**Al-Rafidain J Med Sci. 2024;6(1):200-201.**
**DOI**: https://doi.org/10.54133/ajms.v6i1.684

AJMS
Online ISSN (2789-3219)

## Editorial Letter

# Interactions Between Orally Administered Drugs can be Predicted from a Combination of Machine Learning and Tissue Models

Ismail Ibrahim Al-Janabi*

*Retired academic, Freelance Consultant Pharmacist and Science Writer, 6 Sherwood Way, Epsom, Surrey, UK*

Received: 24 February 2024; Accepted: 5 March 2024

* **Corresponding author**: Ismail I. Al-Janabi, Retired academic, Freelance Consultant Pharmacist and Science Writer, 6 Sherwood Way, Epsom, Surrey, UK; Email: ismail.janabi@gmail.com

***Article Citation***: Al-Janabi II. Interactions Between Orally Administered Drugs can be Predicted from a Combination of Machine Learning and Tissue Models. *Al-Rafidain J Med Sci*. 2024;6(1):200-201. doi: https://doi.org/10.54133/ajms.v6i1.684



Dear Editor,

Orally administered drugs need to go through the lining of the gastrointestinal tract before being transported into the blood circulation. To aid in the oral absorption of drugs, the body employs groups of transporter proteins, and individual drugs can act either as inhibitors or inducers of such transporters. As a result, taking two oral medications that serve as substrates for the same transporter simultaneously could affect how well they absorb. As a result, figuring out which transporter a particular drug uses could help to highlight potential interactions and result in better patient care. A lot has changed in over 40 years since our publications outlining the detection of possible *in vivo* drug-drug interactions [1,2,3]. Machine learning and artificial intelligence are gradually becoming part of many systems designed to enhance and interpret pharmaceutical development and drug interaction data [4,5]. A recent article detailed an approach that employs machine learning algorithms in combination with tissue models to identify the transporter proteins used by different drugs [6]. Out of the many drug transporters identified so far, three of the most commonly used were chosen for the study. These were the ATP-binding cassette transporter proteins BCRP, MRP2 and PgP. The tissue model used was pig intestinal tissue grown in the laboratory. Small interfering RNAs (siRNAs) were used to knock down the expression of unwanted transporters. This enabled the investigation of the influence of individual transporters on different drugs. Using this experimental setup, the tissue was exposed to different drug formulations to measure how well they were absorbed. The researchers tested 23 commonly used drugs and were able to identify the transporter for each of them. The team then trained a machine learning algorithm based on collected data to make predictions about which drugs would interact with which transporters based on similarities in the chemical structures of drugs. The approach was applied to 28 currently used drugs and 1595 experimental molecules and yielded 1,810,270 predictions of potential drug interactions. Some of these interactions are unknown, and others are thought to be driven by alternative mechanisms. To make sure the predictions were right, the researchers looked at how doxycycline interacted with four possible drugs: warfarin, digoxin, levetiracetam, and tacrolimus. They then compared the predictions to the medical records of 50 people who took one of the four drugs along with the antibiotic. In all cases, the system predictions were based on the patients' medical records when it came to what would happen when doxycycline was given with the chosen candidate drug. Machine learning and tissue model systems could help accelerate the identification of potential interactions between existing drugs. Also, it could assist developers of formulations of new drug molecules in improving their absorbability and preventing possible interactions between active ingredients.

### Conflict of interests

The author declared no conflict of interest.

### Source of fund

No specific fund received.

## Data sharing statement

N/A

## REFERENCES


1. Al-Janabi II, Fikrat HT, Mustafa RMA, Razzo FN, Borazan HN, Al-Taee SF. The effect of acetylsalicylic acid and acetaminophen on the solubility and absorption characteristics of nitrofurantoin. *J Fac Med Baghdad.* 1980;22(2):44-53.
2. Anber SA, Al-Janabi II, Mustafa RMA, Razzo FN. *In vitro* detection of possible *in vivo* drug interactions Part 1: The effect of hydrochlorothiazide and frusemide on the *in vitro* absorption characteristics of propranolol hydrochloride. *Pharmazie.* 1981;36(H.6):425-427.
3. Al-Janabi II, Anber SA, Fikrat HT. *In vitro* detection of possible *in vivo* drug interactions Part 2: A study of the effect of hydrochlorothiazide and frusemide on the partition coefficient and solubility characteristics of propranolol hydrochloride. *Pharmazie.*1981;36(H.6):485-488.
4. Han K, Cao P, Wang Y, Xie F, Ma J, Yu M, et al. A Review of approaches for predicting drug-drug interactions based on machine learning. *Front Pharmacol.* 2022;12:814858. doi: 10.3389/fphar.2021.814858.
5. Zhang Y, Deng Z, Xu X, Feng Y, Junliang S. Application of artificial intelligence in drug-drug interactions prediction: A review. *J Chem Inf Model.* 2023. doi: 10.1021/acs.jcim.3c00582.
6. Shi Y, Reker D, Byrne JD, Kirtane AR, Hess K, Wang Z, et al. Screening oral drugs for their interactions with the intestinal transportome via porcine tissue explants and machine learning. *Nat Biomed Eng*. 2024. doi: 10.1038/s41551-023-01128-9.