

Experimental Analysis of iBKH-Backed Drugs

Experiment disease: Parkinson's disease

Experiment drugs:

Rank	Score	Primary_ID	Name	Groups
4	0.99	DrugBank: DB01041	Thalidomide8	Approved / Investigational / Withdrawn
5	0.99	DrugBank: DB00295	Morphine	Approved / Investigational

Experiment 1 - the association between Parkinson's disease & Thalidomide drug.

- **iBKH:**

Rank: 4

Score: 0.99

Primary_ID: DrugBank:DB01041

Name: Thalidomide8

ATC Classification: L: Antineoplastic and immunomodulating agents

Groups: Approved / Investigational / Withdrawn

- **LLM (GPT4):**

Input,

Temperature: 0

Prompts used:

Do you know Parkinson's disease?

Do you know Thalidomide drug? If yes, provide the DrugBank (primary ID) for it.

Is the Thalidomide drug associated with Parkinson's disease? Provide sources to prove that.

Results,

DrugBank: DB01041

Prompt output:

GPT4 There is no direct association between Thalidomide and Parkinson's disease in terms of causation or treatment ... However, there is some research exploring the potential use of

Thalidomide and its derivatives in neurodegenerative diseases, including Parkinson's disease ...

- **Factual check**

Evidence is provided in this paper: [Neuroprotective effect of thalidomide on MPTP-induced toxicity - PubMed \(nih.gov\)](#)

Notes:

- Playing around with the temperature we found that setting it to 0.5 gives correct DrugBank ID whereas increasing it to just 0.6, GPT4 hallucinates and gives a wrong one
- Even when setting the temperature to 0, the model still hallucinates. For example, when asked to show a proof for association between Parkinson's and Thalidomide, it gave results at first:

"One such study is titled "Thalidomide and its analogs overcome drug resistance of human multiple myeloma cells to conventional therapy" by Mitsiades et al., published in Blood in 2000. The study suggests that Thalidomide and its analogs may have potential therapeutic effects in neurodegenerative diseases, including Parkinson's disease..."

But then when asked to provide links for this source it changed the output, saying:

"I apologize for the confusion earlier. Upon further investigation, I could not find the exact studies I mentioned in my previous response."

- The paper given by GPT4 exists. However, it does not show, as GPT4 said, that there is an association between Parkinson's and Thalidomide.

Experiment 2 - the association between Parkinson's disease & Morphine drug.

- **iBKH:**

Rank: 5

Score: 0.99

Primary_ID: DrugBank:DB00295

Name: Morphine

ATC Classification: N: Nervous system / A: Alimentary tract and metabolism

Groups: Approved / Investigational

- **LLM (GPT4):**

Input,

Temperature: 0

Prompts used:

Do you know Parkinson's disease?

Do you know Morphine drug? If yes, provide the DrugBank (primary ID) for it.
Is the Morphine drug associated with Parkinson's disease? Provide sources to prove that.

Results,

DrugBank: DrugBank:DB01041

Prompt output:

There is some evidence suggesting that morphine and other opioids may have an impact on Parkinson's disease symptoms, but the relationship is complex and not yet fully understood ...

1. A study published in the journal "Movement Disorders" found that the use of opioids, including morphine, was associated with a reduced risk of developing Parkinson's disease ...

- **Factual check**

Evidence is provided in this paper: [Acute Morphine Treatments Alleviate Tremor in 1-Methyl-4-Phenyl-1,2,3,6-Tetrahydropyridine-Treated Monkeys - PMC \(nih.gov\)](#)

Notes:

- Sources with links were provided instantly this time. Although the relationship isn't accurate as what the model says

References (all prompts & outputs):

USER

Is Parkinson's disease associated with Cocaine?

ASSISTANT

There is no direct association between Parkinson's disease and cocaine use. Parkinson's disease is a neurodegenerative disorder that affects the dopamine-producing neurons in the brain, leading to symptoms such as tremors, stiffness, and difficulty with movement.

Cocaine is a stimulant drug that increases the levels of dopamine in the brain by blocking its reuptake, leading to feelings of euphoria and increased energy. However, long-term cocaine use can damage dopamine-producing neurons and potentially contribute to movement disorders or other neurological issues. While cocaine use may not directly cause Parkinson's disease, it can have negative effects on the brain and overall health.

USER

Can you give me sources for that?

ASSISTANT

Certainly! Here are some sources that discuss the relationship between cocaine use and Parkinson's disease, as well as the effects of cocaine on dopamine-producing neurons:

1. Substance Abuse and Mental Health Services Administration (US). (2006). Detoxification and Substance Abuse Treatment: A Treatment Improvement Protocol TIP 45. Retrieved from <https://www.ncbi.nlm.nih.gov/books/NBK64115/>

2. Volkow, N. D., & Morales, M. (2015). The Brain on Drugs: From Reward to Addiction. *Cell*, 162(4), 712–725. <https://doi.org/10.1016/j.cell.2015.07.046>

3. Ritz, M. C., Lamb, R. J., Goldberg, S. R., & Kuhar, M. J. (1987). Cocaine receptors on dopamine transporters are related to self-administration of cocaine. *Science*, 237(4819), 1219–1223. <https://doi.org/10.1126/science.2820058>

4. Sulzer, D. (2011). How Addictive Drugs Disrupt Presynaptic Dopamine Neurotransmission. *Neuron*, 69(4), 628–

USER

Do you know Parkinson's disease?

ASSISTANT

Yes, I am familiar with Parkinson's disease. It is a progressive neurological disorder that affects movement and motor control. The disease primarily results from the degeneration of dopamine-producing neurons in a region of the brain called the substantia nigra. Dopamine is a neurotransmitter that plays a crucial role in regulating movement, mood, and other functions.

The exact cause of Parkinson's disease is not yet fully understood, but it is believed to involve a combination of genetic and environmental factors. The most common symptoms of Parkinson's disease include:

1. Tremors: Shaking or trembling, usually beginning in a limb, often in the hand or fingers.
2. Bradykinesia: Slowed movement, making simple tasks difficult and time-consuming.
3. Rigidity: Muscle stiffness, which can limit the range of motion and cause pain.
4. Postural instability: Impaired balance and coordination, leading to an increased risk of falls.
5. Changes in speech: Speaking softly, quickly, or hesitantly, and sometimes slurring words.
6. Loss of automatic movements: Reduced unconscious movements, such as blinking, smiling, or swinging arms while walking.

There is currently no cure for Parkinson's disease, but medications, physical therapy, and, in some cases, surgical interventions

USER

Do you know Thalidomide drug? If yes, provide the DrugBank (primary ID) for it.

ASSISTANT

Yes, I am familiar with Thalidomide. Thalidomide is a drug that was initially used as a sedative and to treat morning sickness in pregnant women in the late 1950s and early 1960s. However, it was later found to cause severe birth defects and was withdrawn from the market. Nowadays, Thalidomide is used to treat certain cancers, such as multiple myeloma, and some inflammatory and autoimmune diseases.

The DrugBank primary ID for Thalidomide is DB01041.

USER

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The DrugBank primary ID for Thalidomide is DB00662.

USER

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ASSISTANT

Yes, I am familiar with Thalidomide. Thalidomide is a drug that was initially used as a sedative and to treat morning sickness in pregnant women in the late 1950s and early 1960s. However, it was later found to cause severe birth defects and was withdrawn from the market. Nowadays, Thalidomide is used to treat certain cancers, such as multiple myeloma, and some inflammatory and autoimmune diseases.

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The DrugBank primary ID for Thalidomide is DB00662.

USER

Is the Thalidomide drug associated with Parkinson's disease? Provide sources to prove that.
ASSISTANT

There is no direct association between Thalidomide and Parkinson's disease in terms of causation or treatment. Thalidomide is primarily used for treating multiple myeloma and some inflammatory and autoimmune diseases, as mentioned earlier. However, there is some research exploring the potential use of Thalidomide and its derivatives in neurodegenerative diseases, including Parkinson's disease, due to their anti-inflammatory and immunomodulatory properties.

One such study is titled "Thalidomide and its analogs overcome drug resistance of human multiple myeloma cells to conventional therapy" by Mitsiades et al., published in Blood in 2000. The study suggests that Thalidomide and its analogs may have potential therapeutic effects in neurodegenerative diseases, including Parkinson's disease, due to their ability to inhibit the production of tumor necrosis factor-alpha (TNF-alpha), a pro-inflammatory cytokine implicated in the pathogenesis of these diseases.

Another study, titled "Thalidomide attenuates the development and expression of antinociceptive tolerance to μ -opioid agonist morphine through l-arginine-iNOS and nitric oxide pathway" by Maleki-Dizaji et al., published in the

USER

can you give me a link for these studies?

ASSISTANT

I apologize for the confusion earlier. Upon further investigation, I could not find the exact studies I mentioned in my previous response. However, I found a couple of other studies that discuss the potential use of Thalidomide and its derivatives in neurodegenerative diseases:

1. "Thalidomide and its immunomodulatory analogs: A review of their clinical properties and mechanisms of action" by Marriott et al., published in Drugs of Today in 2005. This review article discusses the potential use of Thalidomide and its analogs in various diseases, including neurodegenerative diseases. You can access the article here:
https://journals.prous.com/journals/servlet/xmlxsl/pk_journals.xml_summaryn_pr?p_JournalId=4&p_RefId=1021517&p_IsPs=N

2. "Thalidomide and its analogs in the treatment of Multiple Myeloma" by Palumbo et al., published in Experimental Hematology in 2004. This review article briefly mentions the potential use of Thalidomide and its analogs in neurodegenerative diseases. You can access the article here: <https://www.sciencedirect.com/science/article/pii/S>