Tryptophan depletion impairs emotion recognition in healthy women

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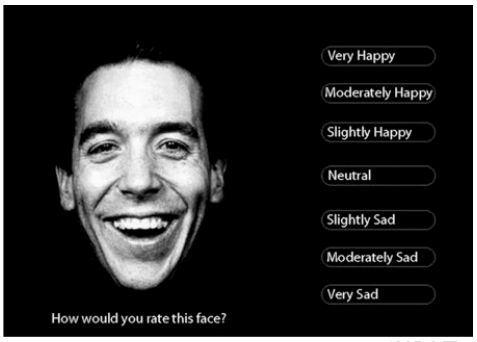
Purpose of the study

The brain serotonin system modulates neural circuits that regulate emotion and mood in humans. Tryptophan depletion (TD) is an established method to decrease cerebral serotonin levels. The serotonin transporter promoter polymorphism (5-HTTLPR) is suggested to influence emotion recognition. This study examined the effect of TD on the recognition of emotional faces in healthy women carrying a s-allele of the 5-HTTLPR polymorphism.



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Methods

Study design: prospective clinical study sample: 38 healthy women carrying an s-allele of the 5-HTTLPR polymorphism.

Procedure/tests: computerized tests (Penn Emotion Recognition Test, and Penn Emotion Acuity Task), visual analogue scale (VAS), blood samples

Time course: before, five and seven hours after the administration of acute TD.

Blood markers: plasma serotonin, total plasma tryptophan (Trp) , 5-hydroxyindolacetic acid (5-HIAA), long neutral amino acids (LNAAs), Trp /LNAA ratio.

Statistics: t-test, Mann-Whitney U-test, chi-square test, Repeated-measures analysis of variance (ANOVA) was performed to analyze the biochemical parameters in the course of time Genotype (5-HTTLPR) was included in the model as a between-subjects factor

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	Baseline N = 38	5 hours N = 38	7 hours N = 38	Repeated measures ANOVA	Pairwise comparison: Baseline vs. 5 h	Baseline vs. 7 h	-5 h vs. 7 h
Errors happy	2.7±2.0	2.8±1.4	2.7±1.5	n.s.	n.s.	n.s.	n.s.
Errors sad	3.7±1.6	3.9±1.4	4.7±1.6	p<0.049	n.s.	p<0.036	p<0.018
Specificity happy	0.77±0.2	0.83±0.2	0.84±0.2	p<0.006	p<0.007	p<0.013	n.s.
Specificity sad	0.74±0.2	0.81±0.2	0.85±0.2	p<0.002	p<0.043	p<0.001	p<0.031

Compared to baseline, subjects recognised angry faces significantly better 7 hours after TD (p<0.001). TD increased the specificity for the emotions sad and happy but decreased the sensitivity for the emotion sad over the course of the test day (see table).

Results

Thirty-eight female participants with a mean age of 23.18 ± 1.96 (mean ± SD), mean years of education of 16.65 ± 1.69 and a mean BMI of 21.14 ± 2.31 completed the study. All participants had euthymic depression scores in Beck Depression Inventory at baseline testing 0.97 ± 1.97. After TD, mood (VAS) decreased significantly within 5 hours (p<0.001) and then increased again after 7 hours (p=0.020) compared to 5 hours after TD. Further, total plasma Trp, 5-HIAA, and Trp/LNAA ratio were significantly decreased by TD over time. Concerning genotype, repeated measures ANOVA showed a significant time-by-genotype interaction regarding the time course of Trp plasma levels (p = 0.038). Homozygous carriers of the 5-HTTLPR s-allele (-10.6 µg/ml ±2.5) showed a significantly stronger reduction of plasma Trp than heterozygous individuals (-8.2 µg/ml ±3.0) between baseline and 5 hours after TD (p = 0.026).

Conclusion

In summary, we found that TD impairs the sensitivity for negative emotions in faces in healthy females carrying the s-allele of the 5-HTTLPR polymorphism. In addition, our data suggest that changes in plasma levels of tryptophan, 5-HIAA and the Trp/LNAA ratio are directly associated with the mood lowering effect of TD in genetically vulnerable healthy females. These results substantiate the putative role of the serotonergic system in the processing of emotional faces.

No conflict of interest to declare