0.08	26.11	25.31	17.36	24.33	24.33	0.54
	n=3	24.23	49.06	0.05	26.19	24.99	17.12	24.70	25.84	0.54
	Average	23.94	50.61	0.08	26.04	25.19	16.68	0.54	24.31	0.54
Cooling + Floor Heating	n=1	24.14	52.55	0.11	26.25	30.39	10.65	25.06	25.78	0.55
	n=2	23.25	54.68	0.15	25.77	29.06	10.11	24.31	24.78	0.40
	n=3	23.99	53.34	0.11	25.63	31.11	11.44	25.03	25.72	0.48
	Average	23.70	53.62	0.13	26.01	29.73	10.38	0.48	25.43	0.48

Note: Due to unstable environmental conditions, the following groups that do not meet the experimental requirements need to be excluded: 1-1-(n=1), 1-2-(n=1), 1-3-(n=1), 1-4-(n=1), 1-5-(n=1), 3-1-(n=1), 3-1-(n=2), 3-2-(n=2), 3-3-(n=2); clo=0.7, MET=1.2.

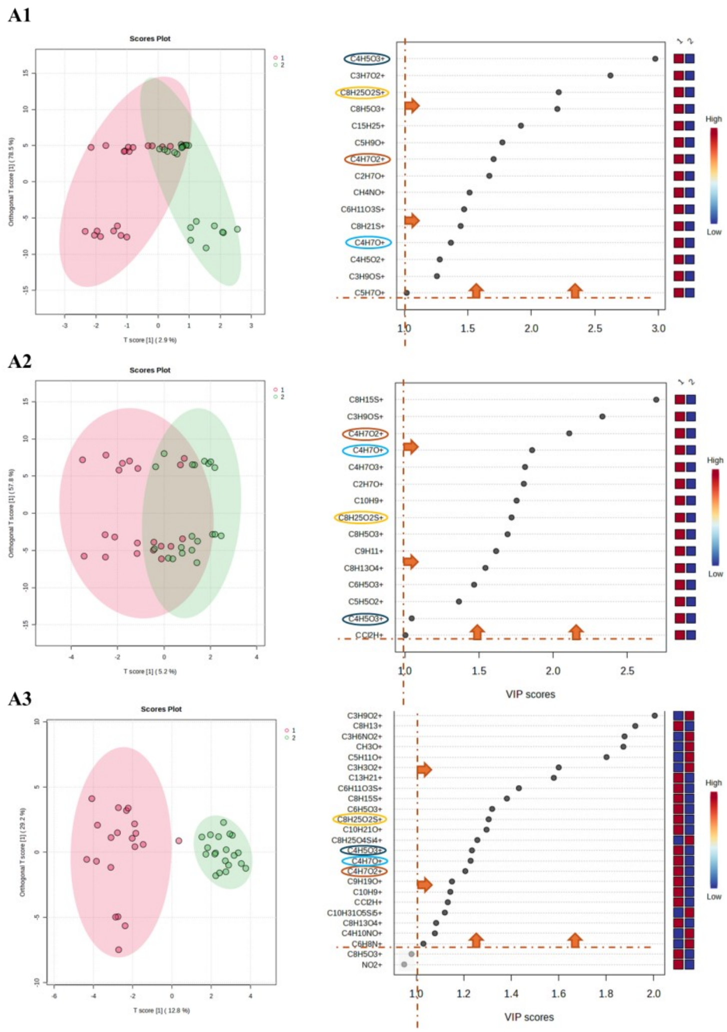

Figure S1. Screening of Differential Components Among 60 Semi-quantitative Exhaled Compounds. A1. OPLS-DA 2D plot of exhaled breath before and after entering Condition A1. Differential components were screened based on the Variable Importance in Projection (VIP > 1) from the OPLS-DA model, identifying 15 significantly different exhaled compounds. **A2.** OPLS-DA 2D plot of exhaled breath before and after entering Condition A2. Differential components were screened based on the Variable Importance in Projection (VIP > 1) from the OPLS-DA model, identifying 15 significantly different exhaled compounds. **A3.** OPLS-DA 2D plot of exhaled breath before and after entering Condition A3. Differential components were screened based on the Variable Importance in Projection (VIP > 1) from the OPLS-DA model, identifying 23 significantly different exhaled compounds.

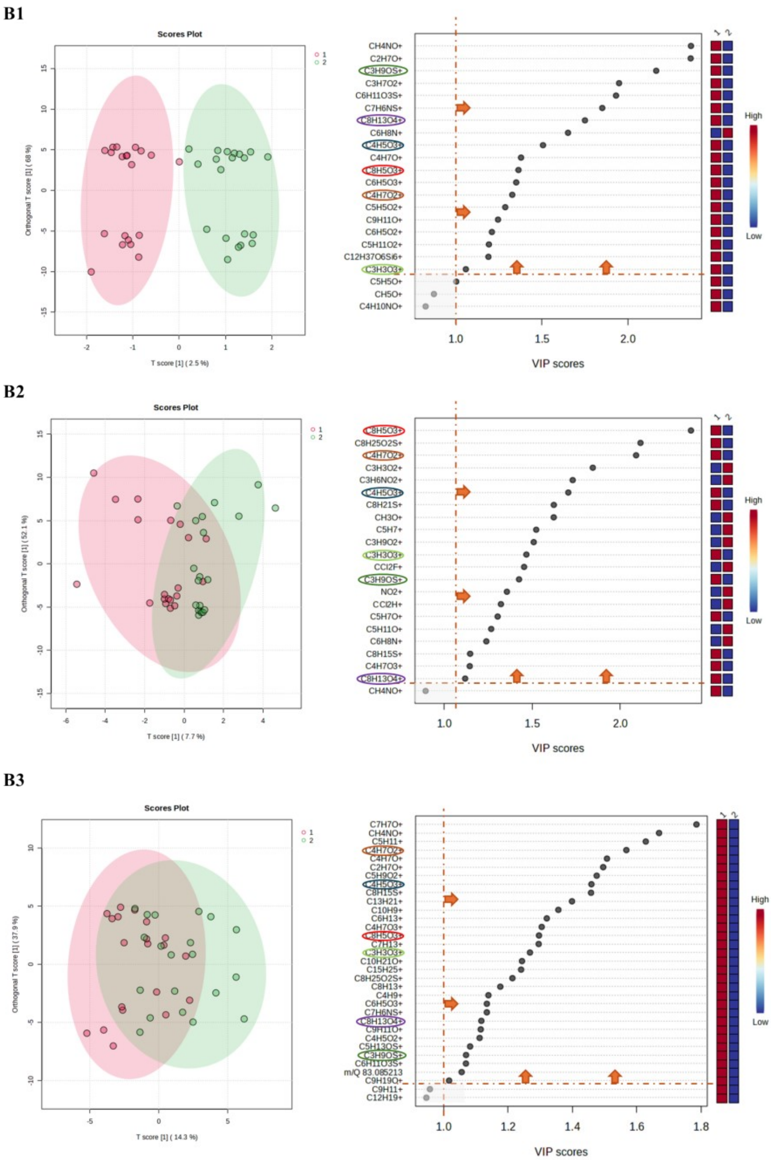

Figure S2. Screening of Differential Components Among 60 Semi-quantitative Exhaled Compounds. B1. OPLS-DA 2D plot of exhaled breath before and after entering Condition B1. Differential components were screened based on the Variable Importance in Projection (VIP > 1) from the OPLS-DA model, identifying 19 significantly different exhaled compounds. **B2.** OPLS-DA 2D plot of exhaled breath before and after entering Condition B2. Differential components were screened based on the Variable Importance in Projection (VIP > 1) from the OPLS-DA model, identifying 21 significantly different exhaled compounds. **B3.** OPLS-DA 2D plot of exhaled breath before and after entering Condition B3. Differential components were screened based on the Variable Importance in Projection (VIP > 1) from the OPLS-DA model, identifying 31 significantly different exhaled compounds.

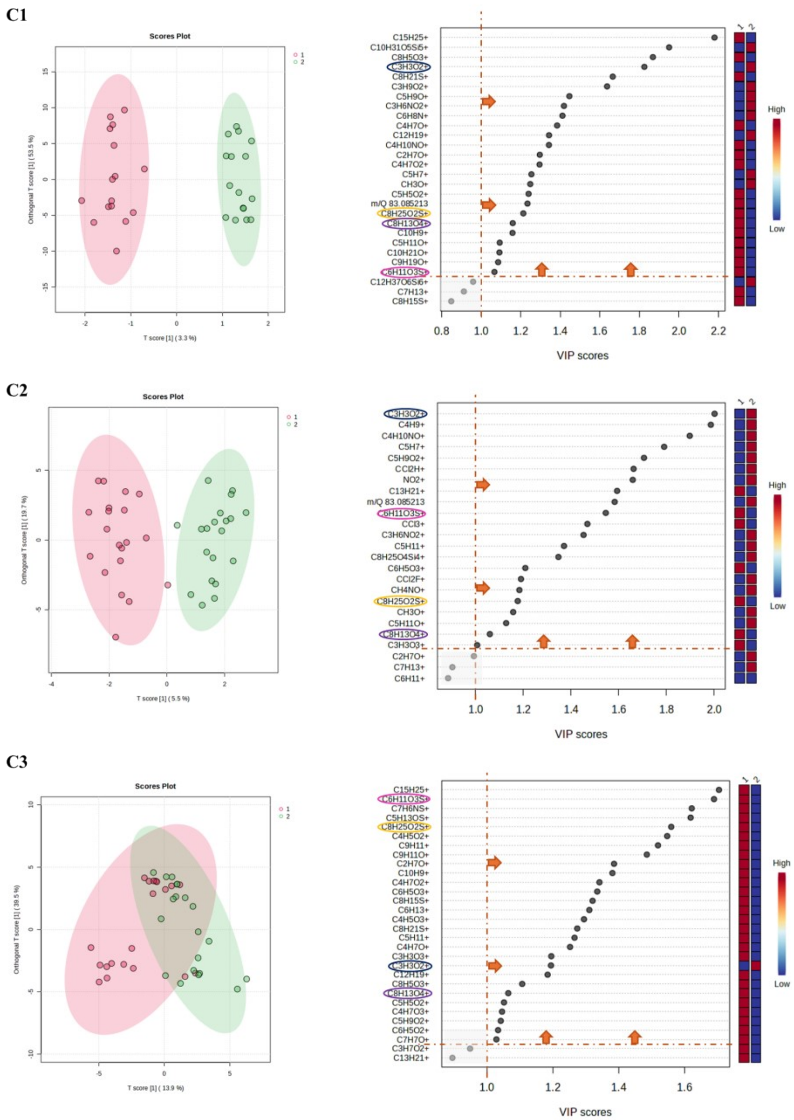

Figure S3. Screening of Differential Components Among 60 Semi-quantitative Exhaled Compounds. C1. OPLS-DA 2D plot of exhaled breath before and after entering Condition C1. Differential components were screened based on the Variable Importance in Projection (VIP > 1) from the OPLS-DA model, identifying 25 significantly different exhaled compounds. **C2.** OPLS-DA 2D plot of exhaled breath before and after entering Condition C2. Differential components were screened based on the Variable Importance in Projection (VIP > 1) from the OPLS-DA model, identifying 22 significantly different exhaled compounds. **C3.** OPLS-DA 2D plot of exhaled breath before and after entering Condition C3. Differential components were screened based on the Variable Importance in Projection (VIP > 1) from the OPLS-DA model, identifying 28 significantly different exhaled compounds.

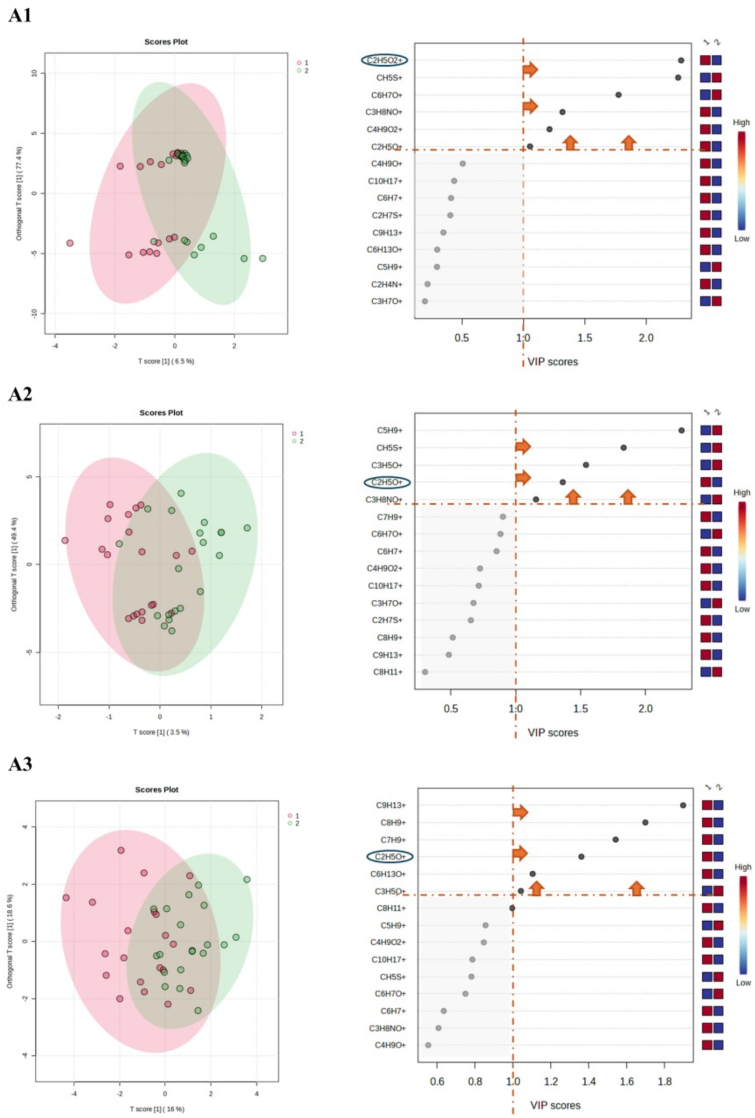

Figure S4. Screening of Differential Components Among 19 Quantitative Exhaled Compounds. A1. OPLS-DA 2D plot of exhaled breath before and after entering Condition A1. Differential components were screened based on the Variable Importance in Projection (VIP > 1) from the OPLS-DA model, identifying 6 significantly different exhaled compounds. **A2.** OPLS-DA 2D plot of exhaled breath before and after entering Condition A2. Differential components were screened based on the Variable Importance in Projection (VIP > 1) from the OPLS-DA model, identifying 5 significantly different exhaled compounds. **A3.** OPLS-DA 2D plot of exhaled breath before and after entering Condition A3. Differential components were screened based on the Variable Importance in Projection (VIP > 1) from the OPLS-DA model, identifying 6 significantly different exhaled compounds.

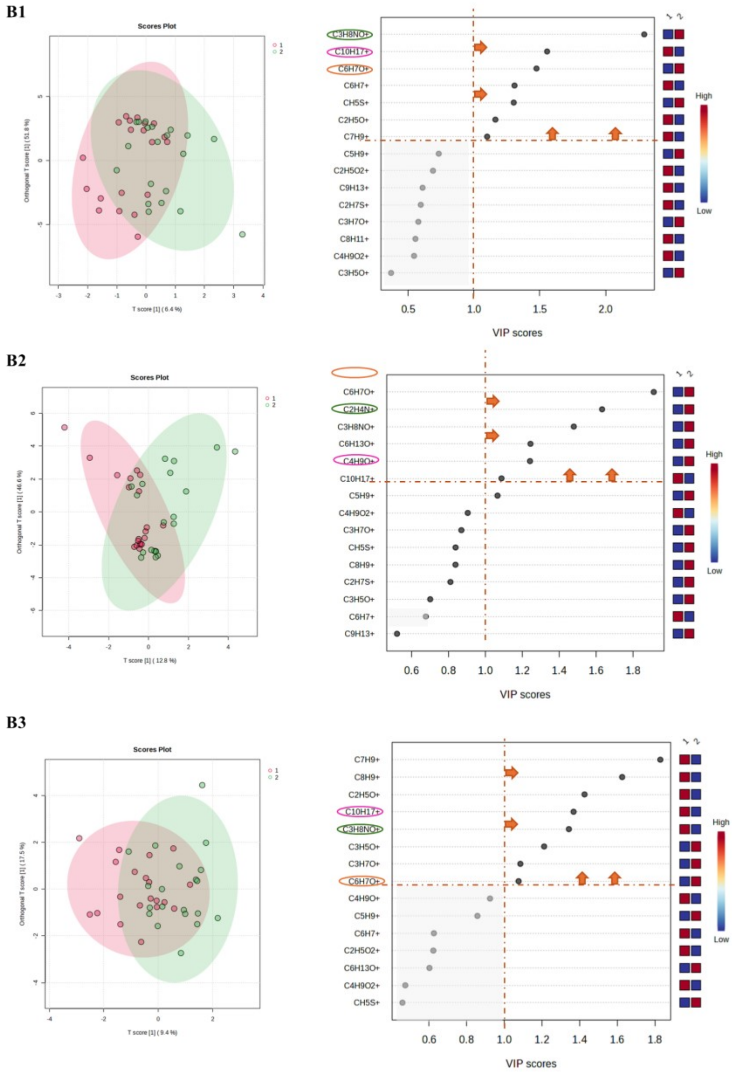

Figure S5. Screening of Differential Components Among 19 Quantitative Exhaled Compounds. B1. OPLS-DA 2D plot of exhaled breath before and after entering Condition B1. Differential components were screened based on the Variable Importance in Projection (VIP > 1) from the OPLS-DA model, identifying 7 significantly different exhaled compounds. **B2.** OPLS-DA 2D plot of exhaled breath before and after entering Condition B2. Differential components were screened based on the Variable Importance in Projection (VIP > 1) from the OPLS-DA model, identifying 7 significantly different exhaled compounds. **B3.** OPLS-DA 2D plot of exhaled breath before and after entering Condition B3. Differential components were screened based on the Variable Importance in Projection (VIP > 1) from the OPLS-DA model, identifying 8 significantly different exhaled compounds.

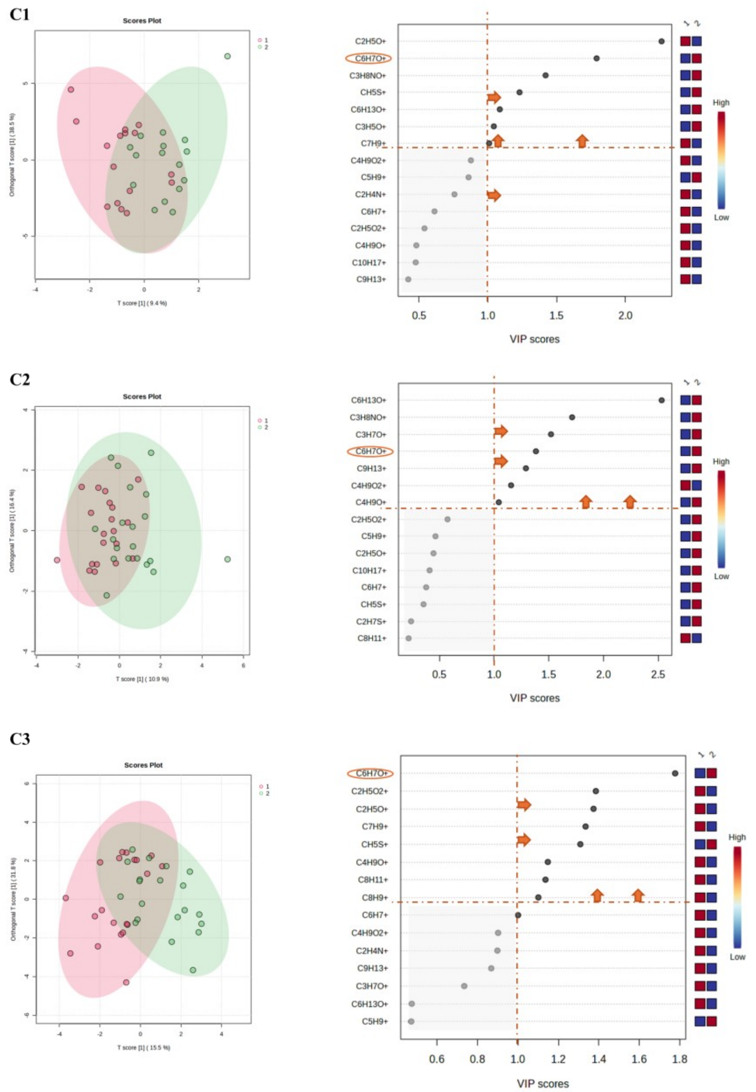

Figure S6. Screening of Differential Components Among 19 Quantitative Exhaled Compounds. C1. OPLS-DA 2D plot of exhaled breath before and after entering Condition C1. Differential components were screened based on the Variable Importance in Projection (VIP > 1) from the OPLS-DA model, identifying 7 significantly different exhaled compounds. **C2.** OPLS-DA 2D plot of exhaled breath before and after entering Condition C2. Differential components were screened based on the Variable Importance in Projection (VIP > 1) from the OPLS-DA model, identifying 7 significantly different exhaled compounds. **C3.** OPLS-DA 2D plot of exhaled breath before and after entering Condition C3. Differential components were screened based on the Variable Importance in Projection (VIP > 1) from the OPLS-DA model, identifying 8 significantly different exhaled compounds.

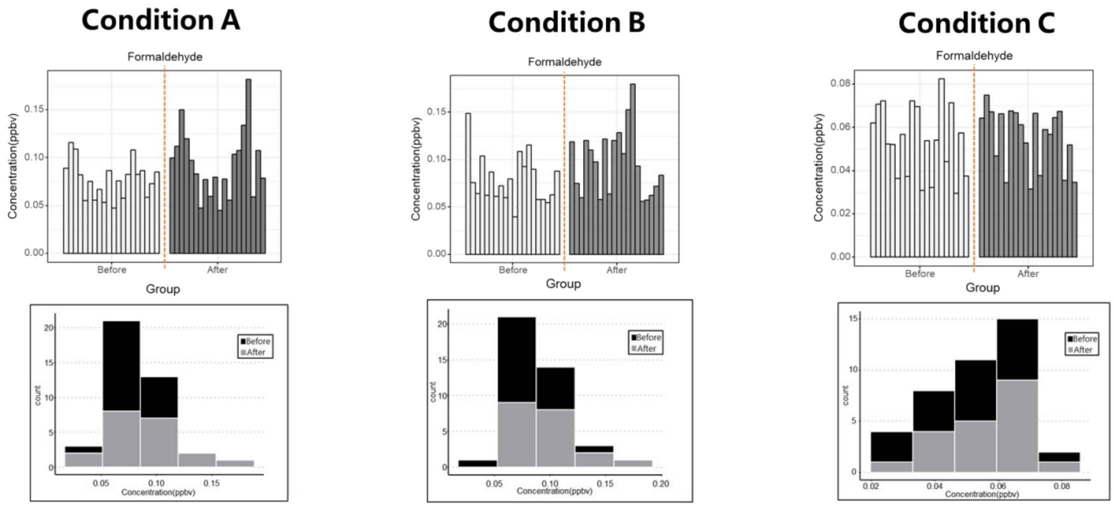

Figure S7. Qualitative and Quantitative analysis of formaldehyde, a key biomarker, across all participants under conditions A, B, and C, highlighting significant variations before and after exposure.

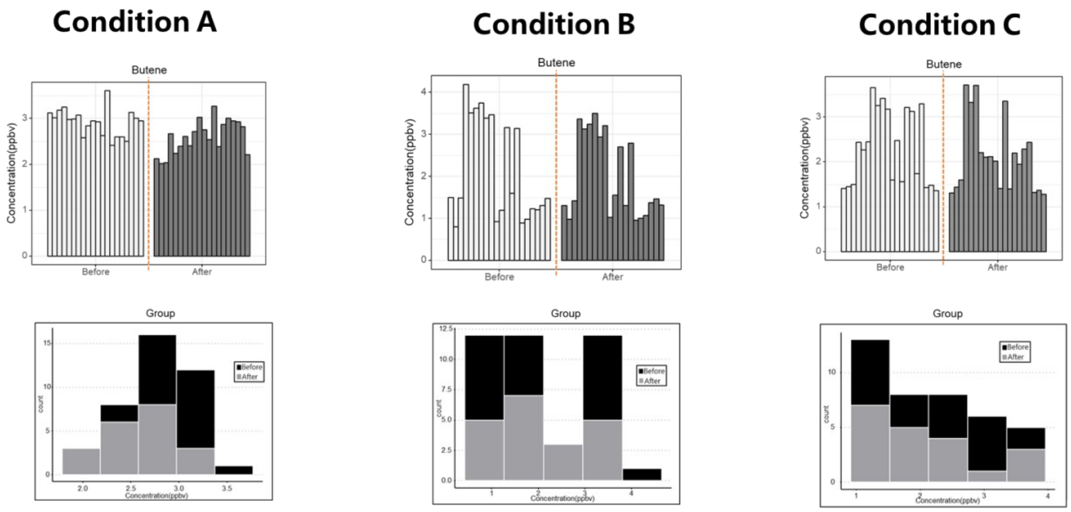

Figure S8. Qualitative and Quantitative analysis of butene, a key biomarker, across all participants under conditions A, B, and C, highlighting significant variations before and after exposure.

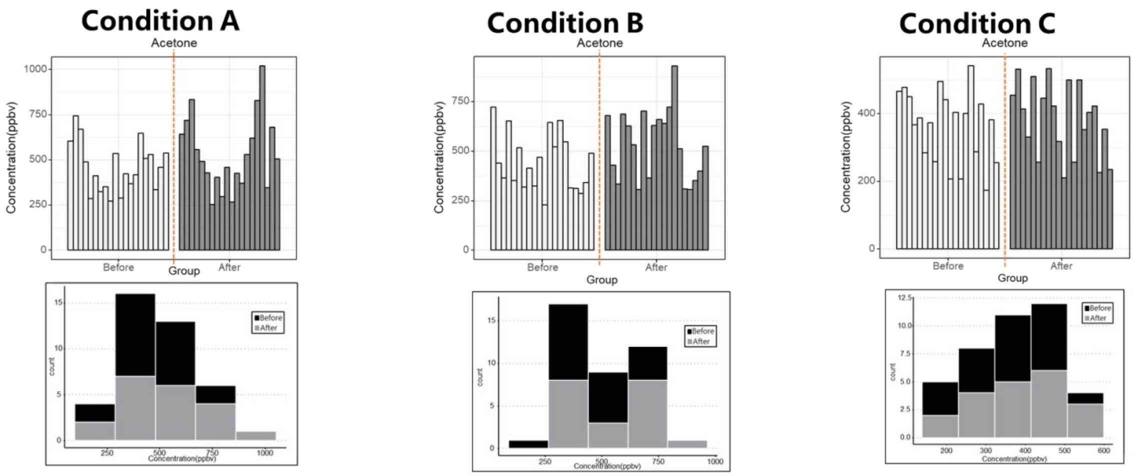

Figure S9. Qualitative and Quantitative analysis of acetone, a key biomarker, across all participants under conditions A, B, and C, highlighting significant variations before and after exposure.

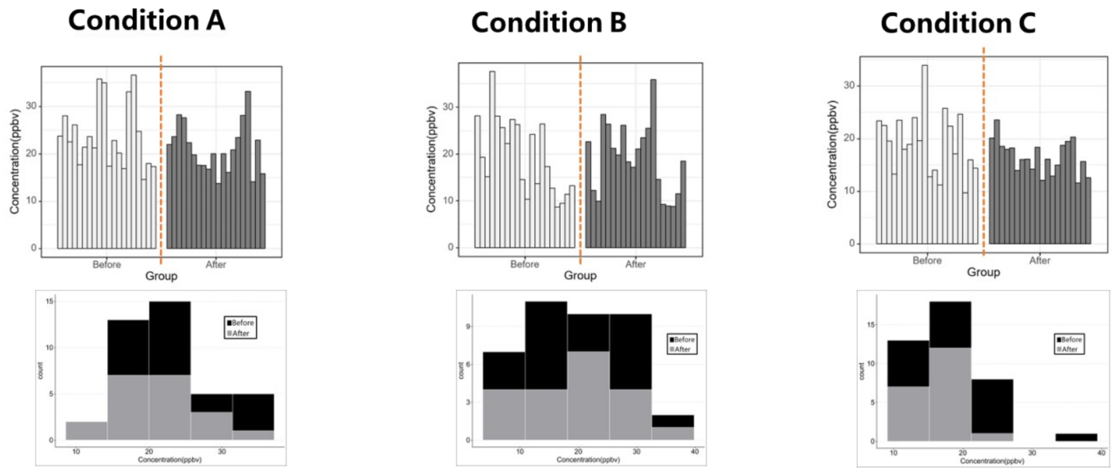

Figure S10. Qualitative and Quantitative analysis of 2-propanol, a key biomarker, across all participants under conditions A, B, and C, highlighting significant variations before and after exposure.