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Relationship of Caffeine Content in Energy Drinks to Health in High School and College-Aged Adolescents

Arti Alagappan
Virginia Commonwealth University

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**Ingredients of Energy Drinks: Caffeine Alone and in Combinations**

Caffeine and its relationship with other additives in energy drinks such as sugars, taurine, D-glucuronos, carbohydrates, B vitamins, and amino acids can amplify and enhance the individual effects of the ingredients.

<table>
<thead>
<tr>
<th>Component</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taurine</td>
<td>Not a clear distinction between amount of taurine necessary for survival and that taken in excess</td>
</tr>
<tr>
<td>Glucose &amp; D-glucuronos</td>
<td>Possible fluctuations in heart rate, plasma catecholamines, and endurance changes</td>
</tr>
<tr>
<td>Vitamin B6</td>
<td>Discrepancy between existing values and those found using the High-Performance Liquid Chromatography (HPLC) method</td>
</tr>
</tbody>
</table>

**An Approach from a Different Aspect: Case Studies Involving Non-Humans**

The lack of control resulting from the general diversity of the population being tested makes such studies conducted on non-human species more valuable and the evaluations more accurate.

According to various case studies that discuss experiments performed on human-like species such as rats and dogs, caffeine, taurine, and D-glucuronos, relationships can be found between the different ingredients in energy drinks to determine if there is a significant correlation to consistent behavioral or cognitive effects, such as growth retardation and increases in malformations during pregnancy, changes in blood pressure, differences in plasma concentration of the growth hormone, or even low blood sugar in young children. However, as is evident by the following research findings, not all correlations found can be absolutely correct and justified.

- **Study in primates** has shown caffeine exposure to be associated with increased still births, miscarriages, reduced birth weight and impaired postnatal performance in a (behavioral) task.
- **One canine trial** demonstrated an increase in cardiac arrhythmias with high doses of caffeine administered, another study demonstrated that "escalating doses of caffeine in dogs surprisingly found that serum caffeine actually decreased the propensity for atrial fibrillation".

Such conditions are determined on a variety of factors, all of which contribute to the idea of energy drink consumption as a method of "self-intended poisoning." This variety of factors, otherwise known as risk factors, associated with consumption are determined on age, sex, body height, body mass index (BMI), systolic pressure, and treatment for hypertension (high blood pressure).