Thymoquinone and Its Derivatives Against Breast Cancer with HER2 Positive: In Silico Studies of ADMET, Docking and QSAR

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Abstract

This study aimed to determine the pharmacokinetics profile (ADMET), docking, and quantitative structure-activity relationship (QSAR) of thymoquinone derivatives as candidates for breast cancer drug with HER2-positive. The prediction of ADMET was using the SMILES online translator and pkCSM online. Molecular docking was using Molegro Virtual Docker version 5.5 and QSAR analysis using the IBM SPSS 21 version and thymoquinone derivative 4 [N’-(4-hydroxy-2,5-) dimethyl phenyl)-4-(trifluoromethyl)benzohydrazide] had the potential to be further developed as a HER2-positive breast cancer drug.

Keywords: thymoquinone, HER2 positive, pkCSM, Molegro Virtual Docker, QSAR

Background

Breast cancer is the cause of the highest mortality rate in women, around 42,1 of 100,000 people. Existing medicine like trastuzumab and lapatinib have many side effects and alternative medicine is needed to solve this problem. The aims of this research were to determine the ADMET, activity and QSAR of thymoquinone derivatives as candidates for breast cancer drugs with HER-2 Positive.

Material and Method

Material

Lenovo brand computer, Windows 7 operating system, 64 bit, Intel Core i3-3110M processor 2.00 GB RAM, Chem Draw 2-D 17.0, Chem Draw 3-D 17.0, Molegro Virtual Docking 5.5 (Molegro ApS), SMILES Translator, pkCSM, and IBM SPSS 21.

Method

The activity of Thymoquinones and its derivatives examined through in silico test that is physicochemical properties, ADMET, docking and QSAR.

Result and Discussion

Pharmacokinetics Profile of 12 Thymoquinone Derivatives

### Compounds

| TQ 1 | 1.263 | 89.05 | -1.919 | NO | 2.206 | NO |
| TQ 2 | 1.257 | 89.56 | -2.206 | NO | 2.206 | NO |
| TQ 3 | 1.211 | 89.54 | -2.056 | NO | 2.195 | NO |

Table 2. Pharmacokinetics profile of 12 Thymoquinone Derivatives

All TQ derivatives have a good physicochemical properties

QSAR of 12 Thymoquinone Derivatives

Log A = 0.336 + 0.000

Table 3. QSAR of 12 Thymoquinone Derivatives

References


Conclusion

In conclusion, thymoquinone derivative 4 [N’-(4-hydroxy-2,5-) dimethyl phenyl)-4-(trifluoromethyl)benzohydrazide] had the potential to be further developed as a HER2-positive breast cancer drug.

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