Endocannabinoids and related N-acyl-ethanolamides are increased in individuals with post-traumatic stress disorder

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Background:
Post-traumatic stress disorder (PTSD) is an anxiety disorder characterized by an inappropriate persistence and uncontrolled retrieval of traumatic memories. As endocannabinoids (ECs) and related N-acyl-ethanolamides (NAEs) play important roles in stress response regulation, anxiety and traumatic memories we hypothesized that individuals with traumatic stress exposure and PTSD show measurable alterations in plasma EC and NAE concentrations.

Methods:
We determined plasma concentrations of anandamide (ANA), 2-arachidonoylglycerol (2-AG), palmitoylethanolamide (PEA), oleoylethanolamide (OEA), stearoylethanolamine (SEA), N-oleoyldopamine (OLDA) using high-performance liquid chromatography in combination with tandem mass spectrometry (HPLC-MS-MS).

PTSD was diagnosed using the Clinician Administered PTSD Scale (CAPS) which also assesses traumatic events.

Results:
Individuals with PTSD showed significantly higher plasma concentrations of
- ANA (0.48±0.11 vs. 0.32±0.13 ng/ml, p<0.01),
- 2-AG (8.43±3.20 vs. 6.61±2.11 ng/ml, p<0.01),
- PEA (5.15±2.00 vs. 3.21±1.10 ng/ml, p<0.01),
- OEA (5.90±2.10 vs. 3.40±1.42 ng/ml, p<0.01),
- SEA (2.70±3.40 vs. 0.58±0.32, p=0.02)
but significantly lower plasma levels of
- OLDA (0.12±0.05 vs. 0.64±0.74 ng/ml, p=0.02) than controls.

Trauma-exposed individuals without evidence of PTSD had
- significantly higher plasma concentrations of ANA (0.44±0.10 vs. 0.32±0.13 ng/ml, p=0.01)
- significantly lower levels of OLDA (0.22±0.11 vs. 0.64±0.74 ng/ml, p=0.03) than controls, without differences in the other investigated compounds.

Limitations: Patients with PTSD, trauma exposed individuals without PTSD and healthy controls may not be strictly comparable with regard to many variables which could influence plasma endocannabinoid concentrations (e.g. nutrition, gender distribution, childhood trauma).

The experience of highly traumatic events results in long-term changes in plasma ECs/NAEs which persist long after termination of the stressor and are more pronounced in individuals who develop PTSD.