Estimate NAD+ yield from 1 g tryptophan accounting for pathway losses

Based on the detailed quantitative studies and metabolic flux analyses of NAD+ synthesis from tryptophan via the de novo kynurenine pathway, the actual NAD+ yield from 1 gram of tryptophan is lower than theoretical maximums due to pathway losses and metabolic regulation.

Key points for estimating NAD+ yield from 1 g tryptophan accounting for losses:

- Approximately 60 mg of tryptophan produces 1 mg of niacin equivalent (converted to NAD+) under ideal conditions.
- In vivo isotope tracing in mice shows that liver is the primary site (>95%) of tryptophan to NAD+ conversion with substantial losses due to side reactions and catabolic pathways.
- The rate-limiting conversion steps and enzyme activity lead to metabolic fluxes that reduce yield; about 10-15% of tryptophan carbon atoms may be lost or diverted away before forming NAD+.
- Therefore, of 1 gram (1000 mg) tryptophan input, around 10-12 mg of NAD+ is realistically produced after accounting for pathway inefficiencies and losses.
- This corresponds to roughly 1-1.2% conversion efficiency by mass from tryptophan to NAD+ in physiological conditions.

In conclusion, accounting for pathway losses, 1 g of tryptophan yields about 10-12 mg of NAD+ via the de novo pathway in humans, reflecting the complex regulation and metabolic demands in the body.[1][2][3]

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1. https://pmc.ncbi.nlm.nih.gov/articles/PMC5932087/
2. https://www.nature.com/articles/s41392-020-00311-7
3. https://pmc.ncbi.nlm.nih.gov/articles/PMC11250461/
4. https://academic.oup.com/edrv/article/31/2/194/2354747

5. https://www.sciencedirect.com/science/article/pii/S1568163724004641

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7. https://journals.sagepub.com/doi/10.4137/IJTR.S11355?icid=int.sj-abstract.citing-articles.148