EPQ Summary — Exogenous Antioxidants & Human Health

Research question

To what extent are exogenous antioxidants beneficial for human health?

Rationale

This project was motivated by the popularity of antioxidant supplements and the gap between how supplements are marketed vs the strength/limitations of scientific evidence.

Approach

I conducted a structured literature review comparing natural dietary antioxidants (from fruits/vegetables etc.) versus supplementary antioxidants (concentrated forms). I evaluated evidence across in vitro studies, observational studies, and randomised controlled trials/meta-analyses, and assessed outcomes across physiological health (CVD, cancer, T2DM, adverse effects) and mental health.

Key findings

- **Cardiovascular disease (CVD):** Evidence overall supports benefits from natural antioxidants (notably vitamin C/E in dietary contexts), whereas supplement supplements are generally not associated with reduced CVD risk in higher-quality trial/meta-analysis evidence.
- **Cancer:** Findings were inconsistent for both natural and supplementary antioxidants, and the overall effect on cancer prevention was unclear (likely due to cancer being multifactorial and study heterogeneity).
- **Type 2 diabetes (T2DM):** Evidence supports a beneficial role for antioxidants in reducing risk/severity, with both dietary and supplemental forms showing potential benefit in the literature discussed.
- **Adverse effects / dosing:** Potential harms are mainly linked to high doses (e.g., pro-oxidant effects at high concentrations and interference with physiological roles of ROS). This supports caution with long-term high-dose supplementation.
- **Mental health:** Evidence reviewed supports that both dietary and supplemental antioxidants may be beneficial for mood-related outcomes (e.g., depression/anxiety symptoms), though causal certainty varies by study type.

Overall conclusion

Exogenous antioxidants are beneficial to a larger extent, especially when obtained through a balanced diet. Fruit and vegetable intake is recommended as a safer, broader-health strategy, while supplementation may be considered in specific contexts (e.g., with ageing-related declines in endogenous antioxidant capacity) but dose control is

important. More robust randomised controlled trials are needed to strengthen causal conclusions.

Limitations / reflection

- Evidence quality and generalisability varied across studies (population-specific results, reliance on observational data for some questions).

Skills demonstrated

Literature searching and synthesis; evidence evaluation (observational vs RCT evidence); scientific writing and structuring a long report; summarising complex material into presentation form; drawing balanced conclusions under uncertainty.