Confidential and Privileged Document

INVENTION DISCLOSURE FORM

Note: You may add rows to add more inventors/applicants.

Will this invention be disclosed by any inventors to any platform within the next 3 months?

Please tick

Yes ☐

No ☐

If yes, please provide date on which it is going to be public.

Suggest Title of Invention

[Please suggest a brief working title which is descriptive and accurate technically and describe the subject invention.]

Estrogen Receptor (ESR) superfamily inhibitor to control tumor growth in breast cancer patients

Please provide details of literature and patent searches

[Please list publications that are closely related to your work. Please also list closely related patents and attach a list of the keywords used and results obtained]

S. No.	Publication details	Relevance to the invention
1		
2		
3		

What is the stage of development of the invention?

Proof of Concept ☐

Idea/concept ☐

Early Stage ☐

Prototype ☐

Industry Interest/Use ☐

What problem does this invention solve?

[Do not describe the invention but instead focus on the problem found with existing technology, processes or services, or a recognized problem not adequately solved by existing technologies, processes or services. You may give a general description of the state of the art as is known to you and the drawbacks that you have identified in conventional systems/devices/methods/process that you wish to make good.]

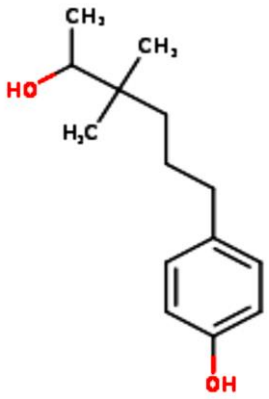
Globally Breast cancer is a huge burden for women and rare in men; it accounts for approximately 12–14% of all cancer cases. In 2023, it is estimated that there will be around 670,000 deaths due to breast cancer. The key component in the development of breast tumors is the elevated levels of hormones. These hormonal imbalances play a crucial role in controlling the development of secondary sexual organs in women. The excess or uncontrolled cell division was observed during the elevated levels of the steroid hormone such as estrogen released into the blood stream. Estrogen is primarily released by the ovaries, fats and adrenal glands. These excess estrogen levels are commonly observed during the week or a few days before the menstrual cycle every month. The estrogen hormone activates the estrogen receptor (ER) and initiates the process of cell division. The error in controlling cell division leads to tumor formation. It is commonly observed in menopause women. Approximately 70-80% of the breast cancer cases are ER positive. The medications that are already available for the treatment of breast tumors have serious side effects, including veginal discharge, menstrual irregularities, an increased risk of blood clots, joint pain, severe allergic reactions, and osteoporosis.

Here we have designed a small molecule with a molecular weight of 222.328 g/mol. It specifically binds with the estrogen receptors alpha and beta and blocks the signal of the estrogen hormone. It helps in tumor growth control, and it may have fewer or no side effects, making it a better option for treating breast cancer.

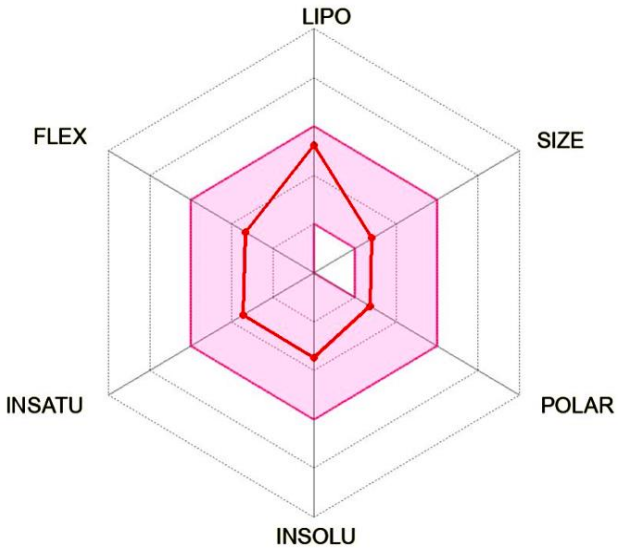
Describe the invention in detail

[Describe in your own words the construction/structure of the invention (if it is machine, device, apparatus or a system) and its working with the help of engineering drawings/block diagrams/flowcharts (in case of software related invention). In case of a novel method, mention the various steps involved, for example, in the manufacturing of a composition/product, or a technique, for example, sewage treatment, or the processing steps in a computer-implemented system to achieve the end result. Describe briefly in your own words all the components/sub-components/assemblies/hardware components that shall be part of the invention by referring to the same shown and marked in the drawings, for example, by numerals such as 10, 20, 30 and so on. Consider the commercial applications of the technology and how it might be applied to a product, process, or service. Importantly, please describe what aspects of the invention have been proven experimentally and what is shown by data. Also describe what materials or prototypes have been created in relation to the invention. Attach any technical documents of the Invention including (submitted or draft) manuscripts, posters, theses and grant applications.]

The drug molecule is designed by using the SWISS ADME tool (**http://www.swissadme.ch/)** Chemical formula of the drug molecule is **C14H22O2** it follows the Lipinski's rule of five.



2D Structure of drug molecule



Bioavailability Rader

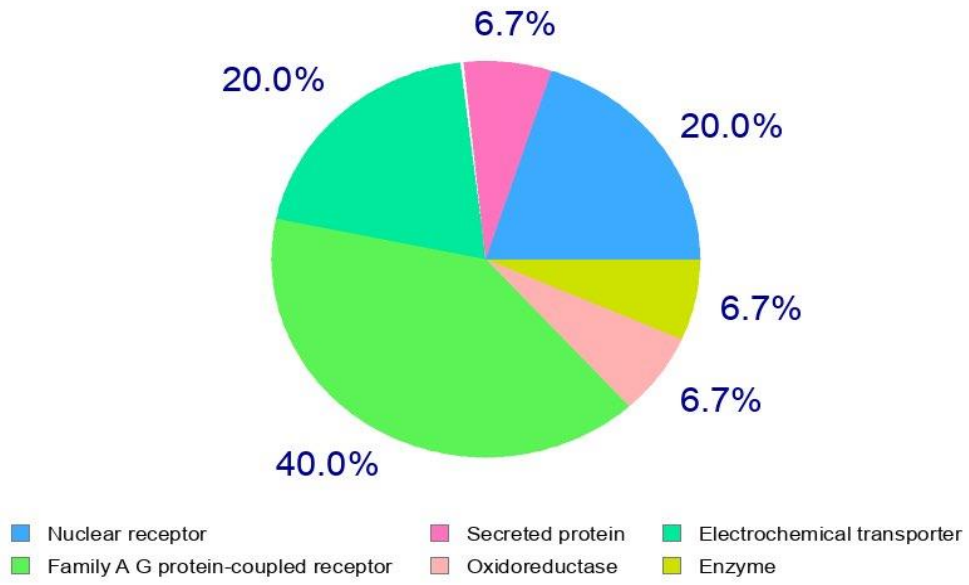
The drug molecule is designed by using the SWISS ADME tool (**http://www.swissadme.ch/)** and docking was performed using CBDOCK2 (https://cadd.labshare.cn/cb-dock2/index.php)

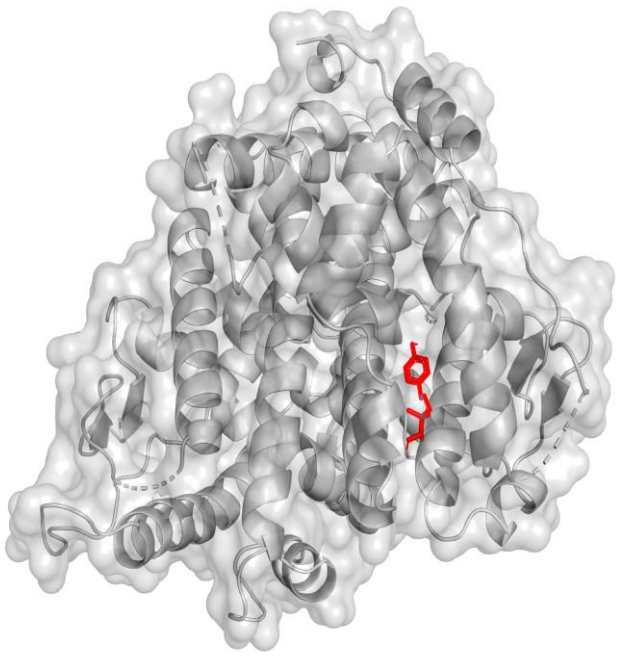
Chemical formula of the drug molecule is **C14H22O2,** Canonical SMILES : CC(O)C(C)(C)CCCC1=CC=C(O)C=C1"

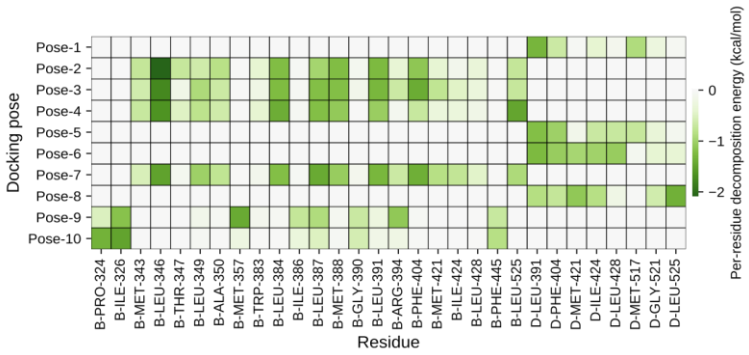
it follows the Lipinski's rule of five (table:1).

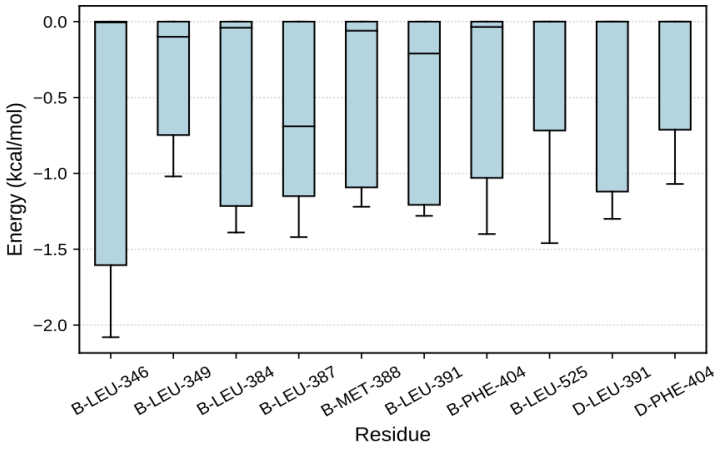
S.NO	Parameter	Value	Reference Value
1	Number of H bond donors	2	<5
2	Number of H bond acceptors	2	<10
3	Number of rotatable bonds	5	<10
4	Molecular weight	222.328	<500
5	LogP	3.122	<5
6	Mol. Refractivity	66.507	40 - 130
7	TPSA [Angstrom^2]	40.46	<140
8	Number of heavy atoms	16	<36

Docking Score is -7.3 and Amino acid residues which are participate in bond formation with drug GLU323, PRO324, PRO325, ILE326, MET343, LEU345, LEU346, THR347, LEU349, ALA350, ASP351, GLU353, HIS356, MET357, TRP383, LEU384, ILE386, LEU387, MET388, GLY390, LEU391, TRP393, ARG394, PHE404, MET421, ILE424, LEU428, PHE445, LYS449, LYS520, GLY521, MET522, HIS524, LEU525, and VAL533


6.7%
20.0%
20.0%
6.7%
6.7%
40.0%
Nuclear receptor
Family A G protein-coupled receptor
Secreted protein
Oxidoreductase
Electrochemical transporter
Enzyme




Docking pose
Pose-1
Pose-2
Pose-3
Pose-4
Pose-5
Pose-6
Pose-7
Pose-8
Pose-9
Pose-10
B-PRO-324
B-ILE-326
B-MET-343
B-LEU-346
B-THR-347
B-LEU-349
B-ALA-350
B-MET-357
B-TRP-383
B-LEU-384
B-ILE-386
B-LEU-387
B-MET-388
B-GLY-390
B-LEU-391
B-ARG-394
B-PHE-404
B-MET-421
B-ILE-424
B-LEU-428
B-PHE-445
B-LEU-525
D-LEU-391
D-PHE-404
D-MET-421
D-ILE-424
D-LEU-428
D-MET-517
D-GLY-521
D-LEU-525
Residue
0
−1
−2
Per-residue decomposition energy (kcal/mol)


Energy (kcal/mol)
0.0
−0.5
−1.0
−1.5
−2.0
B-LEU-346
B-LEU-349
B-LEU-384
B-LEU-387
B-MET-388
B-LEU-391
B-PHE-404
B-LEU-525
D-LEU-391
D-PHE-404
Residue

What competitive advantage(s) the subject invention attains from current state of art?

[Describe the competitor technologies, processes or services which attempt to address the above-described problem. What is the closest existing or known technology – please provide links to the related companies' products or service webpages. What are the advantages and benefits of your invention over these competitor approaches – have you experimentally compared your invention to the "gold standard" competitor technology or process?]

The mainly used selective estrogen receptor modulators are Tamoxifen and Toremifene. Tamoxifen is consumed orally for five years, of course, for breast cancer treatment sold under the brand name Nolvadex. It is also used for a wide range of medical uses, such as dysmenorrhea, infertility, and gynecomastia. The major side effects of the tamoxifen are endometrial cancer, cardiovascular and metabolic disorders, and liver toxicity (hepatotoxicity). Toremifene is commonly used for postmenopausal women with advanced stages of breast cancer. 60 mg oral tablets of toremifene are sold under the brand name Fareston. The side effects include host flashes, veginal bleeding, blood clots, endometrial cancer, and bone metastases.
The drug molecule that we designed follows all the drulikeness properties. It is highly specific to the estrogen receptors alpha and beta. Due to its lower molecular weight, it has a high penetration rate and high gastro-intestinal absorption compared to the above two drugs. It is also easily excreated because of its low molecular weight. It can have no serious adverse effects.

To what can this invention be applied?

[Please provide all technical applications and to the industries this invention is applicable to]

This invention is a part of healthcare. The designed drug is a type of estrogen receptor-blocking molecule used for hormonal/endocrine therapy for estrogen-sensitive breast cancers. It will effectively bind with the estrogen receptors and induce cell death/apoptosis or suppress cancer cells from growing. It has a high affinity for the nuclear estrogen receptors and turns off transcription activation. It has more efficiency and reduces the risk of side effects.