**Posttraumatic Lipidomic Course In Occult Hypoperfusion:
An Analysis in a Standardized Porcine Polytrauma Model**

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Purpose: Occult hypoperfusion is known to be associated with later complications in severely injured patients. Lipids are involved in posttraumatic inflammatory response. We hypothesized that lipids may also contribute to the systemic physiological process during resuscitation and recovery after trauma. The purpose of this study is investigating the relation between responsiveness to resuscitation and lipidomic course after trauma in a standardized polytrauma porcine model.

Methods: 25 male pigs were exposed to a combined injury of blunt chest trauma, a liver laceration, controlled hemorrhagic shock, and femoral shaft fracture. After 60 minutes, animals received resuscitation and fracture stabilization. Venous blood was taken regularly from baseline until 6 hours post-trauma. Animals were divided into 2 groups based on serum lactate level at the end point as an indicator of responsiveness to resuscitation (<2 mmol/L: responder [R] group , ≥2 mmol/L: occult hypoperfusion [OH] group). 233 specific lipids were analyzed using mass spectrometry.

Results: We have observed different patterns of systemic lipid liberation in animals with occult hypoperfusion. AcCas (acylcarnitines) showed a significant increase at 1 hour in both groups (R group: 0.38 ± 0.07 vs 1.01 ± 0.19, $P<0.001$, OH group: 0.20 ± 0.05 vs 0.77 ± 0.13, $P = 0.010$). Six subgroups (PCs [phosphatidylcholines], LPCs [lyso-phosphatidylcholines], Cers [ceramides], PEs [phosphatidylethanolamines], PGs [phosphatidylglycerols], and DAGs [diacylglycerides]) showed a significant increase in R group at 2 hours ($P<0.05$), which was not present in sufficiently resuscitated animals.

Conclusion: Significant increase of AcCa concentration observed in both groups at 1 hour suggested that this lipid has a potential to become a common biomarker indicating the traumatized condition. The results of 6 lipid subgroups, which increased at 2 hours only in R group, demonstrate the liberation of lipids in the presence of occult hypoperfusion and insufficient resuscitation.
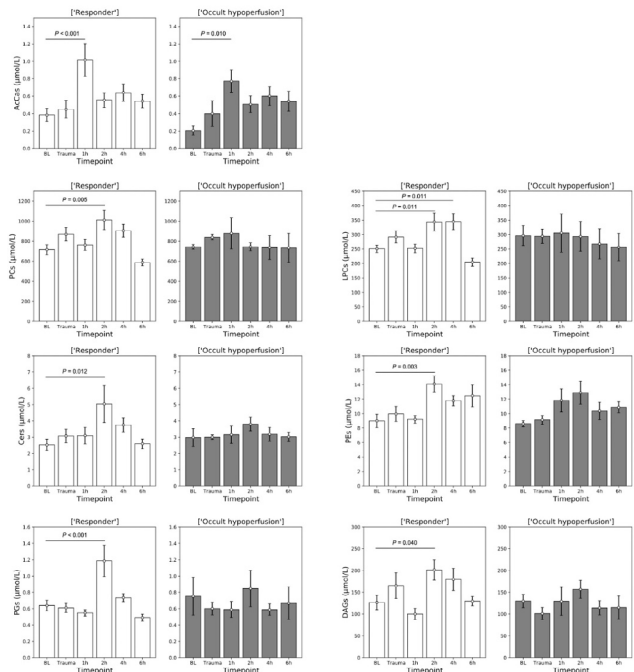
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