The relative contributions of genetic and environmental factors on cortisol metabolism at pre-, mid- and post-pubertal ages

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Introduction

Inter-individual differences in the metabolism of cortisol have been postulated to emerge during puberty, and might be explained by a complex interplay of genetic and environmental factors.

Aim

To estimate the relative contributions of genetic, shared environmental and unshared environmental factors on cortisol metabolism at pre-, mid- and post-pubertal ages.

Study design

218 twins, born between 1995 and 1996, were enrolled from a population-based twin registry. In total, 94 monozygotic and 124 dizygotic twins were included. Early morning urine was collected at:

- Pre-pubertal (9 years),
- Mid-pubertal (12 years), and
- Post-pubertal (17 years) ages

Laboratory analysis: Gas chromatography-mass spectrometry

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>(THF + allo-THF + THE + alpha-cortol + beta-cortol + alpha-cortolone + beta-cortolone)/creatinine</td>
<td>Sum of cortisol metabolites (cortisol production rate)</td>
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<tr>
<td>THF/cortisol</td>
<td>Salptha-reductase activity</td>
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<tr>
<td>THE/cortione</td>
<td>5beta-reductase activity</td>
</tr>
<tr>
<td>cortisol/cortisone</td>
<td>Renal 11beta-HSD type 2 activity</td>
</tr>
<tr>
<td>(THF + allo-THF)/THE</td>
<td>11beta-HSD activities</td>
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<tr>
<td>6-OH cortisol/cortisol</td>
<td>Cytochrome P450 3A4 activity</td>
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Classical twin design

A: Genetic factors
C: Shared environmental factors
D: Dominance factors
E: Unshared environmental factors

Results

The contribution of unshared environmental factors increased with age for the indices cortisol production rate (fig.), Salptha-reductase activity, 5beta-reductase activity (fig.), renal 11beta-HSD type 2 activity and 11beta-HSD activities.

Conclusion

There were considerable differences in the relative contributions of genetic and environmental factors at pre-, mid- and post-pubertal ages. With few exceptions, the contribution of unshared environmental factors to these ratios was found to increase with age, implicating that individual circumstances seem to play a predominant role in later life.