Adverse Effects of Energy Drinks and Their Potential Drug Interactions

Presented by Dr Becca Gilmore

(Core Trainee in Psychiatry,
Hertfordshire Partnership University
NHS Foundation Trust)

Thumbs up if you've ever discussed **reducing or restricting** a patient's **energy drink** use?

INDEPENDENT

News > World > Americas

Teenage beauty queen died after drinking influencer-linked energy drink, family says in lawsuit

Larissa Rodriguez's cause of death was listed as cardiomyopathy caused by excessive caffeine consumption, according to a lawsuit

Owen Scott
Friday 10 April 2026 13:15 BST

4 Comments

BBC

Energy drinks to be banned for under-16s in England

Daily Mail

Revealed: All the potentially deadly health dangers of energy drinks

- Energy drinks contain more caffeine than coffee and can cause heart problems
- READ MORE: The bizarre effects drinking on a plane can have on your body

By REBECCA WHITTAKER, HEALTH FEATURES WRITER
PUBLISHED: 16:30, 10 June 2024 | UPDATED: 16:43, 10 June 2024

THE Sun UK Edition

Health > News Health

CAFFEINE CRUSHER How energy drinks are destroying YOUR kids' body – from heart risks to suicide fears

Read on to find out what exactly happens to your body after you drink an energy drink

Katrina Turrill | Vanessa Chalmers, Assistant Head of Health
Published: 22:07, 6 Sep 2025 | Updated: 22:07, 6 Sep 2025

Adverse Effects of Energy Drinks and Their Potential Drug Interactions

Evidence?

Agenda

1. Background
2. Adverse effects
   a. Caffeine
   b. Other ingredients
   c. Reported adverse events
3. Drug interactions
   a. Caffeine pharmacokinetics and pharmacodynamics
   b. Other ingredients
4. Caffeine withdrawal
5. Conclusion & recommendations

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What's in the can?

Energy drink =
'high caffeine beverages containing more than 150mg/l of caffeine' (1)

16oz (473ml) Red Bull (2)
151mg caffeine
51 grams of sugar
Taurine
Glucuronolactone
Inositol
B-group vitamins

Monster
+Ginseng

Some have 400mg in 16oz.

60 – 100 mg / serving

UK Guidance (3):
- Healthy adults <=400 mg/day
- Pregnant or breastfeeding <=200 mg/day
- Children ~<= 3 mg/kg/day

40 – 70 mg / serving

34 mg / 335ml can

46mg / 380ml bottle

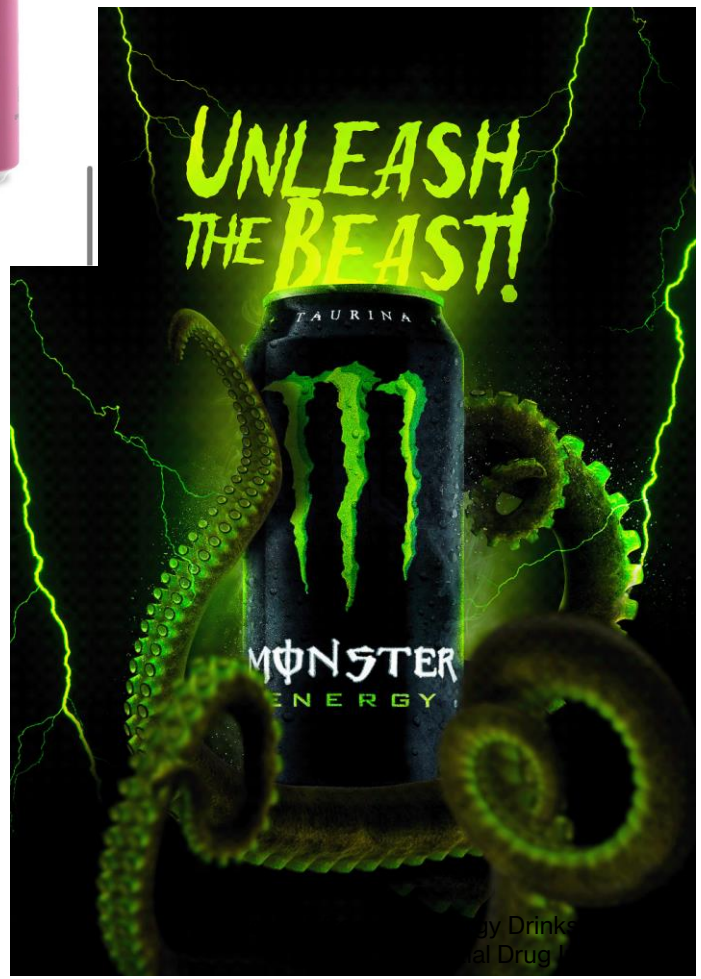
151mg per 16oz

Adverse Effects of Energy Drinks and Their Potential Drug Interactions


RedBull
RedBull
Gives you wiiings.


BLUE
RASPBERRY
NATURALLY FLAVORED
PRIME
ENERGY DRINK
12 FL OZ (355 mL)


Red Bull
ENERGY DRINK


UNLEASH
THE BEAST!
TAURINE
MONSTER
ENERGY

UK Law & Regulations

- = ‘high caffeine beverages containing more than 150mg/l of caffeine’ → must have a warning label
- Currently – no legal age limit
- Many supermarkets choose to restrict sales to under 16s
- NHS – no national guidance

Caffeine & the psychiatric population

- Sedation
- Cognitive slowing
- Emotional blunting

nutrients

MDPI

Nutrients. 2025 Jul 25;17(15):2435. doi: 10.3390/nu17152435

The Review on Adverse Effects of Energy Drinks and Their Potential Drug Interactions

Lukasz Dobrek [1,2]

Editors: Oana Maria Mîrza, Roxana Banc, Anamaria Cozma-Petruț

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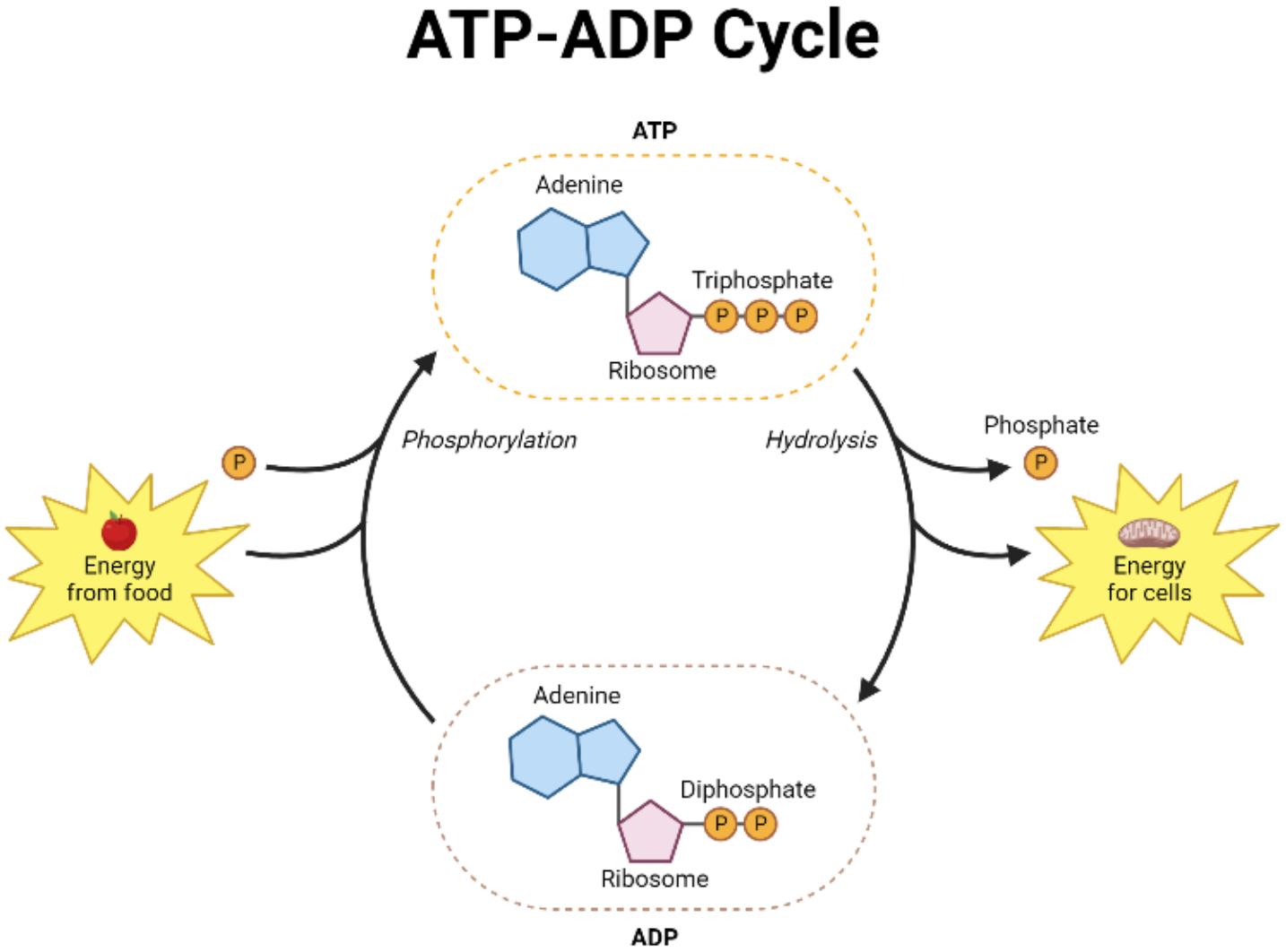
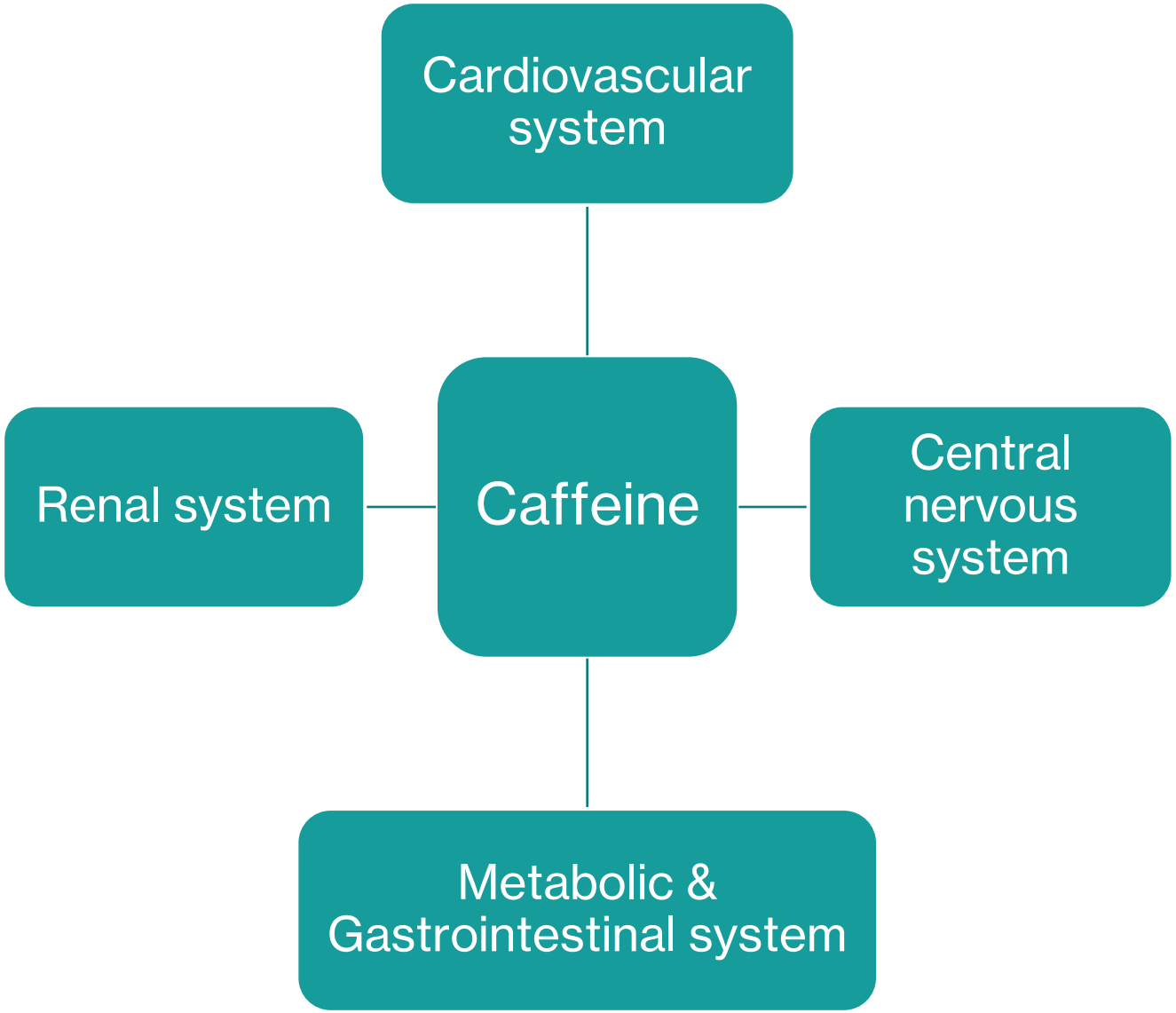
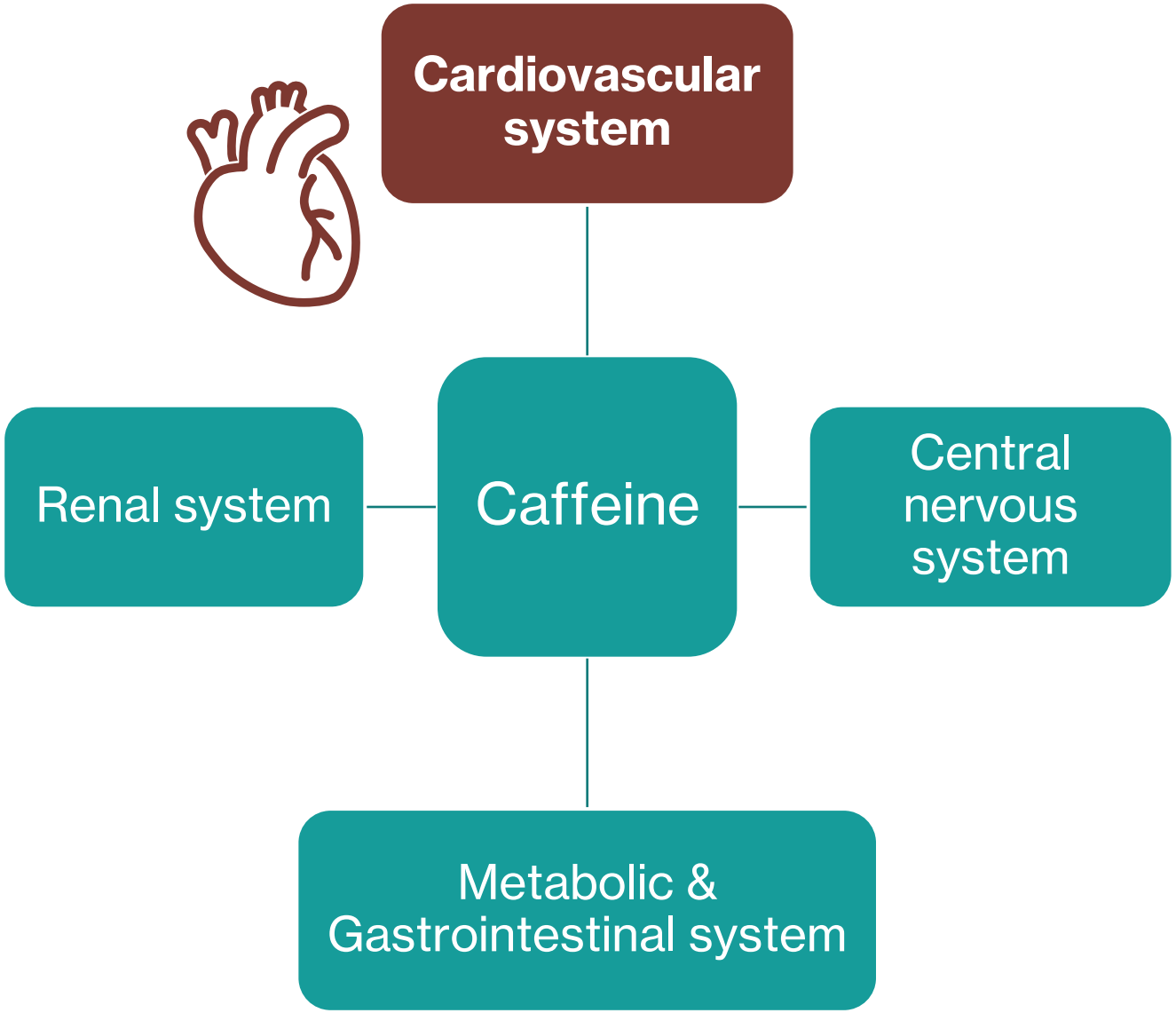
Caffeine – physiological effects

- Non-selective antagonism adenosine receptors A1, A2A, A2B

- Adenosine –
  - Currency of energy
  - Inhibitory neuromodulator
  - Vasodilation, reducing HR




Cardiovascular system
Renal system
Caffeine
Central nervous system
Metabolic & Gastrointestinal system

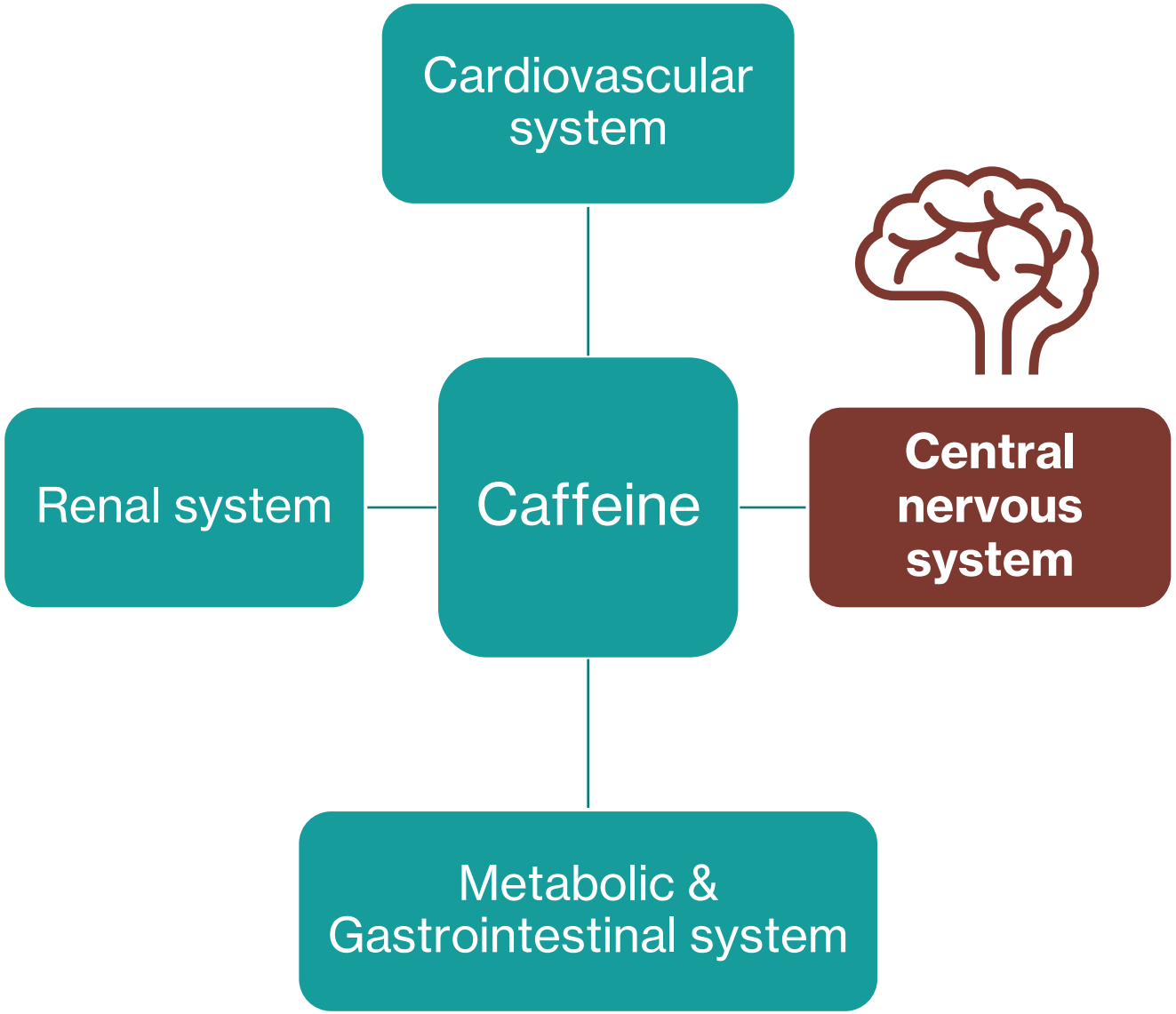


- Enhances adrenergic activity
- Increased peripheral vascular resistance
- Activates RAAS
- Increased HR & BP

- Inhibits phosphodiesterase → increases cAMP & Ca2+ → increases contractility

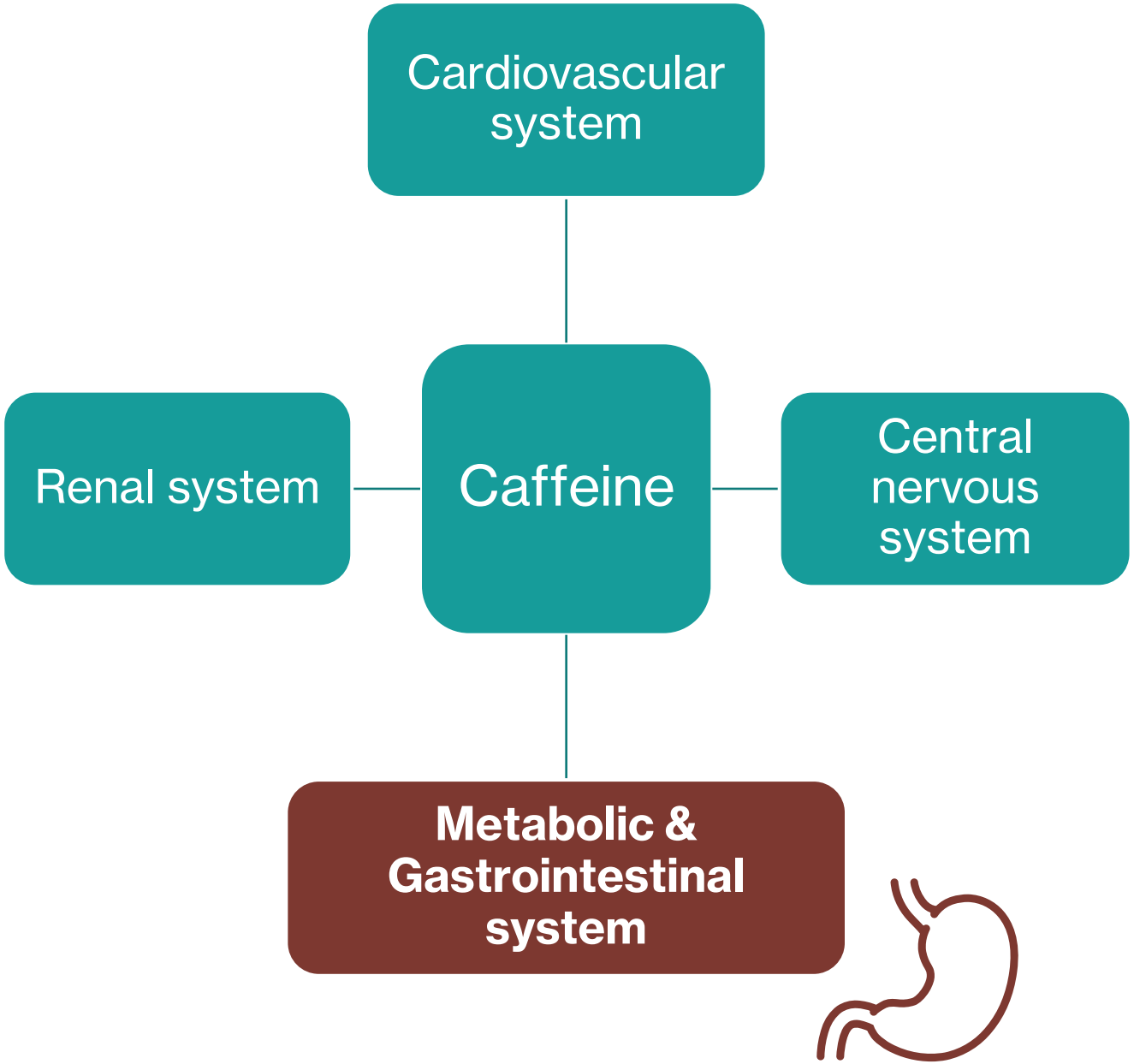
- High doses → tachyarrhythmias

- Chronic excess → Impaired endothelial function → increased risk of inflammation & thrombosis

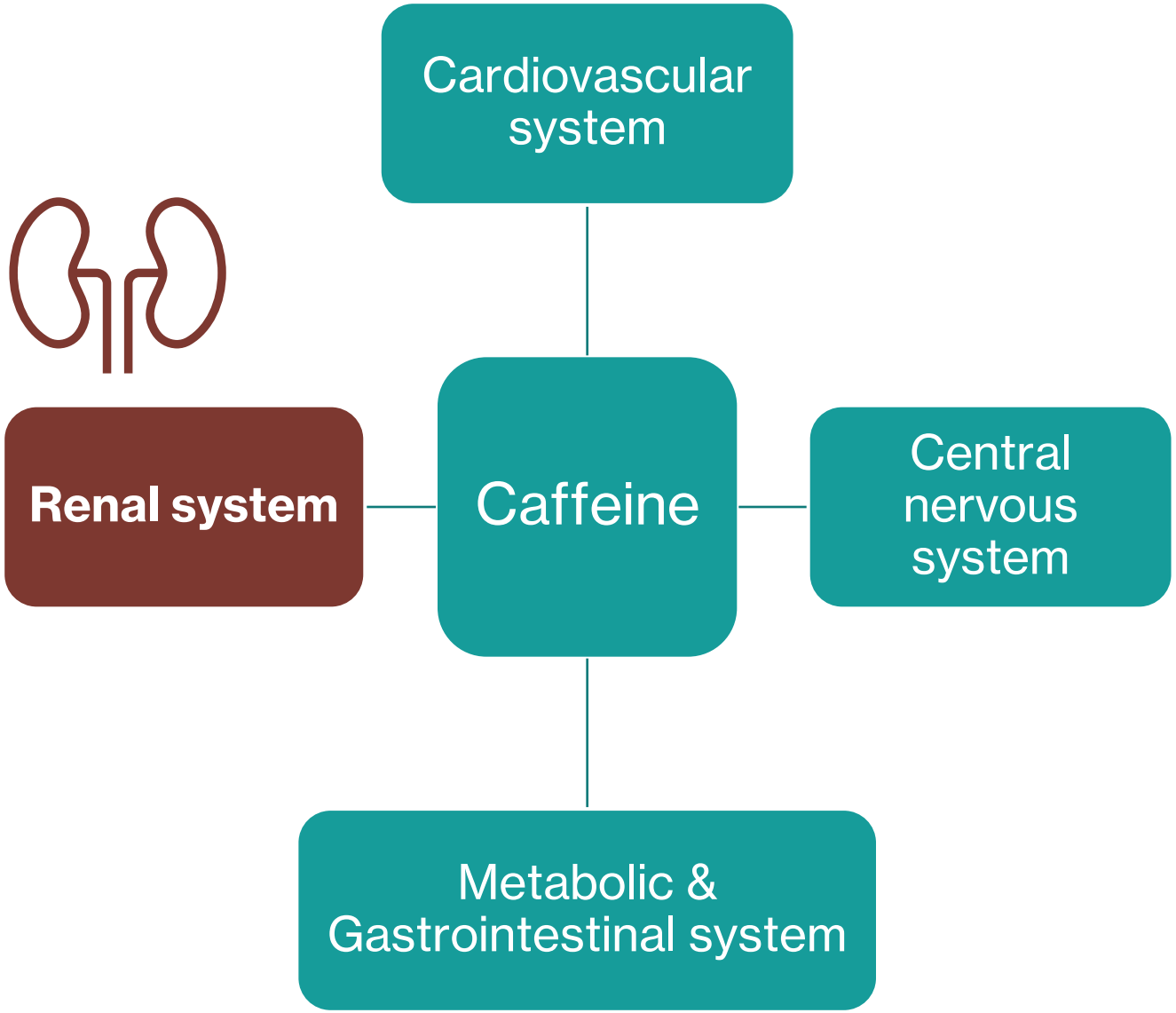


- Antagonism A1 receptors → increase neuronal excitability
- Antagonism A2A receptors – enhances dopamine transmission
- Reduced fatigue & improved cognitive function
- Increase neurotransmitter release (acetylcholine & glutamate)

- Chronic use → tolerance
- High dose → restlessness, anxiety, insomnia, tremors.
- Toxic → seizures (GABAa?)



- Increases adrenergic stimulation → hyperglycaemia & hypokalaemia
- Increased gastric acid & salivary secretion
- Lower oesophageal sphincter relaxes → increased reflux risk
- Stimulates CCK
- Increased colon motility



- Increases GFR
- Stimulates renin
- Diuretic effect

- ?safety with CKD

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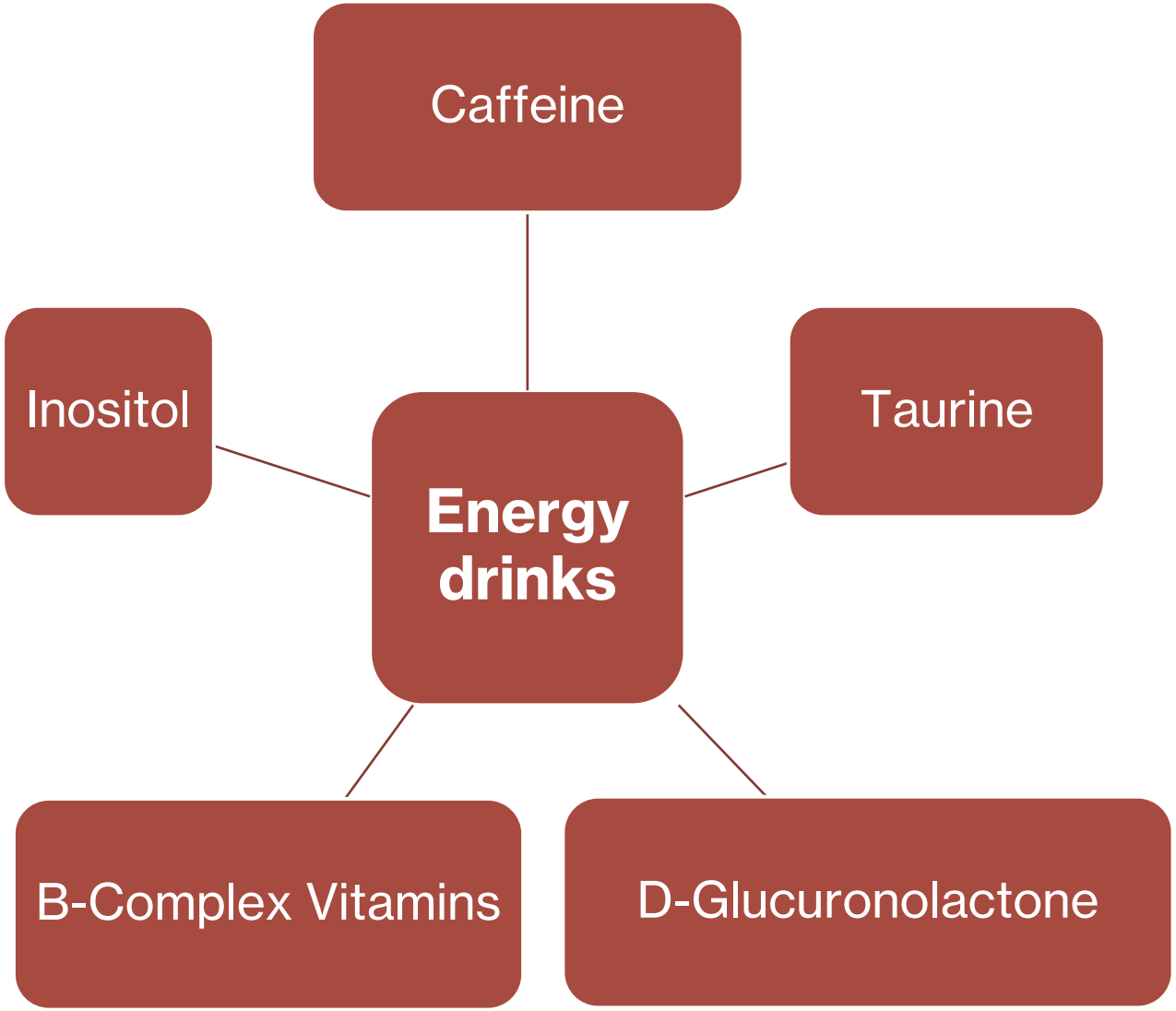
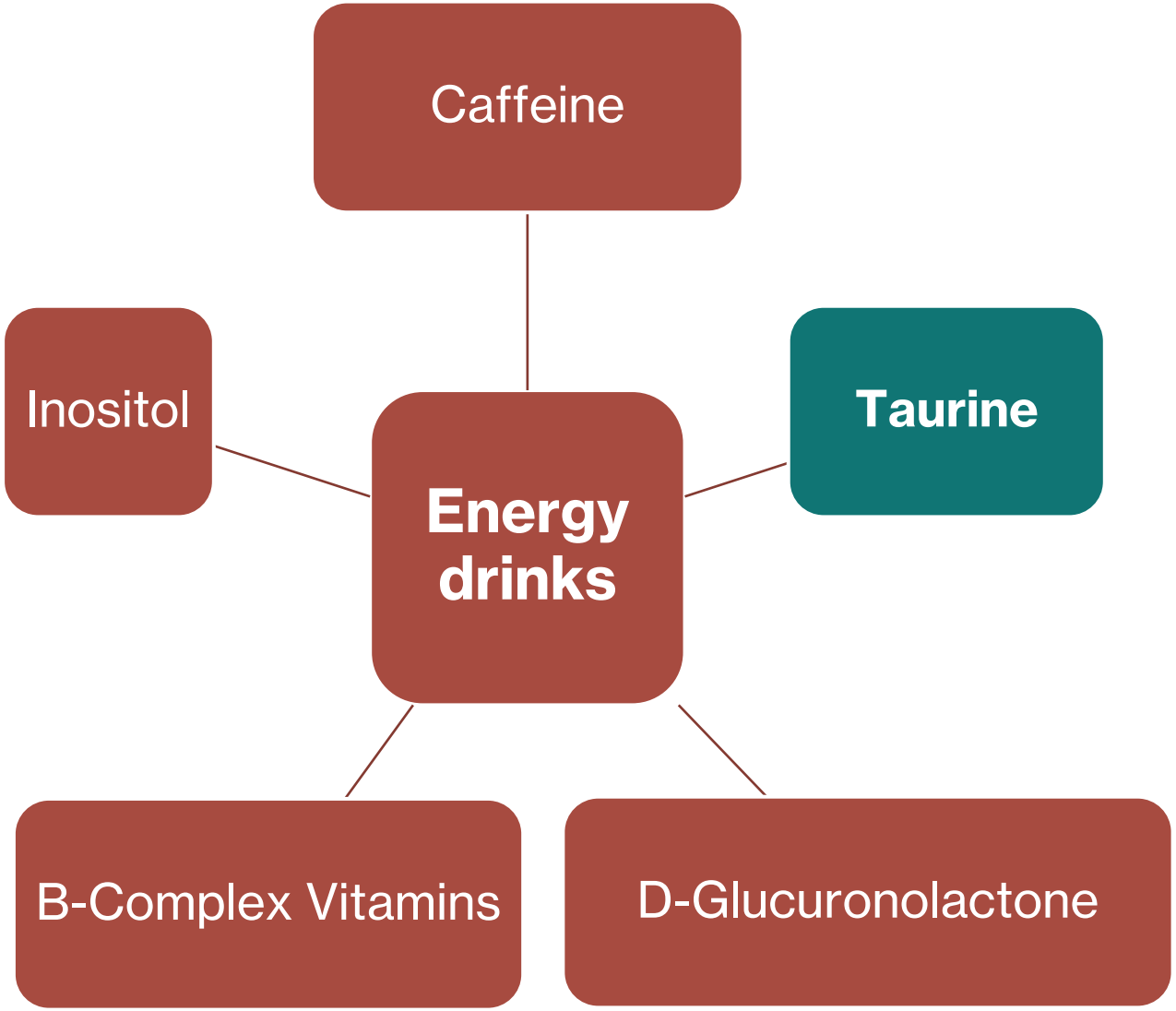
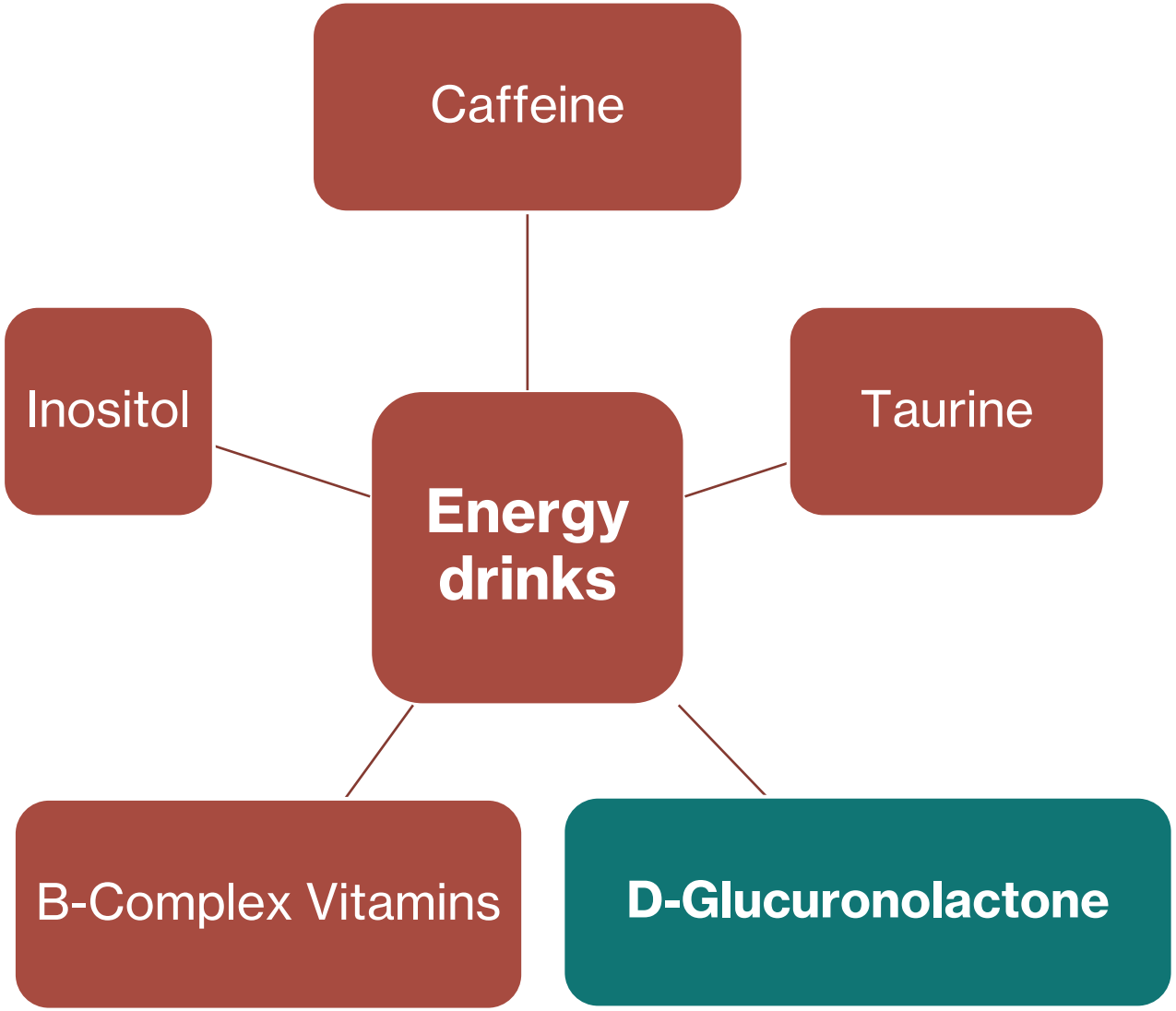

Caffeine
Inositol
Taurine
Energy drinks
B-Complex Vitamins
D-Glucuronolactone

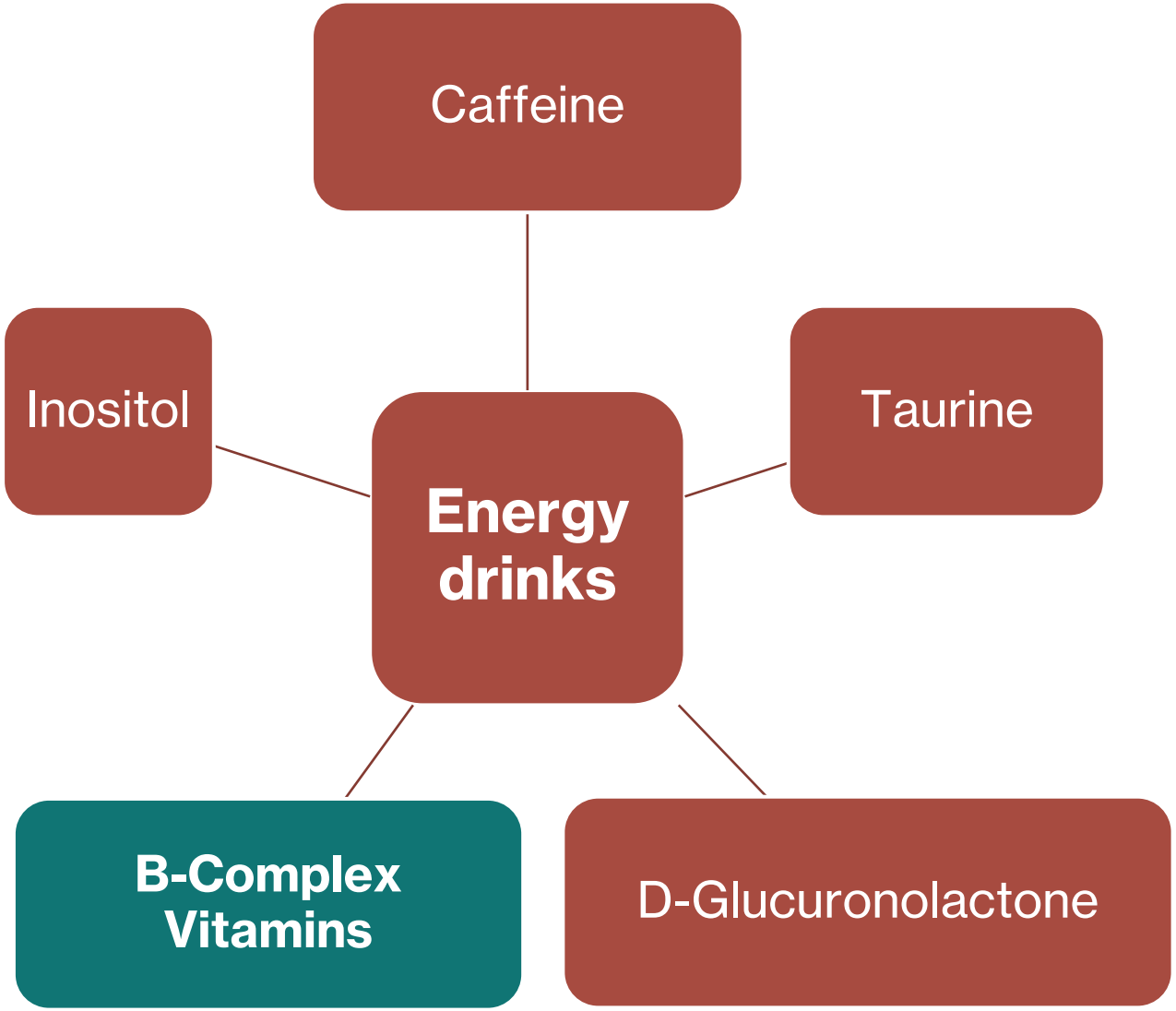


- Acute effects
  - Increases muscle contractility
  - Activates taurine-sodium transporters → increases intracellular calcium
  - Increase BP
- Chronic effects
  - Reduces adrenergic activity → decrease BP
  - Antioxidant, anti-inflammatory and neuroprotective
  - Detoxification of xenobiotics
- Caffeine & taurine
  - Combined benefit and risk
  - Unclear evidence



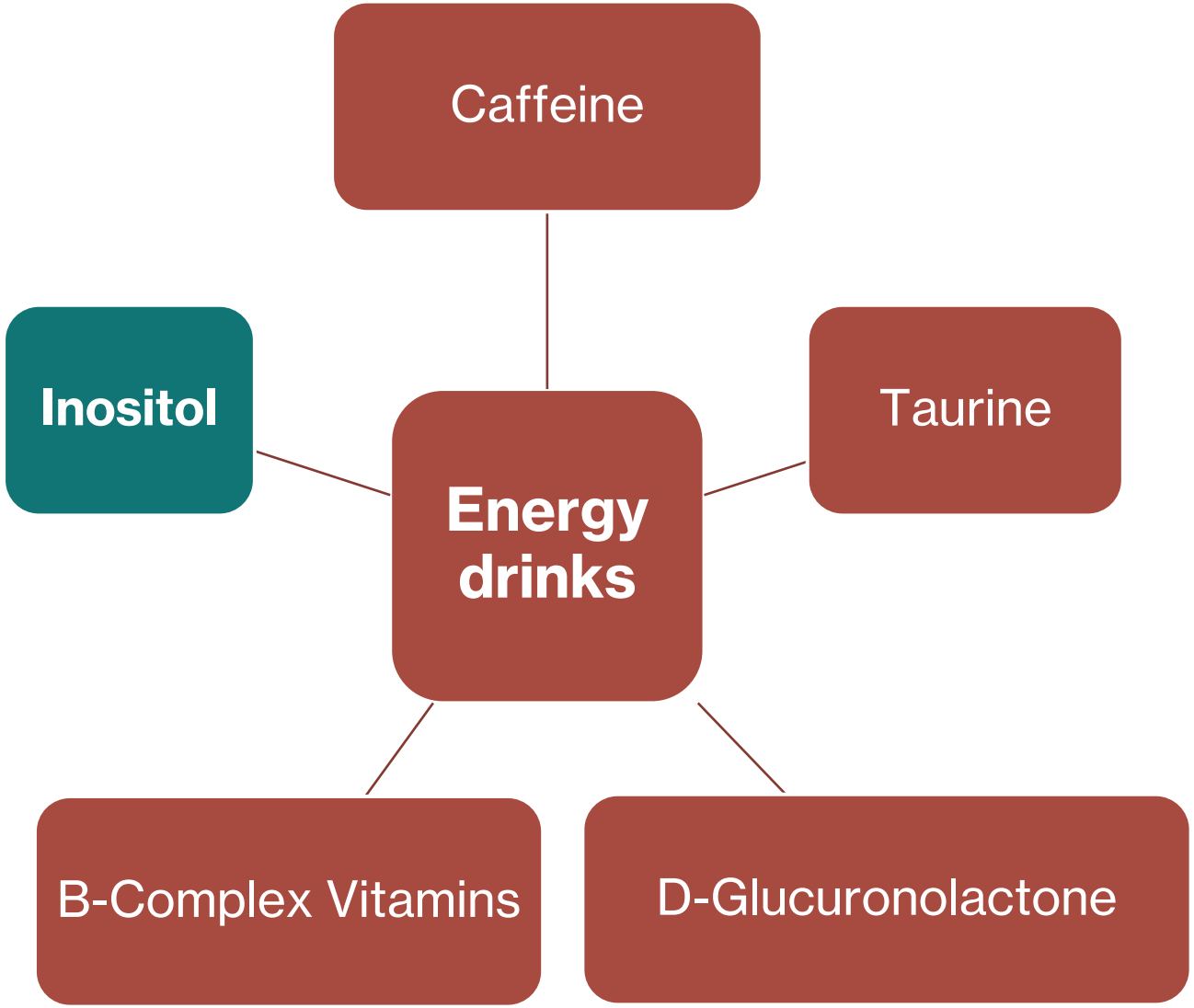
- Detoxification in liver
- Antioxidant & anti-inflammatory
- Increases glucagon stores
- Inhibits alpha-amylase activity
- Synthesis cartilage, ligaments, tendons

- Low levels, safe



- Co-factors in metabolic reactions
- DNA and RNA synthesis
- Neurotransmitter secretion

- Low-levels, safe



- Cellular energy metabolism
- Insulin sensitivity
- Anti-inflammatory and antioxidant

- Mild GI side effects but generally safe, low-levels

- Role? – depression, OCD, ADHD, Alzheimer's

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System	Adverse Event	Rate in Total Population [%]
Nervous system	Headache	18.4
	Dizziness	12.8
	Tremors	11.4
	Slurred speech	32.0
	Walking problems	29.7
	Disturbed coordination	36.9
	Visual disturbances	12.3
	Seizures	1.1
	Depressive mood	23.0
	Agitation/anxiety	23.1
	Irritability	24.0
	Suicidal ideation/attempts	19.8
	Insomnia/sleep-related problems	34.5
Cardiovascular	Tachycardia	26.2
	Palpitations	20.0
	Chest pain	10.3
	Arrhythmia	4.3
	Dyspnea	13.8
Gastrointestinal	Abdominal pain	14.6
	Stomach upset	18.7
	Low appetite	17.3
	Increased salivation	14.0
Urinary	Kidney pain	0.8
	Increased urination	12.9
Musculoskeletal	**Muscle tension/pain/twitching**	14.0
Other events	**Restlessness/shaking hands**	25.1
	Jolt and crush	22.6
	Rapid speech	34.5
	Dehydration	18.6
	Fatigue	12.5
	Weakness	28.9
	Heat intolerance	14.9

Sports Health | SAGE

Sports Health. 2020 Nov 19;13(3):265–277. doi: 10.1177/1941738120949181

Energy Drinks and Their Adverse Health Effects: A Systematic Review and Meta-analysis

Ibrahim M Nadeem, Ajaykumar Shanmugaraj, Seaher Sakha, Nolan S Horner, Olufemi R Ayeni, Moin Khan

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Pharmacokinetics - caffeine

- Absorption
- Distribution
- Metabolism
- Elimination

Pharmacokinetics - caffeine

- Reduce absorption - some antidepressants, antipsychotics, iron & L-thyroxine
- Increase gastric acid secretion – paracetamol, aspirin, levodopa
- Increase pancreatic secretion & colon motility

Absorption

Distribution

Metabolism

Elimination

Pharmacokinetics - caffeine

- Increase BBB tightness – memantine, donepezil
- Inhibits peripheral decarboxylase - levodopa

Absorption

Distribution

Metabolism

Elimination

Pharmacokinetics - caffeine

- CYP1A2

- Antidepressants: fluvoxamine, amitriptyline
- Antipsychotics: clozapine, olanzapine
- Cardiac drugs: verapamil, propafenone
- Anticoagulants: warfarin
- Bronchodilators: theophylline
- Sedatives/hypnotics: zolpidem, melatonin

Absorption

Distribution

Metabolism

Elimination

Pharmacokinetics - caffeine

- Increased renal clearance → faster elimination

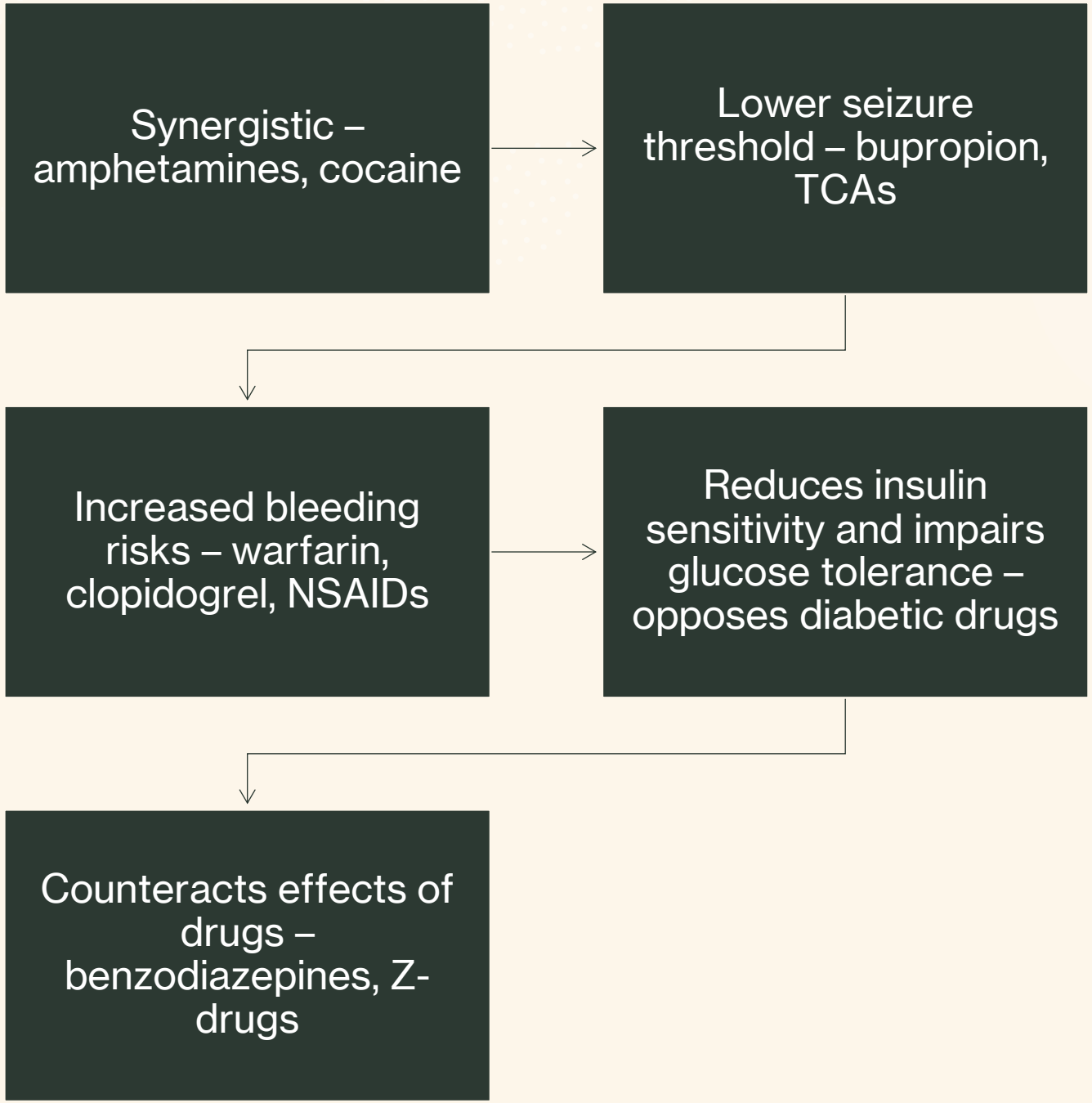
Absorption

Distribution

Metabolism

Elimination

Pharmacodynamics - caffeine



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Drug interactions – other ingredients

Taurine – inhibits CYP2E1 – some anticonvulsants, paracetamol

Ginseng & gingko biloba – increased bleeding risk

Ginseng – hypoglycaemic

Ginko biloba – reduce anticonvulsants effectiveness and increased risk serotonin syndrome with antidepressants

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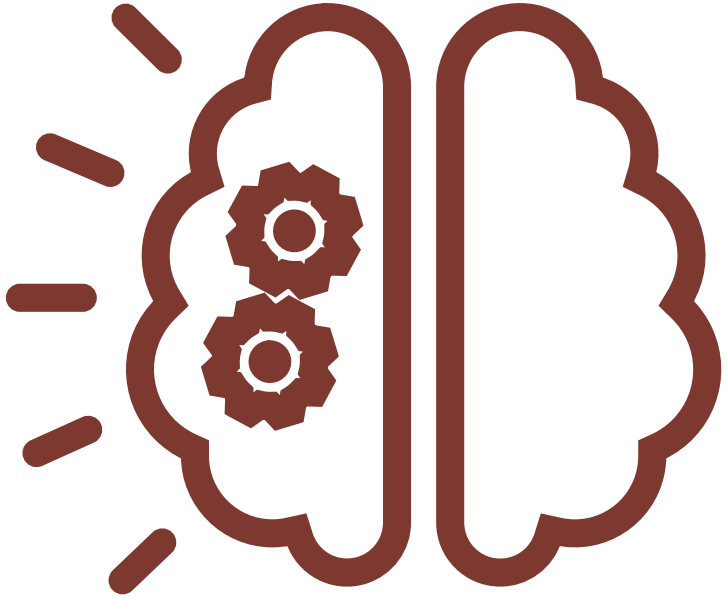
Caffeine withdrawal

- Headache
- Marked fatigue or drowsiness
- Irritability
- Depressed or dysphoric mood
- Nausea or vomiting
- Difficulty concentrating



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Conclusion & recommendations

Conclusion

- Energy drinks contain high amounts of caffeine and sugar
- Energy drinks aren't the whole story and other common drinks contain significant caffeine quantities
- They do contain additional ingredients, but in small quantities and perhaps serve more of a marketing purpose than a clinically significant one
- They aren't inherently harmful for most healthy adults
- Studies focus on the general population, negating the psychiatric and LD population

Recommendations

- Individualised approach
- Curiosity – what purpose does the energy drink serve?
- Caution in patients who take medications and who have physical health conditions, particularly cardiovascular disease and diabetes

Thank you for listening

Questions?
Thoughts?

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