

## Perfusionist

[MSB-24]

### Metabolomic Signatures of Hypothermia Under Cardiopulmonary Bypass: A Systematic Evaluation of Mild and Moderate Hypothermia on Urinary Metabolome Profiles

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**Objective:** This study aimed to investigate the differential impacts of mild (32 to 35°C) and moderate (26 to 31°C) hypothermia on urinary metabolome profiles during cardiopulmonary bypass (CPB) in adult cardiac surgery.

**Methods:** This randomized study included 32 patients who underwent CPB under hypothermic conditions (mild, n=16; moderate, n=16) using only the Bretschneider solution. Urine samples were collected at two time points: immediately before CPB initiation and 1 h after rewarming and termination of CPB. Urinary metabolomic analyses were conducted using gas chromatography-mass spectrometry and liquid chromatography-quadrupole time-of-flight mass spectrometry. Metabolite changes were evaluated using statistical methods, including the Mann-Whitney U test, principal component analysis, and partial least squares discriminant analysis.

**Results:** Significant differences in urinary metabolites were observed between the two hypothermia groups. Mild hypothermia resulted in increased levels of creatinine and 5,6-DHET and decreased levels of 2-methylbutyrylcarnitine and S-adenosylhomocysteine, suggesting a more favorable metabolic response with reduced stress. In contrast, the moderate hypothermia group exhibited increases in metabolites such as C17-sphinganine and ceramide (t18:0/16:0), indicating heightened metabolic stress and potential cellular damage. Principal component analysis and partial least squares discriminant analysis revealed distinct separations between the groups, highlighting greater metabolic perturbations with moderate hypothermia.

**Conclusion:** Mild hypothermia is associated with a more stable urinary metabolomic profile, whereas moderate hypothermia is linked to significant metabolic disruptions, necessitating careful monitoring and management. These findings provide valuable insights for optimizing hypothermia protocols during CPB.

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