Extended Release Carbidopa-Levodopa vs Immediate Release Carbidopa-Levodopa in Treating Parkinson's Disease

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INTRODUCTION

- Parkinson's is a neurodegenerative disease that presents with various motor symptoms, including rigidity and bradykinesia. (Abbott, 2010)
- These symptoms are caused by the degradation of neurons in regions of the brain, as well as dopamine depletion. (Abbott, 2010)
- Extended Release Carbidopa-Levodopa (ER-CL) and Immediate Release Carbidopa-Levodopa (IR-CL) are two common treatment options.

CARBIDOPA-LEVODOPA

- Levodopa is metabolized by the body into dopamine. In Parkinson's patients it reduces motor symptoms. (Fig. 1)
- Carbidopa is added to Levodopa to slow the production of dopamine and increase its bioavailability.

OBJECTIVES

- To determine how effective ER-CL is in treating mild vs advanced cases of Parkinson's disease.
- To determine how effective IR-CL is in treating mild vs advanced cases of Parkinson's disease.

METHODS

- A literary review was conducted using Academic Search Complete through Cleveland State University's Michael Schwartz library.
- Data was compiled from a comparison study. (Hsu, 2015)
- This comparison study was selected for its large scale.

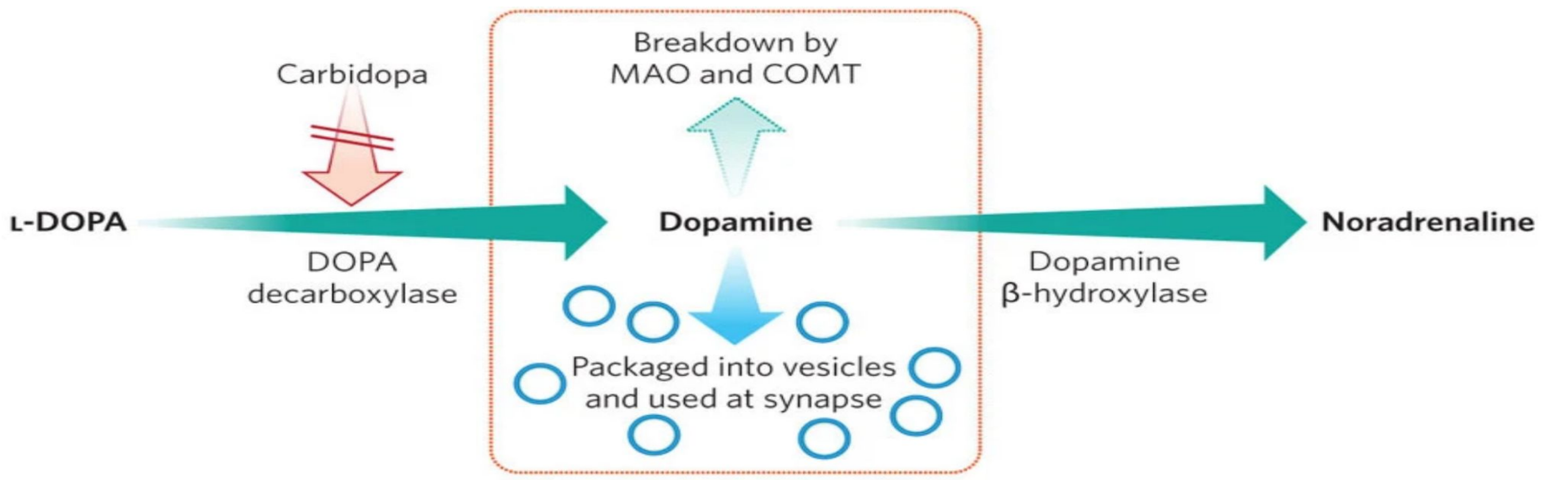

Figure 1. The conversion of Levodopa into dopamine. (Abbott, 2010)

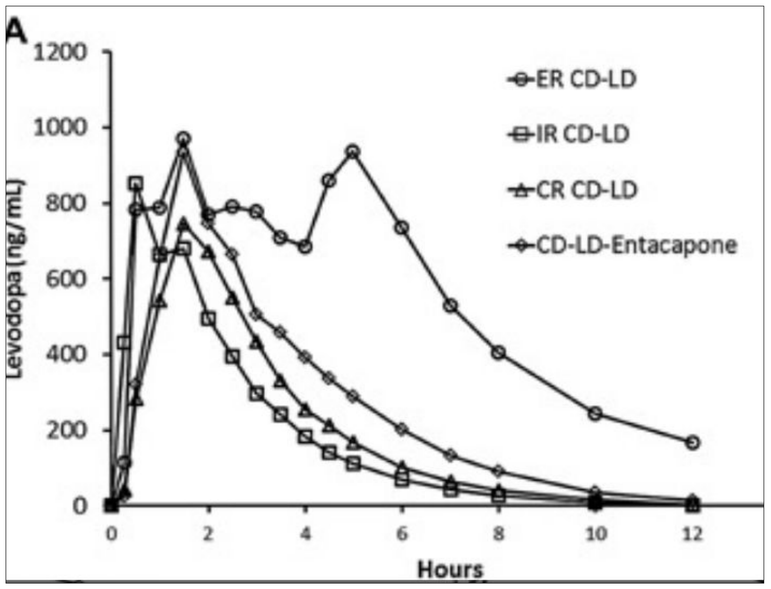

Figure 2. The concentration of Levodopa over time in hours. (Hsu, 2015)

RESULTS

- 393 patients participated in a double-blind CD-LD treatment. Out of the 393, 201 were given ER- CL and 192 were specifically given IR-CL.(Hsu, 2015)
- The study also included sustained release CL and CL-entacapone, but these results are unimportant for this presentation.
- In the 22 week study, ER-CL was found to have reduced off time for patients by about 13.06%. IR-CL was found to have reduced off time by about 6.21%.
- ER-CL maintains a high concentration for longer than IR-CL. (Fig. 2)

CONCLUSIONS

- In early stages of Parkinson's disease, IR-CL is sufficient in treating symptoms. However, as time goes on, the on time of IR-CL is significantly decreased.
- ER-CL has a greater impact on off time and remains in the body for longer than IR-CL.
- The increased on time of ER-CL is linked to increased nausea compared to IR-CL.
- Due to the these factors IR-CL seems to be the better option in early Parkinson's Disease and ER-CL for later.

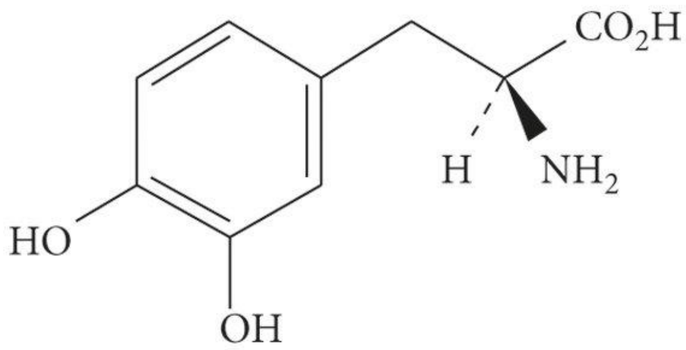

Figure 3. Levodopa chemical structure. (Abdoon, 2022)

FUTURE WORK

- Further clinical research is required to determine if these results translate to treatment of Parkinson's disease.

REFERENCES

- Abbott, A. Levodopa: the story so far. *Nature* 466, S6–S7 (2010). https://doi.org/10.1038/466S6a
- Abdoon, Fadam, et al. "Ternary Complexation Process for New Spectrophotometric Assay of Levodopa Using Ni(Ii) and 2,3-Diaminopyridine." *Advances in Materials Science and Engineering*, vol. 2022, 2022, pp. 1–8., https://doi.org/10.1155/2022/4915162.
- Hsu, A., Yao, H.-M., Gupta, S. and Modi, N.B. (2015), Comparison of the pharmacokinetics of an oral extended-release capsule formulation of carbidopa-levodopa (IPX066) with immediate-release carbidopa-levodopa (Sinemet®), sustained-release carbidopa-levodopa (Sinemet® CR), and carbidopa-levodopa-entacapone (Stalevo®). The Journal of Clinical Pharmacology, 55: 995-1003. https://doi.org/10.1002/jcph.514

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