

[Look Up Full Text](#)[Find PDF](#)[Export...](#)[Add to Marked List](#)

1 of 1

Identifying Analogues Of 2-Deoxyglucose, Alpha-D-Glucose and Beta-D-Glucose-6-Phosphate as Potential Inhibitors of Human Hexokinase II for the Development of Anti-Dengue Therapeutics

By: [Tanbin, S](#) (Tanbin, Suriyea)^[1]; [Salim, NO](#) (Salim, Nurhainis Ogu)^[2]; [Fuad, FAA](#) (Fuad, Fazia Adyani Ahmad)^[1]

PERTANIKA JOURNAL OF SCIENCE AND TECHNOLOGY

Volume: 27 Issue: 4 Pages: 1625-1647

Published: OCT 2019

Document Type: Article

Abstract

The human hexokinase isoform II (HKII) is one of the important enzymes for dengue virus (DENV) replication and thus has been suggested as a potential therapeutic target for DENV drug development. In this work, compounds were identified using Ultrafast Shape Recognition with CREDO Atom Types (USRCAT) by utilizing both HKII's substrate and product; alpha-D-glucose (GLC) and beta-D-glucose-6-phosphate (BG6), as well as a known HKII's inhibitor, 2-deoxyglucose (2DG), as the query molecules. The analogues of the three query molecules were subsequently docked against the HKII's crystal structure (PDB ID: 2NZT) by using Auto Dock 4 program on Chain B, where the active sites and strong bonds were located. Among the top-ranked compounds, Compound 4 (ZINC26898487), which was the most similar to 2DG, showed the best binding energy (-7.63 kcal/mol) and contained two H bonds. Compound 9 (ZINC16930948), an analogue of GLC emerged as the best inhibitor candidate because it had six H bonds. Similarly, among the molecules similar to BG6, Compound 14 (ZINC4403351) had been suggested as a potential inhibitor because it contained four strong H bonds. All compounds were predicted to be non-toxic, based on Toxicity Estimation Software Tool (TEST) analysis. By providing these valuable findings, this study has paved the way for the discovery of compounds that should be further tested for the development of anti-dengue drugs.

Keywords

Author Keywords: 2-deoxyglucose; alpha-D-glucose; beta-D-glucose-6-phosphate; Human Hexokinase II (HK2); ligand-based screening; structure-based screening; toxicity test

KeyWords Plus: DRUG DISCOVERY; HELICASE ACTIVITY; IN-VITRO; VIRUS; PROTEASE; REPLICATION; GLYCOLYSIS; METABOLISM; PREVENTION; GLUTAMINE

Author Information

Reprint Address: Fuad, FAA (reprint author)

+ Int Islamic Univ Malaysia, Fac Engr, Dept Biotechnol Engr, Kuala Lumpur 50728, Malaysia.

Addresses:

+ [1] Int Islamic Univ Malaysia, Fac Engr, Dept Biotechnol Engr, Kuala Lumpur 50728, Malaysia

[2] Inst Med Res, Parasitol Unit, Shah Alam 40170, Selangor, Malaysia

E-mail Addresses: tanbin.khu.bde@gmail.com; Nurhainis@gmail.com; fazia_adyani@iium.edu.my

Funding

Funding Agency	Grant Number
Ministry of Education Malaysia (MOE)	FRGS/1/2016/STG04/UIAM/02/1

[View funding text](#)

Publisher

UNIV PUTRA MALAYSIA PRESS, SERDANG, SELANGOR, 00000, MALAYSIA

Categories / Classification

Research Areas: Science & Technology - Other Topics

Web of Science Categories: Multidisciplinary Sciences

Citation Network

In Web of Science Core Collection

0

Times Cited

[Create Citation Alert](#)

55

Cited References

[View Related Records](#)

Use in Web of Science

Web of Science Usage Count

4

Last 180 Days

4

Since 2013

[Learn more](#)

This record is from:

Web of Science Core Collection

- Emerging Sources Citation Index

[Suggest a correction](#)

If you would like to improve the quality of the data in this record, please [suggest a correction](#).

[See more data fields](#)

◀ 1 of 1 ▶

Cited References: 55**Showing 30 of 55** [View All in Cited References page](#)*(from Web of Science Core Collection)*

1. **The importance of toxicity testing.** Times Cited: 3
By: Arome, D.; Chinedu, E.
J. Pharm. Biosci. Volume: 4 Pages: 146-148 Published: 2014
2. **Suramin inhibits helicase activity of NS3 protein of dengue virus in a fluorescence-based high throughput assay format** Times Cited: 36
By: Basavannacharya, Chandrakala; Vasudevan, Subhash G.
BIOCHEMICAL AND BIOPHYSICAL RESEARCH COMMUNICATIONS Volume: 453 Issue: 3 Pages: 539-544 Published: OCT 24 2014
3. **C-Terminal Residue Optimization and Fragment Merging: Discovery of a Potent Peptide-Hybrid Inhibitor of Dengue Protease** Times Cited: 23
By: Behnam, Mira A. M.; Nitsche, Christoph; Vechi, Sergio M.; et al.
ACS MEDICINAL CHEMISTRY LETTERS Volume: 5 Issue: 9 Pages: 1037-1042 Published: SEP 2014
4. **A novel inhibitor of dengue virus replication that targets the capsid protein** Times Cited: 1
By: Byrd, C. M.; Dai, D.; Grosenbach, D. W.; et al.
American Society for Microbiology Journals Volume: 57 Issue: 1 Pages: 15-25 Published: 2018
[\[Show additional data\]](#)
5. **Virtual screening with AutoDock: theory and practice** Times Cited: 226
By: Cosconati, Sandro; Forli, Stefano; Perryman, Alex L.; et al.
EXPERT OPINION ON DRUG DISCOVERY Volume: 5 Issue: 6 Pages: 597-607 Published: JUN 2010
6. **Molecular Insight into Dengue Virus Pathogenesis and Its Implications for Disease Control** Times Cited: 86
By: Diamond, Michael S.; Pierson, Theodore C.
CELL Volume: 162 Issue: 3 Pages: 488-492 Published: JUL 30 2015
7. **Dengue Virus Induces and Requires Glycolysis for Optimal Replication** Times Cited: 82
By: Fontaine, Krystal A.; Sanchez, Erica L.; Camarda, Roman; et al.
JOURNAL OF VIROLOGY Volume: 89 Issue: 4 Pages: 2358-2366 Published: FEB 2015
8. **Vaccinia Virus Requires Glutamine but Not Glucose for Efficient Replication** Times Cited: 54
By: Fontaine, Krystal A.; Camarda, Roman; Lagunoff, Michael
JOURNAL OF VIROLOGY Volume: 88 Issue: 8 Pages: 4366-4374 Published: APR 2014
9. **Serotype-specific differences in the risk of dengue hemorrhagic fever: an analysis of data collected in Bangkok, Thailand from 1994 to 2006** Times Cited: 6
By: Fried, JR; Gibbons, RV; Kalayanarooj, S; et al.
PLoS Negl Trop Dis Volume: 4 Pages: 1-6 Published: 2010
[\[Show additional data\]](#)
10. **Tumor glycolysis as a target for cancer therapy: progress and prospects** Times Cited: 225
By: Ganapathy-Kanniappan, Shanmugasundaram; Geschwind, Jean-Francois H.
MOLECULAR CANCER Volume: 12 Article Number: 152 Published: DEC 3 2013
11. **Pharmacophore Based Drug Design Approach as a Practical Process in Drug Discovery** Times Cited: 52
By: Gao, Qingzhi; Yang, Lulu; Zhu, Yongqiang
CURRENT COMPUTER-AIDED DRUG DESIGN Volume: 6 Issue: 1 Pages: 37-49 Published: MAR 2010
12. **Hexokinase-2-mediated aerobic glycolysis is integral to cerebellar neurogenesis and pathogenesis of medulloblastoma** Times Cited: 47
By: Gershon, Timothy R.; Crowther, Andrew J.; Tikunov, Andrey; et al.
CANCER & METABOLISM Volume: 1 Article Number: 2 Published: DEC 2013