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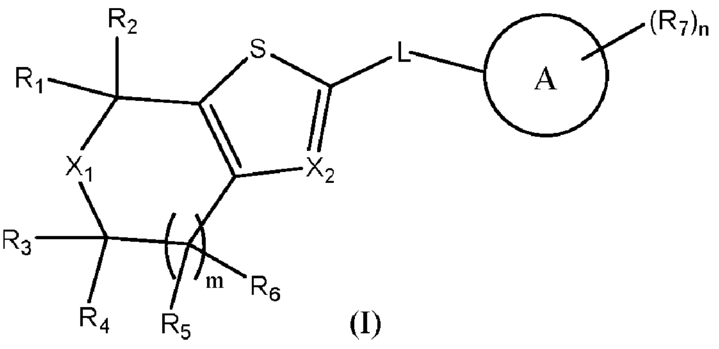
(54) **Title**: FUSED THIOPHENE AND THIAZOLE DERIVATIVES AS ROR GAMMA MODULATORS



(I)

(57) **Abstract**: The present invention provides fused thiophene and thiazole derivatives of formula (I), which may be therapeutically useful, more particularly as ROR$_\gamma$ modulators; in which R$_1$, R$_2$, R$_3$, R$_4$, R$_5$, R$_6$, R$_7$, X$_1$, X$_2$, L, m, n and ring A have the meanings given in the specification, and pharmaceutically acceptable salts thereof that are useful in the treatment and prevention of diseases or disorders, in particular their use in disease(s) or disorder(s) where there is an advantage in modulating ROR$_\gamma$ receptor. The present invention also provides preparation of the compounds and pharmaceutical formulations comprising at least one of the fused thiophene and thiazole derivatives of formula (I), together with a pharmaceutically acceptable carrier, diluent or excipient therefor.

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FUSED THIOPHENE AND THIAZOLE DERIVATIVES AS ROR GAMMA MODULATORS

This application claims the benefit of Indian provisional application number 6203/CHE/2013 filed on 31st December 2013 and Indian provisional application number 243/CHE/2014 filed on 21st January 2014 which hereby incorporated by reference.

FIELD OF THE INVENTION

This invention relates to compounds useful for treatment of disease(s) or disorder(s) associated with Retinoic acid receptor-related orphan receptors (RORs), and more particularly compounds that modulate the function of RORγ. The invention also provides pharmaceutically acceptable compositions comprising compounds of the present invention and methods of using said compositions in the treatment of disease(s) or disorder(s) associated with RORγ.

BACKGROUND OF THE INVENTION

Retinoid-related orphan receptors (RORs) are transcription factors which belong to the steroid hormone nuclear receptor super family (Jetten & Joo, Adv. Dev. Biol. 16:313-355, 2006). Several nuclear receptors are still characterized as orphan receptors because the identification of ligands for these receptors is still elusive or controversial. The ROR family consists of three members, ROR alpha (RORα), ROR beta (ROR$_\beta$) and ROR gamma (RORγ), each encoded by a separate gene (RORA, RORB and RORC, respectively). RORs contain four principal domains shared by the majority of nuclear receptors: an N-terminal A/B domain, a DNA-binding domain, a hinge domain, and a ligand binding domain. Each ROR gene generates several isoforms which differ only in their N-terminal A/B domain. Two isoforms of RORγ have been identified: RORγ1 and RORγt (also known as RORγ2). RORγ is a term used to describe both RORγ1 and/or RORγt.

Upon activation by antigen-presenting cells naive T helper cells undergo clonal expansion and will ultimately differentiate in cytokine secreting effector T cells, such as Th1 and Th2 subtypes. A third and distinct effector subset has been identified, which plays a key role in providing immunity to bacteria and fungi at mucosal surfaces (Kastelein, *et al.*, Ann. Rev. Immunol. 25: 221-242, 2007). This effector T helper cell subset can be distinguished based on its ability to produce large quantities of IL-17A/F, IL-21 and IL-22, and is named Th17 (Miossec, *et al.*, New Eng. J. Med. 361 : 888-898, 2009).

RORγ1 is expressed in a variety of tissues including thymus, muscle, kidney and liver, while RORγt is exclusively expressed in the cells of the immune system. RORγt is highly expressed in Th17 cells (He, *et al.*, Immunity 9: 797-806, 1998). Studies have shown that Th17 cells are one of the important drivers of the inflammatory process in tissue-specific autoimmunity (Steinman, J. Exp. Med. 205:1517- 1522, 2008; Leung, *et al.*, Cell. Mol. Immunol. 7: 182-189, 2010). There is evidence that Th17 cells are activated during the disease process and are responsible for recruiting other inflammatory cells types, especially neutrophils, to mediate pathology in the target tissues (Korn, *et al.*, Ann. Rev. Immunol. 27:485-517, 2009). In addition, Th17 cells or their products have been shown to be associated with the pathology of a variety of human inflammatory and autoimmune disorders including multiple sclerosis, rheumatoid arthritis, psoriasis, Crohn's disease and asthma (Jetten, Nucl. Recept. Signal. 7: e003, 2009; Manel, *et al.*, Nat. Immunol. 9:641-649, 2008).

RORγt was shown to play a crucial role in non-Th17 lymphoid cells. In these studies, RORγt was critically important in innate lymphoid cells expressing Thyl, SCA-1 and IL-23R proteins. Genetic disruption of RORγ in a mouse colitis model dependent on these innate lymphoid cells, prevented colitis development (Buonocore, *et al.*, Nature 464: 1371-1375, 2010). In addition, RORγt was shown to play a crucial role in other non-Th17 cells, such as mast cells (Hueber, *et al.*, J Immunol. 184: 3336-3340, 2010). Finally, RORγt expression and secretion of Th17-type of cytokines was reported for Lymphoid Tissue Inducer cells, NK T-cells, NK cells (Eberl, *et al.*, Nat. Immunol. 5: 64-73, 2004) and gamma-delta T-cells (Sutton, *et al.*, Nat. Immunol. 31 : 331-341, 2009; Louten, *et al.*, J Allergy Clin. Immunol. 123: 1004-1011, 2009), suggesting an important function for RORγt in these subtypes of cells.

Based on the role of IL-17 producing cells (either Thl7 or non-Thl7 cells) RORγt has been identified as a key mediator in the pathogenesis of several diseases (Louten, *et al.*, J Allergy Clin. Immunol. 123: 1004-1011, 2009; Annunziato *et al.*, Nat. Rev. Rheumatol. 5: 325-331, 2009). This was confirmed using several disease models representative of autoimmune diseases. Genetic ablation of the RORγ gene in mice prevented the development of experimental autoimmune diseases, such as experimental autoimmune encephalomyelitis (EAE) and colitis (Ivanov, *et al.*, Cell 126: 1121-33, 2006; Buonocore, *et al.*, Nature 464: 1371-1375, 2010).

Being a critical mediator in Th17-cells and other non-Th17 cells, inhibition of RORγt is expected to have a beneficial effect on autoimmune diseases, such as, but not limited to rheumatoid arthritis, psoriasis, multiple sclerosis, inflammatory bowel disease, Crohn's disease, and asthma (Annunziato, *et al.*, Nat. Rev. Immunol. 5: 325-331, 2009; Louten, *et al.*, J Allergy Clin. Immunol. 123: 1004-1011, 2009). RORγt deficient mice show very little Th17 cells. In addition, RORγt deficiency resulted in amelioration of EAE. Inhibition of RORγt may also be beneficial in other diseases, which are characterized by increased levels of Th17 cells and/or elevated levels of Th17 hallmark cytokines such as IL-17, IL-22 and IL-23. Examples of such diseases are Kawasaki Disease (Jia, *et al.*, Clin. Exp. Immunol. 162: 131-137, 2010) and Hashimoto's thyroiditis (Figueroa-Vega, *et al.*, J Clin.Endocrinol.Metab. 95: 953-62, 2010).

RORγ inverse agonist, SR2211 is a cell-permeable, piperazine containing biphenyl compound that binds directly to retinoic acid receptor related orphan receptor γ (RORγ) and acts as a highly selective, inverse agonist (K_i = 105 nM; IC_{50} ~ 320 nM). It is reported to block the transcriptional activity of RORγ and suppress the synthesis of IL-17 in EL-4 murine lymphoma cell line. SR2211 exhibits only a minimal effect on ROR alpha and LXRalpha activity, indicating that the functional effect is due to selective inhibition of RORγ alone.

Recent findings show the nature and relevance of Th17 cells in mouse models of cancer and human disease (Zou et al., *Nature Reviews Immunology* 10, 248-256 (April 2010)). Evidences suggest that the effector T cell subset is also involved in tumor immunology, thus giving a way to a new target for cancer therapy.

In view of the above, a need exists for therapeutic agents that could modulate the activity of RORγ and thus will open new methods for treating diseases or disorders associated with the modulation of RORγ.

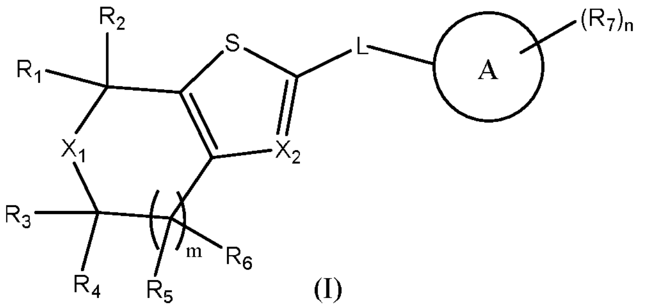
Modulators of the RORγ receptor were disclosed in WO2011/115892, WO2012/027965, WO2012/028100, WO2012/064744, WO2012/074547, WO2012/100732, WO2012/100734 and WO2012/139775.

The present application is directed to compounds that may be modulators of the RORγ receptor. Thus in light of the role RORγ plays in the pathogenesis of diseases, it is desirable to prepare compounds that modulate RORγ activity, which can be used in the treatment of diseases mediated by RORγ.

SUMMARY OF THE INVENTION

Provided herein are fused thiophene and thiazole derivatives and pharmaceutical compositions thereof, which are useful as RORγ modulators.

In one aspect of the present invention, it comprises compounds of formula (I):



(I)

or a pharmaceutically acceptable salt or a stereoisomer thereof;

wherein,

X_1 is $-CR_8R_9-$ or $-NR_{10}$;

X_2 is CR_{11} or N;

L is $–NR_a-C(O)-(CR_aR_b)_p-$, $-C(O)-NR_a-(CR_aR_b)_p-$ or $-NR_a-C(O)-NR_a-$;

ring A is aryl, heteroaryl or heterocycloalkyl;

R_1 and R_2 independently are hydrogen, halo, alkyl or arylalkyl; wherein the said arylalkyl is optionally substituted with one or more halo or haloalkyl;

or R_1 and R_2 together represent an oxo (=O) or a thioxo (=S) group;

R_3 and R_4 independently are hydrogen, alkyl, $-(CH_2)_p$-aryl, $-CO_2R_a$, -CO-aryl or $-CONR_cR_d$; wherein the said aryl is optionally substituted with one or more hydroxy, halo or haloalkyl;

or R_3 and R_4 on the same carbon atom can be combined together to form a 5-8 membered spiro ring;

R_5 and R_6 independently are hydrogen or alkyl;

R_7, at each occurrence, independently is hydrogen, $-S(O)_qR_e$, $-CONR_aR_b$, halo, cyano, haloalkyl or alkyl; wherein the said haloalkyl and alkyl are optionally substitued with hydroxy;

R_8 and R_9 independently are hydrogen, alkyl, $-(CH_2)_p$-aryl, $-CO_2R_a$, -CO-aryl or $-CONR_cR_d$; wherein the said aryl is optionally substituted with one or more hydroxy, halo, alkoxy, haloalkyl or $-CONR_aR_b$;

or R_8 and R_9 on the same carbon atom can be combined together to form a 5-8 membered spiro ring;

R_{10} is hydrogen, alkyl, -$(CH_2)_p$-aryl, -CO-$(CH_2)_q$-aryl or -$S(O)_q$-aryl; wherein the said aryl at each occurrence is optionally substituted with one or more halo, alkyl, haloalkyl, phenyl, -CO_2R_a or -$CONH(CH_2)_q(OH)$;

R_{11} is hydrogen, alkyl, cycloalkyl or aryl;

R_a and R_b independently are hydrogen or alkyl;

or R_a and R_b on the same atom can be combined together to form a 3-7 membered ring;

R_c and R_d independently are hydrogen, alkyl, alkoxy or heteroaryl;

or R_c and R_d on the same atom can be combined together to form a 3-8 membered ring containing one or more additional heteroatoms selected from N, O and S; wherein the said ring is optionally substituted with one or more alkyl;

R_e is alkyl, haloalkyl, alkylamino or hydroxyalkyl; wherein the said alkyl is optionally substituted with heterocycloalkyl or -NR_aR_b;

m and p are independently 0, 1 or 2;

q is 1 or 2; and

n is 1 to 5.

In yet another aspect, the present invention provides a pharmaceutical composition comprising the compound of formula (I), and at least one pharmaceutically acceptable excipient (such as a pharmaceutically acceptable carrier or diluent).

In yet another aspect, the present invention relates to preparation of the compounds of formula (I).

In yet another aspect of the present invention, it provides fused thiophene and thiazole derivatives of formula (I), which are used for the treatment and prevention of diseases or disorder, in particular their use in diseases or disorders where there is an advantage in modulating steroid hormone nuclear receptors - particularly RORs, more particularly RORγ.

DETAILED DESCRIPTION OF THE INVENTION

Unless defined otherwise, all technical and scientific terms used herein have the same meaning as is commonly understood by one of skill in art to which the subject matter herein belongs. As used in the specification and the appended claims, unless specified to the contrary, the following terms have the meaning indicated in order to facilitate the understanding of the present invention.

As used herein, the term "optionally substituted" refers to replacement of one or more hydrogen radicals in a given structure with a radical of a specified substituent including, but not limited to: halo, alkyl, alkenyl, alkynyl, aryl, heterocyclyl, thiol, alkylthio, arylthio, alkylthioalkyl, arylthioalkyl, alkylsulfonyl, alkylsulfonylalkyl, arylsulfonylalkyl, alkoxy, aryloxy, aralkoxy, aminocarbonyl, alkylaminocarbonyl, arylaminocarbonyl, alkoxycarbonyl, aryloxycarbonyl, haloalkyl, amino, trifluoromethyl, cyano, nitro, alkylamino, arylamino, alkylaminoalkyl, arylaminoalkyl, aminoalkylamino, hydroxy, alkoxyalkyl, carboxyalkyl, alkoxycarbonylalkyl, aminocarbonylalkyl, acyl, aralkoxycarbonyl, carboxylic acid, sulfonic acid, sulfonyl, phosphonic acid, aryl, heteroaryl, heterocyclic, and aliphatic. It is understood that the substituent may be further substituted.

As used herein the term "alkyl" refers to a hydrocarbon chain radical that includes solely carbon and hydrogen atoms in the backbone, containing no unsaturation, and which is attached to the rest of the molecule by a single bond. The alkane radical may be straight or branched. For example, the term "C_1-C_4 alkyl" refers to a monovalent, straight, or branched aliphatic group containing 1 to 4 carbon atoms (e.g., methyl, ethyl, n-propyl, i-propyl, n-butyl, i-butyl, s-butyl, t-butyl and the like).

As used herein, the term “alkylamino” means amino substituted with one or more alkyl groups, where alkyl groups are as defined above. The term "amino" used herein means $-NH_2$ group. Representative examples of an alkylamino group include, but not limited to $-NHCH_3$, $-NHCH_2CH_3$, $-NHCH_2-CH(CH_3)_2$, $-N(CH_3)_2$ and the like.

"Alkoxy" as used herein refers the radical -O-alkyl, wherein the alkyl is as defined above. Representative examples of alkoxy include, but are not limited to, methoxy, ethoxy, propoxy, 2-propoxy, butoxy, tert-butoxy, pentyloxy, hexyloxy and heptyloxy. The alkyl portion of the alkoxy may be optionally substituted.

As used herein, the term “aryl” alone or in combination with other term(s) means a carbocyclic aromatic system containing one or more rings wherein such rings may be fused. The term "fused" means that the second ring is attached or formed by having two adjacent atoms in common with the first ring. The term "fused" is equivalent to the term "condensed". Unless otherwise specified, an aryl group typically has from 6 to about 14 carbon atoms but the invention is not limited in that respect. (C_6-C_{12}) aryl refers to an aryl group having six to twelve carbon atoms. Examples of aryl groups include but are not limited to phenyl, naphthyl, indanyl, and the like. Unless otherwise specified, all aryl groups described herein may be optionally substituted.

"Arylalkyl" refers to an alkyl group, as defined above, wherein one or more of the alkyl group's hydrogen atom has been replaced with an aryl group as defined above. Examples of arylalkyl group include, but are not limited to benzyl, benzhydryl, 1-phenylethyl, 2-phenylethyl, 3-phenylpropyl and the like. An arylalkyl group can be unsubstituted or substituted with one or more suitable groups.

“Cyano” refers to -CN group.

As used herein the term “cycloalkyl” refers to C_3-C_{10} saturated cyclic hydrocarbon ring. A cycloalkyl may be a single ring, which typically contains from 3 to 7 carbon ring atoms. Examples of single-ring cycloalkyls include cyclopropyl, cyclobutyl, cyclopentyl, cyclohexyl, cycloheptyl and the like. A cycloalkyl may alternatively be polycyclic or contain more than one ring. Examples of polycyclic cycloalkyls include bridged, fused, and spirocyclic carbocyclyls.

As used herein, the term “halo” or “halogen” alone or in combination with other term(s) means fluorine, chlorine, bromine or iodine.

As used herein, the term “haloalkyl” means alkyl substituted with one or more halogen atoms, wherein the alkyl groups are as defined above. The term "halo" is used herein interchangeably with the term "halogen" means F, Cl, Br or I. Examples of "haloalkyl" include but are not limited to fluoromethyl, difluoromethyl, trifluoromethyl, 2,2,2-trifluoroethyl and the like.

"Hydroxy” or “hydroxyl” refers to -OH group.

As used herein the term “hydroxyalkyl” means alkyl substituted with one or more hydroxy groups, where alkyl groups are as defined above. Examples of “hydroxyalkyl” include but are not limited to hydroxymethyl, hydroxyethyl, hydroxypropyl, and the like.

The term "heteroaryl" unless otherwise specified refers to substituted or unsubstituted 5 to 14 membered aromatic ring radical with one or more heteroatom(s) independently selected from N, O or S (i.e. 5 to 14 membered heteroaryl). The heteroaryl may be a mono-, bi- or tricyclic ring system. The heteroaryl ring radical may be attached to the main structure at any heteroatom or carbon atom that results in the creation of a stable structure. Examples of such heteroaryl ring radicals include, but are not limited to oxazolyl, isoxazolyl, imidazolyl, furyl, indolyl, isoindolyl, pyrrolyl, triazolyl, triazinyl, tetrazoyl, thienyl, oxadiazolyl, thiazolyl, isothiazolyl, pyridyl, pyrimidinyl, pyrazinyl, pyridazinyl, pyrazolyl, benzofuranyl, benzothiazolyl, benzoxazolyl, benzimidazolyl, benzothienyl, benzopyranyl, carbazolyl, and the like. Unless set forth or recited to the contrary, all heteroaryl groups described or claimed herein may be substituted or unsubstituted.

The term "heterocycloalkyl" unless otherwise specified refers to substituted or unsubstituted non-aromatic 3 to 15 membered ring radical (i.e. 3 to 15 membered heterocycloalkyl) which consists of carbon atoms and from one to five hetero atoms selected from nitrogen, oxygen and sulfur. The heterocyclic ring radical may be a mono-, bi- or tricyclic ring system, which may include fused, bridged or spiro ring systems, and the nitrogen or sulfur atoms in the heterocyclic ring radical may be optionally oxidized to various oxidation states. The heterocyclic ring radical may be attached to the main structure at any heteroatom or carbon atom that results in the creation of a stable structure. Unless set forth or recited to the contrary, all heterocycloalkyl groups described or claimed herein may be substituted or unsubstituted. Examples of heterocycloalkyl include, but are not limited to aziridinyl, pyrrolidinyl, piperdinyl, piperazinyl, morpholinyl, 2-oxopyridyl, thiomorpholinyl, thiazolidinyl, 1,3-dioxolanyl, 1,4-dioxanyl, 1,1-dioxido-2,3-dihydrobenzo[b]thiophen-5-yl and the like.

The term "heterocyclic ring" includes the definitions of "heterocycloalkyl" and "heteroaryl".

“Oxo” refers to (=O) group.

“Thioxo” refers to (=S) group.

The term "pharmaceutically acceptable salt" includes salts prepared from pharmaceutically acceptable bases or acids including inorganic or organic bases and inorganic or organic acids. Examples of such salts include, but are not limited to, acetate, benzenesulfonate, benzoate, bicarbonate, bisulfate, bitartrate, borate, bromide, camsylate, carbonate, chloride, citrate, clavulanate, dihydrochloride, edetate, edisylate, estolate, esylate, fumarate, gluceptate, gluconate, glutamate, glycollylarsanilate, hexylresorcinate, hydrabamine, hydrobromide, hydrochloride, hydroxynaphthoate, iodide, isothionate, lactate, lactobionate, laurate, malate, maleate, mandelate, mesylate, methylbromide, methylnitrate, methylsulfate, mucate, napsylate, nitrate, N-methylglucamine ammonium salt, oleate, oxalate, pamoate (embonate), palmitate, pantothenate, phosphate, diphosphate, polygalacturonate, salicylate, stearate, sulfate, subacetate, succinate, tannate, tartrate, teoclate, tosylate, triethiodide and valerate. Examples of salts derived from inorganic bases include, but are not limited to, aluminum, ammonium, calcium, copper, ferric, ferrous, lithium, magnesium, potassium, sodium and zinc.

As used herein, the term "pharmaceutically acceptable carrier" refers to any of the standard pharmaceutical carriers, such as a phosphate buffered saline solution, water, emulsions {e.g., such as an oil/water or water/oil emulsions), and various types of wetting agents. The compositions also can include stabilizers and preservatives. For example carriers, stabilizers and adjuvants known in literature.

As used herein, the term “spiro ring” or “Spiro compound” refers to a bicyclic organic compound with rings connected through just one atom.

The term “stereoisomers” refers to any enantiomers, diastereoisomers, or geometrical isomers of the compounds of formula (I), wherever they are chiral or when they bear one or more double bond. When the compounds of the formula (I) and related formulae are chiral, they can exist in racemic or in optically active form. Since the pharmaceutical activity of the racemates or stereoisomers of the compounds according to the invention may differ, it may be desirable to use the enantiomers. In these cases, the end product or even the intermediates can be separated into enantiomeric compounds by chemical or physical measures known to the person skilled in the art or even employed as such in the synthesis.

The term "SEA Syndrome" refers to Seronegative Enthesopathy and Arthropathy Syndrome.

The term "treating" or "treatment" of a state, disorder or condition includes: (a) preventing or delaying the appearance of clinical symptoms of the state, disorder or condition developing in a subject that may be afflicted with or predisposed to the state, disorder or condition but does not yet experience or display clinical or subclinical symptoms of the state, disorder or condition; (b) inhibiting the state, disorder or condition, i.e., arresting or reducing the development of the disease or at least one clinical or subclinical symptom thereof; or (c) relieving the disease, i.e., causing regression of the state, disorder or condition or at least one of its clinical or subclinical symptoms.

The term "subject" includes mammals (especially humans) and other animals, such as domestic animals (e.g., household pets including cats and dogs) and non-domestic animals (such as wildlife).

As used herein, the term "therapeutically effective amount" means the amount of a compound that, when administered to a subject for treating a state, disorder or condition, is sufficient to effect such treatment. The "therapeutically effective amount" will vary depending on the compound, the disease and its severity and the age, weight, physical condition and responsiveness of the subject to be treated.

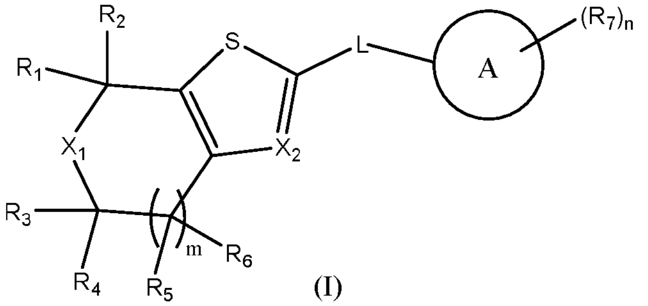
As used herein, the term 'compound(s)' comprises the compounds disclosed in the present invention.

As used herein, the term "comprise" or "comprising" is generally used in the sense of include, that is to say permitting the presence of one or more features or components.

As used herein, the term "composition" is intended to encompass a product comprising the specified ingredients in the specified amounts, as well as any product which results, directly or indirectly, from combination of the specified ingredients in the specified amounts. By "pharmaceutically acceptable" it is meant the carrier, diluent or excipient must be compatible with the other ingredients of the formulation and not deleterious to the recipient thereof.

As used herein, the term "including" as well as other forms, such as "include", "includes" and "included" is not limiting.

In our endeavor to provide fused thiophene and thiazole derivatives, the first embodiment of the present invention provides the structure of compounds as set forth in formula (I):



(I)

or a pharmaceutically acceptable salt or a stereoisomer thereof;

wherein,

X_1 is $-CR_8R_9-$ or $-NR_{10}$;

X_2 is CR_{11} or N;

L is $-NR_a-C(O)-(CR_aR_b)_p-$, $-C(O)-NR_a-(CR_aR_b)_p-$ or $-NR_a-C(O)-NR_a-$;

ring A is aryl, heteroaryl or heterocycloalkyl;

R_1 and R_2 independently are hydrogen, halo, alkyl or arylalkyl; wherein the said arylalkyl is optionally substituted with one or more halo or haloalkyl;

or R_1 and R_2 together represent an oxo (=O) or a thioxo (=S) group;

R_3 and R_4 independently are hydrogen, alkyl, $-(CH_2)_p$-aryl, $-CO_2R_a$, -CO-aryl or $-CONR_cR_d$; wherein the said aryl is optionally substituted with one or more hydroxy, halo or haloalkyl;

or R_3 and R_4 on the same carbon atom can be combined together to form a 5-8 membered spiro ring;

R_5 and R_6 independently are hydrogen or alkyl;

R_7, at each occurrence, independently is hydrogen, $-S(O)_qR_e$, $-CONR_aR_b$, halo, cyano, haloalkyl or alkyl; wherein the said haloalkyl and alkyl are optionally substitued with hydroxy;

R_8 and R_9 independently are hydrogen, alkyl, $-(CH_2)_p$-aryl, $-CO_2R_a$, -CO-aryl or $-CONR_cR_d$; wherein the said aryl is optionally substituted with one or more hydroxy, halo, alkoxy, haloalkyl or $-CONR_aR_b$;

or R_8 and R_9 on the same carbon atom can be combined together to form a 5-8 membered spiro ring;

R_{10} is hydrogen, alkyl, $-(CH_2)_p$-aryl, $-CO-(CH_2)_q$-aryl or $-S(O)_q$-aryl; wherein the said aryl at each occurrence is optionally substituted with one or more halo, alkyl, haloalkyl, phenyl, $-CO_2R_a$ or $-CONH(CH_2)_q(OH)$;

R_{11} is hydrogen, alkyl, cycloalkyl or aryl;

R_a and R_b independently are hydrogen or alkyl;

or R_a and R_b on the same atom can be combined together to form a 3-7 membered ring;

R_c and R_d independently are hydrogen, alkyl, alkoxy or heteroaryl;

or R_c and R_d on the same atom can be combined together to form a 3-8 membered ring containing one or more additional heteroatoms selected from N, O and S; wherein the said ring is optionally substituted with one or more alkyl;

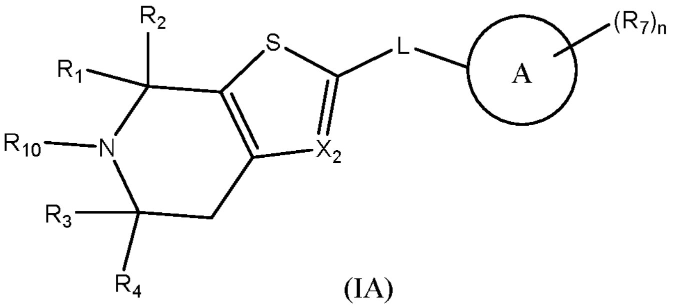
R_e is alkyl, haloalkyl, alkylamino or hydroxyalkyl; wherein the said alkyl is optionally substituted with heterocycloalkyl or $-NR_aR_b$;

m and p are independently 0, 1 or 2;

q is 1 or 2; and

n is 1 to 5.

According to another embodiment the present invention provides compounds of formula (IA):

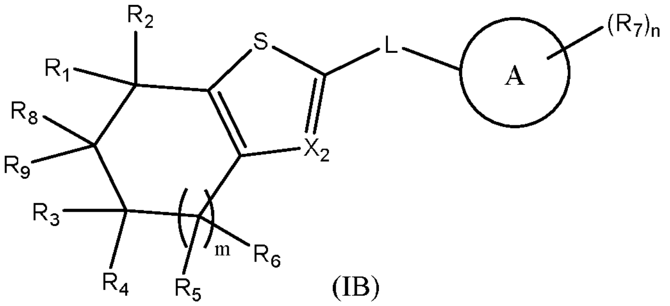


(IA)

or a pharmaceutically acceptable salt or a stereoisomer thereof; wherein,

R_1, R_2, R_3, R_4, R_7, R_{10}, X_2, L, n and ring A are same as defined in formula (I).

According to yet another embodiment the present invention provides compounds of formula (IB):

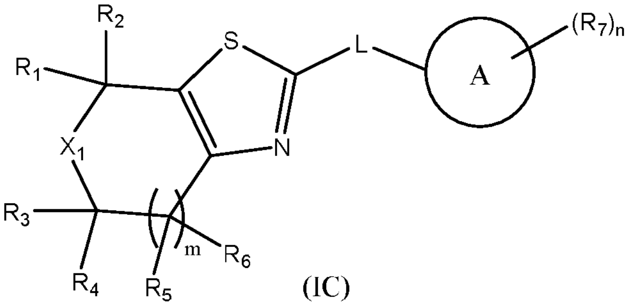


(IB)

or a pharmaceutically acceptable salt or a stereoisomer thereof; wherein,

R_1, R_2, R_3, R_4, R_5, R_6, R_7, R_8, R_9, X_2, L, m, n and ring A are same as defined in formula (I).

According to yet another embodiment the present invention provides compounds of formula (IC):

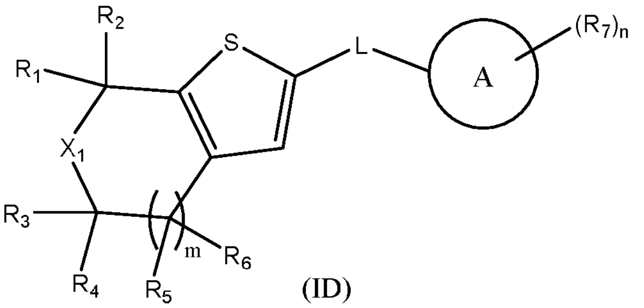


(IC)

or a pharmaceutically acceptable salt or a stereoisomer thereof; wherein,

R_1, R_2, R_3, R_4, R_5, R_6, R_7, X_1, L, m, n and ring A are same as defined in formula (I).

According to yet another embodiment the present invention provides compounds of formula (ID):

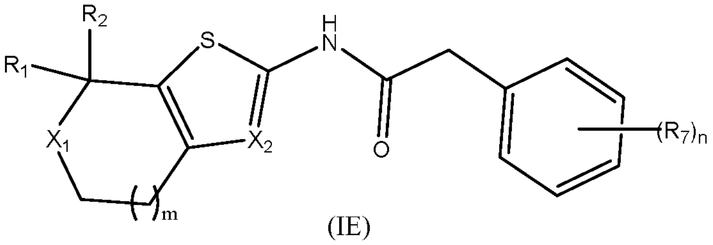


(ID)

or a pharmaceutically acceptable salt or a stereoisomer thereof; wherein,

R_1, R_2, R_3, R_4, R_5, R_6, R_7, X_1, L, m, n and ring A are same as defined in formula (I).

According to yet another embodiment the present invention provides compounds of formula (IE):

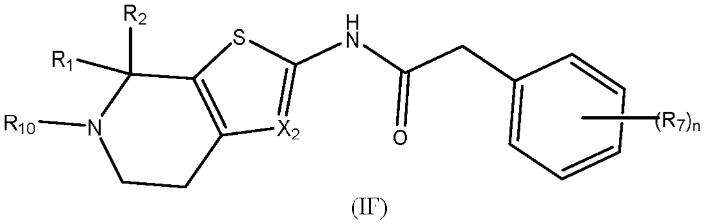


(IE)

or a pharmaceutically acceptable salt or a stereoisomer thereof; wherein,

R_1, R_2, R_7, X_1, X_2, m and n are same as defined in formula (I).

According to yet another embodiment the present invention provides compounds of formula (IF):



(IF)

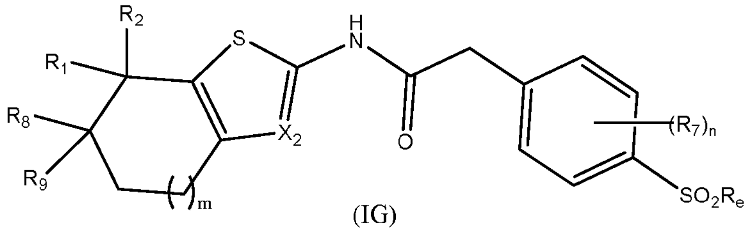
or a pharmaceutically acceptable salt or a stereoisomer thereof; wherein,

R_1 and R_2 are independently hydrogen;

or R_1 and R_2 together represent an oxo (=O) or a thioxo (=S) group; and

R_7, R_{10}, X_2 and n are same as defined in formula (I).

According to yet another embodiment the present invention provides compounds of formula (IG):



(IG)

or a pharmaceutically acceptable salt or a stereoisomer thereof; wherein,

R_7, for each occurrence, is independently hydrogen, or halo;

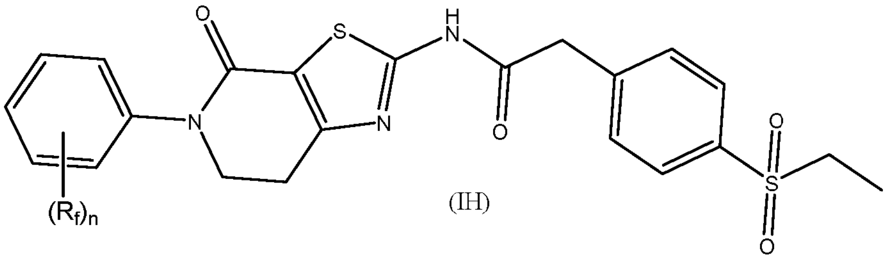
R_e is optionally substituted alkyl or haloalkyl; wherein the optional substituent is $-NR_aR_b$;

m is 0 or 1;

n is 1 to 4; and

R_1, R_2, R_8, R_9, R_a, R_b and X_2 are same as defined in formula (I).

According to yet another embodiment the present invention provides compounds of formula (IH):



(IH)

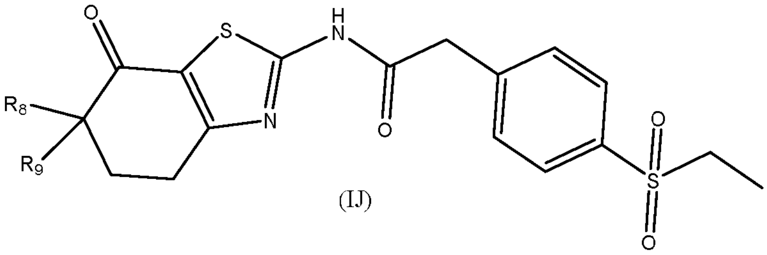
or a pharmaceutically acceptable salt or a stereoisomer thereof; wherein,

R_f, for each occurrence, is hydrogen, halo, alkyl, haloalkyl, phenyl, $-CO_2R_a$ or $-CONH(CH_2)_q(OH)$;

n is 1 to 4; and

R_a and q are same as defined in formula (I).

According to yet another embodiment the present invention provides compounds of formula (IJ):

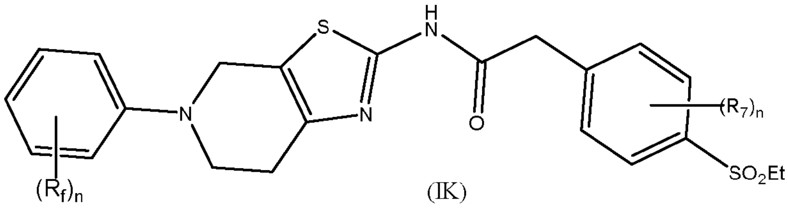


(IJ)

or a pharmaceutically acceptable salt or a stereoisomer thereof; wherein,

R_8 and R_9 are same as defined in formula (I).

According to yet another embodiment the present invention provides compounds of formula (IK):



(IK)

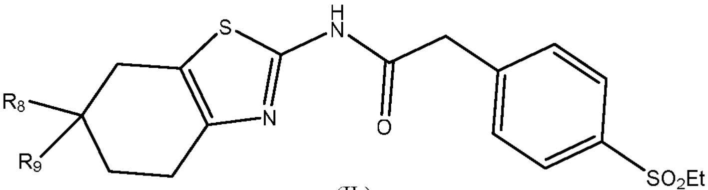
or a pharmaceutically acceptable salt or a stereoisomer thereof; wherein,

R_f is hydrogen, halo or alkyl;

R_7 is hydrogen or halo; and

n is 1 to 4.

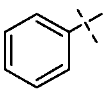
According to yet another embodiment the present invention provides compounds of formula (IL):

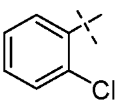
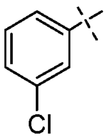
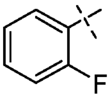
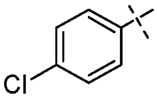
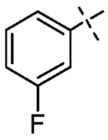
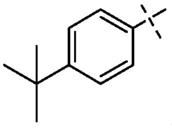
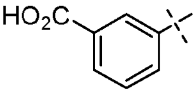


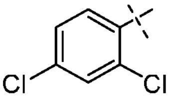
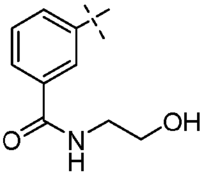
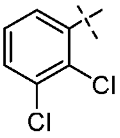
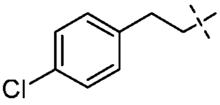
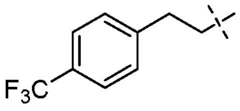
(IL)

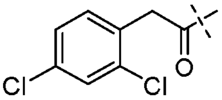
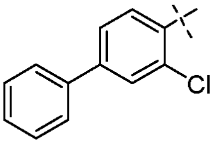
or a pharmaceutically acceptable salt or a stereoisomer thereof; wherein,

R_8 and R_9 are same as defined in formula (I).

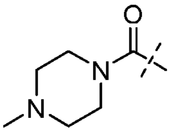
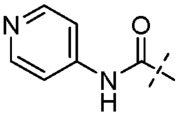
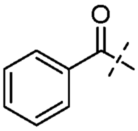
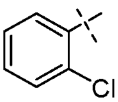
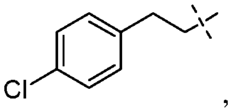
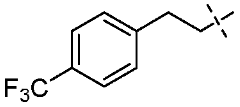
According to yet another embodiment the present invention provides compounds, of the formula (I), (IA), (IC), (ID), (IE) or (IF), in which R_{10} is hydrogen, $-CH_2CH_3$,  ,

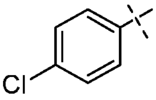
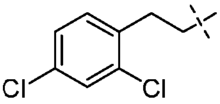
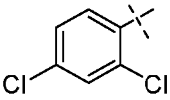
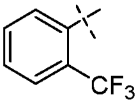
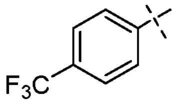
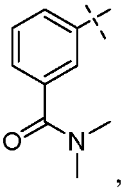
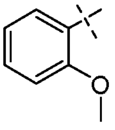
, , , , , , ,

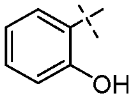
, , , , ,

 or .

According to yet another embodiment the present invention provides compounds, of the formula (I), (IB), (IC), (ID), (IE), (IG) or (IJ), in which R_8 is hydrogen or methyl; and R_9 is hydrogen, methyl, $-CO_2H$, $-CO_2CH_2CH_3$, $-CONH(OCH_2CH_3)$, $-CONH(CH_2CH_3)$,

, , , , , ,

, , , , , , 

or .

The embodiments below are illustrative of the present invention and are not intended to limit the claims to the specific embodiments exemplified.

According to one embodiment the present invention provides compounds of the formula (I) in which R_1 and R_2 are independently hydrogen.

According to another embodiment the present invention provides compounds of the formula (I) in which R_1 and R_2 together represent an oxo (=O) group.

According to yet another embodiment the present invention provides compounds of the formula (I) in which L is $-NHCOCH_2-$.

According to yet another embodiment the present invention provides compounds of the formula (I) in which ring A is aryl optionally substituted with one or more R_7.

According to preceding embodiment the present invention provides compounds of the formula (I) in which ring A is phenyl optionally substituted with one or more R_7.

According to yet another embodiment the present invention provides compounds of the formula (I) in which R_7 is alkylsulfonyl.

According to preceding embodiment the present invention provides compounds of the formula (I) in which R_7 is C_{1-4} alkylsulfonyl.

According to preceding embodiment the present invention provides compounds of the formula (I) in which ring R_7 is methylsulfonyl or ethylsulfonyl.

According to yet another embodiment the present invention provides compounds of the formula (I) in which m is 1.

According to yet another embodiment the present invention provides compounds of the formula (I) in which R_5 and R_6 are both hydrogen.

According to yet another embodiment the present invention provides compounds of the formula (I) in which n is 1.

According to yet another embodiment the present invention provides compounds of the formula (I) in which n is 2 or 3.

According to further particular embodiment of the present invention; the compound of formula (I), (IA), (IB), (IC), (ID), (IE), (IF), (IG), (IH), (IJ), (IK) or (IL) is selected from the group consisting of:

Compound No.	**IUPAC Name**
1	2-(4-(ethylsulfonyl)phenyl)-N-(4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)acetamide;
2	N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide;
3	N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(ethylsulfonyl)phenyl)-2-methylpropanamide;
4	N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-((2,2,2-trifluoroethyl)sulfonyl)phenyl)acetamide;

Compound No.	IUPAC Name
5	N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(methylsulfonyl)phenyl)acetamide;
6	N-(5-(3-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide;
7	N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(N-methylsulfamoyl)phenyl)acetamide;
8	2-(4-(ethylsulfonyl)phenyl)-N-(4-oxo-5-phenyl-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)acetamide;
9	2-(4-(ethylsulfonyl)phenyl)-N-(5-(2-fluorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)acetamide;
10	N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(ethylsulfonyl)piperazin-1-yl)acetamide;
11	N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-3-(4-(ethylsulfonyl)phenyl)propanamide;
12	N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-4-(1,1,1,3,3,3-hexafluoro-2-hydroxypropan-2-yl)benzamide;
13	N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(1,1-dioxido-2,3-dihydrobenzo[b]thiophen-5-yl)acetamide;
14	N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(ethylsulfonyl)-2-fluorophenyl)acetamide;
15	N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(5-(ethylsulfonyl)thiophen-2-yl)acetamide;
16	2-(4-(ethylsulfonyl)-2-fluorophenyl)-N-(5-(2-fluorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)acetamide;
17	N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(ethylsulfonyl)-2-oxopyridin-1(2H)-yl)acetamide;
18	N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-((2-hydroxyethyl)sulfonyl)phenyl)acetamide;

Compound No.	IUPAC Name
19	4-(2-((5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)amino)-2-oxoethyl)-N-methylbenzamide;
20	N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(2-fluoro-4-((2-hydroxyethyl)sulfonyl)phenyl)acetamide;
21	N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(ethylsulfinyl)phenyl)acetamide;
22	N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(pyridin-4-yl)acetamide;
23	N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-cyanophenyl)acetamide;
24	N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(1-(ethylsulfonyl)piperidin-4-yl)acetamide;
25	N-(5-(3-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(ethylsulfonyl)-2-fluorophenyl)acetamide;
26	N-(5-(4-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(ethylsulfonyl)-2-fluorophenyl)acetamide;
27	N-(5-(4-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide;
28	2-(2-chloro-4-(ethylsulfonyl)phenyl)-N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)acetamide;
29	N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(ethylsulfonyl)-2-methylphenyl)acetamide;
30	2-(4-(ethylsulfonyl)phenyl)-N-(5-(3-fluorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)acetamide;
31	2-(4-(ethylsulfonyl)-2-fluorophenyl)-N-(5-(3-fluorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)acetamide;
32	N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(isopropylsulfonyl)phenyl)acetamide;

Compound No.	IUPAC Name
33	N-(5-(4-(tert-butyl)phenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide;
34	N-(5-(4-(tert-butyl)phenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(ethylsulfonyl)-2-fluorophenyl)acetamide;
35	2-(2-chloro-4-(ethylsulfonyl)phenyl)-N-(5-(3-fluorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)acetamide;
36	2-(2-chloro-4-(ethylsulfonyl)phenyl)-N-(5-(3-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)acetamide;
37	3-(2-(2-(4-(ethylsulfonyl)-2-fluorophenyl)acetamido)-4-oxo-6,7-dihydrothiazolo[5,4-c]pyridin-5(4H)-yl)benzoic acid;
38	N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(3-(ethylsulfonyl)phenyl)acetamide;
39	N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(ethylsulfonyl)-2,6-difluorophenyl)acetamide;
40	N-(5-(2,4-dichlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(ethylsulfonyl)-2-fluorophenyl)acetamide;
41	N-(5-(2,3-dichlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(ethylsulfonyl)-2-fluorophenyl)acetamide;
42	N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(trifluoromethyl)phenyl)acetamide;
43	N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(2-fluoro-4-(isopropylsulfonyl)phenyl)acetamide;
44	N-(5-(3-chloro-[1,1'-biphenyl]-4-yl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(ethylsulfonyl)-2-fluorophenyl)acetamide;
45	N-(5-ethyl-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide;
46	N-(5-(4-chlorophenethyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(ethylsulfonyl)-2-fluorophenyl)acetamide;

Compound No.	IUPAC Name
47	N-(5-(4-chlorophenethyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide;
48	3-(2-(2-(4-(ethylsulfonyl)phenyl)acetamido)-4-oxo-6,7-dihydrothiazolo[5,4-c]pyridin-5(4H)-yl)benzoic acid;
49	3-(2-(2-(4-(ethylsulfonyl)phenyl)acetamido)-4-oxo-6,7-dihydrothiazolo[5,4-c]pyridin-5(4H)-yl)-N-(2-hydroxyethyl)benzamide;
50	1-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-3-(4-(ethylsulfonyl)phenyl)urea;
51	N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-((2-(dimethylamino)ethyl)sulfonyl)-2-fluorophenyl)acetamide;
52	N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(2-fluoro-4-((2-(piperidin-1-yl)ethyl)sulfonyl)phenyl)acetamide;
53	N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(2-fluoro-4-((2-hydroxyethyl)sulfonyl)phenyl)-N-methylacetamide;
54	N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(2-fluoro-4-((2-methoxyethyl)sulfonyl)phenyl)-N-methylacetamide;
55	N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(2,6-difluoro-4-((2-hydroxyethyl)sulfonyl)phenyl)acetamide;
56	N-(5-(2,3-dichlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(2-fluoro-4-((2-hydroxyethyl)sulfonyl)phenyl)acetamide;
57	N-(5-(3-chlorophenyl)-4-oxo-5,6,7,8-tetrahydro-4H-thiazolo[5,4-c]azepin-2-yl)-2-(4-(ethylsulfonyl)-2-fluorophenyl)acetamide;
58	N-(5-(3-chlorophenyl)-4-oxo-5,6,7,8-tetrahydro-4H-thiazolo[5,4-c]azepin-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide;
59	N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(2-fluoro-4-((2-hydroxy-2-methylpropyl)sulfonyl)phenyl)acetamide;
60	N-(6-(3-chlorophenyl)-7-oxo-4,5,6,7-tetrahydrothieno[2,3-c]pyridin-2-yl)-2-(4-(ethylsulfonyl)-2-fluorophenyl)acetamide;

Compound No.	IUPAC Name
61	N-(6-(2-chlorophenyl)-7-oxo-4,5,6,7-tetrahydrothieno[2,3-c]pyridin-2-yl)-2-(4-(ethylsulfonyl)-2-fluorophenyl)acetamide;
62	N-(5-(2-chlorophenyl)-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(ethylsulfonyl)-2-fluorophenyl)acetamide;
63	N-(5-(2-chlorophenyl)-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide;
64	2-(4-(ethylsulfonyl)-2-fluorophenyl)-N-(5-(3-fluorophenyl)-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)acetamide;
65	2-(4-(ethylsulfonyl)phenyl)-N-(5-(3-fluorophenyl)-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)acetamide;
66	2-(2-chloro-4-(ethylsulfonyl)phenyl)-N-(5-(2-chlorophenyl)-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)acetamide;
67	2-(4-(ethylsulfonyl)phenyl)-N-(5-(2-fluorophenyl)-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)acetamide;
68	2-(4-(ethylsulfonyl)-2-fluorophenyl)-N-(5-(2-fluorophenyl)-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)acetamide;
69	N-(5-(3-chlorophenyl)-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(ethylsulfonyl)-2-fluorophenyl)acetamide;
70	N-(5-(4-(tert-butyl)phenyl)-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(ethylsulfonyl)-2-fluorophenyl)acetamide;
71	N-(5-(2-chlorophenyl)-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(trifluoromethyl)phenyl)acetamide;
72	N-(5-(4-(tert-butyl)phenyl)-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide;
73	N-(5-(2,3-dichlorophenyl)-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(ethylsulfonyl)-2-fluorophenyl)acetamide;
74	2-(4-(ethylsulfonyl)-2-fluorophenyl)-N-(4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)acetamide;

Compound No.	IUPAC Name
75	N-(5-((2-chlorophenyl)sulfonyl)-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(ethylsulfonyl)-2-fluorophenyl)acetamide;
76	N-(5-(2-(2,4-dichlorophenyl)acetyl)-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide;
77	N-(5-(2,4-dichlorophenethyl)-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide;
78	2-(4-(ethylsulfonyl)-2-fluorophenyl)-N-(5-(4-(trifluoromethyl)phenethyl)-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)acetamide;
79	ethyl 2-(2-(4-(ethylsulfonyl)phenyl)acetamido)-4,5,6,7-tetrahydrobenzo[d]thiazole-6-carboxylate;
80	2-(2-(4-(ethylsulfonyl)phenyl)acetamido)-4,5,6,7-tetrahydrobenzo[d]thiazole-6-carboxylic acid;
81	2-(4-(ethylsulfonyl)phenyl)-N-(6-(4-methylpiperazine-1-carbonyl)-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)acetamide;
82	N-ethoxy-2-(2-(4-(ethylsulfonyl)phenyl)acetamido)-4,5,6,7-tetrahydrobenzo[d]thiazole-6-carboxamide;
83	N-ethyl-2-(2-(4-(ethylsulfonyl)phenyl)acetamido)-4,5,6,7-tetrahydrobenzo[d]thiazole-6-carboxamide;
84	ethyl 2-(3-(4-(ethylsulfonyl)phenyl)propanamido)-4,5,6,7-tetrahydrobenzo[d]thiazole-6-carboxylate;
85	2-(2-(4-(ethylsulfonyl)phenyl)acetamido)-N-(pyridin-4-yl)-4,5,6,7-tetrahydrobenzo[d]thiazole-6-carboxamide;
86	N-(6-benzoyl-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide;
87	2-(4-(ethylsulfonyl)phenyl)-N-(7-oxo-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)acetamide;
88	1-(4-(ethylsulfonyl)phenyl)-N-(7-oxo-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)cyclopropane-1-carboxamide;

Compound No.	IUPAC Name
89	2-(4-(ethylsulfonyl)phenyl)-2-methyl-N-(7-oxo-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)propanamide;
90	N-(7-oxo-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-((2,2,2-trifluoroethyl)sulfonyl)phenyl)acetamide;
91	2-(4-(ethylsulfonyl)phenyl)-N-(6-oxo-5,6-dihydro-4H-cyclopenta[d]thiazol-2-yl)acetamide;
92	N-(4,4-dimethyl-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide;
93	N-(6,6-dimethyl-7-oxo-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide;
94	N-(6,6-dimethyl-7-oxo-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-(ethylsulfonyl)-2-fluorophenyl)acetamide;
95	N-(6,6-dimethyl-7-oxo-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-(ethylsulfonyl)-2,6-difluorophenyl)acetamide;
96	2-(4-(ethylsulfonyl)phenyl)-N-(7-oxo-4,7-dihydro-5H-spiro[benzo[d]thiazole-6,1'-cyclopentan]-2-yl)acetamide;
97	2-(4-(ethylsulfonyl)-2-fluorophenyl)-N-(7-oxo-4,7-dihydro-5H-spiro[benzo[d]thiazole-6,1'-cyclopentan]-2-yl)acetamide;
98	N-(5-(2-chlorophenyl)-7-oxo-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide;
99	N-(5-(2-chlorophenyl)-7-oxo-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-(ethylsulfonyl)-2-fluorophenyl)acetamide;
100	N-(6-(2-chlorophenyl)-7-oxo-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide;
101	N-(6-(2-chlorophenyl)-7-oxo-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-(ethylsulfonyl)-2-fluorophenyl)acetamide;
102	N-(6-(4-chlorophenyl)-7-oxo-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide;

Compound No.	IUPAC Name
103	N-(6-(4-chlorophenyl)-7-oxo-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-(ethylsulfonyl)-2-fluorophenyl)acetamide;
104	N-(6-(2,4-dichlorophenyl)-7-oxo-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide;
105	2-(4-(ethylsulfonyl)phenyl)-N-(7-oxo-6-(2-(trifluoromethyl)phenyl)-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)acetamide;
106	2-(4-(ethylsulfonyl)phenyl)-N-(7-oxo-6-(4-(trifluoromethyl)phenyl)-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)acetamide;
107	N-(6-(2-chlorophenyl)-7-oxo-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-((2,2,2-trifluoroethyl)sulfonyl)phenyl)acetamide;
108	N-(6-(4-chlorophenyl)-7-oxo-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide (Isomer-2);
109	N-(6-(4-chlorophenyl)-7-oxo-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide (Isomer-1);
110	N-(6-(2-chlorophenyl)-7-oxo-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide (Isomer-1);
111	N-(6-(2-chlorophenyl)-7-oxo-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide (Isomer-2);
112	3-(2-(2-(4-(ethylsulfonyl)phenyl)acetamido)-7-oxo-4,5,6,7-tetrahydrobenzo[d]thiazol-6-yl)-N,N-dimethylbenzamide;
113	2-(4-(ethylsulfonyl)phenyl)-N-(6-(2-methoxyphenyl)-7-oxo-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)acetamide;
114	2-(4-(ethylsulfonyl)phenyl)-N-(7-oxo-6,7-dihydro-4H-spiro[benzo[d]thiazole-5,1'-cyclopentan]-2-yl)acetamide;
115	2-(4-(ethylsulfonyl)-2-fluorophenyl)-N-(7-oxo-6,7-dihydro-4H-spiro[benzo[d]thiazole-5,1'-cyclopentan]-2-yl)acetamide;
116	N-(6,6-dimethyl-7-oxo-4,5,6,7-tetrahydrobenzo[b]thiophen-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide;

Compound No.	IUPAC Name
117	N-(6-(2-chlorophenyl)-6-methyl-7-oxo-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide;
118	N-(6-(2-chlorophenyl)-6-methyl-7-oxo-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-(ethylsulfonyl)-2-fluorophenyl)acetamide;
119	N-(6-(4-chlorophenyl)-6-methyl-7-oxo-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide;
120	N-(6-(2-chlorophenyl)-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide;
121	N-(6-(4-chlorophenyl)-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide;
122	N-(6-(2,4-dichlorophenyl)-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide;
123	2-(4-(ethylsulfonyl)phenyl)-N-(6-(2-(trifluoromethyl)phenyl)-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)acetamide;
124	2-(4-(ethylsulfonyl)phenyl)-N-(7-oxo-6-(4-(trifluoromethyl)phenethyl)-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)acetamide;
125	N-(6-(4-chlorophenethyl)-7-oxo-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide;
126	N-(6-(4-chlorophenethyl)-7-oxo-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-(ethylsulfonyl)-2-fluorophenyl)acetamide;
127	N-(6-(2,4-dichlorophenethyl)-7-oxo-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide;
128	2-(4-(ethylsulfonyl)phenyl)-N-(6-(4-(trifluoromethyl)phenethyl)-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)acetamide;
129	N-(6-(4-chlorophenethyl)-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide;
130	N-(6-(2,4-dichlorophenethyl)-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide; and

Compound No.	IUPAC Name
131	2-(4-(ethylsulfonyl)phenyl)-N-(6-(2-hydroxyphenyl)-7-oxo-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)acetamide;

or a pharmaceutically acceptable salt or a stereoisomer thereof.

The present application also provides a pharmaceutical composition that includes at least one compound described herein and at least one pharmaceutically acceptable excipient (such as a pharmaceutically acceptable carrier or diluent). Preferably, the pharmaceutical composition comprises a therapeutically effective amount of at least one compound described herein. The compounds described in the present patent application may be associated with a pharmaceutically acceptable excipient (such as a carrier or a diluent) or be diluted by a carrier, or enclosed within a carrier which can be in the form of a capsule, sachet, paper or other container.

The compounds and pharmaceutical compositions of the present invention are useful for inhibiting the activity of RORγ, which is believed to be related to a variety of disease states.

The present patent application further provides a method of inhibiting RORγ in a subject in need thereof by administering to the subject one or more compounds described herein in the amount effective to cause inhibition of such receptor.

The compounds of the invention are typically administered in the form of a pharmaceutical composition. Such compositions can be prepared using procedures well known in the pharmaceutical art and comprise at least one compound of the invention. The pharmaceutical composition of the present patent application comprises one or more compounds described herein and one or more pharmaceutically acceptable excipients. Typically, the pharmaceutically acceptable excipients are approved by regulatory authorities or are generally regarded as safe for human or animal use. The pharmaceutically acceptable excipients include, but are not limited to, carriers, diluents, glidants and lubricants, preservatives, buffering agents, chelating agents, polymers, gelling agents, viscosifying agents, solvents and the like.

Examples of suitable carriers include, but are not limited to, water, salt solutions, alcohols, polyethylene glycols, peanut oil, olive oil, gelatin, lactose, terra alba, sucrose, dextrin, magnesium carbonate, sugar, amylose, magnesium stearate, talc, gelatin, agar, pectin, acacia, stearic acid, lower alkyl ethers of cellulose, silicic acid, fatty acids, fatty acid amines, fatty acid monoglycerides and diglycerides, fatty acid esters and polyoxyethylene.

The pharmaceutical composition may also include one or more pharmaceutically acceptable auxiliary agents, wetting agents, suspending agents, preserving agents, buffers, sweetening agents, flavouring agents, colorants or any combination of the foregoing.

The pharmaceutical compositions may be in conventional forms, for example, tablets, capsules, solutions, suspensions, injectables or products for topical application. Further, the pharmaceutical composition of the present invention may be formulated so as to provide desired release profile.

Administration of the compounds of the invention, in pure form or in an appropriate pharmaceutical composition, can be carried out using any of the accepted routes of administration of pharmaceutical compositions. The route of administration may be any route which effectively transports the active compound of the patent application to the appropriate or desired site of action. Suitable routes of administration include, but are not limited to, oral, nasal, buccal, dermal, intradermal, transdermal, parenteral, rectal, subcutaneous, intravenous, intraurethral, intramuscular or topical.

Solid oral formulations include, but are not limited to, tablets, capsules (soft or hard gelatin), dragees (containing the active ingredient in powder or pellet form), troches and lozenges.

Liquid formulations include, but are not limited to, syrups, emulsions, and sterile injectable liquids, such as suspensions or solutions.

Topical dosage forms of the compounds include ointments, pastes, creams, lotions, powders, solutions, eye or ear drops, impregnated dressings, and may contain appropriate conventional additives such as preservatives, solvents to assist drug penetration.

The pharmaceutical compositions of the present patent application may be prepared by conventional techniques known in literature.

Suitable doses of the compounds for use in treating the diseases or disorders described herein can be determined by those skilled in the relevant art. Therapeutic doses are generally identified through a dose ranging study in humans based on preliminary evidence derived from the animal studies. Doses must be sufficient to result in a desired therapeutic benefit without causing unwanted side effects. Mode of administration, dosage forms, and suitable pharmaceutical excipients can also be well used and adjusted by those skilled in the art. All changes and modifications are envisioned within the scope of the present patent application.

Compounds of the present invention are particularly useful because they may inhibit the activity of Retinoid-related orphan receptor gamma (RORγ), i.e., they prevent, inhibit, or suppress the action of RORγ, and/or may elicit RORγ modulating effect. Compounds of the invention are thus useful in the treatment of those conditions in which inhibition of a ROR gamma activity is required.

It is contemplated that compounds disclosed in the present invention, provide therapeutic benefits to subjects suffering from immune or inflammatory disorder or disease. Accordingly, one embodiment of the invention provides a method of treating a disorder or disease selected from the group consisting of immune or inflammatory disorder or disease. The method comprises administering a therapeutically effective amount of a compound of the present invention, to a subject in need thereof to ameliorate a symptom of the disorder or disease.

According to another embodiment, the disorder or disease is an immune disorder or disease.

According to yet another embodiment, the disorder or disease is an inflammatory disorder or disease.

According to yet another embodiment, the disorder or disease is an autoimmune disorder or disease.

According to yet another embodiment, the disorder or disease is rheumatoid arthritis, psoriasis, chronic graft-versus-host disease, acute graft-versus-host disease, Crohn's disease, inflammatory bowel disease, multiple sclerosis, systemic lupus erythematosus, Celiac Sprue, idiopathic thrombocytopenic thrombotic purpura, myasthenia gravis, Sjogren's syndrome, asthma, epidermal hyperplasia, scleroderma or ulcerative colitis.

According to yet another embodiment, the disorder or disease is cartilage inflammation, bone degradation, arthritis, juvenile arthritis, juvenile rheumatoid arthritis, pauciarticular juvenile rheumatoid arthritis, polyarticular juvenile rheumatoid arthritis, systemic onset juvenile rheumatoid arthritis, juvenile ankylosing spondylitis, juvenile enteropathic arthritis, juvenile reactive arthritis, juvenile Reter's Syndrome, SEA Syndrome, juvenile dermatomyositis, juvenile psoriatic arthritis, juvenile scleroderma, juvenile systemic lupus erythematosus, juvenile vasculitis, pauciarticular rheumatoid arthritis, polyarticular rheumatoid arthritis, systemic onset rheumatoid arthritis, ankylosing spondylitis, enteropathic arthritis, reactive arthritis, Reter's Syndrome, dermatomyositis, psoriatic arthritis, vasculitis, myolitis, polymyolitis, dermatomyolitis, osteoarthritis, polyarteritis nodossa, Wegener's granulomatosis, arteritis, polymyalgia rheumatica, sarcoidosis, sclerosis, primary biliary sclerosis, sclerosing cholangitis, dermatitis, atopic dermatitis, atherosclerosis, Still's disease, chronic obstructive pulmonary disease, Guillain-Barre disease, Type I diabetes mellitus, Graves' disease, Addison's disease, Raynaud's phenomenon, autoimmune hepatitis, psoriatic epidermal hyperplasia, plaque psoriasis, guttate psoriasis, inverse psoriasis, pustular psoriasis, erythrodermic psoriasis, or an immune disorder or disease associated with or arising from activity of pathogenic lymphocytes.

According to yet another embodiment, the psoriasis is plaque psoriasis, guttate psoriasis, inverse psoriasis, pustular psoriasis or erythrodermic psoriasis.

According to yet another embodiment, the disorder or disease is rheumatoid arthritis.

According to yet another embodiment, the subject is a human.

According to yet another embodiment the present invention provides compounds for use as a medicament.

According to yet another embodiment the invention provides the use of the compounds of the present invention in the manufacture of a medicament.

According to yet another embodiment the invention provides the use of the compounds of the present invention in the manufacture of a medicament for the treatment of immune or inflammatory disorder or disease.

According to yet another embodiment the present invention provides compounds for use as a medicament for the treatment of immune or inflammatory disorder or disease.

According to yet another embodiment, the medicament is for treating a disease or disorder mediated by RORγ.

Further, it is contemplated that the compounds of the present invention can inhibit the activity of RORγ. Accordingly, another embodiment of the invention provides a method of inhibiting the activity of RORγ. The method comprises exposing a RORγ to an effective amount of a compound of the present invention to inhibit said RORγ.

Also, it is contemplated that the compounds of the present invention can reduce the amount of interleukin-17 (IL-17) and other effector cytokines of Th17 cells, in a subject. IL-17 is a cytokine that affects numerous biological functions, including inducing and mediating pro-inflammatory responses. Accordingly, another aspect of the invention provides a method of reducing the amount of IL-17 and other effector cytokines of Th17 cells, in a subject. The method comprises administering to a subject an effective amount of a compound of the present invention to reduce the amount of IL-17 and other effector cytokines of Th17 cells, in the subject.

According to yet another embodiment, administering the compound reduces the amount of IL-17 and other effector cytokines produced by Th17 cells, in the subject. A change in the amount of IL-17 and other effector cytokines produced by, for example, Th17 cells can be measured using procedures described in the literature, such as an ELISA assay or intracellular staining assay.

Further, it is contemplated that compound of the present invention may inhibit the synthesis of IL-17 and other effector cytokines of Th17 cells, in a subject.

Accordingly, another aspect of the invention provides a method of inhibiting the synthesis of IL-17 and other effector cytokines of Th17 cells, in a subject. The method comprises administering to a subject an effective amount of a compound of the present invention to inhibit the synthesis of IL-17 and other effector cytokines of Th17 cells, in the subject.

According to yet another embodiment, the subject is a human.

The method(s) of treatment of the present patent application comprise administering a safe and effective amount of a compound according to formula (I) or a pharmaceutically acceptable salt thereof to a patient (particularly a human) in need thereof.

Compounds of the invention are indicated both in the therapeutic and/or prophylactic treatment of the above-mentioned conditions. For the above-mentioned therapeutic uses the dosage administered will, of course, vary with the compound employed, the mode of administration, the treatment desired and the disorder or disease indicated.

According to one embodiment, the compounds of the present invention can also contain unnatural proportions of atomic isotopes at one or more of the atoms that constitute such compounds. For example, the present invention also embraces isotopically-labeled variants of the present invention which are identical to those recited herein, but for the fact that one or more atoms of the compound are replaced by an atom having the atomic mass or mass number different from the predominant atomic mass or mass number usually found in nature for the atom. All isotopes of any particular atom or element as specified are contemplated within the scope of the compounds of the invention, and their uses. Exemplary isotopes that can be incorporated in to compounds of the invention include isotopes of hydrogen, carbon, nitrogen, oxygen, phosphorous, sulfur, fluorine, chlorine and iodine, such as ^{2}H ("D"), ^{3}H, ^{11}C, ^{13}C, ^{14}C, ^{13}N, ^{15}N, ^{15}O, ^{17}O, ^{18}O, ^{32}P, ^{33}P, ^{35}S, ^{18}F, ^{36}Cl, ^{123}I and ^{125}I. Isotopically labeled compounds of the present inventions can generally be prepared by following procedures analogous to those disclosed in the schemes and/or in the examples herein below, by substituting an isotopically labeled reagent for a non-isotopically labeled reagent.

The following abbreviations refer respectively to the definitions below:
Å – Angstrom; br – Broad; brs – Broad singlet; °C - Degree Celsius; conc. – Concentrated; $CHCl_3$ – Chloroform; $CDCl_3$ - Deuterated Chloroform; CuI – Copper iodide; CCl_4 – Carbon tetrachloride; DMF – *N*, *N*-dimethylformamide; DMSO - Dimethylsulfoxide; DMSO-d_6 - Deuterated dimethylsulfoxide; d – Doublet; EDCI.HCl - 1-(3-Dimethylaminopropyl)-3-ethylcarbodiimide hydrochloride; g - Gram; h – Hours; ^{1}H - Proton; HATU - N-[(Dimethylamino)-1H-1,2,3-triazolo-[4,5-b]pyridin-1-ylmethylene]-N-methylmethanaminium hexafluorophosphate N-oxide; HCl - Hydrochloric acid; Hz - Hertz; HOBt- 1-Hydroxy benzotriazole; *J* - Coupling Constant; K_3PO_4 – Potassium phosphate; K_2CO_3 – Potassium carbonate; LC–MS - Liquid Chromatography-Mass Spectroscopy; LiOH.H_2O – Lithium hydroxide monohydrate; *m*CPBA – *meta*-Chloroperbenzoic acid; NaH – Sodium hydride; MeOH – methanol; M – Molar; MHz – Megahertz (frequency); MS - Mass Spectroscopy; mmol - Millimolar; mL - Milli Liter; min – Minutes; mol – Moles; M^+- Molecular ion; m – Multiplet; N- Normality; NMR - Nuclear Magnetic Resonance; Pd/C - Palladium on activated carbon; PTSA - p-Toluenesulfonic acid; p – Para; rac – Racemic; RM – Reaction mixture; Et_3N – Triethyl amine; rt/RT – Room temperature; s – Singlet; t – Triplet; q – Quartet; dd – Doublet of doublet; dil. – Diluted; THF – Tetrahydrofuran; % - Percentage; and δ- Delta; mol – Molar; μM – Micro molar; Xantphos - 4,5-Bis(diphenylphosphino)-9,9-dimethylxanthene;

Methods for preparing compounds described herein are illustrated in the following examples. The schemes are given for the purpose of illustrating the invention, and are not intended to limit the scope or spirit of the invention. Starting materials shown in the schemes can be obtained from commercial sources or prepared based on procedures described in the literature. Furthermore, in the following schemes, where specific acids, bases, reagents, coupling agents, solvents, etc. are mentioned, it is understood that other suitable acids, bases, reagents, coupling agents etc. may be used and are included within the scope of the present invention. Modifications to reaction conditions, for example, temperature, duration of the reaction or combinations thereof, are envisioned as part of the present invention. All possible stereoisomers are envisioned within the scope of this invention.

The intermediates required for the synthesis are commercially available or alternatively, these intermediates can be prepared using known literature methods. The invention is described in greater detail by way of specific examples.

Unless otherwise stated, work-up includes distribution of the reaction mixture between the organic and aqueous phase indicated within parentheses, separation of layers and drying the organic layer over sodium sulphate, filtration and evaporation of the solvent. Purification, unless otherwise mentioned, includes purification by silica gel chromatographic techniques, generally using ethyl acetate/hexane mixture of a suitable polarity as the mobile phase. Use of a different eluent system is indicated within parentheses.

It is contemplated that some of the intermediates disclosed in the present invention are used for the next step without any characterization data.

It is meant to be understood that the order of the steps in the processes may be varied, that reagents, solvents and reaction conditions may be substituted for those specifically mentioned, and that vulnerable moieties may be protected and deprotected, as necessary.

The MS data provided in the examples described below were obtained as follows:

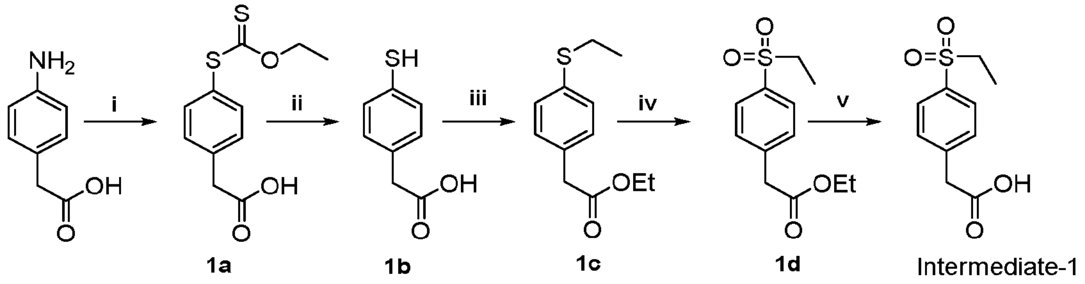
Mass spectrum: Shimadzu LCMS 2020; Agilent 1100; LCMSD VL and Agilent 1100; API 2000

The NMR data provided in the examples described below were obtained as follows:

^{1}H NMR: Varian 300, 400 and 600 MHz.

Scheme I(a)

Intermediate-1: Synthesis of 2-(4-(ethylsulfonyl)phenyl)acetic acid



Reagents and conditions: i) Sodium nitrite, conc.HCl, water, 0 °C, 45 min/ potassium ethylxanthate, sodium carbonate, water, RT – 45 °C , 2h; ii) potassium hydroxide, ethanol, water, reflux, 20 h; iii) bromoethane, K_2CO_3, DMF, RT, 2 - 3 h; iv) *m*CPBA, DCM, 0 °C - RT, 12 h; v) sodium hydroxide, ethanol, water, RT, 12 h.

Step i: 2-(4-((ethoxycarbonothioyl) thio) phenyl)acetic acid

To a 250 mL round bottom flask, were added 4-aminophenylacetic acid (8.5 g, 0.0562 mol), water (28 mL) and conc. hydrochloric acid (11.5 mL) and then cooled to 0 °C. To the same flask, aqueous sodium nitrite (3.9 g, 0.0562 mol in 28 mL of water) was added drop wise. The reaction mass was stirred at 0 °C for 45 minutes. The resulting cold diazonium salt solution was drop wise added to a mixture of potassium ethylxanthate (10.4 g, 0.0648 mol), water (16.8 mL) and 2 M sodium carbonate (42 mL). The reaction mixture was maintained at 45 °C for 2 h. The reaction mixture was cooled to 0 °C, acidified to pH 1.0 with conc. hydrochloric acid and extracted with diethyl ether. The combined organic layer was washed with water, brine, dried over anhydrous sodium sulfate and evaporated under reduced pressure to get crude title compound (19 g). The crude product was used for next step immediately without any further purification.

Step ii: 2-(4-mercaptophenyl)acetic acid

To a 250 mL round bottom flask, were added 2-(4-((ethoxycarbonothioyl)thio)phenyl)acetic acid (19 g, 0.0741 mol) and ethanol (72 mL). To the same flask, was added a solution of potassium hydroxide (15 g, 0.2670 mol) in water (72 mL) and then refluxed for 20 h. The major portion of ethanol was evaporated under reduced pressure to get residue. The residue was acidified to pH 2.0 with conc. hydrochloric acid at 0 °C. The aqueous layer was extracted with diethyl ether. The combined organic layer was washed with water, brine and dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to get crude product (7 g). The crude product was used for next step without any further purification. LC-MS: 166.9 $[M-H]^+$.

Step iii: ethyl 2-(4-(ethylthio)phenyl)acetate

To a 100 mL round bottom flask, were added 2-(4-mercaptophenyl)acetic acid (7 g, 0.0416 mol), potassium carbonate (23 g, 0.1664 mol) and *N,N*-dimethylformamide (50 mL). To the same flask, was added ethyl bromide (13.6 g, 0.1248 mol) and stirred at RT for 2.5 h. The reaction mixture was partitioned between ethyl acetate and water. The organic phase was separated and washed with brine and dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to obtain crude product. The crude product was purified by column chromatography using 10% ethyl acetate in hexane as eluent to get the title compound [6 g, 65

%]. ^{1}H NMR (400 MHz, $CDCl_3$): δ 7.30 (d, 2H), 7.22 (d, 2H), 4.18 (q, 2H), 3.57 (s, 2H), 2.96 (q, 2H), 1.33 (t, 3H), 1.25 (t, 3H).

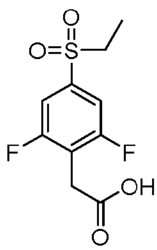
Step iv: ethyl 2-(4-(ethylsulfonyl)phenyl)acetate

To a 250 mL round bottom flask, were added ethyl 2-(4-(ethylthio)phenyl)acetate (5.5 g, 0.0245 mol) and dichloromethane (82.5 mL). The reaction mixture was cooled to 0 °C. To the same flask, was added *m*-chloroperbenzoic acid (12.6 g, 0.073 mol) at 0 °C. The reaction mixture was stirred at RT for 12 h. The resulting suspension was filtered through a pad of celite. The filtrate was washed with water, saturated sodium bicarbonate solution, brine, dried over anhydrous sodium sulfate and evaporated under reduced pressure to get crude product. The crude product was purified by column chromatography using 60-120 silica gel and 50% ethyl acetate in hexane to get the title compound [5.1 g, 82 %]. ^{1}H NMR (400 MHz, DMSO-d_6): δ 7.84 (d, 2H), 7.56 (d, 2H), 4.10 (q, 2H), 3.83 (s, 2H), 3.31 (q, 2H) 1.21-1.07 (m, 6H); LC-MS: 257.2 $[M+H]^+$.

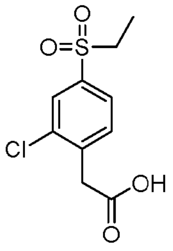
Step v: 2-(4-(ethylsulfonyl)phenyl)acetic acid

To a 50 mL round bottom flask, were added ethyl 2-(4-(ethylsulfonyl)phenyl)acetate (2.5 g, 0.0098 mol) and ethanol (18 mL). To the same flask, was added a solution of sodium hydroxide in water (1.42 g, 0.0355 mol in 18 mL of water) and then stirred at RT for 12 h. The volatiles were evaporated under reduced pressure to obtain residue. The residue was acidified to pH 5.0 with dil. hydrochloric acid and was extracted with ethyl acetate. The organic layer was separated, washed with brine, dried over anhydrous sodium sulfate and evaporated under reduced pressure to get the title compound [2.4 g, 91 %]. ^{1}H NMR (400 MHz, DMSO-d_6): δ 12.5 (brs, 1H), 7.84 (d, 2H), 7.56 (d, 2H), 3.74 (s, 2H), 3.13 (q, 2H), 1.20 (t, 3H).

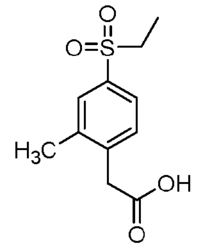
The below acids were prepared by following similar procedures as depicted in Scheme I(a) [step (i) to (v)] and using appropriate reagents.



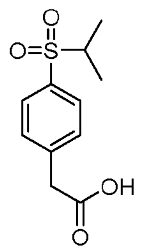
Intermediate-2,



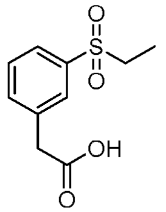
Intermediate-3,



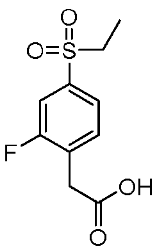
Intermediate-4,



Intermediate-5



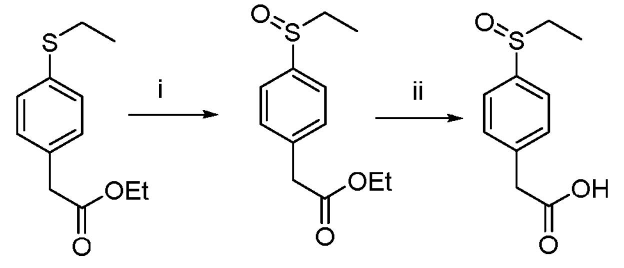
Intermediate-6, and



Intermediate-7

Scheme I(b)

Intermediate-8: Synthesis of 2-(4-(ethylsulfinyl)phenyl)acetic acid



1c fromScheme I(a) **8a** **Intermediate-8**

Reagents and conditions: i) *m*-chloroperbenzoic acid, dichloromethane, RT, 12 h; ii) sodium hydroxide, ethanol, water, RT, 4 h.

Step i: ethyl 2-(4-(ethylsulfinyl)phenyl)acetate

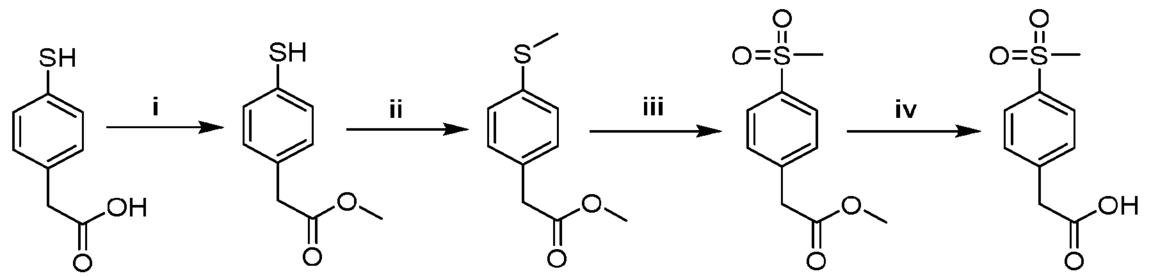
To a 50 mL round bottom flask, were added ethyl 2-(4-(ethylthio)phenyl)acetate [intermediate 1c of Scheme I(a)] (0.94 g, 0.0044 mol) and dichloromethane (15 mL). To the same flask, *m*-chloroperbenzoic acid (0.69 g, 0.004 mol) was added. The reaction mixture was stirred at RT for 12 h. The reaction mixture was filtered through a pad of celite. The filtrate was washed with saturated aqueous sodium bicarbonate and water. The organic layer was separated, washed with brine and dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to get crude. The crude product was purified by column chromatography using 60 – 120 silica gel and 40 – 100 % ethyl acetate in hexane to get the title compound [0.72 g, 72 %]. LC-MS: 241.2 $[M+H]^+$.

Step ii: 2-(4-(ethylsulfinyl)phenyl)acetic acid

To a 50 mL round bottom flask, were added ethyl 2-(4-(ethylsulfinyl)phenyl)acetate (0.71 g, 0.0032 mol) and ethanol (11 mL). To the same flask, a solution of sodium hydroxide (0.44 g, 0.0112 mol) in water (11 mL) was added. The reaction mixture was stirred at RT for 4 h. The volatiles were evaporated under reduced pressure to obtain residue. The residue was acidified to pH 5.0 with dil. hydrochloric acid and extracted with ethyl acetate. The organic layer was separated, washed with brine and dried over sodium sulfate. The solvent was evaporated under reduced pressure to get the title compound [0.5 g, 76 %]. LC-MS: 213.0 $[M+H]^+$.

Scheme I(c)

Intermediate-9: Synthesis of 2-(4-(methylsulfonyl)phenyl)acetic acid



1b from Scheme I(a) **9a** **9b** **9c** **Intermediate-9**

Reagents and conditions: i) Methanol, conc. sulfuric acid, reflux, 3 h; ii) methyl iodide, potassium carbonate, *N,N*-dimethylformamide, RT, 3 h; iii) *m*-chloroperbenzoic acid, dichloromethane, RT, 12 h; iv) sodium hydroxide, methanol, water, RT, 12 h.

<u>Step i: methyl 2-(4-mercaptophenyl) acetate</u>

To a 100 mL round bottom flask, were added 2-(4-mercaptophenyl)acetic acid [intermediate 1b of Scheme Ia] (5.0 g, 0.0298 mol), methanol (50 mL) and con. sulfuric acid (0.1 mL). The reaction mixture was refluxed for 3 h. The volatiles were evaporated under reduced pressure to get residue. The residue was basified with aqueous saturated sodium bicarbonate solution and extracted with ethyl acetate. The combined organic phase was washed with brine, dried over sodium sulfate and evaporated under reduced pressure to get the title compound [4.0 g, 74 %]. The obtained intermediate was used in next step without any further purification.

<u>Step ii: methyl 2-(4-(methylthio)phenyl)acetate</u>

The process of this step was adopted from step-iii of Scheme I(a) to get the title compound [1.75 g, 91 %]. ^{1}H NMR (300 MHz, $CDCl_3$): δ 7.21 (s, 4H), 3.69 (s, 3H), 3.58 (s, 2H), 2.47 (s, 3H).

<u>Step iii: methyl 2-(4-(methylsulfonyl)phenyl)acetate</u>

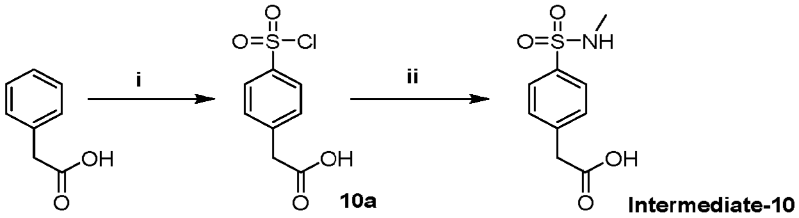
The process of this step was adopted from step-iv of Scheme I(a) to get the title compound [0.7 g, 60%]. ^{1}H NMR (300 MHz, $CDCl_3$): δ 7.87-7.84 (m, 2H), 7.87-7.84 (m, 2H), 3.83 (s, 2H), 3.61 (s, 3H), 3.19 (s, 3H).

<u>Step iv: 2-(4-(methylsulfonyl)phenyl)acetic acid</u>

The process of this step was adopted from step-v of Scheme I(a) to obtain the title compound [0.56 g, 51 %]. ^{1}H NMR (300 MHz, DMSO-d_6): δ 12.58 (s, 1H), 7.88–7.85 (m, 2H), 7.54–7.52 (m, 2H), 3.73 (s, 2H), 3.20 (s, 3H).

<u>Scheme I(d)</u>

Intermediate-10: Synthesis of 2-(4-(N-methylsulfamoyl)phenyl)acetic acid



Reagents and conditions: i) chlorosulfonic acid, 0 °C - RT, 13 h; ii) 2.0 M methylamine in ethanol, RT, 1 h;

Step i: 2-(4-(chlorosulfonyl)phenyl)acetic acid

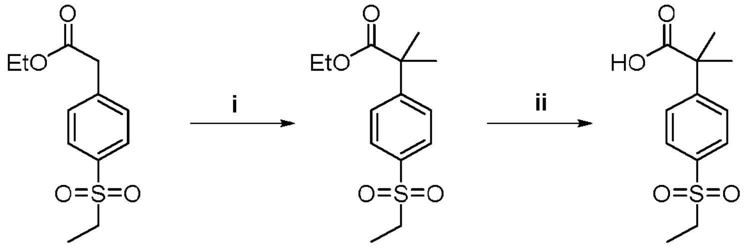
To a 100 mL round bottom flask, were added phenylacetic acid (5.0 g, 0.036 mol) and chlorosulfonic acid (35 mL) at 0 °C. The reaction mixture was stirred at 0 °C for 1 h and then stirred at RT for 12 h. The reaction mixture was quenched with ice-cold water to get precipitate. The precipitate was collected by filtration and dried under reduced pressure to obtain the title compound [2.3 g, 27 %]. ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.03 (d, 2H), 7.56 (d, 2H), 3.80 (s, 2H).

Step ii: 2-(4-(N-methylsulfamoyl)phenyl)acetic acid

To a 25 mL round bottom flask, were added 2-(4-(chlorosulfonyl)phenyl)acetic acid (1 g, 0.0042 mol) and 2.0 M methylamine solution in ethanol (2 mL). The reaction mixture was stirred at RT for 1 h. The reaction mixture was basified with 2N aqueous sodium hydroxide to pH 8.0. The volatiles were evaporated under reduced pressure to get residue. The residue was dissolved in water and acidified with 6.0 M HCl to pH 1.0. The aqueous layer was extracted with dichloromethane. The organic phase was washed with brine, dried over anhydrous sodium sulfate and evaporated under reduced pressure to get the title compound [0.5 g, 34 %]. ^{1}H NMR (400 MHz, $CDCl_3$): δ 7.81 (d, 2H), 7.44 (d, 2H), 4.87-4.85 (m, 1H), 3.72 (s, 2H), 2.63 (d, 3H); LC-MS: 230.1 $[M+H]^+$.

Scheme I(e)

Intermediate-11: Synthesis of 2-(4-(ethylsulfonyl)phenyl)-2-methylpropanoic acid



1d from Scheme I(a) **11a** **Intermediate-11**

Reagents and conditions: i) Methyl iodide, NaH (60 % dispersion in mineral oil), DMF, 0 °C - RT, 12 h; ii) LiOH.H_2O, THF/MeOH/H_2O, RT, 4 h.

Step i: ethyl 2-(4-(ethylsulfonyl)phenyl)-2-methylpropanoate

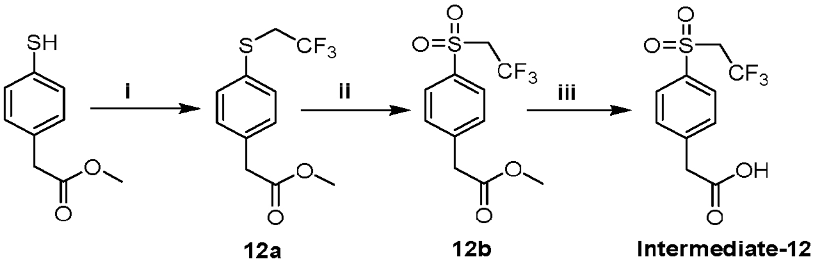
To a 25 mL round bottom flask, were added DMF (5 mL) and 60 % NaH (0.78 g, 19.5 mmol). To the same flask, was slowly added a solution of ethyl 2-(4-(ethylsulfonyl) phenyl) acetate [Intermediate 1d from Scheme I(a)] (1.0 g, 3.9 mmol) in DMF (5 mL) at 0 °C. The reaction mixture was stirred at 0 °C for 15 min. To this mixture, methyl iodide (2.77 g, 19.5 mmol) was added at 0 °C. The reaction mixture was stirred at RT for 12 h. The reaction mixture was quenched with ice cold water and extracted with ethyl acetate. The organic layer was washed with water, brine, dried over anhydrous sodium sulphate and evaporated under reduced pressure to get crude product. The crude product was purified by column chromatography using 60-120 silica gel and 20 % ethyl acetate in hexane to afford the title compound [0.4 g, 36 %]. ^1H NMR (400 MHz, DMSO-d_6): δ 7.86 (d, 2H), 7.61 (d, 2H), 4.11 (q, 2H), 3.32 (q, 2H), 1.54 (s, 6H), 1.13 (m, 6H). LC-MS: 285.3 $[M+H]^+$.

Step ii: 2-(4-(ethylsulfonyl)phenyl)-2-methylpropanoic acid

The process of this step was adopted from step-v of Scheme I(a) to obtain the title compound [0.23 g, 64.7 %]. ^1H NMR (DMSO-d_6, 400 MHz): δ 12.63 (brs, 1H) 7.86 (d, 2H), 7.64 (d, 2H), 3.31 (q, 2H), 1.51 (s, 6H), 1.12 (t, 3H).

Scheme I(f)

Intermediate-12: Synthesis of 2-(4-((2,2,2-trifluoroethyl)sulfonyl)phenyl)acetic acid



Reagents and conditions: i) 1,1,1-trifluoro-2-iodoethane, potassium carbonate, *N,N*-dimethylformamide, RT, 3 h; ii) *m*-chloroperbenzoic acid, dichloromethane, RT, 12 h; iii) acetic acid, conc. hydrochloric acid, 105 °C, 1.5 h.

Step i: methyl 2-(4-((2,2,2-trifluoroethyl)thio)phenyl)acetate

The process of this step was adopted from step-iii of Scheme I(a) to obtain crude product [1.1 g, 63 %]. The obtained intermediate was used in next step without any further purification.

Step ii: methyl 2-(4-((2,2,2-trifluoroethyl)sulfonyl)phenyl)acetate

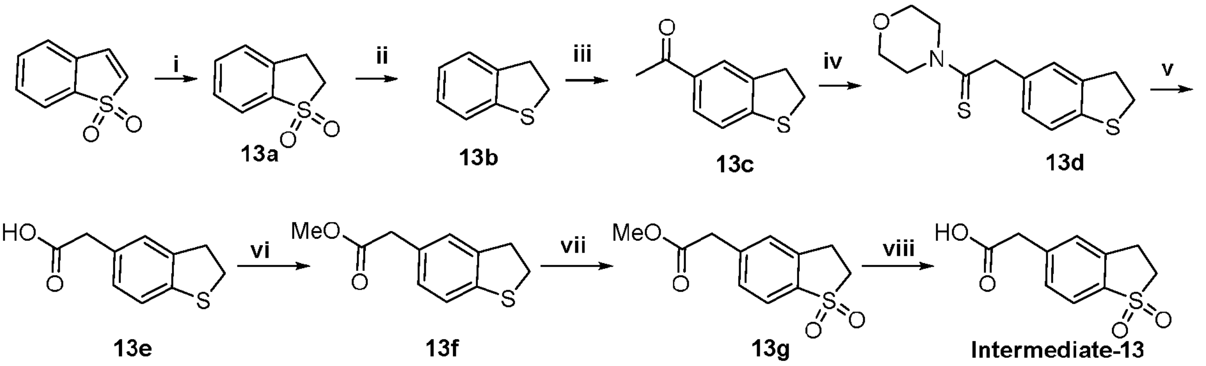
The process of this step was adopted from step-iv of Scheme I(a) to get the titled compound [0.355 g, 29 %]. ^{1}H NMR ($CDCl_3$, 300 MHz): δ 7.94 (d, 2H), 7.55 (d, 2H), 3.94 (q, 2H), 3.75 (s, 2H), 3.73 (s, 3H).

Step iii: 2-(4-((2,2,2-trifluoroethyl)sulfonyl)phenyl)acetic acid

To a 50 mL round bottom flask, were added methyl 2-(4-((2,2,2-trifluoroethyl)sulfonyl) phenyl)acetate (0.35 g, 0.00118 mol), acetic acid (9.5 mL) and conc. hydrochloric acid (9.5 mL). The reaction mixture was stirred at 105 °C for 1.5 h. The volatiles were evaporated under reduced pressure to get residue. The residue was partitioned between dichloromethane and water. The combined organic layer was washed with brine, dried over anhydrous sodium sulfate and evaporated under reduced pressure to obtain the title compound [0.18 g, 54 %]. ^{1}H NMR (DMSO-d_6, 300 MHz): δ 12.57 (s, 1H), 7.92-7.90 (m, 2H), 7.60 (d, 2H), 4.99 (q, 2H), 3.77 (s, 2H).

Scheme I(g)

Intermediate-13: Synthesis of 2-(1,1-dioxido-2,3-dihydrobenzo[b]thiophen-5-yl)acetic acid



Reagents and conditions: i) Pd/C [10%]/H_2, ethanol, Parr shaker, 1 h; ii) $LiAlH_4$, 1,4- dioxane, RT -reflux, 5 h; iii) acetyl chloride, $AlCl_3$, DCM, -10 °C, 30 min; iv) morpholine, sulfur, PTSA, 130 °C, 5 h; v) conc. H_2SO_4, AcOH/water, 100 °C, 4 h; vi) MeOH, HCl, 65 °C, 16 h; vii) formic acid, 30 % H_2O_2, 0 °C – rt, 6 h; viii) LiOH. H_2O, THF, MeOH, H_2O, 50 °C, 3 h.

Step i: 2,3-dihydrobenzo[b]thiophene 1,1-dioxide

To a Parr hydrogenation vessel, were added benzo[b]thiophene 1,1-dioxide (1.0 g, 0.006 mol), ethanol (30 mL) and 10 % palladium on activated carbon (0.1 g). The hydrogenation vessel was placed on a Parr shaker at 50 psi for 1 h. The reaction mixture filtered through a pad of celite and concentrated under reduced pressure to afford the title compound as white solid [0.95 g, 94 %].

^{1}H NMR ($CDCl_3$, 300 MHz): δ 7.75 (d, 1H), 7.60 (t, 1H), 7.49 (t, 1H), 7.39 (d, 1H), 3.52 (t, 2H), 3.41 (t, 2H) LC-MS: 169.1 $[M+H]^+$.

Step ii: 2,3-dihydrobenzo[b]thiophene

To a 25 mL round bottom flask, were added dry 1,4-dioxane (15 mL) and $LiAlH_4$ (1.88 g, 0.0508 mol). To the same flask, 2,3-dihydrobenzo[b]thiophene 1,1-dioxide (0.95 g, 0.0056 mol) in 1,4-dioxane (15 mL) was added at RT. The reaction mixture was stirred at reflux temperature for 5 h. The reaction mixture was cooled and quenched with ice cold water. The resulting mixture was dissolved in 4 M aqueous HCl. The aqueous layer was extracted with diethyl ether. The combined organic layer was dried over anhydrous sodium sulfate and evaporated under reduced pressure to get crude product. The crude product was purified by column chromatography using 60-120 silica gel and 20 % EtOAc in hexane to afford the title compound as colourless oil [0.92 g, crude]. LC-MS: 136.1 $[M]^+$.

Step iii: 1-(2,3-dihydrobenzo[b]thiophen-5-yl)ethanone

To a 50 mL round bottom flask, were added 2,3-dihydrobenzo[b]thiophene (0.92 g, 0.00735 mol) and DCM (15 mL). The reaction mixture was cooled to -10 °C. To the same flask, a solution of acetyl chloride (1.14 g, 0.014 mol) and aluminum chloride (0.98 g, 0.00735 mol) in DCM (15 mL) were added, while maintaining the temperature below -6 °C. The reaction mixture was stirred at -10 °C for 30 min. The reaction mixture was quenched with ice and conc.HCl. The reaction mixture was extracted with DCM. The organic layer was dried over anhydrous sodium sulfate and evaporated under reduced pressure to get crude product. The crude product was purified by column chromatography using 60-120 silica gel and 20 % ethyl acetate in hexane to afford the title compound as colourless oil [1.0 g, 84 %]. ^{1}H NMR ($CDCl_3$, 300 MHz): δ 7.76 (brs, 1H), 7.72 (d, 1H), 7.26 (d, 1H), 3.43-3.32 (m, 4H), 2.54 (s, 3H), LC-MS: 179.3 $[M+H]^+$.

Step iv: 2-(2,3-dihydrobenzo[b]thiophen-5-yl)-1-morpholinoethanethione

To a 25 mL round bottom flask, were added 1-(2,3-dihydrobenzo[b]thiophen-5-yl)ethanone (1.0 g, 0.0055 mol), morpholine (0.957 g, 0.011 mol), sulfur (0.264 g, 0.0082 mol) and PTSA (0.2 g, 0.0011 mol). The reaction mixture was stirred at 130 °C for 5 h. The reaction mixture was cooled to RT and methanol was added. The volatiles were evaporated under reduced pressure to get crude product. The crude product was purified by column chromatography using 60-120 silica gel and 30 % ethyl acetate in hexane to afford the title compound as brown solid [0.8 g, 53 %]. LC-MS: 280.1 $[M+H]^+$.

Step v: 2-(2,3-dihydrobenzo[b]thiophen-5-yl)acetic acid

To a 25 mL round bottom flask, were added 2-(2,3-dihydrobenzo[b]thiophen-5-yl)-1-morpholinoethanethione (0.8 g, 0.0028 mol), acetic acid (5 mL), conc. H_2SO_4 (1 mL) and water (1.5 mL). The reaction mixture was stirred at 100 °C for 4 h. The reaction mixture was added to water and extracted with ethyl acetate. The organic layer was dried over anhydrous sodium sulfate and evaporated under reduced pressure to afford crude product. The crude product was purified by column chromatography using 60–120 silica gel and 40 % ethyl acetate in hexane to get the title compound [0.4 g, 62 %]. ^1H NMR ($CDCl_3$, 300 MHz): δ 7.17 (d, 1H), 7.11 (brs, 1H), 7.03 (d, 1H), 3.57 (s, 2H), 3.36-3.26 (m, 4H), LC-MS: 195.1 $[M+H]^+$.

Step vi: methyl 2-(2,3-dihydrobenzo[b]thiophen-5-yl)acetate

To a 25 mL round bottom flask, were added 2-(2,3-dihydrobenzo[b]thiophen-5-yl)acetic acid (0.4 g, 0.0020 mol), methanol (10 mL) and conc. HCl (2 drops). The reaction mixture was stirred at 65 °C for 16 h. The volatiles were evaporated under reduced pressure to get residue. The residue was diluted with water and extracted with ethyl acetate. The organic layer was washed with aqueous sodium bicarbonate solution, dried over anhydrous sodium sulfate and evaporated under reduced pressure to afford the title compound as yellow oil [0.22g, 51.4 %]. ^1H NMR ($CDCl_3$, 300 MHz): δ 7.16 (d, 1H), 7.11 (brs, 1H), 7.02 (d, 1H), 3.68 (s, 3H), 3.55 (s, 2H), 2.36-3.62 (m, 4H), LC-MS: 209.3 $[M+H]^+$.

Step vii: methyl 2-(1,1-dioxido-2,3-dihydrobenzo[b]thiophen-5-yl)acetate

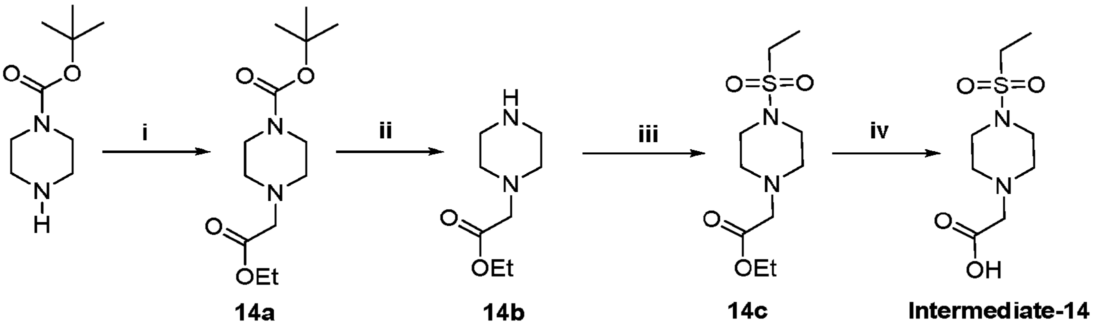
To a 25 mL round bottom flask, were added methyl 2-(2,3-dihydrobenzo[b]thiophen-5-yl)acetate (0.2 g, 0.00096 mol), formic acid (7.5 mL) and aqueous 30 % hydrogen peroxide (7.5 mL) at 0 °C. The reaction mixture was stirred at RT for 6 h. The reaction mixture was cooled to 0 °C, quenched with saturated sodium sulfite solution and extracted with ethyl acetate. The organic layer was washed with brine, dried over anhydrous sodium sulfate, evaporated under reduced pressure and azeotroped with toluene to afford the title compound as a light brown solid [0.15 g, 65 %], LC-MS: 241.1 $[M+H]^+$.

Step viii: 2-(1,1-dioxido-2,3-dihydrobenzo[b]thiophen-5-yl)acetic acid

To a 25 mL round bottom flask, were added methyl 2-(1,1-dioxido-2,3-dihydrobenzo[b]thiophen-5-yl)acetate (0.15 g, 0.00062 mol) and a mixture of THF/methanol (15 mL, 1:1 ratio). To the same flask, 2 mL of aqueous $LiOH.H_2O$ (0.25 g, 0.00625 mol) was added. The reaction mixture was stirred at 50 °C for 3 h. The volatiles were evaporated under reduced pressure to get residue. The residue was dissolved in 10 mL of water and acidified with dil. HCl to pH 3.0 to get solid. The solid was filtered and dried under vacuum to get the title compound as white solid [0.1 g, 70 %]. ^{1}H NMR ($CDCl_3$, 300 MHz): δ 7.71 (d, 1H), 7.39 (d, 1H), 7.31 (brs, 1H), 3.71 (s, 2H), 3.52-3.34 (m, 4H).

Scheme I(h)

Intermediate-14: Synthesis of 2-(4-(ethylsulfonyl)piperazin-1-yl)acetic acid



Reagents and conditions: i) Ethyl bromoacetate, K_2CO_3, DMF, 12 h; ii) TFA, DCM, RT, 4 h; iii) ethanesulfonyl chloride, DCM, TEA, RT, 12 h; iv) NaOH, ethanol, water, RT, 3 h.

Step i: tert-butyl 4-(2-ethoxy-2-oxoethyl)piperazine-1-carboxylate

To a 50 mL round bottom flask, were added tert-butyl piperazine-1-carboxylate (4.0 g, 0.0214 mol), ethyl bromoacetate (5.38 g, 0.0322 mol), potassium carbonate (11.8 g, 0.0859 mol) and *N*, *N*-dimethylformamide (10 mL). The reaction mixture was stirred at RT for 12 h. The reaction mixture was diluted with water and extracted with ethyl acetate. The combined organic layer was washed with brine and dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to obtain the title compound [2.8 g, 48 %]. ^{1}H NMR ($CDCl_3$, 300 MHz): δ 4.20 (q, 2H), 3.48 (t, 4H), 3.20 (s, 2H), 3.52 (t, 4H), 1.44 (s, 9H), 1.17 (t, 3H).

Step ii: ethyl 2-(piperazin-1-yl)acetate

To a 50 mL round bottom flask, were added tert-butyl 4-(2-ethoxy-2-oxoethyl)piperazine-1-carboxylate (2.6 g, 0.0095 mol), trifluoroacetic acid (10.8 g, 0.095 mol) and DCM (5 mL). The reaction mixture was stirred at RT for 12 h. The volatiles were evaporated under reduced pressure to get residue. The residue was neutralized with sodium bicarbonate. The volatiles were evaporated under reduced pressure and azeotroped with toluene to get residue. The residue was extracted with 15 % methanol in chloroform. The organic layer was evaporated under reduced pressure to obtain the desired product [1.55 g, 95 %]. The obtained intermediate was used in next step without any further purification.

Step iii: ethyl 2-(4-(ethylsulfonyl)piperazin-1-yl)acetate

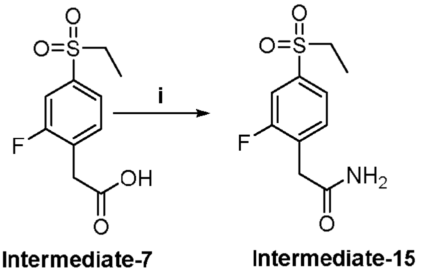
To a 50 mL round bottom flask, were added ethyl 2-(piperazin-1-yl)acetate (1.5 g, 0.0087 mol), DCM (15 mL), ethanesulfonyl chloride (1.68 g, 0.013 mol) and triethylamine (1.76 g, 0.0174 mol). The reaction mixture was stirred at RT for 12 h. The reaction mixture was diluted with DCM and washed with water. The organic layer was washed with brine, dried over anhydrous sodium sulfate and evaporated under reduced pressure to get crude product. The crude product was purified by column chromatography using 60-120 silica gel and 50 % ethyl acetate in hexane to obtain the title compound [1.0 g, 43 %]. ^{1}H NMR ($CDCl_3$, 300 MHz): δ 4.21 (q, 2H), 3.36 (brs, 4H), 3.24 (s, 2H), 2.98 (q, 2H), 2.66 (brs, 4H), 1.39 (t, 3H), 1.29 (t, 3H).

Step iv: 2-(4-(ethylsulfonyl)piperazin-1-yl)acetic acid

To a 50 mL round bottom flask, were added ethyl 2-(4-(ethylsulfonyl)piperazin-1-yl)acetate (1.0 g, 0.00378 mol), sodium hydroxide (0.6 g, 0.01513 mol) ethanol (15 mL) and water (15 mL). The reaction mixture was stirred at RT for 3 h. The reaction mixture was acidified with dil. hydrochloric acid. The volatiles were evaporated under reduced pressure to get residue. The residue was extracted with 15 % methanol in chloroform. The organic layer was evaporated under reduced pressure to get the title compound [0.6 g, 67 %]. ^{1}H NMR (DMSO-d_6, 300 MHz): δ 4.17 (s, 2H), 3.54 (brs, 4H), 3.82 (brs, 4H), 3.21 (q, 2H), 1.24 (t, 3H).

Scheme I(i)

Intermediate-15: Synthesis of 2-(4-(ethylsulfonyl)-2-fluorophenyl)acetamide

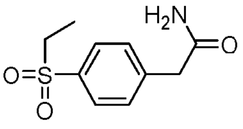


Reagents and conditions: i) thionyl chloride, RT, 12h, DCM, Aq. Ammonia, 10 °C.

Step i: 2-(4-(ethylsulfonyl)-2-fluorophenyl)acetamide

To a 50 mL round bottom flask, were added 2-(4-(ethylsulfonyl)-2-fluorophenyl)acetic acid (0.85 g 0.0035 mol) and thionyl chloride (8.5 mL). The reaction mixture was stirred at RT for 12 h. The volatiles were evaporated under reduced pressure to get residue. The residue was dissolved in dichloromethane (10 mL) and cooled to 10 °C. To the same flask, aqueous ammonia (8.5 mL) was added. The reaction mixture was stirred at RT for 2 h. The volatiles were evaporated under reduced pressure to get residue. The residue was extracted with 10% methanol in chloroform. The combined organic phase was washed with water, dried over anhydrous sodium sulfate and evaporated under reduced pressure to get the title compound [0.45 g, 53 %]. ^{1}H NMR (300 MHz, DMSO-d_6): δ 7.69-7.62 (m, 3H), 7.60 (brs, 1H), 7.08 (brs, 1H), 3.59 (s, 2H), 3.39 (q, 2H), 1.13 (t, 3H). LC-MS: 245.9 $[M+H]^+$.

Intermediate-16: Synthesis of 2-(4-(ethylsulfonyl)phenyl)acetamide

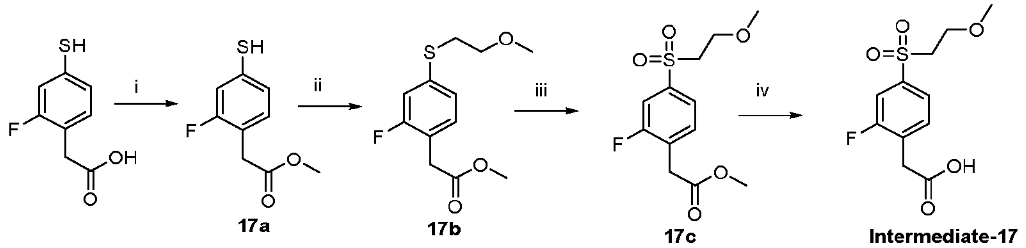


Intermediate-16

This intermediate was prepared by following similar procedures as described above and using appropriate reagents.

Scheme I(j)

Intermediate-17: Synthesis of 2-(2-fluoro-4-((2-methoxyethyl)sulfonyl)phenyl)acetic acid



17a **17b** **17c** **Intermediate-17**

Reagents and conditions: i) methanol, conc. sulphuric acid, 70 °C, 45 min; ii) 2-bromoethyl methyl ether, potassium carbonate, *N,N*-dimethylformamide, RT, 3 h; iii) *m*-chloroperbenzoic acid , dichloromethane, RT, 12 h; iv) potassium hydroxide, methanol, water, RT, 2 h.

Step i: methyl 2-(2-fluoro-4-mercaptophenyl)acetate

To a 100 mL round bottom flask, were added methyl 2-(2-fluoro-4-mercaptophenyl)acetic acid 1.5 g, 0.008 mol), methanol (15 mL) and conc.sulfuric acid (2 drops). The reaction mixture was stirred at 70 °C for 45 min. The reaction mixture was cooled to 0 °C in an ice bath. The reaction mixture was neutralized with sodium bicarbonate. The volatiles were evaporated under reduced pressure to a volume of 5 mL and diluted with 50 mL of water. The aqueous layer was extracted with dichloromethane. The combined organic layer was dried over anhydrous sodium sulfate and evaporated under reduced pressure to get the title compound [1.31 g, 82 %]. The obtained intermediate was used in next step without any further purification. LC-MS: 199.3 $[M-H]^+$.

Step ii: methyl 2-(2-fluoro-4-((2-methoxyethyl)thio)phenyl)acetate

To a 25 mL round bottom flask, were added methyl 2-(2-fluoro-4-mercaptophenyl)acetate (1.3 g, 0.0065 mol), potassium carbonate (1.79 g, 0.0129 mol), 2-bromoethyl methyl ether (1.35 g, 0.0097 mol) and *N,N*-dimethylformamide (10 mL). The reaction mixture was stirred at RT for 3h. The reaction mixture was partitioned between dichloromethane and water. The organic phase was separated, washed with brine, dried over anhydrous sodium sulphate and evaporated under reduced pressure to obtain crude product [1.1 g, 66 %]. The obtained intermediate was used in next step without any further purification.

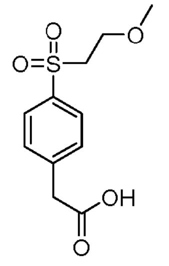
Step iii: methyl 2-(2-fluoro-4-((2-methoxyethyl)sulfonyl)phenyl)acetate

To a 50 mL round bottom flask, were added methyl 2-(2-fluoro-4-((2-methoxyethyl)thio)phenyl)acetate (1.0 g, 0.0039 mol) and dichloromethane (10 mL). To the same flask, was added *m*-chloroperbenzoic acid (1.0 g, 0.0058 mol) and stirred at RT for 12 h. The resulting suspension was filtered off through a pad of celite. The filtrate was washed with water, saturated sodium bicarbonate solution, brine, dried over anhydrous sodium sulfate and evaporated under reduced pressure to get crude product. The crude product was purified by column chromatography using 60-120 silica gel and 10-30% ethyl acetate in hexane to get the title compound [0.855 g, 76%]. ^{1}H NMR (300 MHz, $CDCl_3$): δ 7.69 (m, 2H), 7.51 (t, 1H), 3.77-3.73 (m, 7H), 3.40 (t, 2H), 3.24 (s, 3H); LC-MS: 291.2 $[M+H]^+$.

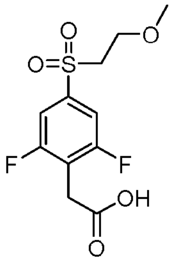
Step iv: 2-(2-fluoro-4-((2-methoxyethyl)sulfonyl)phenyl)acetic acid

To a 50 mL round bottom flask, were added methyl 2-(2-fluoro-4-((2-methoxyethyl)sulfonyl)phenyl)acetate (0.85 g, 0.0029 mol) and methanol (15 mL). To the same flask, was added 3 mL of aqueous potassium hydroxide (0.328 g, 0.0058 mol). The reaction mixture was stirred at RT for 2 h. The volatiles were evaporated under reduced pressure to get residue. The obtained residue was diluted with ice and acidified with citric acid to pH 1.0. The compound was extracted with ethyl acetate. The combined organic layer was washed with brine, dried over anhydrous sodium sulfate and evaporated under reduced pressure to obtain the title compound [0.65 g, 81 %]. ^{1}H NMR (300 MHz, $CDCl_3$): δ 7.70-7.62 (m, 2H), 7.50 (t, 1H), 3.80 (s, 2H), 3.77 (t, 2H), 3.41 (t, 2H), 3.23 (s, 3H); LC-MS: 277.2 $[M+H]^+$.

The intermediates showed below were prepared by following similar procedure as depicted in Scheme I(j) [step (i) to (iv)] and using appropriate reagents.



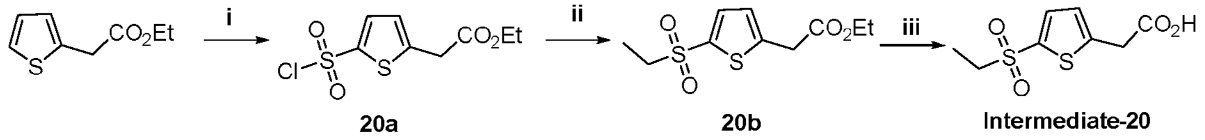
Itermediate-18



Itermediate-19

Scheme I(k)

Intermediate-20: Synthesis of 2-(5-(ethylsulfonyl)thiophen-2-yl)acetic acid



Reagents and conditions: i) chlorosulfonic acid, chloroform, 0 - 70 °C, 3 h; ii) sodium sulphite, sodium bicarbonate, 1,4-dioxane and water, 90 °C, 1 h followed by ethyl bromide, *N,N*-dimethylformamide, RT, 12 h; iii) lithium hydroxide monohydrate, tetrahydrofuran, ethanol, water, RT, 4 h.

Step i: ethyl 2-(5-(chlorosulfonyl)thiophen-2-yl)acetate

To a 25 mL round bottom flask, were added ethyl 2-(thiophen-2-yl)acetate (1 g, 0.0059 mol) and chloroform (10 mL). The reaction mixture was cooled to 0 °C. To the same flask, chlorosulfonic acid (0.783 mL, 0.0118 mol) was added. The reaction mixture was stirred at 70 °C for 3 h. The reaction mixture was quenched with ice cold water and partitioned between dichloromethane and water. The combined organic layer was washed with brine, dried over anhydrous sodium sulfate and evaporated under reduced pressure to obtain crude compound [0.8 g, 47 %]. The crude product was used in next step without further purification. LC-MS: 270.0 $[M+H]^+$.

Step ii: ethyl 2-(5-(ethylsulfonyl)thiophen-2-yl)acetate

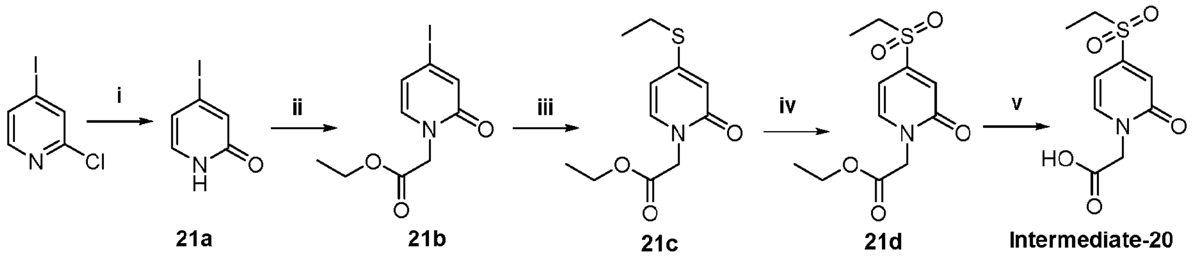
To a 25 mL round bottom flask, were added ethyl 2-(5-(chlorosulfonyl)thiophen-2-yl)acetate (0.8 g, 0.00298 mol), 1,4-dioxane (10 mL) and water (4 mL). To the same flask, were added sodium sulfite (0.75 g, 0.00597 mol) and sodium bicarbonate (0.501 g, 0.00597 mol). The reaction mixture was maintained at 90 °C for 1 h. The volatiles were evaporated under reduced pressure to get residue. To the residue, *N,N*-dimethyl formamide (10 mL) and ethyl bromide (0.441 mL, 0.00597 mol) were added. The reaction mixture was stirred at RT for 12 h. The reaction mixture was partitioned between ethyl acetate and water. The combined organic layer was washed with brine, dried over anhydrous sodium sulfate and evaporated under reduced pressure to obtain crude product. The crude product was purified by flash column chromatography (50 % ethyl acetate in hexane) to get the title compound [0.3 g, 38 %]. ^{1}H NMR ($CDCl_3$, 300 MHz): δ 7.54 (d, 1H), 6.99 (d, 1H), 4.24 (q, 2H), 3.86 (s, 2H), 3.23 (q, 2H), 1.33-1.24 (m, 6H); LC-MS: 263.1 $[M+H]^+$.

Step iii: 2-(5-(ethylsulfonyl)thiophen-2-yl)acetic acid

The process of this step was adopted from step-v of Scheme I(a) to get the title compound [0.2 g, 85 %]. ^{1}H NMR ($CDCl_3$, 300 MHz): δ 7.56 (d, 1H), 7.02 (d, 1H), 3.94 (s, 2H), 3.25 (q, 2H), 1.37 (t, 3H).

Scheme I(l)

Intermediate-21: Synthesis of 2-(4-(ethylsulfonyl)-2-oxopyridin-1(2H)-yl)acetic acid



Reagents and conditions: i) Sodium acetate, acetic acid, 100 °C, 12 h; ii) ethyl bromo acetate, potassium carbonate, *N,N*-dimethylformamide, RT, 2 h; iii) sodium ethanethiolate, *N,N*-dimethylformamide, RT, 12 h; iv) m-chloroperbenzoic acid, dichloromethane, RT, 12 h; v) lithium hydroxide monohydrate, ethanol and water, 50 °C, 12 h.

Step i: 4-iodopyridin-2(1H)-one

To 25 mL round bottom flask, were added 2-chloro-4-iodopyridine (1 g, 0.0042 mol) and acetic acid (10 mL). To the same flask, sodium acetate (1.7 g, 0.0209 mol) was added. The reaction mixture was maintained at 100 °C for 12 h. The reaction mixture was cooled to RT and poured into ice cold water. The aqueous layer partitioned with ethyl acetate. The organic layer was separated. The combined organic layer was washed with brine, dried over anhydrous sodium sulfate and evaporated under reduced pressure to obtain the title compound [0.34 g, 22 %]. ^{1}H NMR (DMSO-d_6, 300 MHz): δ 11.80 (s, 1H), 7.15 (d, 1H), 6.87 (d, 1H), 6.50 (dd, 1H); LC-MS: 221.9 $[M+H]^+$.

Step ii: ethyl 2-(4-iodo-2-oxopyridin-1(2H)-yl)acetate

To a 25 mL round bottom flask, were added 4-iodopyridin-2(1H)-one (0.34 g, 0.0015 mol), potassium carbonate (0.254 g, 0.0018 mol), ethyl bromo acetate (0.308 g, 0.0018 mol) and *N,N*-dimethylformamide (10 mL). The reaction mixture was stirred at RT for 2 h. The reaction mixture diluted with ice cold water to get solid. The solid was collected by filtration to get the title compound [0.2 g, 48 %]. ^{1}H NMR (DMSO-d_6, 300 MHz): δ 7.46 (d, 1H), 6.97 (d, 1H), 6.50 (dd, 1H), 4.64 (s, 2H), 4.16 (q, 2H), 1.21 (t, 3H); LC-MS: 307.9 $[M+H]^+$.

Step iii: ethyl 2-(4-(ethylthio)-2-oxopyridin-1(2H)-yl)acetate

To a 25 mL round bottom flask, were added ethyl 2-(4-iodo-2-oxopyridin-1(2H)-yl)acetate (0.2 g, 0.00065 mol) and *N,N*-dimethylformamide (10 mL). To the same flask, sodium ethanethiolate (0.054 g, 0.00065 mol) was added. The reaction mixture was stirred at RT for 12 h. The reaction mixture diluted with ice cold water to get solid. The solid was collected by filtration to get the title compound [0.1 g, 66 %]. ^{1}H NMR (DMSO-d_6, 300 MHz): δ 7.53 (d, 1H), 6.16 (m 2H), 4.61 (s, 2H), 4.16 (q, 2H), 3.02 (q, 2H), 1.29-1.17 (m, 6H).

Step iv: ethyl 2-(4-(ethylsulfonyl)-2-oxopyridin-1(2H)-yl)acetate

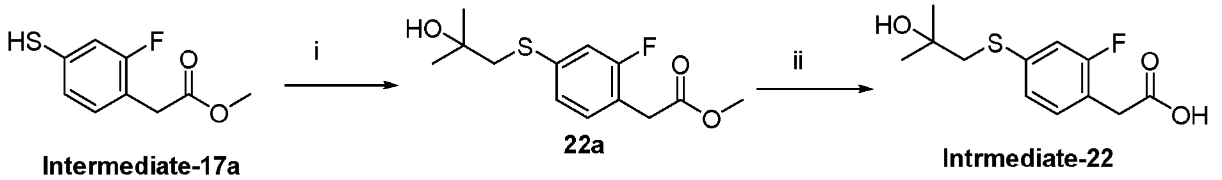
The process of this step was adopted from step-iv of Scheme I(a) to get crude product [0.06 g, 75 %]. ^{1}H NMR (DMSO-d_6, 300 MHz): δ 8.00 (d, 1H), 6.97 (d, 1H), 6.50 (dd, 1H), 4.77 (s, 2H), 4.19 (q, 2H), 3.47 (q, 2H), 1.23 (t, 3H), 1.17 (t, 3H); LC-MS: 273.8 $[M+H]^+$.

Step v: 2-(4-(ethylsulfonyl)-2-oxopyridin-1(2H)-yl)acetic acid

The process of this step was adopted from step-v of Scheme I(a) to get the title compound [0.04 g, 75 %]. ^{1}H NMR (DMSO-d_6, 300 MHz): δ 7.98 (d, 1H), 6.85 (d, 1H), 6.65 (dd, 1H), 4.67 (s, 2H), 3.45 (q, 2H), 1.17 (t, 3H), LC-MS: 246.0 $[M+H]^+$.

Scheme I(m)

Intermediate-22: Synthesis of 2-(2-fluoro-4-((2-hydroxy-2-methylpropyl)thio)phenyl)acetic acid



Intermediate-17a

22a

Intrmediate-22

Reagents and conditions: i) 1-chloro-2-methylpropan-2-ol, potassium carbonate, DMF, RT, 12 h; ii) sodium hydroxide, methanol, water, RT, 5 h.

Step i: methyl 2-(2-fluoro-4-((2-hydroxy-2-methylpropyl)thio)phenyl)acetate

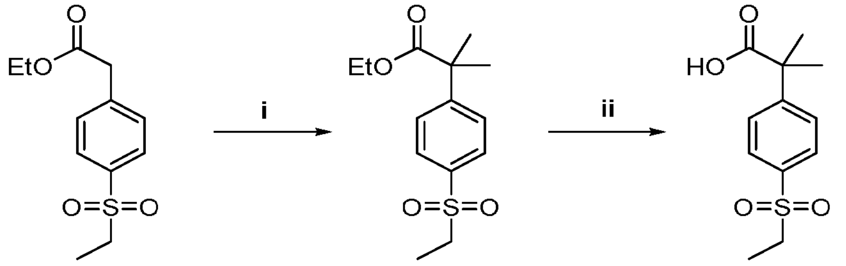
To a 25 mL round bottom flask, were added methyl 2-(2-fluoro-4-mercaptophenyl)acetate [17a, Scheme I(j)] (1 g, 0.005 mol) and DMF (10 mL). To the same flask, potassium carbonate (2.07 g, 0.015 mol) and 1-chloro-2-methylpropan-2-ol (0.651 g, 0.006 mol) were added. The resulting reaction mixture was stirred under nitrogen atmosphere at RT for 12 h. The reaction mixture was diluted with water and extracted with ethyl acetate. The organic layer was separated, washed with brine, dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to get crude product. The crude product was purified by column chromatography using 60–120 silica gel and 15–20 % ethyl acetate in hexane to get the title compound [0.8 g, 59 %]. ^{1}H NMR (300 MHz, $CDCl_3$): δ 7.14–7.08 (m, 3H), 3.70 (s, 3H), 3.60 (s, 2H), 3.08 (s, 2H), 1.30 (s, 6H).

Step ii: 2-(2-fluoro-4-((2-hydroxy-2-methylpropyl)thio)phenyl)acetic acid

To a 50 mL round bottom flask, was added methyl 2-(2-fluoro-4-((2-hydroxy-2-methylpropyl)thio)phenyl)acetate (05 g, 0.0018 mol) and methanol (10 mL). To the same flask, sodium hydroxide (0.22 g, 0.0055 mol) and water (10 mL) were added. The reaction mixture was stirred at RT for 5 h. The volatiles were evaporated under reduced pressure to get residue. The residue was dissolved in water and washed with diethyl ether. The aqueous layer was acidified to pH 2.0 with dil. hydrochloric acid. The aqueous layer was extracted with ethyl acetate. The organic layer was separated, washed with brine, dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to get the title product [0.4 g, 84 %]. ^{1}H NMR (400 MHz, $CDCl_3$): δ 7.07–7.04 (m, 3H), 3.54 (s, 2H), 3.05 (s, 2H), 1.28 (s, 6H).

Scheme I(n)

Intermediate-23: Synthesis of 2-(4-(ethylsulfonyl)phenyl)-2-methylpropanoic acid



1d from Scheme I(a) **23a** **Intermediate-23**

Reagents and conditions: i) Methyl iodide, NaH (60 % dispersion in mineral oil), DMF, 0 °C - RT, 12 h; ii) $LiOH.H_2O$, $THF/MeOH/H_2O$, RT, 4 h.

Step i: ethyl 2-(4-(ethylsulfonyl)phenyl)-2-methylpropanoate

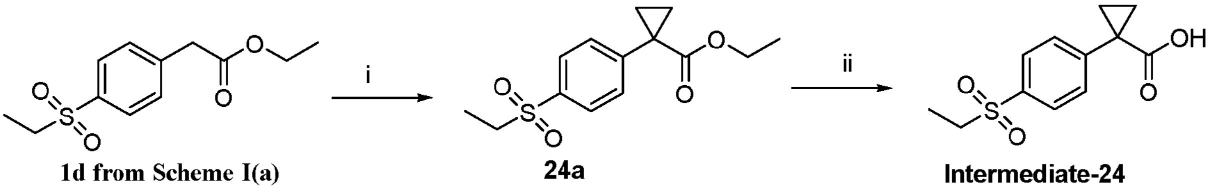
To a 25 mL round bottom flask, were added DMF (5 mL) and 60 % NaH (0.78 g, 19.5 mmol). To the same flask, a solution of ethyl 2-(4-(ethylsulfonyl) phenyl) acetate [Intermediate 1d from Scheme I(a)] (1.0 g, 3.9 mmol) in DMF (5 mL) was slowly added at 0 °C. The reaction mixture was stirred at 0 °C for 15 min. To the same flask, methyl iodide (2.77 g, 19.5 mmol) was added at 0 °C. The reaction mixture was stirred at RT for 12 h. The reaction mixture was quenched with ice cold water and extracted with ethyl acetate. The organic layer was separated, washed with water, brine, dried over anhydrous sodium sulfate and evaporated under reduced pressure to get crude product. The crude product was purified by column chromatography using 60-120 silica gel and 20 % ethyl acetate in hexane as eluent to afford the title compound [0.4 g, 36 %]. ^{1}H NMR (400 MHz, DMSO-d_6): δ 7.86 (d, 2H), 7.61 (d, 2H), 4.11 (q, 2H), 3.32 (q, 2H), 1.54 (s, 6H), 1.13 (m, 6H). LC-MS: 285.3 $[M+H]^+$.

Step ii: 2-(4-(ethylsulfonyl)phenyl)-2-methylpropanoic acid

The process of this step was adopted from step-v of Scheme-I(a) to obtain the title compound [0.23 g, 64.7 %]. ^{1}H NMR (DMSO-d_6, 400 MHz): δ 12.63 (brs, 1H), 7.86 (d, 2H), 7.64 (d, 2H), 3.31 (q, 2H), 1.51 (s, 6H), 1.12 (t, 3H).

Scheme I(o)

Intermediate-24: Synthesis of 1-(4-(ethylsulfonyl)phenyl)cyclopropanecarboxylic acid



Reagents and Conditions: a) 1,2 dibromoethane, NaH (60 % in mineral oil), DMSO, 0 °C - rt, 12 h; b) LiOH.H_2O, THF : H_2O [1:1], rt, 12 h.

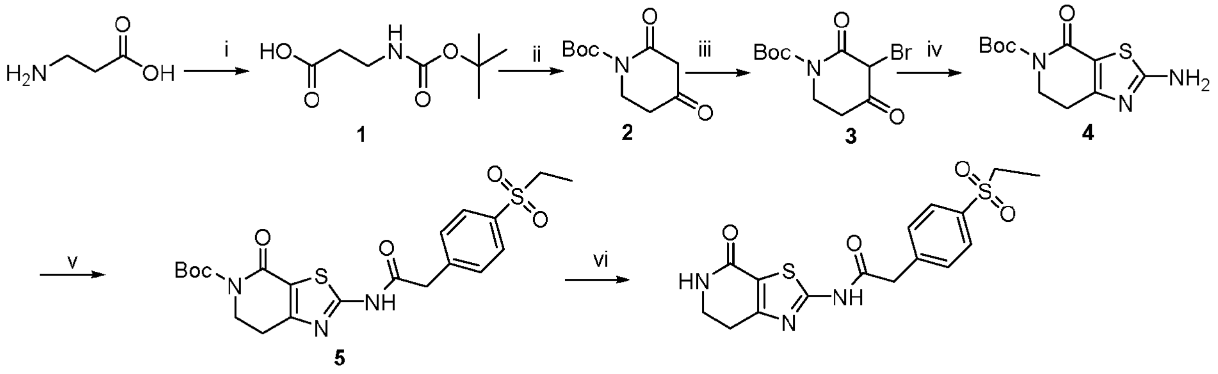
Step-i: ethyl 1-(4-(ethylsulfonyl)phenyl)cyclopropanecarboxylate

To a 100 mL round bottom flask, were added 60% NaH in mineral oil (0.027 g, 0.655 mmol) and DMSO (2 mL). The suspension was cooled to 0 °C. To the same flask, ethyl 2-(4-(ethylsulfonyl)phenyl)acetate [Intermediate 1d from Scheme I(a)] (0.05 g, 0.218 mmol) was added at 0 °C. The resulting mixture was stirred at 0 °C for 30 min and then treated with 1,2-dibromoethane (0.02 g, 0.109 mmol) at the same temperature. The reaction mixture was stirred at RT for 12 h. The reaction mixture was quenched with water and methanol then partitioned between with ethyl acetate and brine. The organic layer was separated and dried over anhydrous sodium sulfate. The solvent was removed under reduced pressure to get crude product. The crude product was purified by column chromatography using 60-120 silica gel and 20-30 % ethyl acetate in hexane to get the title compound [0.025 g, 42 %]. ^{1}H NMR (300 MHz, $CDCl_3$): δ 7.85 (d, 2H), 7.54 (d. 2H), 4.13 (q, 2H), 3.15 (q, 2H), 1.69-1.60 (m, 2H), 1.28-1.62 (m, 8H).

Step-ii: 1-(4-(ethylsulfonyl)phenyl)cyclopropanecarboxylic acid

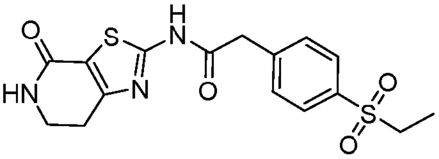
To a 50 mL round bottom flask, were added ethyl 1-(4-(ethylsulfonyl)phenyl) cyclopropane carboxylate (0.025 g, 0.000098 mol), THF and water [1:1] (10 mL). To the same flask, was added $LiOH.H_2O$ (0.041 g, 0.00098 mol). The reaction mixture was stirred at RT for 12 h. The solvent was removed under reduced pressure to get residue. The residue was dissolved in water and acidified with 2N HCl to pH 2.0 to get solid. The solid was collected by filtration and dried under vacuum to get the title compound [0.01 g, 44 %]. ^{1}H NMR (400 MHz, $CDCl_3$): δ 7.85 (d, 2H), 7.55 (d, 2H), 3.13 (q, 2H), 1.77-1.74 (m, 2H), 1.30 (m 5H); LC-MS (ESI): 255.4 $[M+H]^+$.

Scheme II(a)



Reagents and conditions: i) Di-*tert*-butyl dicarbonate, potassium carbonate, 1,4-dioxane, water, 0 °C - RT, 12 h; (ii) Meldrum's acid, EDCI.HCl, 4-dimethylaminopyridine, anhydrous dichloromethane, 0 °C - RT, 12 h; ethyl acetate, reflux, 4 h; (iii) NBS, carbon tetrachloride, 0 °C - RT, 2 h; (iv) thiourea, sodium bicarbonate, ethanol, 80 °C, 2.5 h; (v) 2-(4-(ethylsulfonyl)phenyl)acetic acid, EDCI.HCl, HOBt, dichloromethane, RT, 12 h; (vi) trifluoroacetic acid, dichloromethane, RT, 2 h.

Example 1: Synthesis of 2-(4-(ethylsulfonyl)phenyl)-N-(4-oxo-4,5,6,7-tetrahydrothiazolo [5,4-c]pyridin-2-yl)acetamide (Compound-1)



Step i: 3-((tert-butoxycarbonyl)amino)propanoic acid

To a 250 mL round bottom flask, were added 3-aminopropanoic acid (5 g, 0.0561 mol), potassium carbonate (15.4 g, 0.1122 mol), 1,4-dioxane (100 mL) and water (25 mL). The reaction mixture was cooled to 0 °C and di-*tert*-butyl dicarbonate (13.47 g, 0.0617 mol) was added. The reaction mixture was stirred at RT for 12 h. The reaction mixture was acidified with potassium hydrogen sulfate to pH ~ 3.0. The crude product was extracted with ethyl acetate. The organic layer was separated, washed with brine and dried over anhydrous sodium sulphate. The solvent was evaporated under reduced pressure to get the product [7.2 g, 68 %]. ^{1}H NMR (300 MHz, $CDCl_3$): δ 5.04 (brs, 1H), 3.47 (brs, 2H), 2.58 (brs, 2H), 1.43 (9H).

Step ii: tert-butyl 2,4-dioxopiperidine-1-carboxylate

To a 250 mL round bottom flask, were added 3-((tert-butoxycarbonyl)amino)propanoic acid (4 g, 0.0211 mol), Meldrum's acid (3.66 g, 0.0253 mol), 4-dimethylaminopyridine (3.92 g, 0.0316 mol) and anhydrous dichloromethane (100 mL). The reaction mixture was cooled to 0 °C. To the same flask, EDCI.HCl (6.01 g, 0.0316 mol) was added. The reaction mixture was stirred at RT for 12 h. The reaction mixture was diluted with dichloromethane and washed with 5 % aqueous potassium hydrogen sulfate. The organic layer was separated, washed with brine and dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to get residue. The residue was dissolved in ethyl acetate (100 mL) and refluxed for 4 h. The volatiles were evaporated under reduced pressure to get the title compound [3.2 g, 71 %]. ^{1}H NMR (300 MHz, $CDCl_3$): δ 4.12 (t, 2H), 3.51 (s, 2H), 2.64 (t, 2H), 1.55 (s, 9H). LCMS: 211.9 $(M-H)^+$.

Step iii: tert-butyl 3-bromo-2,4-dioxopiperidine-1-carboxylate

To a 100 mL round bottom flask, were added tert-butyl 2,4-dioxopiperidine-1-carboxylate (3 g, 0.014 mol) and carbon tetrachloride (50 mL). The reaction mixture was cooled to 0 °C. To the same flask, NBS (3 g, 0.0168 mol) was added portion wise. The reaction mixture was stirred at RT for 2 h. The reaction mixture was diluted with dichloromethane and washed with water. The organic layer was separated, washed with brine and dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to get the title compound [1.2 g, 29 %]. The obtained title compound was used in next step without any further purification. LCMS: 191.8 $(M\text{-}Boc+1)^+$.

Step iv: tert-butyl 2-amino-4-oxo-6,7-dihydrothiazolo[5,4-c]pyridine-5(4H)-carboxylate

To a 50 mL round bottom flask, were added tert-butyl 3-bromo-2,4-dioxopiperidine-1-carboxylate (1 g, 0.0034 mol), thiourea (0.287 g, 0.0038 mol), sodium bicarbonate (0.317 g, 0.0038 mol) and ethanol (15 mL). The reaction mixture was stirred at 80 °C for 2.5 h. The volatiles were evaporated under reduced pressure to get residue. The residue was partitioned between ethyl acetate and water. The organic layer was separated, washed with brine and dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to obtain the title compound [0.7 g, 76 %]. ^1H NMR (300 MHz, CD_3OD): δ 4.05 (t, 2H), 2.83 (t, 2H), 1.52 (s, 9H).

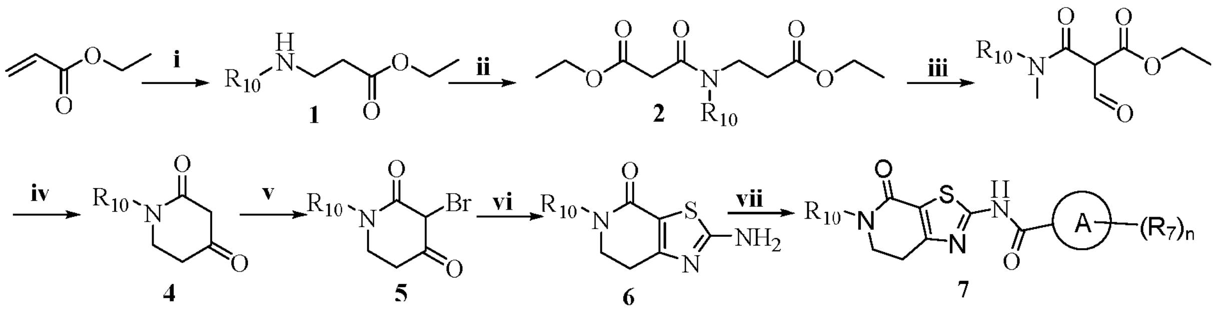
Step v: tert-butyl 2-(2-(4-(ethylsulfonyl)phenyl)acetamido)-4-oxo-6,7-dihydrothiazolo[5,4-c]pyridine-5(4H)-carboxylate

To a 25 mL round bottom flask, were added tert-butyl 2-amino-4-oxo-6,7-dihydrothiazolo[5,4-c]pyridine-5(4H)-carboxylate (0.25 g, 0.0009 mol), 2-(4-(ethylsulfonyl)phenyl)acetic acid (0.318 g, 0.0014 mol) and dichloromethane (10 mL). To the same flask, EDCI.HCl (0.265 g, 0.0014 mol) and HOBt (0.188 g, 0.0014) were added. The reaction mixture was stirred under nitrogen atmosphere at RT for 12 h. The reaction mixture was diluted with dichloromethane and washed with water. The organic layer was separated, washed with water followed by saturated aqueous sodium bicarbonate and dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to obtain crude product. The crude product was purified by column chromatography using 60-120 silica gel and 100 % ethyl acetate to get the title compound [0.1g, 22 %]. LCMS: 379.8 $[M\text{-}Boc+H]^+$.

Step vi: 2-(4-(ethylsulfonyl)phenyl)-N-(4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)acetamide

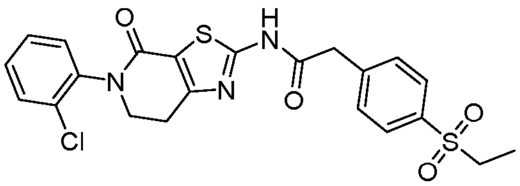
To 25 mL round bottom flask, were added tert-butyl 2-(2-(4-(ethylsulfonyl)phenyl)acetamido)-4-oxo-6,7-dihydrothiazolo[5,4-c]pyridine-5(4H)-carboxylate (0.1 g, 0.0002 mol) and dichloromethane (10 mL). To the same flask, trifluoroacetic acid (1 mL) was added. The reaction mixture was stirred at RT for 2 h. The reaction mixture was diluted with dichloromethane and basified with aqueous saturated sodium bicarbonate solution. The aqueous layer was extracted with 10 % methanol in chloroform. The combined organic layer was washed with brine and dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to obtain crude product. The crude product was purified by column chromatography using 60-120 silica gel and 2 % methanol in chloroform to get the title compound [0.02g, 25 %]. ^{1}H NMR (400 MHz, DMSO-d$_6$): δ 12.7 (s, 1H), 7.86 (d, 2H), 7.64 (s, 1H), 7.61 (d, 2H), 3.96 (s, 2H), 3.44 (t, 2H), 3.25 (q, 2H), 2.84 (t, 2H), 1.09 (t, 3H). LCMS: 379.8 [M+H]$^+$.

Scheme II(b)



Reagents and conditions: i) R_{10}-NH_2, 100 °C, 16 h; ii) ethyl malonyl chloride, *N,N*-diisopropylethylamine, dichloromethane, 0 °C - RT, 3 h; iii) 21 % sodium ethoxide in ethanol, ethanol, 90 °C, 16 h; iv) acetic acid, water, 100 °C, 16 h; v) *NBS*, dichloromethane, 0 °C - RT, 2 h; vi) thiourea, sodium bicarbonate, ethanol, 80 °C, 2.5 h; vii) appropriate acid, 1-propanephosphonic acid cyclic anhydride 50 % solution [T_3P] in ethyl acetate, triethylamine, dichloromethane, RT, 12 h (or) appropriate acid, EDCI.HCl, HOBt, CH_2Cl_2, RT, 12 h.

Example 2: Synthesis of N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide (Compound-2)



Step i: ethyl 3-((2-chlorophenyl)amino)propanoate

To a 25 mL sealed tube, were added 2-chloroaniline (3.5 g, 0.0275 mol), ethyl acrylate (3.3 g, 0.033 mol) and acetic acid (2 mL). The reaction mixture was maintained at 100 °C for 16 h. The reaction mixture was cooled to RT, poured into aqueous saturated sodium bicarbonate solution. The aqueous layer was extracted with ethyl acetate. The organic layer was separated, washed with brine and dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to get crude product. The crude product was purified by column chromatography using

60-120 silica gel and 5 % ethyl acetate in n-hexane to get the title compound [6 g, 96 %]. ^{1}H NMR ($CDCl_3$, 300 MHz): δ 7.27-7.22 (m, 2H), 7.17-7.03 (m, 2H), 4.21 (q, 2H), 3.54 (q, 2H), 2.67 (t, 2H), 1.30 (t, 3H); LC-MS: 227.9 $[M+H]^+$.

Step ii: ethyl 3-((2-chlorophenyl)(3-ethoxy-3-oxopropyl)amino)-3-oxopropanoate

To a 100 mL round bottom flask, were added ethyl 3-((2-chlorophenyl)amino)propanoate (1.8 g, 0.0079 mol), *N,N*-diisopropylethylamine (2.75 mL, 0.0158 mol) and dichloromethane (30 mL). The reaction mixture was cooled to 0 °C. To the same flask, ethyl malonyl chloride (1.42 g, 0.0095 mol) was added. The reaction mixture was stirred at RT for 3 h. The reaction mixture was poured into ice cold water and extracted with dichloromethane. The organic layer was washed with brine and dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to get crude product. The crude product was purified by column chromatography using 60-120 silica gel and 25 % ethyl acetate in hexane to get the title compound [1.6 g, 59 %]. ^{1}H NMR ($CDCl_3$, 300 MHz): δ 7.53-7.50 (m, 1H), 7.36-7.31 (m, 3H), 4.25 (q, 1H), 4.12-4.05 (m, 4H), 3.76 (q, 1H), 3.16 (q, 2H), 2.68 (m, 2H), 1.24-1.18 (m, 6H); LC-MS: 342.1 $[M+H]^+$.

Step iii: ethyl 1-(2-chlorophenyl)-2,4-dioxopiperidine-3-carboxylate

To a 50 mL round bottom flask, were added ethyl 3-((2-chlorophenyl)(3-ethoxy-3-oxopropyl) amino)-3-oxopropanoate (1.6 g, 0.0047 mol) and ethanol (20 mL). To the same flask, 21 % sodium ethoxide in ethanol (0.63 g, 0.0094 mol) was added. The reaction mixture was maintained at 90 °C for 16 h. The volatiles were evaporated under reduced pressure to get residue. The residue was washed with ethyl acetate, acidified to pH 3.0 using dil. hydrochloric acid and extracted with chloroform. The organic layer was separated, washed with brine and dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to get the title product [0.5 g, 37 %]. ^{1}H NMR ($CDCl_3$, 300 MHz): δ 7.58-7.55 (m, 1H), 7.46-7.41 (m, 2H), 7.35-7.29 (m, 1H), 4.37-4.28 (m, 1H), 4.13 (q, 2H), 3.84 (m, 1H), 3.07 (s, 1H), 2.73-2.63 (m, 2H), 1.25 (t, 3H); LC-MS: 296.1 $[M+H]^+$.

Step iv: 1-(2-chlorophenyl)piperidine-2,4-dione

To a 100 mL round bottom flask, were added ethyl 1-(2-chlorophenyl)-2,4-dioxopiperidine-3-carboxylate (0.47 g, 0.0016 mol) acetic acid (50 mL) and water (10 mL). The reaction mixture was stirred at 100 °C for 16 h. Acetic acid was evaporated under reduced pressure. The remaining aqueous layer was partitioned with ethyl acetate. The organic layer was dried over anhydrous sodium sulfate and evaporated under reduced pressure to get the title compound [0.2

g, 56 %]. ^{1}H NMR (CDCl$_3$, 300 MHz): δ 7.53-7.50 (m, 1H), 7.36-7.29 (m, 3H), 4.23-4.08 (m, 1H), 3.94-3.84 (m, 2H), 3.71-3.66 (m, 1H), 2.98-2.88 (m, 2H); LC-MS: 223.9 [M+H]$^+$.

Step v: 3-bromo-1-(2-chlorophenyl)piperidine-2,4-dione

To a 50 mL round bottom flask, were added 1-(2-chlorophenyl) piperidine-2,4-dione (0.5 g, 0.0022 mol) and dichloromethane (25 mL). The reaction mixture was cooled to 0 °C. To the same flask, NBS (0.476 g, 0.0026 mol) was added. The reaction mixture was stirred at RT for 2 h. The reaction mixture was diluted with dichloromethane and washed with water. The organic layer was separated, washed with brine and dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to get the title compound [0.6 g, 83 %]. The obtained title compound was used in next step without further purification. LC-MS: 305.0 [M+H] $^+$

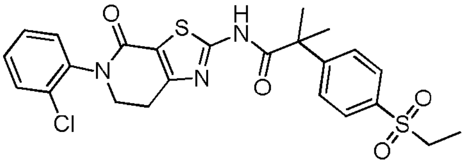
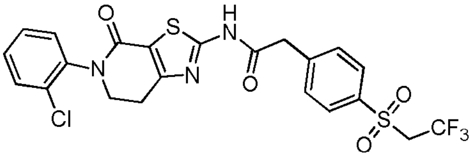
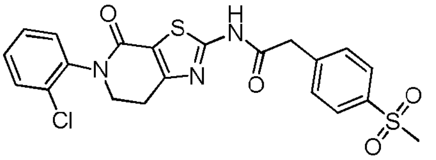
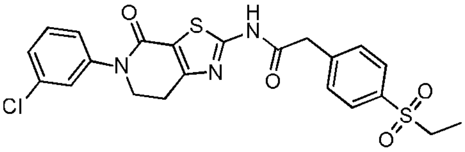
Step vi: 2-amino-5-(2-chlorophenyl)-6,7-dihydrothiazolo[5,4-c]pyridin-4(5H)-one

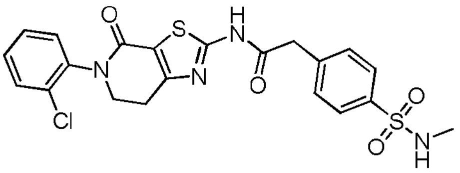
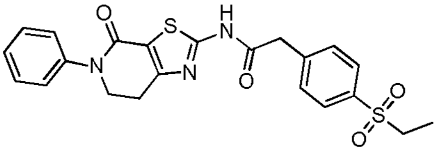
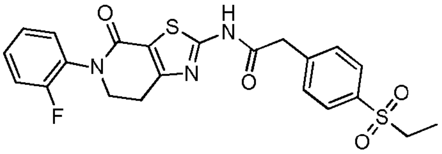
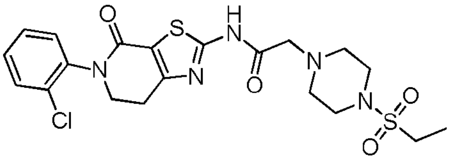
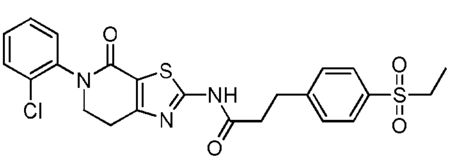
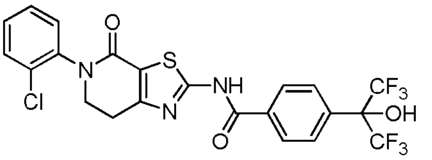
To a 50 mL round bottom flask, were added 3-bromo-1-(2-chlorophenyl)piperidine-2,4-dione (0.6 g, 0.0019 mol), thiourea (0.167 g, 0.0021 mol), sodium bicarbonate (0.184 g, 0.0021 mol) and ethanol (10 mL). The reaction mixture was stirred at 80 °C for 2.5 h. The volatiles were evaporated under reduced pressure to get residue. The residue was partitioned between ethyl acetate and water. The organic layer was separated, washed with brine, dried over anhydrous sodium sulfate and evaporated under reduced pressure to obtain the title compound [0.15 g, 26 %]. ^{1}H NMR (CDCl$_3$, 300 MHz): δ 7.4-7.47 (m, 1H), 7.36-7.28 (m, 3H), 5.42 (brs, 2H), 3.93-3.85 (m, 2H), 3.13-3.08 (m, 1H), 3.00-2.95 (m, 1H); LC-MS: 280.1 [M+H]$^+$.

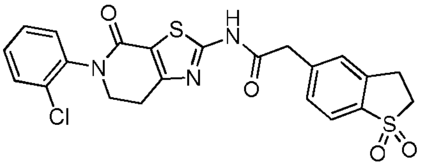
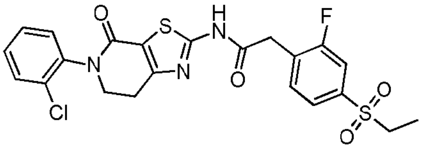
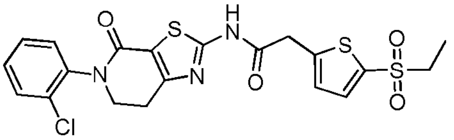
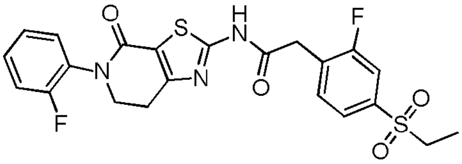
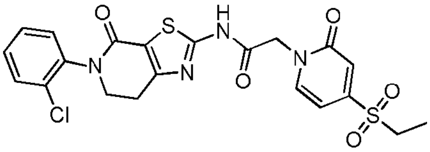
Step vii: N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide

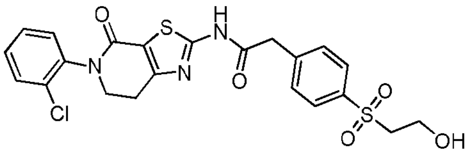
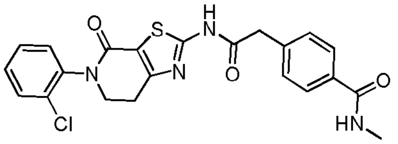
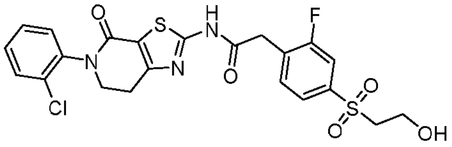
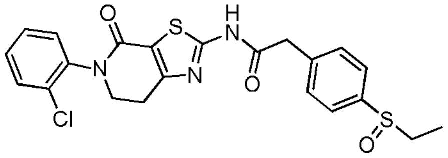
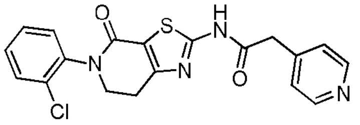
To 25 mL round bottom flask, were added 2-amino-5-(2-chlorophenyl)-6,7-dihydrothiazolo[5,4-c]pyridin-4(5H)-one (0.125 g, 0.00044 mol), 2-(4-(ethylsulfonyl)phenyl) aceticacid (0.12 g, 0.00053 mol) and dichloromethane (10 mL). To the same flask, 1-propanephosphonic acid cyclic anhydride 50 % solution [T$_3$P] in ethyl acetate (0.286 g, 0.00088 mol) and triethylamine (0.15 ml, 0.0011 mol) was added. The reaction mixture was stirred at RT for 12 h. The reaction mixture was diluted with dichloromethane and washed with water. The organic layer was separated, washed with brine and dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to obtain crude product. The crude product was purified by column chromatography using 60-120 silica gel and 70 % ethyl acetate in n-hexane to get the title compound [0.05g, 22 %]. ^{1}H NMR (CDCl$_3$, 400 MHz): δ 9.76 (s, 1H), 7.97 (d, 2H), 7.60 (d, 2H), 7.53 (d, 1H), 7.42-7.30 (m, 3H), 4.01-3.96 (m, 4H), 3.20-3.11 (m, 4H), 1.36 (t, 3H); LC-MS: 490.1 $[M+H]^+$.

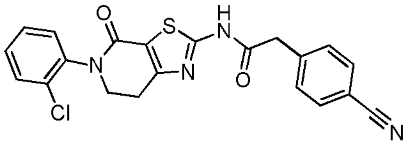
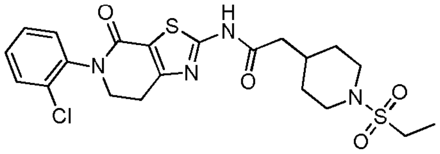
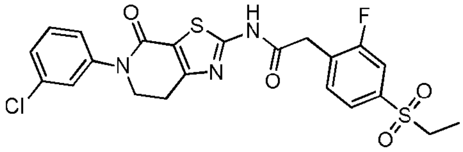
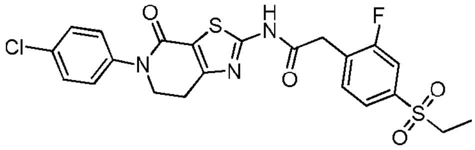
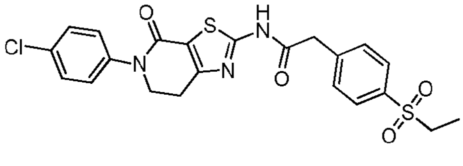
The compounds listed in below table were prepared by procedure similar to the one described in Example-2 [Scheme II(b)] with appropriate variations in reactants, quantities of reagents, solvents and reaction conditions. The characterization data of the compounds are summarized herein below table.

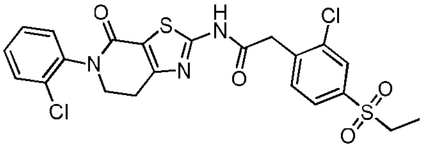
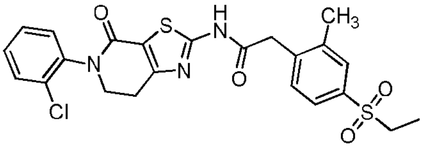
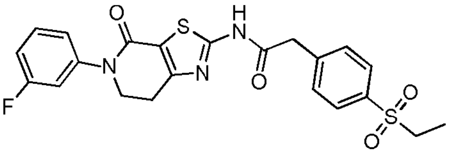
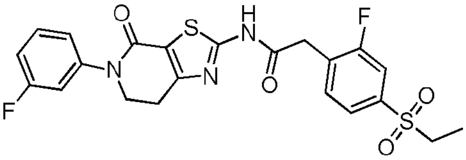
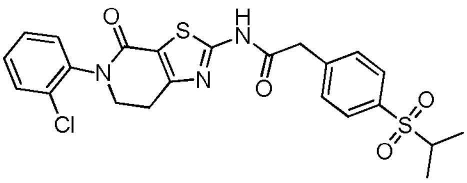
Compound No.	Structure	Characterization data
3		^1H NMR (400 MHz, $CDCl_3$): δ 8.58 (s, 1H), 7.95 (d, 2H), 7.59 (d, 2H), 7.51 (d, 1H), 7.38-7.30 (m, 4H), 3.94 (t, 2H), 3.17-3.12 (m, 3H), 3.06-2.98 (m, 1H), 1.74 (s, 6H), 1.34 (t, 3H). LC-MS: 518.1 $[M+H]^+$.
4		^1H NMR (400 MHz, CD_3OD): δ 8.00 (d, 2H), 7.68 (d, 2H), 7.58 (d, 1H), 7.47-7.38 (m, 3H), 4.52-4.45 (m, 2H), 4.02-3.97 (m, 4H), 3.23-3.16 (m, 2H). LC-MS: 543.95. $[M+H]^+$.
5		^1H NMR (400 MHz, CD3OD): δ 7.97 (d, 2H), 7.65 (d, 2H), 7.58-7.56 (m, 1H), 7.47-7.38 (m, 3H), 4.00 (m, 4H), 3.22-3.19 (m, 2H), 3.19 (S, 1H). LC-MS: 476.0 $[M+H]^+$.
6		^1H NMR (400 MHz, $CDCl_3$): δ 9.20 (s, 1H), 7.96-7.93 (m, 2H), 7.57 (d, 2H), 7.39-7.32 (m, 2H), 7.26-7.22 (m, 2H), 4.09 (t, 2H), 3.95 (s, 2H), 3.19 (m, 4H), 1.35-1.31 (t, 3H). LC-MS: 490.1 $[M+H]^+$.

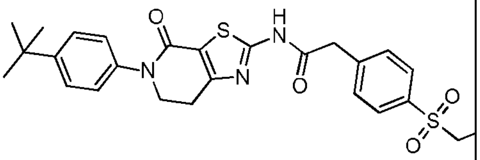
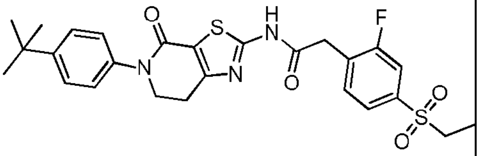
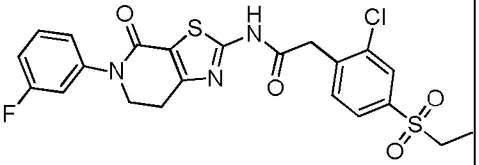
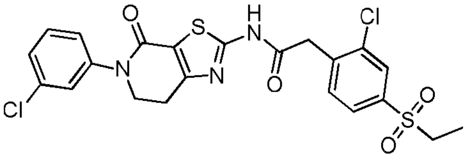
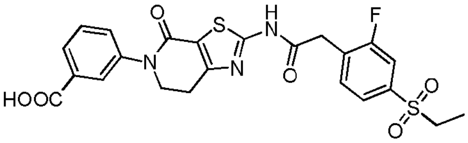
Compound No.	Structure	Characterization data
7		^{1}H NMR (400 MHz, CD$_3$OD): δ 7.85 (d, 2H), 7.59-7.56 (m, 3H), 7.46-7.40 (m, 3H), 3.99 (m, 4H), 3.18 (m, 2H), 2.54 (s, 3H). LC-MS: 491.0 [M+H]$^+$.
8		^{1}H NMR (400 MHz, DMSO-d$_6$): δ 9.56 (s, 1H), 8.00 (t, 2H), 7.90 (d, 2H), 7.72-756 (m, 5H), 4.11-4.08 (m, 1H), 4.00 (s, 3H), 3.18 (d, 4H), 1.09 (t, 3H). LC-MS: 456.1 [M+H]$^+$.
9		^{1}H NMR (300 MHz, DMSO-d$_6$): δ 12.90 (s, 1H), 7.88 (d, 2H), 7.63 (d, 2H), 7.46 (t, 1H), 7.36-7.23 (m, 3H), 4.00-3.94 (m, 4H), 3.33-3.27 (m, 2H), 3.10 (t, 2H), 1.10 (t, 3H). LC-MS: 473.95 [M+H]$^+$.
10		^{1}H NMR (300 MHz, DMSO-d$_6$): δ 12.90 (s, 1H), 7.88 (d, 2H), 7.63 (d, 2H), 7.46 (t, 1H), 7.36-7.23 (m, 3H), 4.00-3.94 (m, 4H), 3.33-3.27 (m, 2H), 3.10 (t, 2H), 1.10 (t, 3H). LC-MS: 498.2 [M+H]$^+$.
11		^{1}H NMR (300 MHz, CDCl$_3$): δ 7.77 (d, 2H), 7.45-7.38 (m, 3H), 7.30-7.26 (m, 3H), 3.91-3.88 (m, 2H), 3.13-3.03 (m, 4H), 2.92-2.75 (m, 4H), 1.24 (t, 3H). LC-MS: 504.0 [M+H]$^+$.
12		^{1}H NMR (400 MHz, DMSO-d$_6$): δ 13.20 (s, 1H), 9.06 (s, 1H), 8.25 (d, 2H), 7.88 (d, 2H), 7.61 (d, 1H), 7.54 (d, 1H), 7.45-7.39 (m, 2H), 4.04-4.01 (m, 2H), 3.87-3.84 (m, 2H). LC-MS: 550.0 [M+H]$^+$.

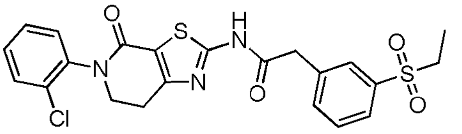
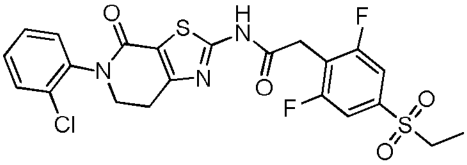
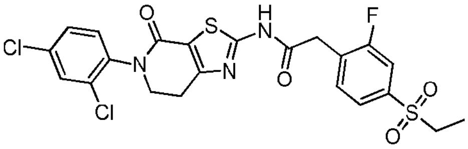
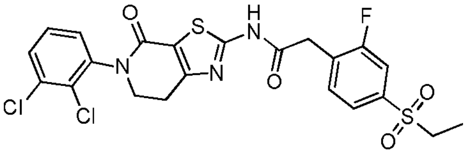
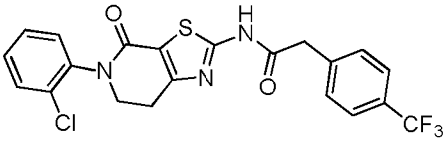
Compound No.	Structure	Characterization data
13		^{1}H NMR (400 MHz, DMSO-d$_6$): δ 7.69 (d, 1H), 7.53 (d, 1H), 7.46-7.45 (m, 3H), 7.39-7.37 (m, 3H), 3.93-3.91 (m, 2H), 3.80-3.76 (m, 2H), 3.53 (t, 2H), 3.32 (t, 2H), 3.07 (t, 2H). LC-MS: 488.0 [M+H]$^+$.
14		^{1}H NMR (400 MHz, CDCl$_3$): δ 7.74-7.66 (m, 2H), 7.61 (t, 3H), 7.50-7.47 (m, 1H), 7.39-7.28 (m, 3H), 4.00-3.89 (m, 2H), 3.93 (s, 2H), 3.28-3.05 (m, 2H), 3.17 (q, 2H), 1.34 (t, 3H). LC-MS: 508.0 [M+H]$^+$.
15		^{1}H NMR (400 MHz, DMSO-d$_6$): δ 12-90 (s, 1H), 7.63 (d, 1H), 7.59-7.57 (m, 1H), 7.52-749 (m, 1H), 7.43-7.37 (m, 2H), 7.19-7.17 (m, 1H), 4.24 (s, 2H), 4.20-3.90 (m, 1H), 3.83-3.81 (m, 1H), 3.54-3.52 (m, 2H), 3.15-3.09 (m, 2H), 1.21-1.14 (m, 3H). LC-MS: 496.0 [M+H]$^+$.
16		^{1}H NMR (400 MHz, DMSO-d$_6$): δ 12.90 (s, 1H), 7.75-7.71 (m, 3H), 7.48-7.43 (m, 1H), 7.63-7.23 (m, 3H), 4.06 (s, 2H), 3.98 (t, 2H), 3.39-3.34 (m, 2H), 3.09 (t, 2H), 1.11 (t, 3H). LC-MS: 491.7 [M+H]$^+$.
17		^{1}H NMR (400 MHz, DMSO-d$_6$): δ 8.02 (d, 2H), 7.59-7.56 (m, 1H), 7.52-7.50 (m, 1H), 7.42-7.37 (m, 2H), 6.88 (d, 1H), 6.71-6.69 (m, 1H), 4.98 (s, 2H), 4.00-

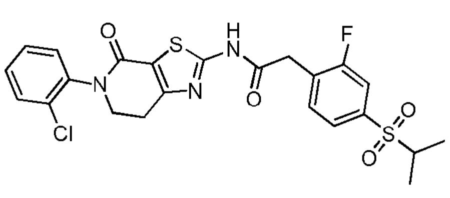
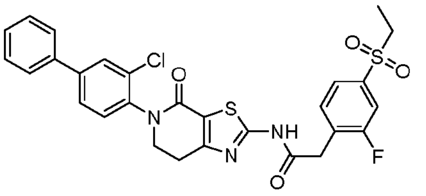
Compound No.	Structure	Characterization data
		3.95 (m, 1H), 3.85-3.78 (m, 1H), 3.46 (q, 2H), 3.14 (t, 2H), 1.18 (t, 3H). LC-MS: 506.7 $[M+H]^+$.
18		^1H NMR (300 MHz, $CDCl_3$): δ 12.9 (s, 1H), 7.87 (d, 2H), 7.59 (d, 3H), 7.50-7.48 (m, 1H), 7.41-7.36 (m, 2H), 4.80 (s, 1H), 3.98-3.95 (m, 3H), 3.83-3.79 (m, 1H), 3.69 (q, 2H), 3.45-3.37 (m, 4H), 3.12 (t, 2H). LC-MS: 506.5 $[M+H]^+$.
19		^1H NMR (400 MHz, CD_3OD): δ 7.70 (d, 1H), 7.69 (d, 1H), 7.46 (dd, 1H), 7.36-7.32 (m, 3H), 7.30-7.26 (m, 2H), 3.89-3.85 (m, 2H), 3.80 (s, 3H), 3.10-3.03 (m, 2H), 2.81 (s, 3H). LC-MS: 455.0 $[M+H]^+$.
20		^1H NMR (400 MHz, DMSO-d_6): δ 12.90 (s, 1H), 7.76-7.68 (m, 3H), 7.60-7.58 (m, 1H), 7.52-7.50 (m, 1H), 7.45-7.36 (m, 2H), 4.94 (t, 1H), 4.04 (s, 2H), 4.02-3.95 (m, 1H), 3.85-3.81 (m, 1H), 3.73-3.70 (m, 2H), 3.55 (t, 2H), 3.16-3.10 (m, 2H). LC-MS: 523.6 $[M+H]^+$.
21		^1H NMR (400 MHz, DMSO-d_6) 3.90-3.88 (m, 1H), 3.13-3.09 (m, 2H), 3.08-2.99 (m, 1H), 2.80-2.75 (m, 1H), 1.04 (t, 3H). LC-MS: 474.0 $[M+H]^+$.
22		^1H NMR (300 MHz, $CDCl_3$): δ 8.6 (s, 2H), 7.49-7.47 (m, 1H), 7.35-7.26 (m, 5H), 3.94-3.92 (m, 2H), 3.84 (s, 2H),

Compound No.	Structure	Characterization data
		3.26-3.12 (m, 1H), 3.12-3.00 (m, 1H). LC-MS: 399.0 $[M+H]^+$.
23		^{1}H NMR (300 MHz, DMSO-d_6): δ 12.89 (s, 1H), 7.84 (d, 2H), 7.60-7.50 (m, 4H), 7.45-7.36 (m, 2H), 4.00-3.94 (m, 3H), 3.86-3.80 (m, 2H), 3.14 (t, 3H). LC-MS: 423.0 $[M+H]^+$.
24		^{1}H NMR (300 MHz, $CDCl_3$): δ 9.44 (s, 1H), 7.51-7.48 (m, 1H), 7.40-7.26 (m, 3H), 3.98-3.91 (m, 2H), 3.85 (d, 2H), 3.51 (q, 2H), 3.28-3.18 (m, 1H), 3.11-3.04 (m, 1H), 2.99-2.91 (m, 2H), 2.83-2.76 (m, 2H), 2.42 (d, 2H), 2.09-2.04 (m, 1H), 1.86 (d, 2H), 1.38 (t, 3H). LC-MS: 497.3 $[M+H]^+$.
25		^{1}H NMR (400 MHz, $CDCl_3$): δ 9.78 (s, 1H), 7.73-7.66 (m, 2H), 7.60 (t, 1H), 7.38 (t, 1H), 7.33 (t, 1H), 7.26-7.19 (m, 1H), 4.08 (t, 2H), 3.92 (s, 2H), 3.18-3.10 (m, 4H). LC-MS: 507.8 $[M+H]^+$.
26		^{1}H NMR (400 MHz, DMSO-d_6): δ 12.90 (s, 1H), 7.76-7.72 (m, 3H), 7.47 (d, 2H), 7.41 (d, 2H), 4.06-4.02 (m, 4H), 3.40-3.33 (m, 2H), 3.16 (t, 2H), 1.11 (t, 3H). LC-MS: 508.0 $[M+H]^+$.
27		^{1}H NMR (300 MHz, DMSO-d_6): δ 12.90 (s, 1H), 7.88 (d, 2H), 7.63 (d, 2H), 7.47-7.38 (m, 4H), 4.06-4.00 (m, 4H), 3.34-3.25 (m, 2H), 3.11 (t, 2H), 1.10 (t, 3H).

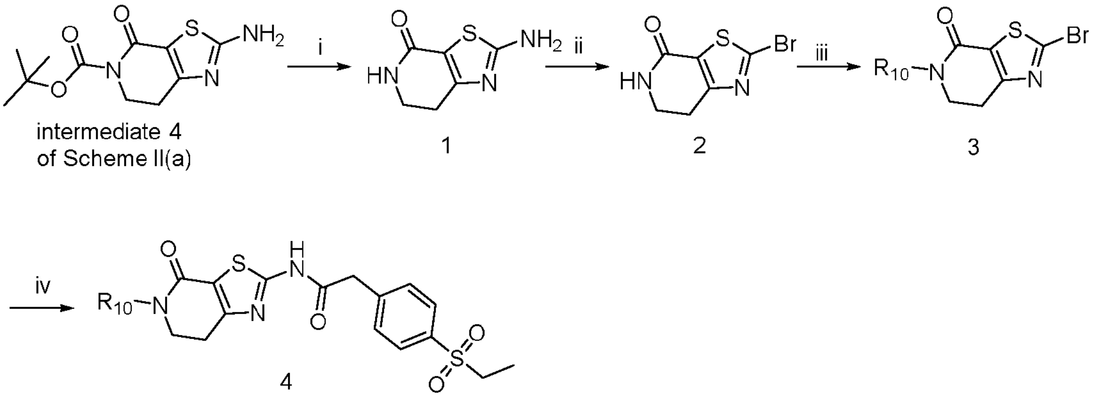
Compound No.	**Structure**	**Characterization data**
		LC-MS: 490.3 $[M+H]^+$.
28		^{1}H NMR (400 MHz, DMSO-d_6): δ 7.94 (s, 1H), 7.87 (d, 1H), 7.74 (d, 1H), 7.59 (d, 1H), 7.51 (d, 1H), 7.44-7.36 (m, 2H), 4.13 (s, 2H), 4.10-3.95 (m, 1H), 3.83-3.79 (m, 1H), 3.42-3.33 (m, 2H), 3.12-3.09 (m, 2H), 1.13 (t, 3H). LC-MS: 524.0 $[M+H]^+$.
29		^{1}H NMR (400 MHz, CD_3OD): δ 7.74-7.57 (m, 2H), 7.52-7.49 (m, 2H), 7.43-7.33 (m, 3H), 4.00 (s, 2H), 3.98-3.94 (m, 2H), 3.19-3.10 (m, 4H), 2.42 (s, 3H), 1.22 (t, 3H). LC-MS: 504.20 $[M+H]^+$.
30		^{1}H NMR (400 MHz, DMSO-d_6): δ 12.95 (s, 1H), 7.88 (d, 2H), 7.63 (d, 2H), 7.47 (q, 1H), 7.29 (t, 2H), 7.10 (t, 1H), 4.09 (t, 2H), 4.00 (s, 2H), 3.30 (t, 2H), 3.11 (t, 2H), 1.13 (t, 3H). LC-MS: 473.8 $[M+H]^+$.
31		^{1}H NMR (400 MHz, DMSO-d_6): δ 12.95 (s, 1H), 7.77 (t, 3H), 7.45 (q, 1H), 7.30 (t, 2H), 7.10 (t, 1H), 4.09 (t, 4H), 3.42 (t, 2H), 3.12 (t, 2H), 1.15 (t, 3H). LC-MS: 492.2 $[M+H]^+$.
32		^{1}H NMR (400 MHz, DMSO-d_6): δ 7.81 (d, 2H), 7.61-7.55 (m, 3H), 7.49 (d, 1H), 7.42-7.34 (m, 2H), 3.93 (s, 3H), 3.81-3.76 (m, 1H), 3.06 (m, 3H), 1.15 (d, 6H). LC-MS: 504.40. $[M+H]^+$.

Compound No.	Structure	Characterization data
33		^{1}H NMR (400 MHz, DMSO-d_6): δ 12.90 (s, 1H), 7.86 (d, 2H), 7.69 (d, 2H) 7.40 (d, 2H), 7.27 (d, 2H), 4.02-3.98 (m, 4H), 3.32-3.28 (m, 2H), 3.24 (t, 2H), 1.28 (s, 9H), 1.09 (t, 3H). LC-MS: 512.10 $[M+H]^+$.
34		^{1}H NMR (400 MHz, DMSO-d_6): δ 12.90 (s, 1H), 7.75-7.71 (m, 3H), 7.41 (d, 2H), 7.27 (d, 2H), 4.05-3.99 (m, 4H), 3.39-3.27 (m, 2H), 3.08-3.05 (t, 2H), 1.28 (s, 9H), 1.19 (t, 3H). LC-MS: 530.40 $[M+H]^+$.
35		^{1}H NMR (400 MHz, DMSO-d_6): δ 12.98 (s, 1H), 7.96 (s,1H), 7.88 (d, 1H), 1.85 (d, 1H), 7.47 (q, 1H), 7.30 (q, 2H), 7.11 (q, 1H), 4.17 (s, 2H), 4.09 (t, 2H), 3.44 (t, 2H), 3.12 (t, 2H), 1.15 (t, 3H). LC-MS: 508.2 $[M+H]^+$.
36		^{1}H NMR (400 MHz, DMSO-d_6): δ 12.90 (s, 1H), 7.95 (s, 1H), 7.86 (d, 1H), 7.74 (d, 1H), 7.48 (s, 1H), 7.40 (t, 1H), 7.33 (d, 1H), 7.28 (d, 1H), 4.16 (s, 2H), 4.06 (t, 2H), 3.35 (m, 2H), 3.09 (t, 2H), 1.12 (t, 3H). LC-MS: 524.30 $[M+H]^+$.
37		^{1}H NMR (400 MHz, CD$_3$OD): δ 7.99 (s, 1H), 7.92 (d, 1H), 7.73-7.71 (m, 1H), 7.68-7.67 (m, 2H), 7.59 (d, 1H), 7.49 (t, 1H), 7.14 (t, 1H), 4.14 (t, 2H), 4.03 (s, 2H), 3.29-3.23 (m, 2H), 3.11 (t, 2H), 1.22

Compound No.	Structure	Characterization data
		(t, 3H). LC-MS: 517.70 [M+H]$^+$.
38		^{1}H NMR (300 MHz, DMSO-d$_6$): δ 12.90 (s, 1H), 7.89 (s, 1H), 7.82 (d, 1H), 7.80-7.72 (m, 2H), 7.70-7.67 (m, 1H), 7.60-7.57 (m, 1H), 7.50-7.38 (m, 2H), 4.01 (s, 3H), 3.84-3.82 (m, 1H), 3.34-3.28 (m, 2H), 3.11 (t, 2H), 1.11 (t, 3H). LC-MS: 490.0 [M+H]$^+$.
39		^{1}H NMR (300 MHz, DMSO- d$_6$): δ 13.0 (s, 1H), 7.73 (d, 2H), 7.58-7.50 (m, 2H), 7.43-7.38 (m, 2H), 4.10 (s, 2H), 3.97-3.85 (m, 2H), 3.49 (q, 2H), 3.17-3.10 (m, 2H), 1.16 (t, 3H). LC-MS: 526.2 [M+H]$^+$.
40		^{1}H NMR (400 MHz, CDCl$_3$): δ 9.5 (s, 1H), 7.75-7.58 (m, 3H), 7.50 (s, 1H), 7.31 (s, 2H), 3.94 (t, 2H), 3.22-3.04 (m, 2H), 1.34 (t, 3H). LC-MS: 542.0 [M+H]$^+$.
41		^{1}H NMR (400 MHz, CDCl$_3$): δ 9.8 (s, 1H), 7.72-7.55 (m, 3H), 7.45 (d, 1H), 7.31-7.22 (m, 3H), 3.94 (d, 4H), 3.24-3.05 (m, 4H), 1.34 (t, 3H). LC-MS: 542.1 [M+H]$^+$.
42		^{1}H NMR (300 MHz, DMSO-d$_6$): δ 12.90 (s, 1H), 7.73-7.70 (m, 2H), 7.60-7.57 (m, 3H), 7.52-7.51 (m, 1H), 7.44-7.38 (m, 2H), 4.03 (s, 3H), 3.85-3.79 (m, 1H), 3.11 (t, 2H). LC-MS: 466.3 [M+H]$^+$.

Compound No.	Structure	Characterization data
43		^{1}H NMR (400 MHz, CDCl$_3$): δ 9.95 (s, 1H), 7.70 (dd, 2H), 7.59 (t, 1H), 7.49 (d, 1H), 7.40 (d, 1H), 7.32-7.25 (m, 2H), 3.98 (t, 2H), 3.88 (s, 2H), 3.29-3.19 (m, 2H), 3.03-3.13 (m, 1H), 1.32 (d, 6H). LC-MS: 522.1 [M+H]$^+$.
44		^{1}H NMR (400 MHz, DMSO-d$_6$): δ 12.9 (s, 1H), 7.91 (s, 1H), 7.81-7.75 (m, 6H), 7.65 (d, 1H), 7.56-7.44 (m, 3H), 4.12 (s, 3H), 3.93-3.90 (m, 1H), 3.45-3.38 (m, 2H), 3.19 (m, 2H), 1.13 (t, 3H). LC-MS: 584.1 [M+H]$^+$.

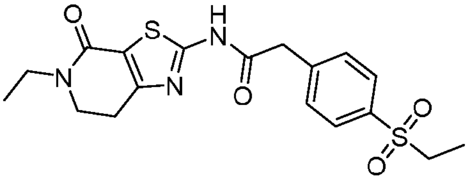
Scheme II(c)



R$_{10}$ is alkyl or arylalkyl

Reagents and conditions: i) HCl(g) in 1,4-dioxane, 1,4-dioxane, RT, 3 h; ii) amyl nitrite, copper(II) bromide, THF, RT, 12 h; iii) appropriate alkyl halide or arylalkyl halide, caesium carbonate, DMF, RT, 12 h; iv) 2-(4-(ethylsulfonyl)phenyl)acetamide, *N*, *N*'-dimethyl ethylenediamine, CuI, K$_3$PO$_4$, 1,4- dioxane, 100 °C, 4 h.

Example 3: Synthesis of N-(5-ethyl-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(ethyl sulfonyl)phenyl)acetamide (Compound-45)



Step i: 2-amino-6,7-dihydrothiazolo[5,4-c]pyridin-4(5H)-one

To a 50 mL round bottom flask, were added tert-butyl 2-amino-4-oxo-6,7-dihydrothiazolo[5,4-c]pyridine-5(4H)-carboxylate [intermediate 4 of scheme II(a)] (0.7 g, 0.0026 mol) and 1,4-dioxane. To the same flask, hydrochloric acid in 1,4-dioxane (10 mL) was added. The reaction mixture was stirred at RT for 3 h. The volatiles were evaporated under reduced pressure to get solid. The solid was washed with diethyl ether to get the title compound [0.4 g, 96 %]. LC-MS: 169.9 $[M+H]^+$.

Step ii: 2-bromo-6,7-dihydrothiazolo[5,4-c]pyridin-4(5H)-one

To a 50 mL round bottom flask, were added 2-amino-6,7-dihydrothiazolo[5,4-c]pyridin-4(5H)-one (0.4 g, 0.0023 mol) and THF (10 mL). To the same flask, amyl nitrite (1.6 mL) and copper (II) bromide (0.4 g) were added. The reaction mixture was stirred at RT for 12 h. The reaction mixture was diluted with ethyl acetate and washed with water. The organic layer was separated, washed with brine and dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to get crude product. The crude product was purified by column chromatography using 60–120 silica gel and 50 % ethyl acetate in hexane to get the title compound [0.2 g, 36 %]. LC-MS: 232.0 $[M+H]^+$.

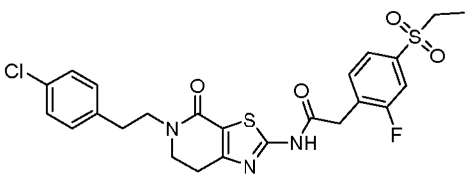
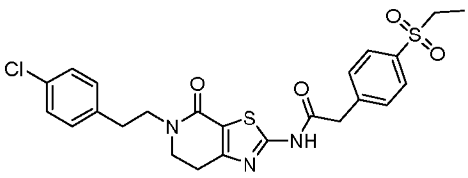
Step iii: 2-bromo-5-ethyl-6,7-dihydrothiazolo[5,4-c]pyridin-4(5H)-one

To a 50 mL round bottom flask, were added 2-bromo-6,7-dihydrothiazolo[5,4-c]pyridin-4(5H)-one (0.2 g, 0.00086 mol) and DMF (10 mL). To the same flask, caesium carbonate (0.7 g, 0.0022 mol) and ethyl iodide (0.272 g, 0.00172 mol) were added. The reaction mixture was stirred at RT for 12 h. The reaction mixture was diluted with ethyl acetate and washed with water. The organic layer was separated, washed with brine and dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to get crude product. The crude product was purified by column chromatography using 60–120 silica gel and 40 % ethyl acetate in hexane to get the title compound [0.1 g, 45 %]. LC-MS: 261.0 $[M+H]^+$.

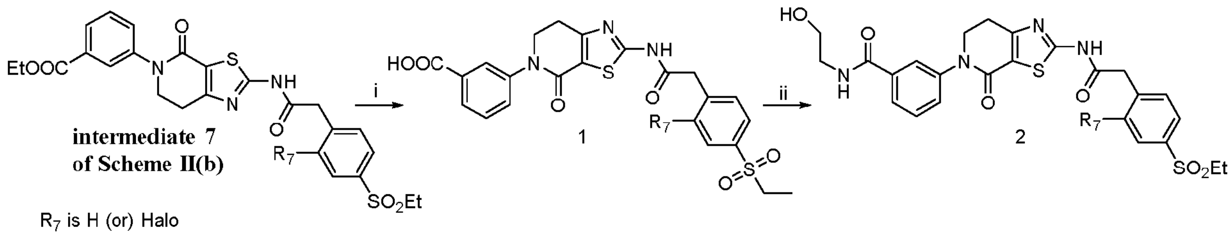
Step iv: N-(5-ethyl-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(ethyl sulfonyl)phenyl)acetamide

To a 25 mL sealed tube, were added 2-bromo-5-ethyl-6,7-dihydrothiazolo[5,4-c]pyridin-4(5H)-one (0.075 g, 0.00029 mol), 2-(4-(ethylsulfonyl)phenyl)acetamide (0.079 g, 0.00034 mol), 1,4-dioxane (7 mL). The reaction mixture was degassed with nitrogen. To the same tube, K_3PO_4 (0.155 g, 0.00019 mol), CuI (0.003 g, 0.000029 mol) and *N,N'*-dimethylethylenediamine (0.003 g, 0.000029 mol) were added. The reaction mixture was again degassed with nitrogen and stirred at 100 °C for 4 h. The reaction mixture was cooled to RT and diluted with ethyl acetate. The organic layer was washed with water and dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to get crude product. The crude product was purified by preparative high performance liquid chromatography using the method: Column- XBRIDGE-C18 (19.0 X 150mm, 5micron), with eluents A=0.1 % trifluoroacetic acid in water and 1B = acetonitrile with the gradient (30 % B at zero min, 40 % B at 2nd min, 80 % B at 8th in a flow rate of 20 mL/min. to get the title compound [0.015 g, 4 %]. ^{1}H NMR (400 MHz, DMSO-d_6, D_2O exchange): δ 7.87 (d, 2H), 7.62 (d, 2H), 3.60–3.55 (m, 3H), 3.39–3.37 (m, 3H), 3.24–3.22 (m, 2H), 2.89–2.86 (m, 2H), 1.10–1.02 (m, 6H); LC-MS: 408.4 $[M+H]^+$.

The compounds listed in below table were prepared by procedure similar to the one described in Example-3 [Scheme II(c)], with appropriate variations in reactants, quantities of reagents, solvents and reaction conditions. The characterization data of the compounds are summarized herein below table.

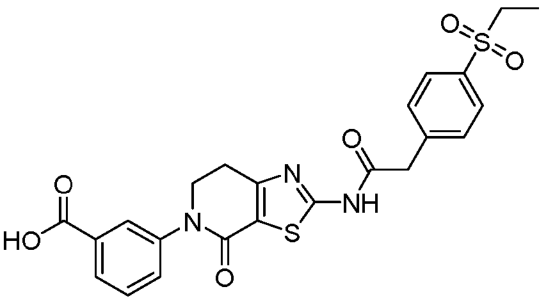
Compound No.	Structure	Characterization data
46		^{1}H NMR (400 MHz, DMSO-d_6): δ 12.9 (s, 1H), 7.74-7.67 (m, 3H), 7.34-7.26 (m, 4H), 4.02 (s, 2H), 3.60-3.52 (m, 4H), 3.39-3.32 (m, 2H), 2.86-2.79 (m, 4H), 1.12 (t, 3H). LC-MS: 536.2 $[M+H]^+$.
47		^{1}H NMR (400 MHz, DMSO-d_6): δ 12.9 (s, 1H), 7.89 (d, 2H), 7.62 (d, 2H), 7.33 (d, 2H), 7.29 (d, 2H), 3.96 (s, 2H), 3.62-3.52 (m, 4H), 3.33-3.29 (m, 2H), 2.90-2.79 (m, 4H), 1.12 (t, 3H). LC-MS: 518.1 $[M+H]^+$.

Scheme II(d)



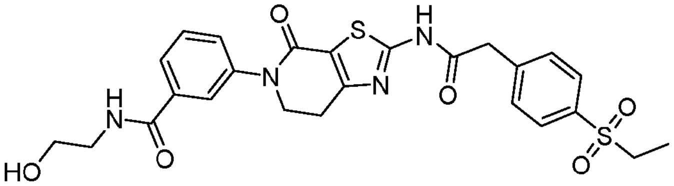
Reagents and conditions: i) Lithium hydroxide monohydrate, ethanol, water, RT, 12 h; ii) 2-aminoethanol, 1-[bis(dimethylamino)methylene]-1H-1,2,3-triazolo[4,5-b]pyridinium 3-oxid hexafluorophosphate [HATU], triethylamine, RT, 12 h.

Example 4: Synthesis of 3-(2-(2-(4-(ethylsulfonyl)phenyl)acetamido)-4-oxo-6,7-dihydrothiazolo[5,4-c]pyridin-5(4H)-yl)benzoic acid (Compound-48)



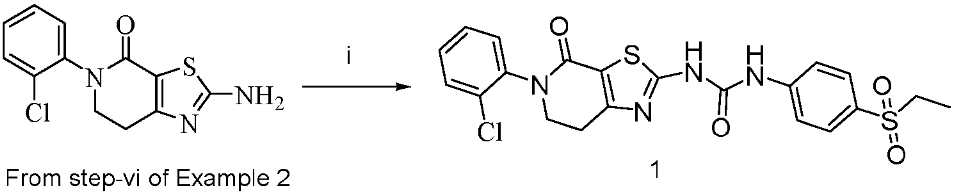
To a 50 mL round bottom flask, were added 3-(2-(2-(4-(ethylsulfonyl)phenyl)acetamido)-4-oxo-6,7-dihydrothiazolo[5,4-c]pyridin-5(4H)-yl)phenyl propionate [according to intermediate 7 of Scheme II(b)] (0.1 g, 0.00019 mol) and ethanol (5 mL). To the same flask, a solution of lithium hydroxide monohydrate (0.03 g, 0.00076 mol) in water (5 mL) was added. The reaction mixture was stirred at RT for 12 h. The volatiles were evaporated under reduced pressure to get residue. The residue was acidified with dil. hydrochloric acid to get the solid. The solid was collected by filtration to get crude product. The crude product was purified by preparative thin layer chromatography using 5 % methanol in chloroform to get the title compound [0.08 g, 84 %]. ^{1}H NMR (400 MHz, DMSO-d$_6$): δ 12.98 (brs, 2H), 7.91–7.79 (m, 4H), 7.62–7.50 (m, 4H), 4.10 (t, 2H), 4.00 (s, 2H), 2.97–3.27 (m, 2H), 3.12 (t, 2H), 1.12 (t, 3H); LC-MS: 498.0 [M-H]$^+$.

Example 5: Synthesis of 3-(2-(2-(4-(ethylsulfonyl)phenyl)acetamido)-4-oxo-6,7-dihydrothiazolo[5,4-c] pyridin-5(4H)-yl)-N-(2-hydroxyethyl)benzamide (Compound-49)



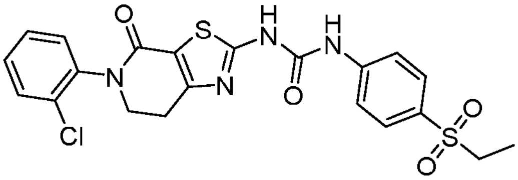
To a 50 mL round bottom flask, were added 3-(2-(2-(4-(ethylsulfonyl)phenyl)acetamido)-4-oxo-6,7-dihydrothiazolo[5,4-c]pyridin-5(4H)-yl)benzoic acid [Compound-48] (0.05 g, 0.0001 mol) and DMF (5 mL). To the same flask, 2-aminoethanol (0.009 g, 0.00015 mol), 1-[bis(dimethylamino)methylene]-1H-1,2,3-triazolo[4,5-b]pyridinium 3-oxid hexafluorophosphate [HATU] (0.057 g, 0.00015 mol) and triethylamine (0.04 mL, 0.0003 mol) were added. The reaction mixture was stirred at RT for 12 h. The reaction mixture was diluted with water and extracted with chloroform. The organic layer was separated, washed with brine and dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to get crude product. The crude product was purified by column chromatography using 60–120 silica gel and 3 % methanol in chloroform to get the title compound [0.015 g, 28 %]. ^{1}H NMR (300 MHz, DMSO-d$_6$): δ 12.98 (brs, 1H), 8.47 (brs, 1H), 7.88–7.70 (m, 4H), 7.63–7.47 (m, 4H), 4.73 (m, 1H), 4.10 (t, 2H), 4.00 (s, 2H), 3.51–3.47 (m, 4H), 3.18–3.10 (m, 4H), 1.12 (t, 3H); LC-MS: 543.0 [M+H]$^+$.

Scheme II(e)



Reagents and conditions: i) 4-(ethylsulfonyl)aniline, triphosgene, triethylamine, THF, 0 °C – RT, 12 h.

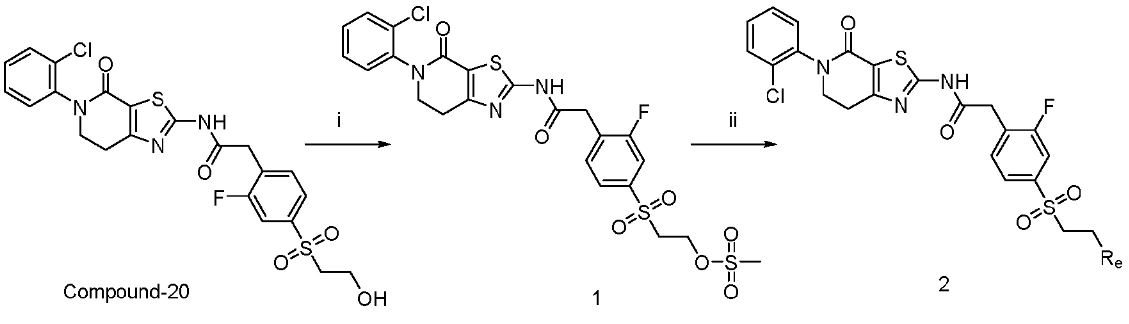
Example 6: Synthesis of 1-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-3-(4-(ethylsulfonyl)phenyl)urea (Compound-50)



To 25 mL round bottom flask, were added 2-amino-5-(2-chlorophenyl)-6,7-dihydrothiazolo[5,4-c]pyridin-4(5H)-one [according to step-vi of Example 2] (0.2 g, 0.00072 mol) and THF (30 mL).

The reaction mixture was cooled to 0 °C. To the same flask, triphosgene (0.212 g, 0.00072 mol) and triethyl amine (0.217 g, 0.00216 mol) were added. The reaction mixture was stirred at RT for 1 h. To the same flask, 4-(ethylsulfonyl)aniline (0.145 g, 0.00078 mol) was added. The resulting reaction mixture was stirred at RT for 12 h. The reaction mixture was diluted with water and extracted with ethyl acetate. The organic layer was separated, washed with brine and dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to get crude product. The crude product was purified by preparative high performance liquid chromatography [Column: XBRIDGE-C18 (19.0 X 150 mm, 5 micron), with eluents A=0.1 % trifluoroacetic acid in water and 1B = acetonitrile with the gradient (30 % B at zero min, 40 % B at 2nd min, 80%B at 8th min in a flow rate of 20 mL/min.] to get the title compound [0.015 g, 4 %]. ^{1}H NMR (400 MHz, DMSO-d_6): δ 11.19 (brs, 1H), 9.59 (brs, 1H), 7.85–7.75 (m, 4H), 7.61–7.38 (m, 4H), 3.99–3.96 (m, 1H), 3.84–3.82 (m, 1H), 3.28–3.21 (m, 2H), 3.12–3.07 (m, 2H), 1.12 (t, 3H); LC-MS: 490.8 $[M+H]^+$.

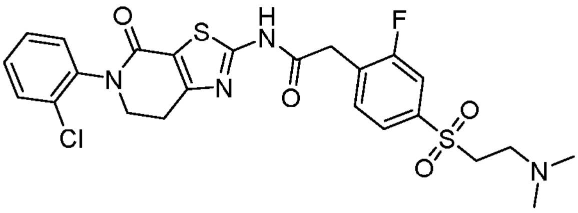
Scheme II(f)



R$_e$ is heterocycloalkyl or -NR$_a$R$_b$;
R$_a$ and R$_b$ are same as defined in formula (I)

Reagents and conditions: i) methanesulfonyl chloride, triethylamine, dichloromethane, RT, 90 min.; ii) appropriate amine, potassium carbonate, DMF, 70 °C, 3 h.

Example 7: Synthesis of N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-((2-(dimethylamino)ethyl)sulfonyl)-2-fluorophenyl)acetamide (Compound-51)



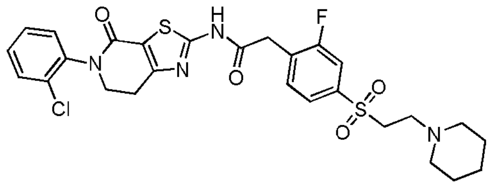
Step i: 2-((4-(2-((5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)amino)-2-oxoethyl)-3-fluorophenyl)sulfonyl)ethyl methanesulfonate

To a 25 mL round bottom flask, were added N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(2-fluoro-4-((2-hydroxyethyl)sulfonyl)phenyl) acetamide (Compound-20) (0.25 g, 0.00048 mol) and dichloromethane (10 mL). To the same flask, triethylamine (0.096 g, 0.00096 mol) and methanesulfonyl chloride (0.082 g, 0.00072 mol) were added. The reaction mixture was stirred at RT under nitrogen atmosphere for 90 min. The reaction mixture was quenched with ice cold water and extracted with dichloromethane. The organic layer was separated, washed with brine and dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to get crude product [0.25 g, 87 %]. The obtained crude product was used in next step without any further purification.

Step ii: N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-((2-(dimethylamino)ethyl)sulfonyl)-2-fluorophenyl)acetamide

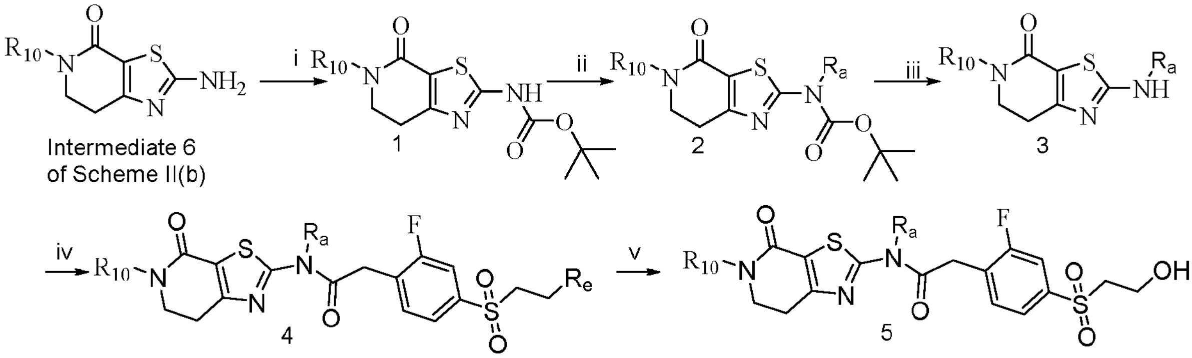
To a 25 mL round bottom flask, were added 2-((4-(2-((5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)amino)-2-oxoethyl)-3-fluorophenyl)sulfonyl)ethyl methane sulfonate (0.15 g, 0.00025 mol) and DMF (10 mL). To the same flask, potassium carbonate (0.103 g, 0.00075 mol) and dimethylamine hydrochloride (0.03 g, 0.00037 mol) were added. The reaction mixture was stirred at 70 ^{o}C for 3 h. The reaction mixture was diluted with water and extracted with ethyl acetate. The organic layer was separated, washed with brine and dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to get crude product. The crude product was purified by column chromatography using 60–120 silica gel and 5 % methanol in chloroform followed by preparative thin layer chromatography using 3 % methanol in chloroform to get the title compound [0.018 g, 13 %]. ^{1}H NMR (300 MHz, $CDCl_3$): δ 7.72–7.66 (m, 2H), 7.59 (t, 1H), 7.48-7.36 (m, 2H), 7.32–7.28 (m, 2H), 3.97–3.95 (m, 4H), 3.33 (t, 2H), 3.24–3.18 (m, 1H), 3.08–3.00 (m, 1H), 2.81 (t, 2H), 2.23 (s, 6H); LC-MS: 551.3 $[M+H]^+$.

Compound 52: Synthesis of N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(2-fluoro-4-((2-(piperidin-1-yl)ethyl)sulfonyl)phenyl)acetamide



This compound was prepared by procedure similar to the one described in Example-7 [Scheme II(f)], with appropriate variations in reactants, quantities of reagents, solvents and reaction conditions. ^{1}H NMR (400 MHz, $CDCl_3$): δ 7.76 (dd, 2H), 7.61 (t, 1H), 7.52 (d, 1H), 7.40 (d, 1H), 7.35-7.28 (m, 2H), 4.02-3.96 (m, 4H), 3.36 (t, 2H), 3.28-3.19 (m, 1H), 3.10-3.02 (m, 1H), 3.80 (t, 2H), 2.31 (s, 4H), 1.45 (t, 3H), 1.37 (t, 3H), 1.28 (t, 1H). LC-MS: 518.1 $[M+H]^+$

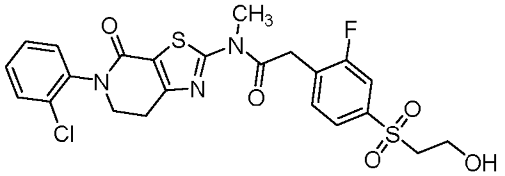
Scheme II(g)



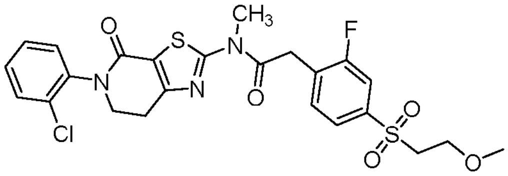
R_a is alkyl;
R_e is -OMe or H;
R_{10} is aryl (e.g. phenyl)

Reagents and conditions: i) Di-*tert*-butyl dicarbonate, 60 % sodium hydride in mineral oil, THF, 0 °C – RT, 5 h; ii) alkyl halide, 60 % sodium hydride in mineral oil, THF, 0 °C – RT, 5 h; iii) trifluoroacetic acid, dichloromethane, RT, 5 h; iv) 2-(2-fluoro-4-((2-methoxyethyl)sulfonyl)phenyl)acetic acid, 1-propanephosphonic acid cyclic anhydride [T_3P] 50 % solution in ethyl acetate, triethylamine, dichloromethane, RT, 5 – 12 h; v) 1.0 M boron tribromide solution in dichloromethane, dichloromethane, 0 °C – RT, 5 h.

Example 8: Synthesis of N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(2-fluoro-4-((2-hydroxyethyl)sulfonyl)phenyl)-N-methylacetamide (Compound-53) and N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(2-fluoro-4-((2-methoxyethyl)sulfonyl)phenyl)-N-methylacetamide (Compound-54)



Compound-53



Compound-54

Step i: *tert*-butyl (5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)carbamate

To a 50 mL round bottom flask, were added 2-amino-5-(2-chlorophenyl)-6,7-dihydrothiazolo[5,4-c]pyridin-4(5H)-one [according to intermediate 6 of Example 2] (0.6 g, 0.002 mol) and THF (20 mL). The reaction mixture was cooled to 0 °C. To the same flask, 60 % sodium hydride in mineral oil (0.078 g, 0.003 mol) was added at 0 °C to get suspension. To this suspension, di-*tert*-butyl dicarbonate (0.703 g, 0.003 mol) was added. The reaction mixture was stirred at RT for 5 h. The reaction mixture was quenched with ice cold water and extracted with ethyl acetate. The organic layer was separated, washed with brine and dried over anhydrous sodium sulfate. The organic layer was evaporated under reduced pressure to get crude product. The crude product was purified by column chromatography using 60–120 silica gel and 30 % ethyl acetate in hexane to get the title compound [0.3 g, 37 %]. LC-MS: 380.0 $[M+H]^+$.

Step ii: *tert*-butyl (5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl) (methyl) carbamate

To a 50 mL round bottom flask, were added tert-butyl (5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)carbamate (0.3 g, 0.0008 mol) and THF (20 mL). The reaction mixture was cooled to 0 °C. To the same flask, 60 % sodium hydride in mineral oil (0.025 g, 0.0009 mol) was added at 0 °C to get suspension. To this suspension, methyl iodide (0.126 g, 0.0009 mol) was added. The reaction mixture was stirred at RT for 5 h. The reaction mixture was quenched with ice cold water and extracted with ethyl acetate. The organic layer was separated, washed with brine, dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to get crude product [0.28 g, 90 %]. The obtained crude product was used in next step without any further purification. LC-MS: 294.2 $[M-100+H]^+$.

Step iii: 5-(2-chlorophenyl)-2-(methylamino)-6,7-dihydrothiazolo[5,4-c]pyridin-4(5H)-one

To a 50 mL round bottom flask, were added tert-butyl (5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)(methyl)carbamate (0.28 g, 0.0007 mol) and dichloromethane (20 mL). To the same flask, trifluoroacetic acid (0.8 mL, 0.007 mol) was added.

The reaction mixture was stirred at RT for 5 h. The reaction mixture was diluted with dichloromethane and washed with saturated aqueous sodium bicarbonate. The organic layer was separated, washed with brine and dried over anhydrous sodium sulfate. The organic layer was evaporated under reduced pressure to get the title compound [0.12 g, 57 %]. ^{1}H NMR (400 MHz, $CDCl_3$): δ 7.50–7.48 (m, 1H), 7.38–7.28 (m, 3H), 5.70 (brs, 1H), 3.93–3.85 (m, 2H), 3.14–3.11 (m, 1H), 3.04 (d, 3H), 3.01–2.98 (m, 1H); LC-MS: 293.9 $[M+H]^+$.

Step iv: N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(2-fluoro-4-((2-methoxyethyl)sulfonyl)phenyl)-N-methylacetamide (Compound-54)

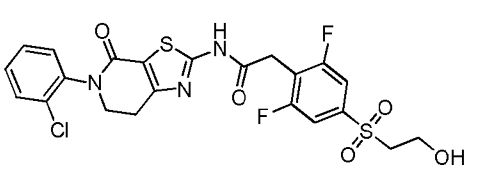
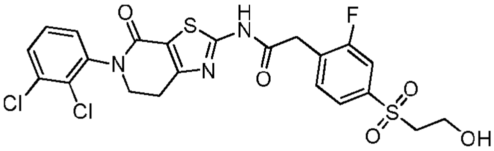
To a 50 mL round bottom flask, were added 5-(2-chlorophenyl)-2-(methylamino)-6,7-dihydrothiazolo[5,4-c]pyridin-4(5H)-one (0.1 g, 0.00034 mol), 2-(2-fluoro-4-((2-methoxyethyl)sulfonyl)phenyl)acetic acid (0.14 g, 0.0005 mol) and dichloromethane (20 mL). To the same flask, propylphosphonic anhydride solution ≥50 wt. % in ethyl acetate (0.54 mL, 0.0017 mol) and triethylamine (0.09 mL, 0.00068 mol) were added. The reaction mixture was stirred at RT for 5 h. The reaction mixture was diluted with dichloromethane and washed with water. The organic layer was separated, washed with brine and dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to get crude product. The crude product was purified by CombiFlash® chromatography using 2 % methanol in chloroform to get the title compound [0.055 g, 29 %]. LC-MS: 552.0 $[M+H]^+$.

Step v: N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(2-fluoro-4-((2-hydroxyethyl)sulfonyl)phenyl)-N-methylacetamide (Compound-53)

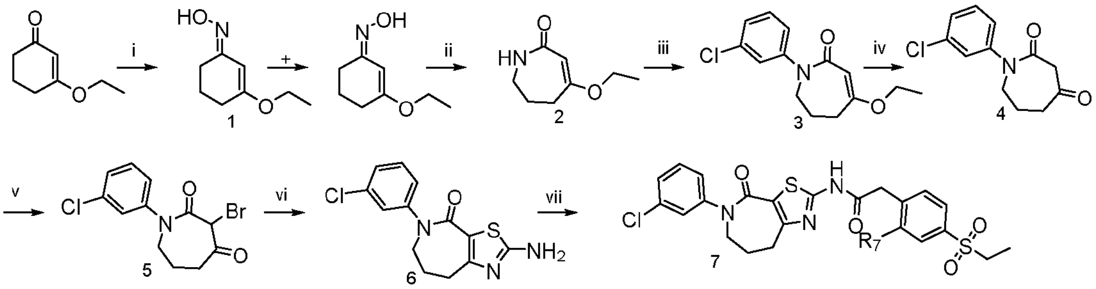
To a 50 mL round bottom flask, were added N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(2-fluoro-4-((2-methoxyethyl)sulfonyl)phenyl)-N-methylacetamide (0.055 g, 0.00009 mol) and dichloromethane (10 mL). The reaction mixture was cooled to 0 °C. To the same flask, 1.0 M boron tribromide solution in methylene chloride (0.5 mL, 0.00049 mol) was added at 0 °C. The reaction mixture was stirred at RT for 5 h. The reaction mixture was quenched with ice cold water and extracted with dichloromethane. The organic layer was separated, washed with brine and dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to get crude product. The crude product was purified by preparative thin layer chromatography using 70 % ethyl acetate in hexane to get the title compound [0.025 g, 47 %]. ^{1}H NMR (300 MHz, $CDCl_3$): δ 7.76–7.68 (m, 2H), 7.61–7.48

(m, 2H), 7.36–7.30 (m, 3H), 4.14 (s, 2H), 4.02–3.92 (m, 4H), 3.86 (s, 3H), 3.40–3.09 (m, 3H), 2.17 (m, 1H); LC-MS: 538.0 $[M+H]^+$.

The compounds listed in below table were prepared by procedure similar to the one described in Example 2 [Scheme II(b)] and Example 8 [Scheme II(g)] with appropriate variations in reactants, quantities of reagents, solvents and reaction conditions. The characterization data characteristics of the compounds are summarized herein below table.

Compound No.	Structure	Characterization data
55		^1H NMR (300 MHz, DMSO-d_6): δ 13.0 (s, 1H), 7.72 (d, 2H), 7.60-7.50 (m, 2H), 7.43-7.38 (m, 2H), 4.99 (t, 1H), 4.07 (s, 2H), 3.97-3.83 (m, 2H), 3.74-3.70 (m, 2H), 3.63-3.59 (m, 2H), 3.17-3.10 (m, 2H). LC-MS: 542.0 $[M+H]^+$.
56		^1H NMR (400 MHz, $CDCl_3$): δ 9.87 (s, 1H), 7.77 (d, 1H), 7.70 (d, 1H), 7.63 (t, 1H), 7.49 (d, 1H), 7.29-7.26 (m, 3H), 4.08 (t, 2H), 3.93 (s, 3H), 3.40-3.37 (m, 3H), 3.29-3.20 (m, 1H), 3.12-3.05 (m, 1H), 3.02-2.98 (s, 1H). LC-MS: 557.9 $[M+H]^+$.

Scheme II(h)

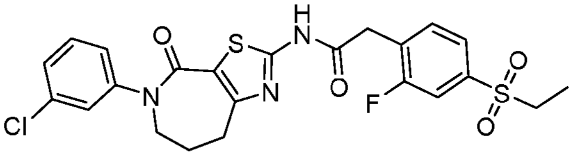


R_7 is H or F

Reagents and conditions: i) Hydroxylamine hydrochloride, ethanol, 100 °C, 2 h; ii) *p*-toluenesulfonyl chloride, triethylamine, anhydrous THF, 0 – 5 °C, 1 h; iii) 1-bromo-3-

chlorobenzene, K_2CO_3, CuI, *N,N'*-dimethylethylene diamine, 1, 4-dioxane, 140 °C, 12 h; iv) conc. hydrochloric acid, ethanol, water, 50 °C, 3 h; v) *NBS*, dichloromethane, 0°C - RT, 2h; vi) thiourea, sodium bicarbonate, ethanol, 80 °C, 2.5 h; vii) 2-(4-(ethylsulfonyl)-2-fluorophenyl)acetic acid (or) 2-(4-(ethylsulfonyl)phenyl)acetic acid, 1-propanephosphonic acid cyclic anhydride 50 % solution[T_3P] in ethyl acetate, triethylamine, dichloromethane, RT, 12 h (or) EDCI.HCl, HOBt, dichloromethane, RT, 12 h.

Example 9: Synthesis of N-(5-(3-chlorophenyl)-4-oxo-5,6,7,8-tetrahydro-4H-thiazolo[5,4-c]azepin-2-yl)-2-(4-(ethylsulfonyl)-2-fluorophenyl)acetamide (Compound-57)



Step i: 3-ethoxycyclohex-2-enone oxime

To a 100 mL round bottom flask, were added 3-ethoxycyclohex-2-enone (5 g, 0.036 mol), hydroxylamine hydrochloride (2.7 g, 0.0392 mol) and ethanol (50 mL). The reaction mixture was stirred at 100 °C for 2 h. The volatiles were evaporated under reduced pressure to get residue. The residue was dissolved in water and basified with aqueous potassium carbonate. The aqueous layer was extracted with diethyl ether. The organic layer was separated, washed with brine and dried over anhydrous sodium sulphate. The solvent was evaporated under reduced pressure to get residue. The residue was triturated with hexane to get solid. The solid was collected by filtration to get the title compound [2.5 g, 56 %]. ^1H NMR (300 MHz, $CDCl_3$): δ 5.94 (s, 1H), 3.95 (q, 2H), 2.35–2.28 (m, 4H), 1.89–1.78 (m, 2H), 1.36 (t, 3H); LC-MS: 156.2 $[M+H]^+$.

Step ii: 4-ethoxy-6,7-dihydro-1H-azepin-2(5H)-one

To a 250 mL round bottom flask, were added 3-ethoxycyclohex-2-enone oxime (2.2 g, 0.0142 mol) and anhydrous THF (55 mL). The reaction mixture was cooled to 0 – 5 °C. To the same flask, *p*-toluenesulfonyl chloride (3.3 g, 0.0173 mol) and triethylamine (5.5 mL, 0.0395 mol) were added. The reaction mixture was stirred at 0 – 5 °C for 1 h. The reaction mixture was quenched with 10 % aqueous potassium carbonate. The volatiles were evaporated under reduced pressure to get residue. The residue was neutralized with 1.0 N aqueous hydrochloric acid and extracted with dichloromethane. The solvent was evaporated under reduced pressure to get crude product. The crude product was purified by flash column chromatography using 0-1 % methanol in chloroform to obtain the title compound [0.6 g, 27 %]. ^{1}H NMR (400 MHz, $CDCl_3$): δ 6.20 (brs, 1H), 5.08 (d, 1H), 3.83 (q, 2H), 3.26–3.22 (m, 2H), 2.52 (t, 2H), 1.98–1.95 (m, 2H), 1.34 (t, 3H); LC-MS: 156.1 $[M+H]^+$.

Step iii: 1-(3-chlorophenyl)-4-ethoxy-6,7-dihydro-1H-azepin-2(5H)-one

To a 25 mL sealed tube, were added 4-ethoxy-6,7-dihydro-1H-azepin-2(5H)-one (0.55 g, 0.0035 mol), 1-bromo-3-chlorobenzene (1 g, 0.0053 mol) and 1, 4-dioxane (10 mL). The reaction mixture was degassed with nitrogen. To this K_2CO_3 (1.5 g, 0.0106 mol), CuI (0.07 g, 0.00035 mol), and *N,N'*-dimethylethylenediamine (0.016 g, 0.00018 mol) were added. The reaction mixture was stirred at 140 °C for 12 h. The reaction mixture was cooled to RT and diluted with ethyl acetate. The organic layer was washed with water and dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to get crude product. The crude product was purified by flash column chromatography using 10-30 % ethyl acetate in hexane to get the title compound [0.45 g, 48 %]. ^{1}H NMR (300 MHz, $CDCl_3$): δ 7.30–7.20 (m, 4H), 5.19 (s, 1H), 3.86–3.75 (m, 4H), 2.60 (t, 2H), 2.13–2.09 (m, 2H), 1.39 (t, 3H); LC-MS: 266.2 $[M+H]^+$.

Step iv: 1-(3-chlorophenyl)azepane-2,4-dione

To a 25 mL round bottom flask, were added 1-(3-chlorophenyl)-4-ethoxy-6,7-dihydro-1H-azepin-2(5H)-one (0.4 g, 0.0015 mol), ethanol (6 mL), water (6 mL) and conc. hydrochloric acid (2 mL). The reaction mixture was stirred at 50 °C for 3 h. The reaction mixture poured onto ice cold water and neutralized with 10 % aqueous potassium carbonate. The aqueous layer was extracted with ethyl acetate. The organic layer was separated, washed with water and dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to get crude product [0.305 g, 85 %]. ^{1}H NMR (300 MHz, $CDCl_3$): δ 7.35–7.15 (m, 4H), 3.99 (t, 2H), 3.73 (s, 2H), 2.81 (t, 2H), 2.21–2.71 (m, 2H); LC-MS: 238.0 $[M+H]^+$.

Step v: 3-bromo-1-(3-chlorophenyl)azepane-2,4-dione

The process of this step was adopted from step v of Example 2. LC-MS: 317.9 $[M+2H]^+$.

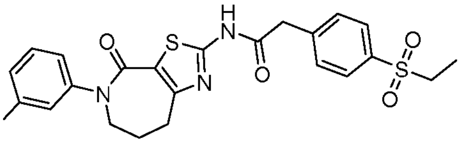
Step vi: 2-amino-5-(3-chlorophenyl)-5,6,7,8-tetrahydro-4H-thiazolo[5,4-c]azepin-4-one

The process of this step was adopted from step vi of Example 2. ^{1}H NMR (300 MHz, DMSO-d_6): δ 7.50–7.24 (m, 6H), 3.78 (m, 2H), 2.83 (m, 2H), 2.09 (m, 2H); LC-MS: 294.0 $[M+H]^+$.

Step vii: N-(5-(3-chlorophenyl)-4-oxo-5,6,7,8-tetrahydro-4H-thiazolo[5,4-c]azepin-2-yl)-2-(4-(ethylsulfonyl)-2-fluorophenyl)acetamide

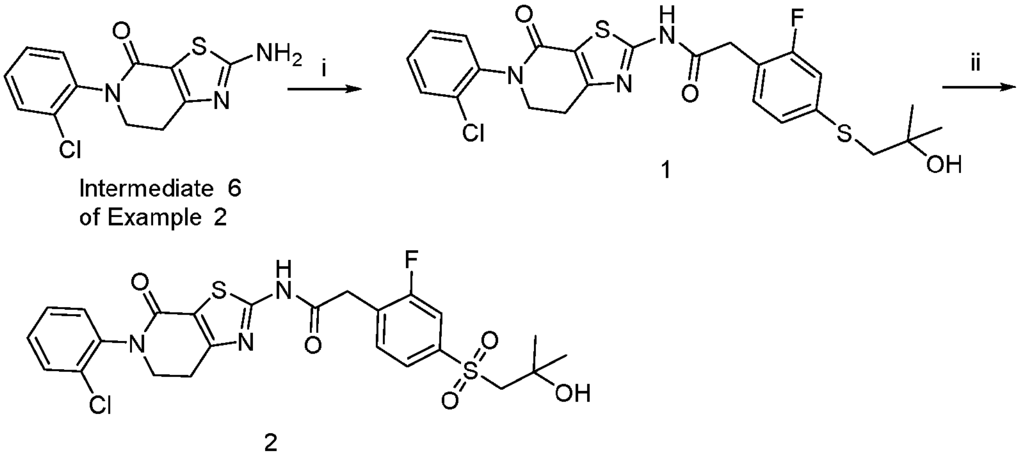
The process of this step was adopted from step vii of example 2. ^{1}H NMR (300 MHz, DMSO-d$_6$): δ 12.68 (brs, 1H), 7.76–7.69 (m, 3H), 7.46–7.41 (m, 2H), 7.35 (d, 1H), 7.30 (d, 1H), 4.03 (s, 2H), 3.85 -3.83 (m, 2H), 3.40 (q, 2H), 3.06 (t, , 2H), 2.22–2.17 (m, 2H), 1.14 (t, 3H); LC-MS: 522.0 [M+H]$^+$.

Compound 58: Synthesis of N-(5-(3-chlorophenyl)-4-oxo-5,6,7,8-tetrahydro-4H-thiazolo[5,4-c]azepin-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide



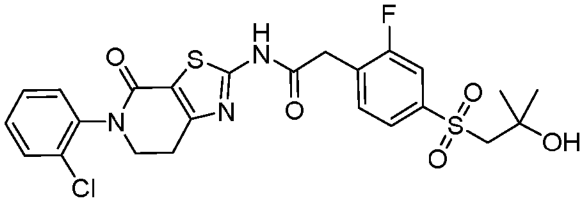
This compound was prepared by procedure similar to the one described in Example-9 [Scheme II(h)] with appropriate variations in reactants, quantities of reagents, solvents and reaction conditions. ^{1}H NMR (400 MHz, DMSO-d$_6$): δ 12.60 (brs,1H), 7.87 (d, 2H), 7.61 (d, 2H), 7.43 (d, 2H), 7.33 (d, 1H), 7.29 (d, 1H), 3.95 (s, 2H), 3.89-3.63 (m, 2H), 3.29 (q, 2H), 3.03 (t, 2H), 2.19-2.12 (m, 2H), 1.11 (t, 3H). LC-MS: 504.0 [M+H]$^+$.

Scheme II(i)



Reagents and conditions: i) 2-(2-Fluoro-4-((2-hydroxy-2-methylpropyl)thio)phenyl)acetic acid, 1-propanephosphonic acid cyclic anhydride 50 % solution[T$_3$P] in ethyl acetate, triethylamine, dichloromethane, RT, 2 h; ii) *m*-chloroperbenzoic acid, dichloromethane, RT, 12 h.

Example 10: Synthesis of N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(2-fluoro-4-((2-hydroxy-2-methylpropyl)sulfonyl)phenyl)acetamide (Compound-59)



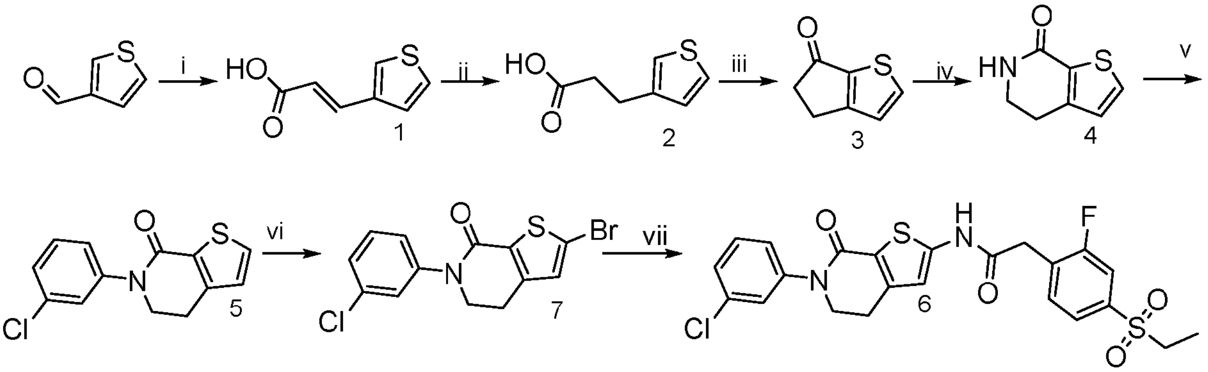
Step i: N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(2-fluoro-4-((2-hydroxy-2-methylpropyl)thio)phenyl)acetamide

To a 25 mL round bottom flask, were added 2-amino-5-(2-chlorophenyl)-6,7-dihydrothiazolo[5,4-c]pyridin-4(5H)-one [intermediate 6 of Example 2] (0.15 g, 0.00053 mol), 2-(2-fluoro-4-((2-hydroxy-2-methylpropyl)thio)phenyl)acetic acid (0.166 g, 0.00064 mol) and dichloromethane (20 mL). To the same flask, propylphosphonic anhydride solution ≥50 wt. % in ethyl acetate (1.6 mL, 0.00268 mol) and triethylamine (0.22 mL, 0.00161 mol) were added. The reaction mixture was stirred under nitrogen atmosphere at RT for 2 h. The reaction mixture was diluted with dichloromethane and washed with water. The organic layer was separated, washed with saturated aqueous sodium bicarbonate followed by brine and dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to get crude product. The crude product was purified by column chromatography using 60–120 silica gel and 50–60 % ethyl acetate in hexane to get the title compound [0.13 g, 47 %]. LC-MS: 520.1 $[M+H]^+$.

Step ii: N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(2-fluoro-4-((2-hydroxy-2-methylpropyl)sulfonyl)phenyl)acetamide

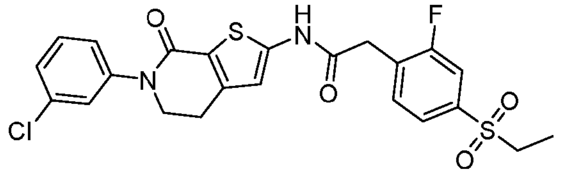
To a 50 mL round bottom flask, were added N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(2-fluoro-4-((2-hydroxy-2-methylpropyl)thio)phenyl) acetamide (0.13 g, 0.00025 mol) and dichloromethane (20 mL). To the same flask, *m*-chloroperbenzoic acid (0.129 g, 0.00075 mol) was added. The reaction mixture was stirred under nitrogen atmosphere at RT for 12 h. The reaction mixture was filtered through a pad of celite®. The filtrate was washed with water followed by brine and dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to get crude product. The crude product was purified by column chromatography using 60–120 silica gel and 50–60 % ethyl acetate in hexane to obtain the title compound [0.05 g, 36 %]. ^{1}H NMR (300 MHz, $CDCl_3$): δ 9.54 (brs, 1H), 7.77–7.69 (m, 2H), 7.68–7.48 (m, 2H), 7.40–7.28 (m, 3H), 3.99–3.92 (m, 4H), 3.57 (s, 1H), 3.34 (s, 2H), 3.24 – 3.21 (m, 1H), 3.10 – 3.06 (m, 1H), 1.48 (s, 6H); LC-MS: 552.1 $[M+H]^+$.

Scheme II(j)



Reagents and conditions: i) Malonic acid, pyridine, 100 °C, 2 h; ii) 10 % Pd/C, acetic acid, methanol, 50 °C, 2 h; iii) phosphorous pentoxide, methanesulfonic acid, RT, 1 h; iv) (a) hydroxylamine hydrochloride, sodium acetate, methanol, RT 12 h (b) polyphosphoric acid, 130 °C, 30 min.; v) 1-bromo-3-chlorobenzene, K_2CO_3, CuI, *N,N'*-dimethylethylene diamine, 1, 4-dioxane, 140 °C, 12 h; vi) bromine, acetic acid, water, 0 °C – RT, 1 h; vii) 2-(4-(ethylsulfonyl)-2-fluorophenyl)acetamide, Xantphos, tris(dibenzylideneacetone)dipalladium(0), Cs_2CO_3, 1,4-dioxane, 120 °C, 12 h.

Example 11: Synthesis of N-(6-(3-chlorophenyl)-7-oxo-4,5,6,7-tetrahydrothieno[2,3-c]pyridin-2-yl)-2-(4-(ethylsulfonyl)-2-fluorophenyl)acetamide (Compound-60)



Step i: 3-(thiophen-3-yl)acrylic acid

To a 50 mL round bottom flask, were added thiophene-3-carboxaldehyde (5 g, 0.0446 mol), malonic acid (6.5 g, 0.0624 mol) and pyridine (6 mL). The reaction mixture was stirred at 100 °C for 2 h. The reaction mixture was quenched with ice cold water and acidified with conc. hydrochloric acid to get solid. The solid was collected by filtration, washed with water and hexane to get the title compound [6.5 g, 96 %]. ^{1}H NMR (400 MHz, DMSO-d_6): 12.30 (brs, 1H), 7.94 (d, 1H), 7.62–7.53 (m, 3H), 6.38 (d, 1H).

Step ii: 3-(thiophen-3-yl)propanoic acid

A stainless autoclave vessel was charged with 3-(thiophen-3-yl)acrylic acid (2 g, 0.013 mol), acetic acid (12 mL) and methanol (24 mL). The autoclave vessel was degassed with nitrogen for 5 min and 10 % Pd/C (1 g) was added to this. The vessel was flushed with H_2 and stirred at 50 °C for 12 h. The reaction mixture was filtered through a pad of celite®. The filtrate was poured onto ice cold water and extracted with ethyl acetate. The organic layer was separated, washed with brine and dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to get crude product [1.5 g, 75 %]. ^{1}H NMR (300 MHz, $CDCl_3$): δ 7.29–7.26 (m, 1H), 7.01–6.96 (m, 2H), 3.02 (t, 2H), 2.73 (t, 2H).

Step iii: 4H-cyclopenta[b]thiophen-6(5H)-one

To a 50 mL round bottom flask, were added phosphorous pentoxide (8.5 g, 0.0299 mol) and methanesulfonic acid (17 mL). To the same flask, 3-(thiophen-3-yl)propanoic acid (0.85 g, 0.0054 mol) was added. The reaction mixture was stirred at RT for 1 h. The reaction mixture was quenched with ice cold water and extracted with ethyl acetate. The organic layer was separated, washed with brine, dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to get crude product. The crude product was purified by flash column chromatography using 30 % ethyl acetate in hexane to get the title compound [0.41 g, 55 %]. LC-MS: 139.1 $[M+H]^+$.

Step iv: 5,6-dihydrothieno[2,3-c]pyridin-7(4H)-one

To a 100 mL round bottom flask, were added 4H-cyclopenta[b]thiophen-6(5H)-one (0.4 g, 0.0029 mol) and methanol (30 mL). To the same flask, hydroxylamine hydrochloride (0.22 g, 0.003 mol) and sodium acetate (1.4 g, 0.017 mol) were added. The reaction mixture was stirred at RT for 12 h. The volatiles were evaporated under reduced pressure to get residue. The residue was stirred with ethyl acetate and filtered through a pad of silica gel. The filtrate was evaporated under reduced pressure to get residue. The residue was treated with polyphosphoric acid (18 g) at 130 °C for 30 min, with occasional stirring. The reaction mixture was cooled to RT, poured onto ice cold water and extracted with dichloromethane. The organic layer was separated, washed with aqueous 0.1 M sodium hydroxide followed by brine and dried over anhydrous sodium sulfate. The organic layer was evaporated under reduced pressure to get crude product [0.25 g, 57 %]. The crude product was used in next step without any further purification. LC-MS: 154.0 $[M+H]^+$.

Step v: 6-(3-chlorophenyl)-5,6-dihydrothieno[2,3-c]pyridin-7(4H)-one

To a 25 mL sealed tube, were added 5,6-dihydrothieno[2,3-c]pyridin-7(4H)-one (0.25 g, 0.0016 mol), 1-bromo-3-chlorobenzene (0.47 g, 0.0025 mol) and 1, 4-dioxane (10 mL). The reaction mixture was degassed with nitrogen. To the same sealed tube, K_2CO_3 (0.451 g, 0.0033 mol), CuI

(0.012 g, 0.000065 mol), and *N,N'*-dimethylethylenediamine (0.003 g, 0.000032 mol) were added. The reaction mixture was stirred at 140 °C for 12 h. The reaction mixture was cooled to RT and diluted with ethyl acetate. The organic layer was washed with water and dried over anhydrous sodium sulphate. The solvent was evaporated under reduced pressure to get crude product. The crude product was purified by column chromatography using 60–120 silica gel and 0-30 % ethyl acetate in hexane to get the title compound [0.2 g, 47 %]. ^{1}H NMR (300 MHz, $CDCl_3$): δ 7.55 (d, 1H), 7.39–7.20 (m, 4H), 6.98 (d, 1H), 4.07 (t, 2H), 3.10 (t, 2H); LC-MS: 264.0 $[M+H]^+$.

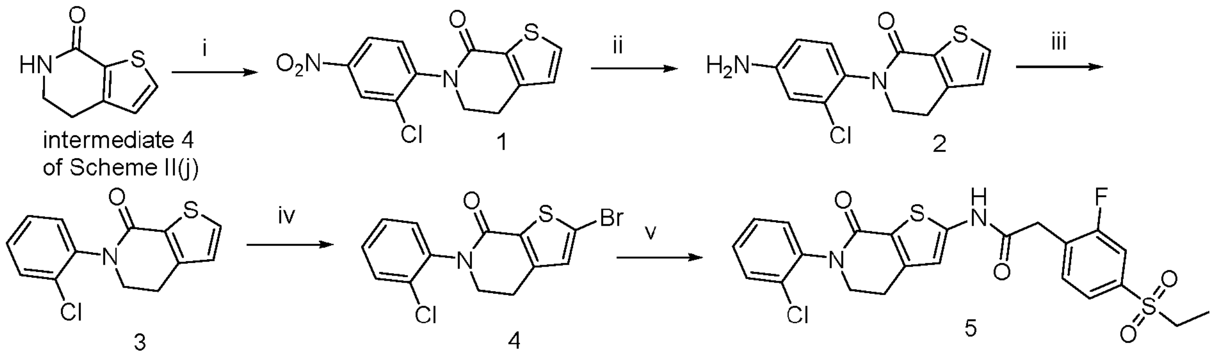
Step vi: 2-bromo-6-(3-chlorophenyl)-5,6-dihydrothieno[2,3-c]pyridin-7(4H)-one

To a 25 mL round bottom flask, were added 6-(3-chlorophenyl)-5,6-dihydrothieno[2,3-c]pyridin-7(4H)-one (0.2 g, 0.00076 mol), acetic acid (10 mL) and water (1 mL). The reaction mixture was cooled to 0 °C. To the same flask, bromine (0.134 g, 0.00084 mol) was added. The reaction mixture was stirred at RT for 1 h. The reaction mixture was diluted with water to get solid. The solid was collected by filtration and dried under vacuum to get the title compound [0.15 g, 58 %]. LC-MS: 343.9 $[M+2H]^+$.

Step vii: N-(6-(3-chlorophenyl)-7-oxo-4,5,6,7-tetrahydrothieno[2,3-c]pyridin-2-yl)-2-(4-(ethylsulfonyl)-2-fluorophenyl)acetamide

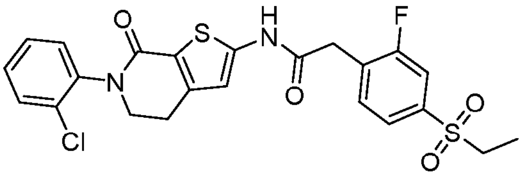
A 25 mL sealed tube was charged with 2-bromo-6-(3-chlorophenyl)-5,6-dihydrothieno[2,3-c]pyridin-7(4H)-one (0.075 g, 0.00022 mol), 2-(4-(ethylsulfonyl)-2-fluorophenyl)acetamide (0.064 g, 0.00026 mol) and 1, 4-dioxane (10 mL). To the same tube, Cs_2CO_3 (0.1g, 0.00032 mol), Xantphos (0.019 g, 0.00003 mol), and tris(dibenzylideneacetone)dipalladium(0) (0.01 g, 0.00001 mol) were added. The reaction mixture was degassed with nitrogen. The reaction mixture was stirred at 120 °C for 12 h. The reaction mixture was cooled to RT and diluted with ethyl acetate. The organic layer was washed with water. The organic layer was separated and dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to get crude product. The crude product was purified by preparative thin layer chromatography using 1 % methanol in chloroform to get the title compound [0.003 g, 3 %]. ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.36 (d, 1H), 7.81 (brs, 1H), 7.75–7.63 (m, 3H), 7.56–7.48 (m, 2H), 7.25-7.24 (m, 1H), 6.98 (d, 1H), 4.04 (t, 2H), 3.91 (s, 2H), 3.17 (q, 2H), 3.10 (t, 2H), 1.33 (t, 3H); LC-MS: 507.1 $[M+H]^+$.

Scheme II(k)



Reagents and conditions: i) 2-chloro-1-fluoro-4-nitrobenzene, 60 % sodium hydride in mineral oil, THF, RT, 2.5 h; ii) stannous chloride dihydrate, EtOH, 70 °C, 2 h; iii) isoamyl nitrite, DMF, 60 °C, 1 h; iv) bromine, acetic acid, water, RT, 3 h; v) 2-(4-(ethylsulfonyl)-2-fluorophenyl) acetamide, K_3PO_4, CuI, and *N,N'*-dimethylethylene diamine, 1,4-dioxane, 90 °C, 3 h.

Example 12: N-(6-(2-chlorophenyl)-7-oxo-4,5,6,7-tetrahydrothieno[2,3-c]pyridin-2-yl)-2-(4-(ethylsulfonyl)-2-fluorophenyl)acetamide (Compound-61)



Step i: 6-(2-chloro-4-nitrophenyl)-5,6-dihydrothieno[2,3-c]pyridin-7(4H)-one

To a 25 mL round bottom flask, were added 60 % sodium hydride in mineral oil (0.163 g, 0.0041 mol) and THF (10 mL). To the same flask, 5,6-dihydrothieno[2,3-c]pyridin-7(4H)-one [according to intermediate 4 of Scheme II(j)] (0.25 g, 0.0016 mol) was added. The resulting reaction mixture was stirred at RT for 30 min. To the same flask, 2-chloro-1-fluoro-4-nitrobenzene (0.313 g, 0.0018 mol) was added. The reaction mixture was stirred at RT for 2.5 h. The reaction mixture was quenched with ice cold water and extracted with ethyl acetate. The organic layer was separated, washed with brine and dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to get crude product. The crude product was purified by column chromatography using 60–120 silica gel and 30 % ethyl acetate in hexane to get the title compound [0.35g, 70 %]. LC-MS: 309.0 $[M+3H]^+$.

Step ii:6-(4-amino-2-chlorophenyl)-5,6-dihydrothieno[2,3-c]pyridin-7(4H)-one

To a 25 mL round bottom flask, were added 6-(2-chloro-4-nitrophenyl)-5,6-dihydrothieno[2,3-c]pyridin-7(4H)-one (0.35 g, 0.0011 mol) and ethanol (10 mL). To the same flask, stannous chloride dihydrate (1.27 g, 0.0055 mol) was added. The reaction mixture was stirred at 75 °C for 2 h. The volatiles were evaporated under reduced pressure to get residue. The residue was basified with saturated aqueous sodium bicarbonate and filtered through a pad of celite®. The filtrate was extracted with ethyl acetate. The organic layer was separated, washed with brine and dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to get crude product. The crude product was purified by column chromatography using 60–120 silica gel and 50 % ethyl acetate in hexane to get the title compound [0.27 g, 84 %]. LC-MS: 279.2 $[M+3H]^+$.

Step iii: 6-(2-chlorophenyl)-5,6-dihydrothieno[2,3-c]pyridin-7(4H)-one

To a 25 mL round bottom flask, were added 6-(4-amino-2-chlorophenyl)-5,6-dihydrothieno[2,3-c]pyridin-7(4H)-one (0.27 g, 0.00097 mol) and DMF (5 mL). The reaction mixture was stirred at 60 °C. To the same flask, isoamyl nitrite (0.227 g, 0.00194 mol) was added. The reaction mixture was stirred at 60 °C for 1 h. The reaction mixture was poured onto ice cold water and extracted with ethyl acetate. The organic layer was separated, washed with brine and dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to get crude product. The crude product was purified by column chromatography using 60–120 silica gel and 20 % ethyl acetate in hexane to get the title compound [0.225 g, 88 %]. ^{1}H NMR (300 MHz, $CDCl_3$): δ 7.55–7.49 (m, 2H), 7.41–7.28 (m, 2H), 6.99 (d, 2H), 3.97–3.90 (m, 2H), 3.21–3.18 (m, 1H), 3.09–3.05 (m, 1H); LC-MS: 264.2 $[M+H]^+$.

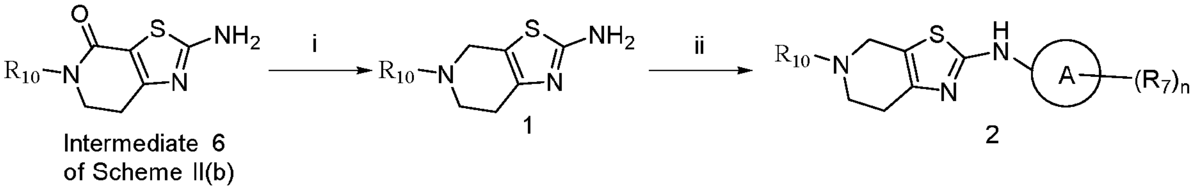
Step iv: 2-bromo-6-(2-chlorophenyl)-5,6-dihydrothieno[2,3-c]pyridin-7(4H)-one

To a 25 mL round bottom flask, were added 6-(2-chlorophenyl)-5,6-dihydrothieno[2,3-c]pyridin-7(4H)-one (0.22 g, 0.00084 mol), acetic acid (5 mL) and water (2 mL). The reaction mixture was cooled to 0 °C. To the same flask, bromine (0.133 g, 0.00084 mol) was added. The reaction mixture was stirred at RT for 3 h. The volatiles were evaporated under reduced pressure to get residue. The residue was dissolved in ethyl acetate and washed with water. The organic layer was separated, washed with brine and dried over anhydrous sodium sulphate. The solvent was evaporated under reduced pressure to get crude product. The crude product was purified by column chromatography using 60–120 silica gel and 20 % ethyl acetate in hexane to obtain the title compound [0.18 g, 63 %]. ^{1}H NMR (300 MHz, $CDCl_3$): δ 7.50–7.47 (m, 1H), 7.38–7.27 (m, 3H), 6.96 (s, 1H), 3.94–3.87 (m, 2H), 3.15–3.10 (m, 1H), 3.02–2.98 (m, 1H); LC-MS: 343.7 $[M+3H]^+$.

Step v: N-(6-(2-chlorophenyl)-7-oxo-4,5,6,7-tetrahydrothieno[2,3-c]pyridin-2-yl)-2-(4-(ethylsulfonyl)-2-fluorophenyl)acetamide

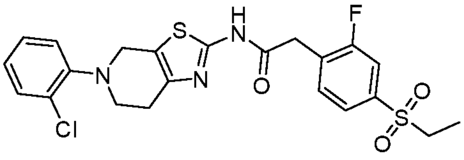
A 25 mL sealed tube was charged with 2-bromo-6-(2-chlorophenyl)-5,6-dihydrothieno[2,3-c]pyridin-7(4H)-one (0.075 g, 0.00022 mol), 2-(4-(ethylsulfonyl)-2-fluorophenyl)acetamide (0.065 g, 0.00026 mol) and 1, 4-dioxane (7 mL). To the same sealed tube, K_3PO_4 (0.117g, 0.00055 mol), CuI (0.008 g, 0.000044 mol), and *N,N'*-dimethylethylenediamine (0.001 g, 0.000022 mol) were added. The reaction mixture was degassed with nitrogen. The reaction mixture was stirred at 90 °C for 3 h. The reaction mixture was cooled to RT and diluted with ethyl acetate. The organic layer was washed with water and dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to get crude product. The crude product was purified by preparative thin layer chromatography using 60–120 silica gel and 50 % ethyl acetate in hexane to get the title compound [0.015 g, 14 %]. ^1H NMR (300 MHz, DMSO-d_6): δ 11.91 (brs, 1H), 7.74–7.66 (m, 3H), 7.56–7.48 (m, 1H), 7.48–7.45 (m, 1H), 7.41–7.34 (m, 2H), 6.66 (s, 1H), 3.95 (s, 2H), 3.91–3.84 (m, 1H), 3.77–3.73 (m, 1H), 3.44-3.3.36 (m, 2H), 3.19 (t, 2H), 1.12 (t, 3H); LC-MS: 507.1 $[M+H]^+$.

Scheme II(l)



Reagents and conditions: i) Lithium aluminum hydride, THF, 50 °C, 6 h; ii) appropriate acid, EDCI.HCl, HOBt, DCM, RT, 12 h (or) appropriate acid, 1-propanephosphonic acid cyclic anhydride 50 % solution [T_3P] in ethyl acetate, triethyl amine, dichloromethane, RT, 2 – 10 h.

Example 13: N-(5-(2-chlorophenyl)-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(ethylsulfonyl)-2-fluorophenyl)acetamide (Compound-62)



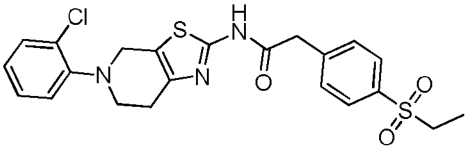
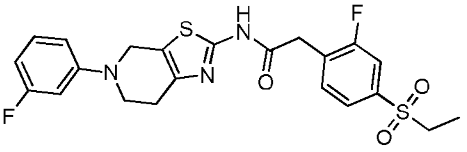
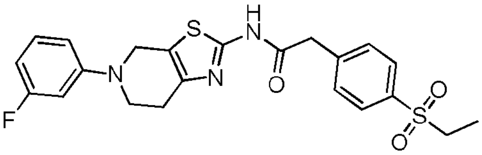
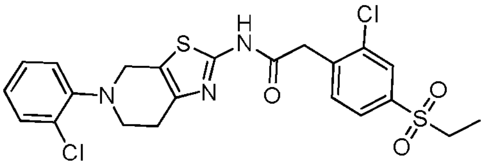
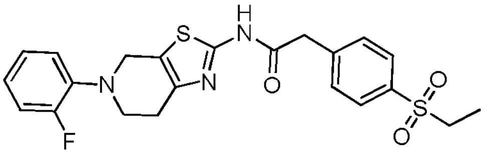
Step i: 5-(2-chlorophenyl)-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-amine

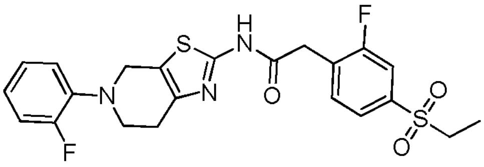
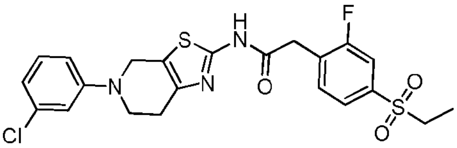
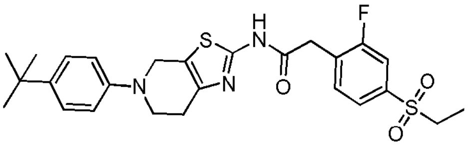
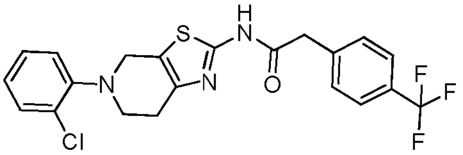
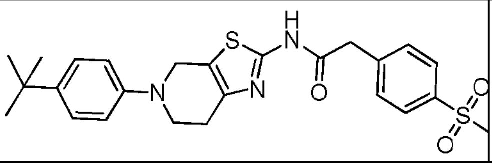
To a 100 mL round bottom flask, were added lithium aluminum hydride (0.258 g, 0.0072 mol) and THF (50 mL). To the same flask, 2-amino-5-(2-chlorophenyl)-6,7-dihydrothiazolo[5,4-c]pyridin-4(5H)-one [according to intermediate-6 of example 2] (0.5 g, 0.0018 mol) was added. The reaction mixture was stirred at 50 °C for 6 h. The reaction mixture was cooled to 0 °C and quenched with saturated aqueous ammonium chloride. The reaction mixture was filtered through a pad of celite. The filtrate was extracted with ethyl acetate. The organic layer was washed with brine and dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to get crude product. The crude product was purified by column chromatography using 60–120 silica gel and 50 % ethyl acetate in hexane to obtain the title compound [0.15 g, 32 %]. LC-MS: 266.0 $[M+H]^+$.

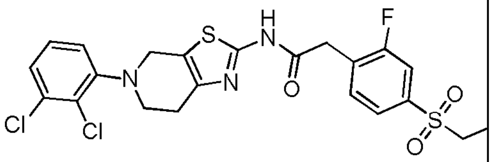
Step ii: N-(5-(2-chlorophenyl)-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(ethyl sulfonyl)-2-fluorophenyl)acetamide

To a 50 mL round bottom flask, were added 5-(2-chlorophenyl)-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-amine (0.2 g, 0.00075 mol), 2-(4-(ethylsulfonyl)-2-fluorophenyl)acetic acid (0.222 g, 0.0009 mol) and dichloromethane (20 mL). To the same flask, EDCI.HCl (0.288 g, 0.0015 mol) and HOBt (0.205 g, 0.0015 mol) were added. The reaction mixture was stirred at RT for 12 h. The reaction mixture was diluted with dichloromethane and washed with water. The organic layer was separated, washed with brine and dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to get crude product. The crude product was purified column chromatography using 50 % ethyl acetate followed by CombiFlash® chromatography using 30–40 % ethyl acetate in hexane to get the title compound [0.1 g, 37 %]. ^{1}H NMR (300 MHz, $CDCl_3$): δ 9.16 (brs, 1H), 7.75–7.57 (m, 3H), 7.41–7.37 (m, 1H), 7.22–7.17 (m, 1H), 7.08–6.97 (m, 2H), 4.28 (s, 2H), 3.91 (s, 2H), 3.51 (t, 2H), 3.18 (q, 2H), 2.86 (t, 2H), 1.35 (t, 3H); LC-MS: 494.0 $[M+H]^+$.

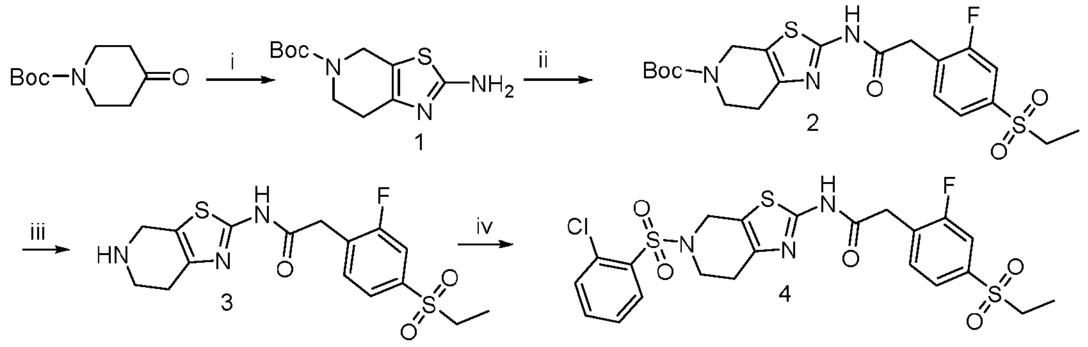
The compounds listed in below table were prepared by procedure similar to the one described in Example-13 [Scheme II(l)], with appropriate variations in reactants, quantities of reagents, solvents and reaction conditions. The characterization data of the compounds are summarized herein below table.

Compound No.	Structure	Characterization data
63		^{1}H NMR (400 MHz, DMSO-d_6): δ 12.20 (s, 1H), 7.86 (d, 2H), 7.61 (d, 2H), 7.42 (d, 1H), 7.40-7.10 (m, 3H), 4.22 (s, 2H), 3.92 (s, 2H), 3.40-3.27 (m, 4H), 2.74 (t, 2H), 1.09 (t, 3H). LC-MS: 475.95 [M+H]$^+$.
64		^{1}H NMR (400 MHz, CDCl$_3$): δ 9.72 (s, 1H), 7.72-7.55 (m, 4H), 7.22 (q, 1H), 6.72 (dd, 2H), 6.55 (t,1H), 4.37 (s, 2H), 3.88 (s, 2H), 3.68 (t, 2H), 3.17 (q, 2H), 2.82 (s, 2H), 1.33 (t, 3H). LC-MS: 475.7 [M+H]$^+$.
65		^{1}H NMR (400 MHz, CDCl$_3$): δ 9.57 (s, 1H), 7.90 (d, 2H), 7.50 (d, 2H), 7.25-7.14 (m, 1H), 6.71-6.49 (m, 3H), 4.37 (s, 2H), 3.86 (s, 2H), 3.65 (s, 2H), 3.16 (q, 2H), 2.80 (s, 2H), 1.31 (t, 3H). LC-MS: 460.2 [M+H]$^+$.
66		^{1}H NMR (400 MHz, DMSO-d_6): δ 7.94 (s, 1H), 7.82 (d, 1H), 7.67 (d, 1H), 7.37 (d, 1H), 7.21 (d, 1H), 7.16 (d, 1H), 6.99 (t, 1H), 4.19 (s, 2H), 4.09 (s, 2H), 3.42 (s, 2H), 3.24 (m, 2H), 2.79 (s, 2H), 1.20 (t, 3H). LC-MS: 512.2 [M+H]$^+$.
67		^{1}H NMR (400 MHz, CDCl$_3$): δ 7.93 (d, 2H), 7.54 (d, 2H), 7.08-6.92 (m, 4H), 4.30 (s, 2H), 3.89 (s, 2H), 3.54 (t, 2H), 3.16 (q, 2H), 2.81 (d, 2H),

Compound No.	Structure	Characterization data
		1.33 (t, 3H). LC-MS: 460.3 $[M+H]^+$.
68		^{1}H NMR (400 MHz, $CDCl_3$): δ 9.0 (s, 1H), 7.74-7.57 (m, 3H), 7.08-6.93 (m, 4H), 4.31 (s, 2H), 3.90 (s, 2H), 3.55 (t, 2H), 3.17 (q, 2H), 2.83 (d, 2H), 1.34 (t, 3H). LC-MS: 478.3 $[M+H]^+$.
69		^{1}H NMR (400 MHz, CD_3OD): δ 7.72-7.62 (m, 3H), 7.16 (t, 1H), 6.99-6.98 (m, 1H), 6.93 (m, 1H), 6.77-6.74 (m, 1H), 4.35 (s, 2H), 3.90 (s, 2H), 3.65 (t, 2H), 3.28-3.22 (m, 2H), 2.78 (t, 2H), 1.23 (t, 3H). LC-MS: 494.1 $[M+H]^+$.
70		^{1}H NMR (400 MHz, CD_3OD): δ 7.72-7.62 (m, 3H), 7.27 (d, 2H), 6.97 (d, 2H), 4.30 (s, 2H), 3.59 (t, 2H), 3.33-3.21 (m, 4H), 2.76 (t, 2H), 1.20 (s, 9H), 1.21 (t, 3H). LC-MS: 516.2 $[M+H]^+$.
71		^{1}H NMR (400 MHz, $CDCl_3$): δ 8.82 (s, 1H), 7.63 (d, 2H), 7.42 (d, 2H), 7.36 (d, 1H), 7.17 (t, 1H), 7.04 (d, 1H), 6.98 (t, 1H), 4.25 (s, 2H), 3.84 (s, 2H), 3.46 (t, 2H), 2.79 (t, 2H). LC-MS: 452.3 $[M+H]^+$.
72		^{1}H NMR (300 MHz, DMSO-d_6): δ 12.20 (s, 1H), 7.85 (d, 2H), 7.60 (d, 2H), 7.22 (d, 2H), 6.94 (d, 2H), 4.33

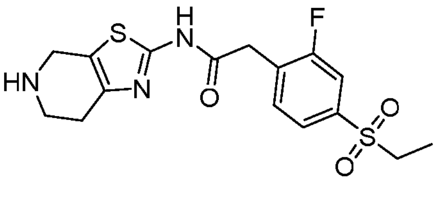
Compound No.	Structure	Characterization data
		(s, 3H), 3.89 (s, 2H), 3.59-3.57 (m, 2h), 2.69 (m, 4H), 1.22 (s, 9H), 1.09 (t, 3H). LC-MS: 504.40 $[M+H]^+$.
73		^1H NMR (400 MHz, $CDCl_3$): δ 9.13 (s, 1H), 7.75-7.68 (m, 2H), 7.63 (t, 1H), 7.21 (t, 1H), 7.15 (t, 1H), 7.01 (d, 1H), 4.29 (s, 2H), 3.92 (s, 2H), 3.52 (t, 2H), 3.18 (q, 2H), 2.88 (t, 2H), 1.36 (t, 3H). LC-MS: 528.1 $[M+H]^+$.

Scheme II(m)



Reagents and conditions: i) (a) Pyrrolidine, *p*-toluenesulfonic acid monohydrate, cyclohexane, reflux, 2 h (b) cyanamide, sulfur powder, dry methanol, RT, 5 h; ii) 2-(4-(ethylsulfonyl)-2-fluorophenyl)acetic acid, EDCI.HCl, HOBt, dichloromethane, RT, 12 h; iii) trifluoroacetic acid, dichloromethane, RT, 12 h; iv) 2-chlorobenzenesulfonyl chloride, triethyl amine, dichloromethane, RT, 5 h.

Example 14: 2-(4-(ethylsulfonyl)-2-fluorophenyl)-N-(4,5,6,7-tetrahydrothiazolo[5,4-c] pyridin-2-yl) acetamide (Compound-74)



Step i: tert-butyl 2-amino-6,7-dihydrothiazolo[5,4-c]pyridine-5(4H)-carboxylate

To a 50 mL round bottom flask, were added *tert*-butyl 4-oxopiperidine-1-carboxylate (5 g, 0.0251 mol), *p*-toluenesulfonic acid monohydrate (0.023 g, 0.00012 mol), pyrrolidine (2.2 mL) and cyclohexane (10 mL). The round bottom flask was fitted with a Dean-Stark reflux condenser. The reaction mixture was stirred at reflux temperature for 2 h. The volatiles were evaporated under reduced pressure to get residue. The residue was dissolved in dry methanol (9 mL). To the same flask, sulfur powder (0.8 g, 0.0251 mol) was added. The reaction mixture was cooled to 0 °C. To the same flask, cyanamide (1.05 g, 0.0251 mol) in dry methanol (9 mL) was added. The resulting reaction mixture was stirred at RT for 5 h to get solid. The solid was collected by filtration to get the title compound [3 g, 47 %]. ^{1}H NMR (600 MHz, $CDCl_3$): δ 6.82 (brs, 2H), 4.30 (s, 2H), 3.58 (t, 2H), 2.45 (t, 2H), 1.41 (s, 9H); LC-MS: 256.1 $[M+H]^+$.

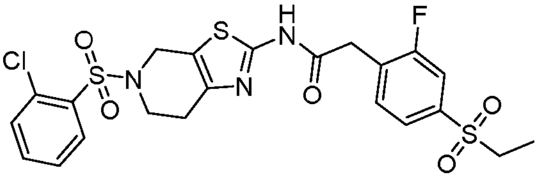
Step ii: tert-butyl 2-(2-(4-(ethylsulfonyl)-2-fluorophenyl)acetamido)-6,7-dihydrothiazolo[5,4-c]pyridine-5(4H)-carboxylate

To a 50 mL round bottom flask, were added tert-butyl 2-amino-6,7-dihydrothiazolo[5,4-c]pyridine-5(4H)-carboxylate (0.3 g, 0.0012 mol), 2-(4-(ethylsulfonyl)-2-fluorophenyl)acetic acid (0.43 g, 0.0018 mol) and dichloromethane (15 mL). To the same flask, EDCI.HCl (0.34 g, 0.0018 mol) and HOBt (0.24 g, 0.0018 mol) were added. The reaction mixture was stirred at RT for 12 h. The reaction mixture was diluted with dichloromethane. The diluted reaction mixture was washed with water. The organic layer was separated, washed with brine and dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to get crude product. The crude product was purified by column chromatography using 60–120 silica gel and 40 % ethyl acetate in hexane to get the title compound [0.3 g, 53 %]. ^{1}H NMR (300 MHz, $CDCl_3$): δ 7.66–7.54 (m, 3H), 4.53 (s, 2H), 3.89 (s, 2H), 3.70–3.69 (m, 2H), 3.16 (q, 2H), 2.07–2.62 (m, 2H), 1.46 (s, 9H), 1.29 (t, 3H); LC-MS: 482.0 $[M-H]^+$.

Step iii: 2-(4-(ethylsulfonyl)-2-fluorophenyl)-N-(4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)acetamide

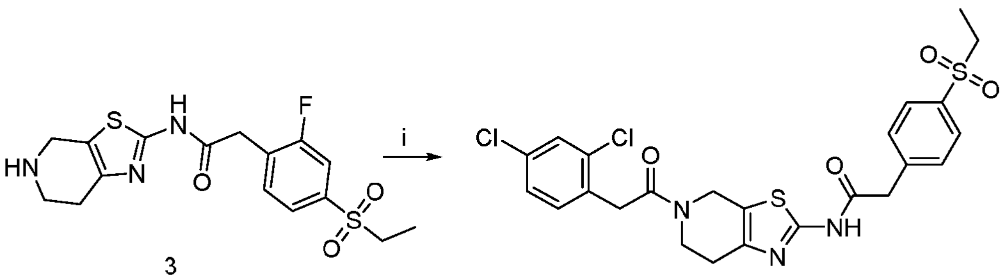
To a 50 mL round bottom flask, were added tert-butyl 2-(2-(4-(ethylsulfonyl)-2-fluorophenyl)acetamido)-6,7-dihydrothiazolo[5,4-c]pyridine-5(4H)-carboxylate (0.3 g, 0.0006 mol) and dichloromethane (10 mL). To the same flask, trifluoroacetic acid (0.5 mL) was added. The reaction mixture was stirred at RT for 12 h. The volatiles were evaporated under reduced pressure to get residue. The residue was basified with cold saturated aqueous sodium bicarbonate. The aqueous layer was extracted with 10 % methanol in chloroform. The organic layer was separated, washed with brine and dried over anhydrous sodium sulfate. The organic layer was evaporated under reduced pressure to get crude product. The crude product was purified by preparative thin layer chromatography using 5 % methanol in chloroform to get the title compound [0.2 g, 84 %]. ^{1}H NMR (300 MHz, $CDCl_3$): δ 7.72–7.58 (m, 3H), 3.98 (s, 2H), 3.89 (s, 2H), 3.19–3.10 (m, 4H), 2.69 (t, 2H), 1.34 (t, 3H); LC-MS: 384.1 $[M+H]^+$.

Example 15: N-(5-((2-chlorophenyl)sulfonyl)-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(ethyl sulfonyl)-2-fluorophenyl)acetamide (Compound-75)



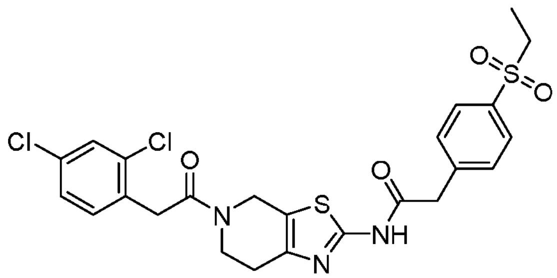
To a 50 mL round bottom flask, were added 2-(4-(ethylsulfonyl)-2-fluorophenyl)-N-(4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)acetamide [step-iii of Example 14] (0.1 g, 0.00026 mol) and dichloromethane (20 mL). The reaction mixture was cooled to 0 °C. To the same flask, triethylamine (0.067 mL, 0.00052 mol) and 2-chlorobenzenesulfonyl chloride (0.066 g, 0.00031 mol) were added. The reaction mixture was stirred at RT for 5 h. The reaction mixture was diluted with dichloromethane and washed with water. The organic layer was separated, washed with brine and dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to get crude product. The crude product was purified by CombiFlash® chromatography using 50 % ethyl in ethyl acetate to get the title compound [0.035 g, 25 %]. ^{1}H NMR (300 MHz, $CDCl_3$): δ 9.82 (brs, 1H), 8.13–8.11 (m, 1H), 7.72–7.39 (m, 6H), 4.54 (s, 2H), 3.88 (s, 2H), 3.71–3.67 (m, 2H), 3.17 (q, 2H), 1.85-1.83 (m, 2H), 1.33 (t, 3H); LC-MS: 558.0 $[M+H]^+$.

Scheme II(n)



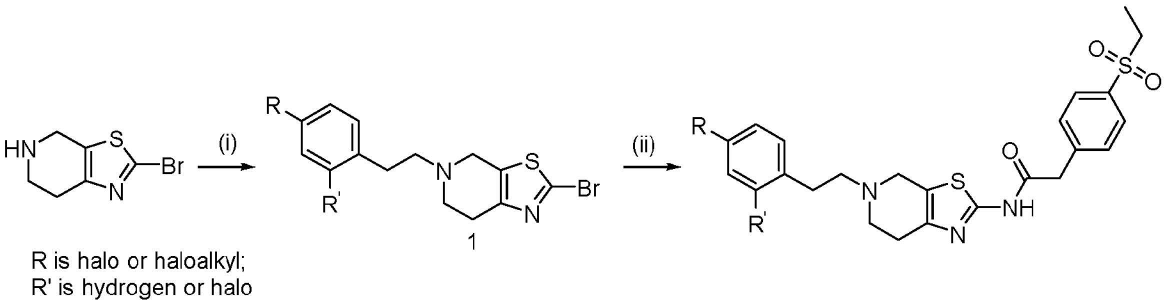
Reagents and conditions: i) 2-(2,4-dichlorophenyl)acetic acid, EDCI.HCl, HOBt, dichloromethane, RT, 12 h.

Example 16: N-(5-(2-(2,4-dichlorophenyl)acetyl)-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide (Compound-76)



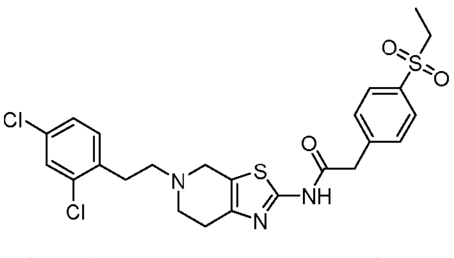
This compound was synthesized using the similar protocol described in Step-v of Example 1 from Scheme II(a); Yield (0.08g, 26.6%). ^{1}H NMR (400 MHz, CDCl3): δ 7.93 (d, 2H), 7.53 (d, 2H), 7.40 (d, 1H), 7.22-7.18 (m, 2H), 4.76 (s, 1H), 4.63 (s, 1H), 3.95 (t, 1H), 3.88 (d, 3H), 3.83 (s, 1H), 3.77 (t, 1H), 3.16 (q, 2H), 2.74-2.68 (m, 2H), 1.32 (t. 3H). LC-MS: 551.9 [M+H]$^+$.

Scheme II(o)



Reagents and conditions: i) NaH, 1-(2-bromoethyl)-2,4-dihalobenzene, THF, 0 - 5° C; ii) 2-(4-(ethylsulfonyl)phenyl)acetamide, K_3PO_4, CuI, N,N'-ethylenediamine, 1,4-Dioxane, 110 °C, 16 h.

Example 17: N-(5-(2,4-dichlorophenethyl)-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide (Compound-77)



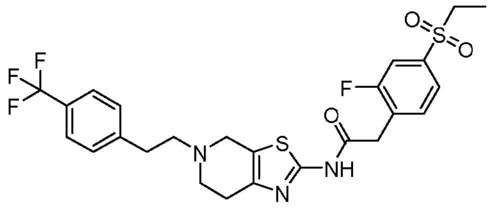
Step i: Synthesis of 2-bromo-5-(2,4-dichlorophenethyl)-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridine

A mixture of 1-(2-bromoethyl)-2,4-dichlorobenzene (0.1 g, 0.000393 mol) and 2-bromo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridine(0.103 g, 0.000472 mol) in DMF (2 mL) was cooled to 0 – 5 °C, and added NaH (0.014 g, 0.00059 mol). The RM was then warmed to 60 °C for 6 h. The RM was cooled to RT, quenched with water, extracted into ethyl acetate and organic portion was washed with water, dried over sodium sulphate, concentrated to get the titled compound (0.06g, 38.2%).

Step ii: Synthesis of N-(5-(2,4-dichlorophenethyl)-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide

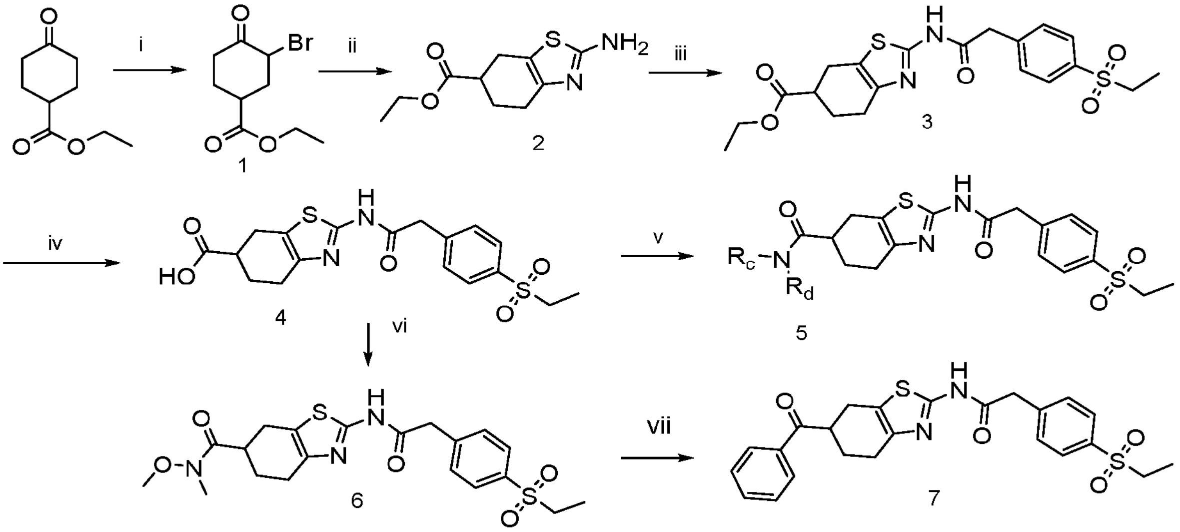
To a degassed mixture of 2-bromo-5-(2,4-dichlorophenethyl)-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridine (0.05 g, 0.000127 mol), 2-(4-(ethylsulfonyl)phenyl)acetamide (0.035 g, 0.000153 mol) in dioxane (5mL) were added potassium phosphate (0.054 g, 0.000255 mol), cuprous iodide (0.0048 g, 0.000025 mol) and N,N'-ethylenediamine (0.045 g, 0.000051 mol). The reaction mixture was heated to 110 °C for 16 h. The RM was cooled, diluted with ethyl acetate, filtered through celite® and concentrated to get residue. The residue was purified by flash chromatograph using 5% methanol in dichloromethane to get the titled compound (0.15 g, 21.8%). ^{1}H NMR (400 MHz, $CDCl_3$): δ 7.92 (d, 2H), 7.53 (d, 2H), 7.36 (s, 1H), 7.17 (s, 2H), 3.88 (s, 2H), 3.73 (s, 2H), 3.14 (q, 2H), 2.97-2.91 (m, 4H), 2.80-2.76 (m, 4H), 1.32 (t. 3H). LC-MS: 537.9 $[M+H]^+$.

Compound-78: 2-(4-(ethylsulfonyl)-2-fluorophenyl)-N-(5-(4-(trifluoromethyl)phenethyl)-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)acetamide



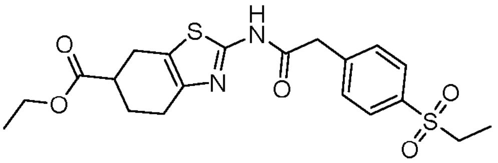
This compound was prepared by procedure similar to the one described in Example-17 [Scheme II(o)], with appropriate variations in reactants, quantities of reagents, solvents and reaction conditions. ^{1}H NMR (300 MHz, $CDCl_3$): δ 7.73-7.71 (m, 1H), 7.68-7.65 (m, 1H), 7.60-7.57 (m, 3H), 7.36 (d, 3H), 4.25 (s, 1H), 3.94 (m, 2H), 3.49-3.44 (m, 3H), 3.27-3.18 (m, 2H), 3.18-3.13 (m, 4H), 3.04-2.88 (m, 2H), 1.23 (t, 3H). LC-MS: 555.9 $[M+H]^+$.

Scheme II(p)



Reagents and Conditions: i) *NBS*, PTSA , toluene, reflux, 2 h; ii) thiourea, ethanol, reflux, 2 h; iii) 2-(4-(ethylsulfonyl)phenyl)acetic acid, EDCI.HCl, HOBt, DCM, rt, 12 h; iv) LiOH.H_2O, THF/MeOH/H_2O (1:1:1), rt, 4h; v) appropriate amine (i.e., -N(R_c)(R_d), HATU, Et_3N, DMF, rt, 12 h; vi) *N,O-* dimethyl hydroxylamine hydrochloride, EDCI.HCl, HOBt, Et_3N, DMF, rt, 12 h; viii) phenyl magnesium bromide (3.0 M, in ether), THF, rt, 12 h.

Example 18: ethyl 2-(2-(4-(ethylsulfonyl)phenyl)acetamido)-4,5,6,7-tetrahydro benzo[d]thiazole-6-carboxylate (Compound-79)



Step i: ethyl 3-bromo-4-oxocyclohexanecarboxylate

To a 100 mL round bottom flask, were added ethyl 4-oxocyclohexanecarboxylate (1.5 g, 8.81 mmol) and toluene (15 mL). To the same flask, *N-* bromosuccinimide (1.56 g, 8.81 mmol), and *p*-toluenesulfonic acid (0.167 g, 0.881 mmol) were added. The reaction mixture was stirred at reflux temperature for 2 h. The volatiles were evaporated under reduced pressure to get residue. The residue was dissolved in ethyl acetate and washed with water. The organic layer was separated, washed with aqueous sodium bicarbonate followed by brine and dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to get title compound [2.19 g, 98 %]. ^1H NMR (400 MHz, $CDCl_3$): δ 4.47 (t, 1H), 4.20–4.15 (m, 2H), 3.19–3.07 (m, 2H), 2.52–2.23 (m, 3H), 1.98–1.90 (m, 1H), 1.30 (t, 3H).

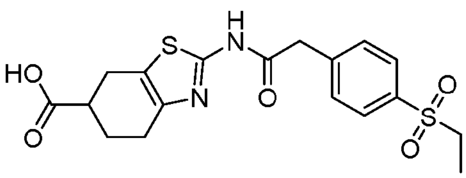
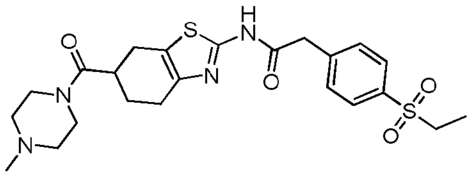
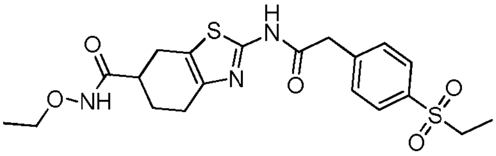
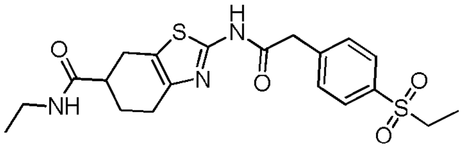
Step ii: ethyl 2-amino-4,5,6,7-tetrahydrobenzo[d]thiazole-6-carboxylate

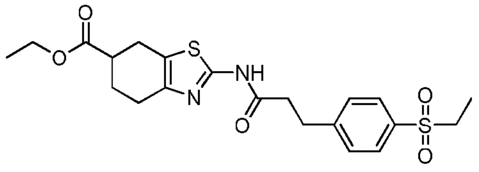
To a 100 mL round bottom flask, were added ethyl 3-bromo-4-oxocyclohexanecarboxylate (2.2 g, 8.83 mmol) and ethanol (15 mL). To the same flask, thiourea (0.672 g, 8.83 mmol) was added. The reaction mixture was stirred at reflux temperature for 2 h. The volatiles were evaporated under reduced pressure to get residue. The residue was basified with aqueous sodium carbonate and extracted with ethyl acetate. The organic layer was separated, washed with brine and dried over anhydrous sodium sulfate. The solvent was removed under reduced pressure to get title compound [1.0 g, 46 %]. ^{1}H NMR (300 MHz, DMSO-d_6): δ 8.95 (brs, 2H), 4.11 (q, 2H), 2.77-2.54 (m, 5H), 2.20-2.08 (m, 1H), 1.85-1.70 (m, 1H), 1.19 (t, 3H); LC-MS: 227.1 $[M+H]^+$.

Step iii: ethyl 2-(2-(4-(ethylsulfonyl)phenyl)acetamido)-4,5,6,7-tetrahydrobenzo[d]thiazole-6-carboxylate

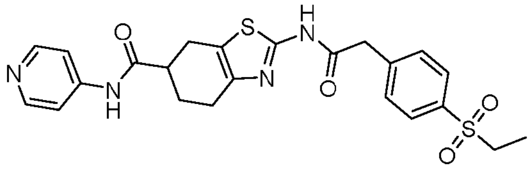
To a 50 mL round bottom flask, were added ethyl 2-amino-4,5,6,7-tetrahydrobenzo[d]thiazole-6-carboxylate (0.3 g, 1.32 mmol), 2-(4-(ethylsulfonyl)phenyl)acetic acid (0.602 g, 2.64 mmol) and dichloromethane (15 mL). To the same flask, EDCI.HCl (0.633 g, 3.31 mmol) and HOBt (0.448 g, 3.31 mmol) were added. The reaction mixture was stirred at room temperature for 12 h. The reaction mixture was quenched with aqueous sodium bicarbonate. The reaction mixture was extracted with 10 % dichloromethane in methanol. The organic layer was separated, washed with brine and dried over anhydrous sodium sulfate. The solvent was removed under reduced pressure to get crude product. The crude product was purified by flash chromatography using 5 % methanol in dichloromethane to get the title compound [0.2 g, 35 %]. ^{1}H NMR (300 MHz, $CDCl_3$): δ 9.50 (brs, 1H), 7.89 (d, 2H), 7.50 (d, 2H), 4.18 (q, 2H), 3.85 (s, 2H), 3.16 (q, 2H), 2.97 (d, 2H), 2.28 -2.62 (m, 3H), 2.30-2.16 (m, 1H), 2.00-1.92 (m, 1H), 1.31 (t, 3H), 1.29 (t, 3H); LC-MS : 437.1 $[M+H]^+$.

The compounds listed in below table were prepared by procedure similar to the one described in Example-18 [Scheme II(p)], with appropriate variations in reactants, quantities of reagents, solvents and reaction conditions. The characterization data of the compounds are summarized herein below table.

Compound No.	Structure	Characterization data
80		^{1}H NMR (400 MHz, DMSO-d$_6$): δ 12.2 (s, 1H), 7.86 (d, 2H), 7.59 (d, 2H), 3.88 (s, 2H), 3.30 (q, 2H), 2.89-2.67 (m, 5H), 2.13-2.10 (m, 1H), 1.84-1.77 (m, 1H), 1.11 (t, 3H); LC-MS: 409.4 [M+H]$^+$.
81		^{1}H NMR (400 MHz, DMSO-d$_6$): δ 12.24 (s, 1H), 7.85 (d, 2H), 7.59 (d, 2H), 3.88 (s, 2H), 3.55-3.48 (m, 4H), 3.30-3.24 (m, 3H), 3.11-3.01 (m, 1H), 2.79-2.64 (m, 4H), 2.35-2.29 (m, 4H), 2.20 (s, 3H), 1.93-1.90 (m, 1H), 1.75-1.65 (m, 1H), 1.10 (t, 3H). LC-MS: 491.0 [M+H]$^+$.
82		^{1}H NMR (400 MHz, DMSO-d$_6$): δ 12.12 (s, 1H), 11.04 (s, 1H), 7.86 (d, 2H), 7.60 (d, 2H), 3.88 (s, 2H), 3.83 (q, 2H), 3.31-3.25 (m, 3H), 2.74-2.64 (m, 4H), 1.93-1.91 (m, 1H), 1.83-1.72 (m, 1H), 1.16-1.07 (m, 6H). LC-MS: 452.1 [M+H]$^+$.
83		^{1}H NMR (400 MHz, DMSO-d$_6$): δ 12.12 (s, 1H), 7.91-7.84 (m, 3H), 7.60 (d, 2H), 3.88 (s, 2H), 3.30-3.25 (m, 3H), 3.08 (s, 2H), 2.73-2.64 (m, 4H), 1.99-1.96 (m, 1H), 1.77-1.73 (m, 1H), 1.14 (t. 3H), 1.03 (t, 3H). LC-MS: 436.2 [M+H]$^+$.

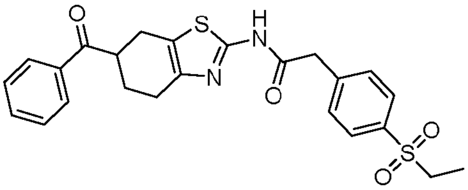
Compound No.	Structure	Characterization data
84		^{1}H NMR (400 MHz, DMSO-d$_6$): δ 12.0 (s, 1H), 7.79 (d, 2H), 7.51 (d, 2H), 4.08 (q, 2H), 3.22 (q, 2H), 3.01 (t, 2H), 2.87- 2.72 (m, 5H), 2.55-2.50 (m, 2H), 1.85-1.75 (m, 1H), 1.17 (t, 3H), 1.06 (t, 3H). LC-MS: 451.2 [M+H]$^+$.

Example 19: 2-(2-(4-(ethylsulfonyl)phenyl)acetamido)-N-(pyridin-4-yl)-4,5,6,7-tetrahydro benzo[d]thiazole-6-carboxamide (Compound-85)



To a 50 mL round bottom flask, were added 2-(2-(4-(ethylsulfonyl)phenyl)acetamido)-4,5,6,7-tetrahydrobenzo[d]thiazole-6-carboxylic acid (Compound-80) (0.06 g, 0.146 mmol), 4-aminopyridine (0.0138 g, 0.146 mmol) and DMF (5 mL). To the same flask, HATU (0.11 g, 0.293 mmol) and triethylamine (0.059 mL, 0.044 mmol) were added. The reaction mixture was stirred at room temperature for 12 h. The reaction mixture was diluted with ethyl acetate and washed with water. The organic layer was separated, washed with brine and dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to get crude product. The crude product was purified by flash chromatography using 3 % methanol in chloroform to get the title compound [0.015 g, 21 %]. ^{1}H NMR (400 MHz, DMSO-d$_6$): δ 12.2 (s, 1H), 10.4 (s, 1H), 8.43 (brs, 2H), 7.86 (d, , 2H), 7.71 (d, 4H), 3.89 (s, 2H), 3.31 (q, 2H), 2.95-2.64 (m, 5H), 2.16-2.12 (m, 1H), 1.86-1.84 (m, 1H), 1.11 (t, 3H) ; LC-MS: 485.1 [M+H]$^+$.

Example 20: N-(6-benzoyl-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-(ethylsulfonyl) phenyl)acetamide: (Compound-86)



Step-i: 2-(2-(4-(ethylsulfonyl)phenyl)acetamido)-N-methoxy-N-methyl-4,5,6,7-tetrahydrobenzo [d]thiazole-6-carboxamide:

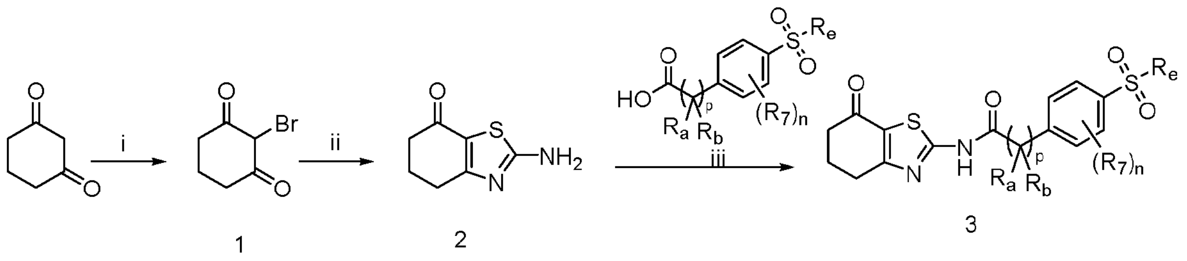
To a 50 mL round bottom flask, were added 2-(2-(4-(ethylsulfonyl)phenyl)acetamido)-4,5,6,7-tetrahydrobenzo[d]thiazole-6-carboxylic acid (Compound-80) (0.25 g, 0.91 mmol), *N,O*-dimethylhydroxyl amine hydrochloride (0.089 g, 0.735 mmol) and DMF (15 mL). To the same flask, EDCI.HCl (0.233 g, 1.22 mmol), HOBt (0.165 g, 1.22 mmol) and triethylamine (0.16 mL, 1.22 mmol) were added. The reaction mixture was stirred at room temperature for 12 h. The reaction mixture was quenched with aqueous sodium bicarbonate. The reaction mixture was extracted with ethyl acetate. The organic layer was separated, washed with brine and dried over anhydrous sodium sulfate. The solvent was removed under reduced pressure to get crude product. The crude product was purified by column chromatography using 60-120 silica gel and 50 % ethyl acetate in hexane to get the title compound [0.2 g, 73 %]. ^{1}H NMR (300 MHz, $CDCl_3$): δ 9.38 (brs, 1H), 7.91 (d, 2H), 7.52 (d, 2H), 3.87 (s, 2H), 3.72 (s, 3H), 3.23 (s, 3H), 3.14 (q, 2H), 2.97-2.74 (m, 5 H), 2.09-1.96 (m, 2H), 1.33 (t, 3H) LC-MS: 452.5 $[M+H]^+$.

Step-ii: N-(6-benzoyl-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-(ethylsulfonyl)phenyl) acetamide:

To a 50 mL of round bottom flask, were added 2-(2-(4-(ethylsulfonyl)phenyl)acetamido)-N-methoxy-N-methyl-4,5,6,7-tetrahydrobenzo[d]thiazole-6-carboxamide (0.1 g, 0.221 mmol), and dry THF (15 mL). The reaction mixture was cooled to 0 °C. To the same flask, 3.0 M phenyl magnesium bromide in diethyl ether (0.146 mL, 0.44 mmol) was added at 0 °C. The reaction mixture was stirred at room temperature for 12 h. The reaction mixture was quenched with saturated ammonium chloride and extracted with ethyl acetate. The organic layer was separated, washed with brine and dried over anhydrous sodium sulfate. The solvent was removed under reduced pressure to get crude product. The crude product was purified by column chromatography using 60-120 silica gel and 20 % ethyl acetate in hexane followed by preparative high performance liquid chromatography using 10 mM NH_4OAc in water and 1:1 methanol and acetonitrile to get the title compound [0.02 g, 19 %]. ^{1}H NMR (300 MHz, $CDCl_3$):

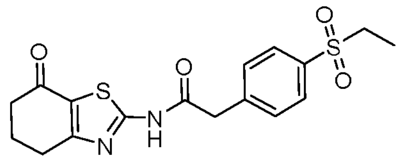
δ 7.98–7.90 (m, 4H), 7.62-7.46 (m, 5H), 3.87 (s, 2H), 3.76-3.46 (m, 1H), 3.16 (q, 2H), 3.08-2.76 (m, 4H), 2.27-2.22 (m, 1H), 1.99-1.92 (m, 1H), 1.33 (t, 3H); LC-MS (ESI): 469.2 $[M+H]^+$.

Scheme II(q)



Reagents and Conditions: **i)** *NBS*, CCl_4, rt, 2 h; ii) thiourea, pyridine, methanol, reflux, 4 h; iii) EDCI.HCl, HOBt, DCM, rt, 12 h.

Example 21: 2-(4-(ethylsulfonyl)phenyl)-N-(7-oxo-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)acetamide (Compound-87)



Step-i: 2-bromocyclohexane-1,3-dione

To a 100 mL round bottom flask, were added cyclohexane-1,3-dione (3.0 g, 26.78 mmol) and CCl_4 (50 mL). To the same flask, *NBS* (4.76 g, 8.813 mmol) was added. The reaction mixture was stirred at room temperature for 2 h. The volatiles were evaporated under reduced pressure to get residue. The residue was dissolved in ethyl acetate and washed with water. The organic layer was separated, washed with brine and dried over anhydrous sodium sulfate. The solvent was removed under reduced pressure to get the title compound [4.0 g, 81 %]. ^1H NMR (400 MHz, CD_3OD): δ 3.36 (s, 1H), 2.86 (t, 1H), 2.61 (t, 2H), 2.53 (t, 1H), 2.07-1.97 (m, 2H).

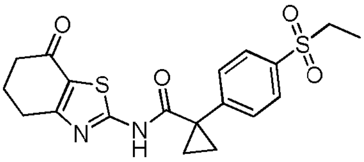
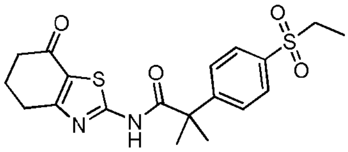
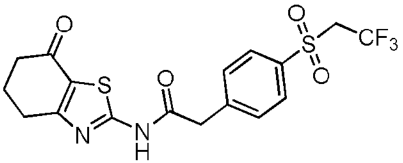
Step-ii: 2-amino-5,6-dihydrobenzo[d]thiazol-7(4H)-one

To a 100 mL round bottom flask, were added 2-bromocyclohexane-1,3-dione (1.0 g, 5.23 mmol) and methanol (15 mL). To the same flask, thiourea (0.0.397 g, 5.23 mmol) and pyridine (0.412 g, 5.23 mmol) were added. The reaction mixture was stirred at reflux temperature for 4 h. The volatiles were evaporated under reduced pressure to get residue. The residue was dissolved in water and stirred for 5 min. to get precipitate. The precipitate was collected by filtration and washed with water to get the title compound [0.8 g, 91 %]. ^1H NMR (300 MHz, DMSO-d_6): δ 8.12 (brs, 2H), 2.69 (t, 2H), 2.38 (t, 2H), 2.02 (m, 2H); LC-MS (ESI): 168.9 $[M+H]^+$.

Step-iii:2-(4-(ethylsulfonyl)phenyl)-N-(7-oxo-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)acetamide

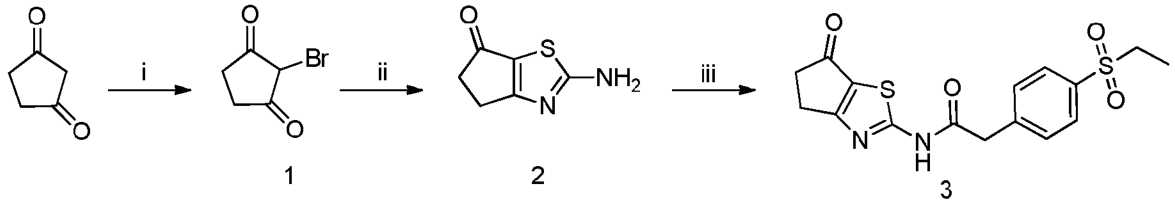
To a 50 mL round bottom flask, were added 2-amino-5,6-dihydrobenzo[d]thiazol-7(4H)-one (0.05 g, 0.297 mmol), 2-(4-(ethylsulfonyl)phenyl)acetic acid (0.067 g, 0.297 mmol) and dichloromethane (10 mL). To the same flask, EDCI.HCl (0.0623 g, 0.327 mmol) and HOBt (0.044 g, 0.327 mmol) were added. The reaction mixture was stirred at room temperature for 12 h. The reaction mixture was quenched with aqueous sodium bicarbonate. The reaction mixture was extracted with dichloromethane. The organic layer was separated, washed with brine and dried over anhydrous sodium sulfate. The solvent was removed under reduced pressure to get crude product. The crude product was purified by flash chromatography using 3 % methanol in dichloromethane to get the title compound [10 mg, 9 %]. ^{1}H NMR (300 MHz, $CDCl_3$): δ 9.46 (s, 1H), 7.92 (d, 2H), 7.54 (d, 2H), 3.94 (s, 2H), 3.18 (q, 2H), 2.89 (t, 2H), 2.61 (t, 2H), 2.19-2.15 (m, 2H), 1.32 (t, 3H); LC-MS: 379.1 $[M+H]^+$.

The compounds listed in below table were prepared by procedure similar to the one described in Example-21 [Scheme II(q)] with appropriate variations in reactants, quantities of reagents, solvents and reaction conditions. The characterization data of the compounds are summarized herein below table.

Compound No.	Structure	Characterization data
88		^{1}H NMR (400 MHz, DMSO-d_6): δ 12.25 (brs, 1H), 7.85 (d, 2H), 7.62 (d, 2H), 3.32 (q, 2H), 2.84 (t, 2H), 2.08 (t, 2H), 1.69 (t, 2H), 1.37 (t, 2H), 1.23 (d, 2H), 1.14 (t, 3H). LCMS: 405.2 $[M+H]^+$.
89		^{1}H NMR (400 MHz, $CDCl_3$): δ 9.07 (brs, 1H), 7.91 (d, 1H), 7.57 (d, 1H), 3.16-3.11 (m, 2H), 2.83-2.80 (t, 2H), 2.58-2.55 (t, 2H), 2.18-2.12 (m, 2H), 1.72 (s, 9H), 1.33-1.25 (t, 3H). LC-MS: 407.20 $[M+H]^+$.
90		^{1}H NMR (400 MHz, DMSO-d_6): δ 12.9 (s, 1H), 7.95 (d, 2H), 7.65 (d, 2H), 5.00-4.93 (m, 2H), 4.01 (s, 2H), 2.89 (t, 2H), 2.53-

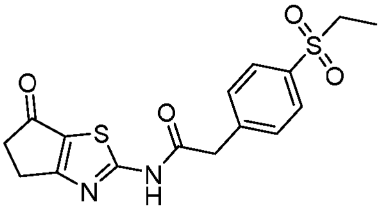
		2.48 (m. 2H), 2.10-2.07 (m, 2H). LC-MS: 432.7 $[M+H]^+$.

Scheme II(r):



Reagents and Conditions: i) Bromine, acetic acid, rt, 45 min; ii) thiourea, DMF, 85 °C, 12 h; iii) 2-(4-(ethylsulfonyl)phenyl)acetic acid, EDCI.HCl, HOBt, DCM, rt, 12 h.

Example 22: 2-(4-(ethylsulfonyl)phenyl)-N-(6-oxo-5,6-dihydro-4H-cyclopenta[d]thiazol-2-yl)acetamide (Compound-91)



Step-i: 2-bromocyclopentane-1,3-dione

To a 100 mL round bottom flask, were added cyclopentane-1,3-dione (1.0 g, 10.2 mmol) and acetic acid (25 mL). To the same flask, bromine (0.56 mL, 10.7 mmol) was added drop wise. The reaction mixture was stirred at room temperature for 45 min to get solid. The solid was collected by filtration. The solid was washed with diethyl ether and dried under vacuum to get the title compound [1.5 g, 88 %]. LC-MS: 177.1 $[M+H]^+$.

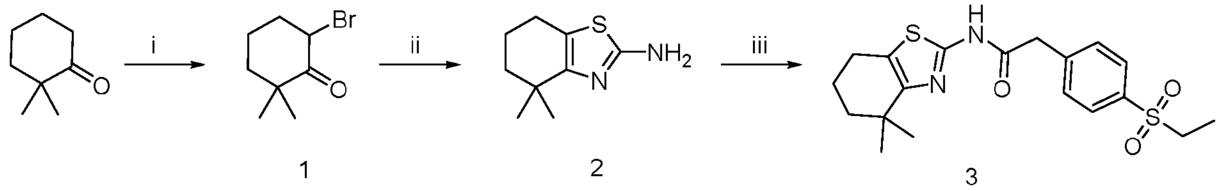
Step-ii: 2-amino-4H-cyclopenta[d]thiazol-6(5H)-one

To a 100 mL round bottom flask, were added 2-bromocyclopentane-1,3-dione (0.5 g, 2.84 mmol) and DMF(10 mL). To the same flask, thiourea (0.672 g, 8.83 mmol) was added. The reaction mixture stirred for 12 h at 85 °C. The reaction mixture was cooled to room temperature and poured into ice cold sodium bicarbonate. The reaction mixture was extracted with dichloromethane. The organic layer was separated, washed with brine and dried over anhydrous sodium sulfate. The solvent was removed under reduced pressure to get the title compound [0.12 g, 28 %]. ^1H NMR (400 MHz, DMSO-d^6): δ 8.36 (brs, 2H), 3.02-2.98 (m, 2H), 2.92-2.86 (m, 2H); LC-MS: 155.0 $[M+H]^+$.

Step-iii: 2-(4-(ethylsulfonyl) phenyl)-N-(6-oxo-5,6-dihydro-4H-cyclopenta[d]thiazol-2-yl) acetamide

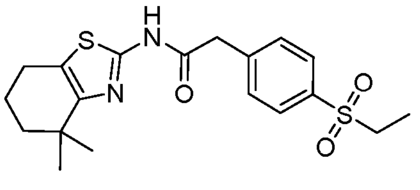
To a 50 mL round bottom flask, were added 2-amino-4H-cyclopenta[d]thiazol-6(5H)-one (0.06 g, 0.389 mmol), 2-(4-(ethylsulfonyl)phenyl)acetic acid (0.124 g, 0.0.544 mmol) and dichloromethane (10 mL). To the same flask, EDCI.HCl (0.148 g, 0.779 mmol) and HOBt (0.1 g, 0. 779 mmol) were added. The reaction mixture was stirred at room temperature for 12 h. The reaction mixture was quenched with aqueous sodium bicarbonate and extracted with 10 % methanol in dichloromethane. The organic layer was separated and dried over anhydrous sodium sulfate. The solvent was removed under reduced pressure to get crude product. The crude product was purified by flash chromatography using 2% methanol in dichloromethane to get the title compound [0.02 g, 14 %]. ^{1}H NMR (400 MHz, DMSO-d_6): δ 13.05 (s, 1H), 7.87 (d, 2H), 7.62 (d, 2H), 4.02 (s, 2H), 3.32 (q, 2H), 3.01-2.84 (m, 4H), 1.12 (t, 3H); LC-MS (ESI): 364.9 $[M+H]^+$.

Scheme II(s)



Reagents and Conditions: i) NBS, PTSA , toluene, reflux, 2 h; ii) thiourea, ethanol, reflux, 2 h; iii) 2-(4-(ethylsulfonyl)phenyl)acetic acid, EDCI. HCl, HOBt, DCM, RT, 12 h.

Example 23: N-(4,4-dimethyl-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide (Compound-92)



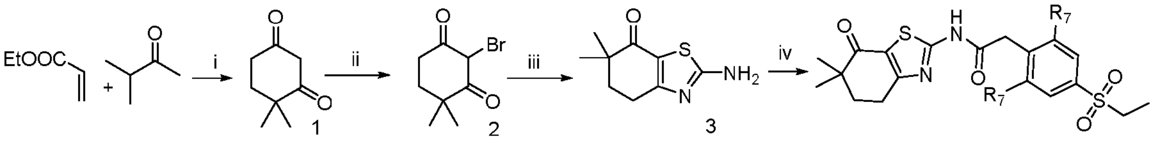
Step i and step ii:

Similar procedure was followed as depicted in step i and step ii of Example 18 by using appropriate reactant(s).

Step iii: N-(4,4-dimethyl-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-(ethylsulfonyl) phenyl)acetamide

To a 50 mL round bottom flask, were added 4,4-dimethyl-4,5,6,7-tetrahydrobenzo[d]thiazol-2-amine (0.07 g, 0.384 mmol), 2-(4-(ethylsulfonyl)phenyl)acetic acid (0.105g, 0. 461 mmol) and dichloromethane (20 mL). To the same flask, EDCI.HCl (0.145 g, 0.76 mmol) and HOBt (0.102 g, 0.0.76 mmol) were added. The reaction mixture was stirred at room temperature for 12 h. The reaction mixture was quenched with aqueous sodium bicarbonate and extracted with 10 % methanol in dichloromethane. The organic layer was separated, washed with brine and dried over anhydrous sodium sulfate. The solvent was removed under reduced pressure to get crude product. The crude product was purified by column chromatography using 60-120 silica gel and 20 % ethyl acetate in hexane to get the title compound [0.05 g, 33 %]. ^{1}H NMR (400 MHz, $CDCl_3$): δ 9.01 (brs, 1H), 7.91 (d, 2H), 7.54 (d, 2H), 3.85 (s, 2H), 3.17 (q, 2H), 2.67 (t, 2H), 1.86-1.80 (m, 2H), 1.66-1.63 (m, 2H), 1.31 (t, 3H), 1.20 (s, 6H); LC-MS: 393.5 $[M+H]^+$.

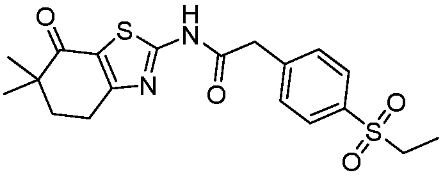
Scheme II(t)



R7 at each occurence is independently hydrogen or halo

Reagents and Conditions: i) Potassium *t*-butoxide, THF, 0 °C - rt, 20 min; ii) bromine, sodium acetate, $CHCl_3$, 0 °C, 1 h; iii) (a) thiourea, THF, room temperature 12 h followed by reflux, 2 h (b) pyridine, reflux, 2 h; iv) appropriate acid, EDCI.HCl, HOBt, DCM, rt, 12 h.

Example 24: Synthesis of N-(6,6-dimethyl-7-oxo-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-(ethyl sulfonyl)phenyl)acetamide (Compound-93)



Step-i: 4,4-dimethylcyclohexane-1,3-dione

To a 100 mL of round bottom flask, were added isopropyl methyl ketone (5.0 g, 58.05 mmol), potassium *t*-butoxide (13.0 g, 116.1 mmol) and THF (50 mL). The reaction mixture was cooled to 0 °C. To the same flask, ethyl acrylate (5.8 g, 58.05 mmol) was added at 0 °C. The reaction mixture was stirred at room temperature for 20 min. The reaction mixture was quenched with aqueous ammonium chloride and extracted with ethyl acetate. The solvent was separated, washed with brine and dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to get crude product. The crude product was purified by column chromatography using 60-120 silica gel and 50 % ethyl acetate in hexane to get the title compound (4.0 g, 49.2 %). ^{1}H NMR (300 MHz, $CDCl_3$): δ 3.28 (s, 2H), 2.64 (t, 2H), 1.87 (t, 2H), 1.22 (s, 6H); LC-MS: 141.0 $[M+H]^+$.

Step-ii: 2-bromo-4,4-dimethylcyclohexane-1,3-dione

To a 100 mL round bottom flask, were added 4,4-dimethylcyclohexane-1,3-dione (4.0 g, 28.57 mmol), sodium acetate (2.5 g, 31.0 mmol) and chloroform (50 mL). The reaction mixture was cooled to 0 °C. To the same flask, bromine (1.4 mL, 28.57 mmol) in chloroform (10 mL) was added drop wise. The reaction mixture was stirred at 0 °C for 1 h. The reaction mixture was poured into water to get solid. The solid was collected by filtration to get the title compound [4.0 g, 65%]. ^{1}H NMR (300 MHz, $CDCl_3$): δ 3.40 (s, 1H), 2.62 (t, 2H), 1.86 (t, 2H), 1.21 (s, 6H).

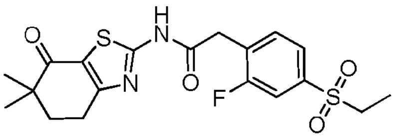
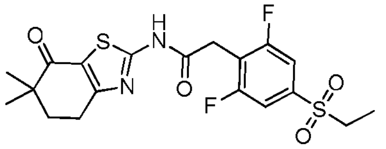
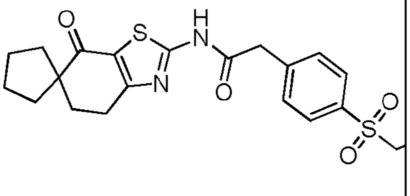
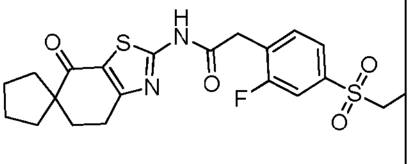
Step-iii: 2-amino-6,6-dimethyl-5,6-dihydrobenzo[d]thiazol-7(4H)-one

To a 25 mL round bottom flask, were added 2-bromo-4,4-dimethylcyclohexane-1,3-dione (4 g, 0.0183 mol), thiourea (1.65 g, 0.0219 mol) and THF (30 mL). The resulting reaction mixture was stirred at room temperature for 12 h and at reflux temperature for 2 h. The volatiles were evaporated under reduced pressure to get residue. The residue was dissolved in pyridine (10 mL) and stirred at reflux temperature for 2 h. The volatiles were evaporated under reduced pressure to get residue. The residue was partitioned between chloroform and water. The organic layer was separated, washed with brine and dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to get the title compound [0.4 g, 11 %]. ^{1}H NMR (400 MHz, DMSO-d_6): δ 8.07 (brs, 2H), 2.72 (t, 2H), 1.88 (t, 2H), 1.06 (s, 6H); LC-MS: 197.5 $[M+H]^+$.

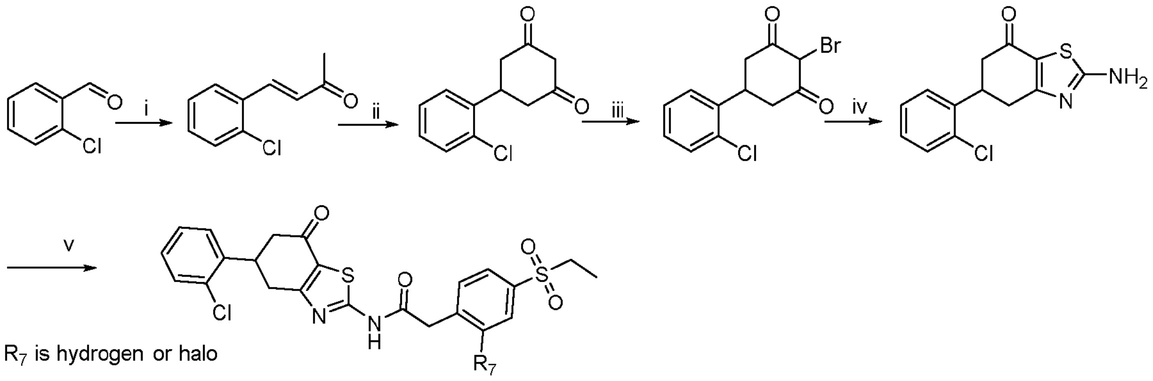
Step-iv: N-(6,6-dimethyl-7-oxo-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-(ethylsulfonyl) phenyl)acetamide

To a 50 mL round bottom flask, were added 2-amino-6,6-dimethyl-5,6-dihydrobenzo[d]thiazol-7(4H)-one (0.2 g, 1.02 mmol), 2-(4-(ethylsulfonyl)phenyl)acetic acid (0.232 g, 1.02 mmol) and dichloromethane (10 mL). To the same flask, EDCI.HCl (0.389 g, 2.04 mmol) and HOBt (0.275 g, 2.04 mmol) were added. The reaction mixture was stirred at room temperature for 12 h. The reaction mixture was quenched with aqueous sodium bicarbonate and extracted with 10 % methanol in dichloromethane. The organic layer was separated, washed with brine and dried over anhydrous sodium sulfate. The solvent was removed under reduced pressure to get crude product. The crude product was purified by flash chromatography using 50% ethyl acetate in hexane to get the title compound [0.06 g, 15 %]. ^{1}H NMR (400 MHz, DMSO-d_6): δ 12.9 (s, 1H), 7.86 (d, 2H), 7.60 (d, 2H), 3.98 (s, 2H), 3.29 (q, 2H), 2.90 (t, 2H), 1.98 (t, 2H), 1.90-1.07 (m, 9H); LC-MS: 407.0 [M+H]$^+$.

The compounds listed in below table were prepared by procedure similar to the one described in Example-24 [Scheme II(t)], with appropriate variations in reactants, quantities of reagents, solvents and reaction conditions. The characterization data of the compounds are summarized herein below table.

Compound No.	Structure	Characterization data
94		^{1}H NMR (400 MHz, $CDCl_3$): δ 7.71-7.55 (m, 3H), 3.92 (s, 2H), 3.15 (q, 2H), 2.90 (t, 2H), 2.00 (t, 2H), 1.31-1.18 (m, 9H). LC-MS: 425.3 [M+H]$^+$.
95		^{1}H NMR (400 MHz, $CDCl_3$): δ 9.4 (brs, 1H), 7.52 (d, 2H), 3.95 (s, 2H), 3.17 (q, 2H), 2.92 (t, 2H), 2.01 (t, 2H), 1.34 (t, 3H), 1.19 (s, 6H). LC-MS: 443.1 [M+H]$^+$.
96		^{1}H NMR (300 MHz, $CDCl_3$): δ 7.94 (d, 2H), 7.54 (d, 2H), 3.93 (s, 2H), 3.18 (q, 2H), 2.89 (t, 2H), 2.09 (t, 2H), 1.81-1.68 (m, 4H), 1.63-1.51 (m, 4H), 1.33 (t, 3H). LC-MS: 433.1 [M+H]$^+$.
97		^{1}H NMR (300 MHz, $CDCl_3$): δ 7.74-7.57 (m, 3H), 3.94 (s, 2H), 3.18 (q, 2H), 2.92 (t, 2H), 2.10 (t, 2H), 1.78-1.71 (m, 4H), 1.57-1.51 (m, 4H), 1.34 (t, 3H). LC-MS: 451.1 [M+H]$^+$.

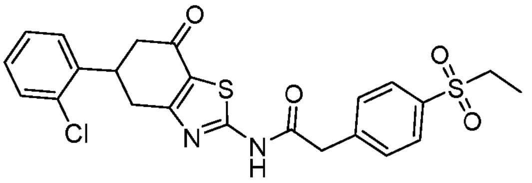
Scheme II(u)



R_7 is hydrogen or halo

Reagents and conditions: i) (Triphenylphosphoranylidene)acetone, THF, room temperature, 12 h; ii) (a) diethyl malonate, 21 % sodium ethoxide in ethanol, ethanol, room temperature, 12 h (b) 3N aqueous sodium hydroxide, room temperature, 12 h; iii) bromine, sodium acetate, chloroform, -10 °C - room temperature, 3 h; iv) (a) thiourea, THF, room temperature, 12 h followed by reflux, 2 h (b) pyridine, reflux, 2 h; v) appropriate acid, EDCI.HCl, HOBt, DCM, 12 h.

Example 25: Synthesis of N-(5-(2-chlorophenyl)-7-oxo-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide (Compound-98)



Step i: 4-(2-chlorophenyl)but-3-en-2-one

To a 50 mL round bottom flask, were added 2-chlorobenzaldehyde (3 g, 0.0213 mol), (triphenylphosphoranylidene)acetone (6.8 g, 0.0213 mol) and THF (25 mL). The reaction mixture was stirred at room temperature for 12 h. The volatiles were evaporated under reduced pressure to get crude product. The crude product was purified by flash column chromatography using 0–10 % ethyl acetate in hexane to get the title compound [3.6 g, 94 %]. ^{1}H NMR (300 MHz, $CDCl_3$): δ 7.96 (d, 1H), 7.65–7.62 (m, 1H), 7.44–7.41 (m, 1H), 7.35–7.26 (m, 2H), 6.94 (d, 1H), 2.42 (s, 3H); LC-MS: 181.2 $[M+H]^+$.

Step ii: 5-(2-chlorophenyl)cyclohexane-1,3-dione

To a 500 mL round bottom flask, were added 4-(2-chlorophenyl)but-3-en-2-one (3.5 g, 0.0194 mol), diethyl malonate (3.1 g, 0.0194 mol) and ethanol (15 mL). To the same flask, 21 % sodium ethoxide in ethanol (12.5 mL, 0.0388 mol) was added. The reaction mixture was stirred at room temperature for 12 h. To the reaction mixture, 3 N aqueous sodium hydroxide (195 mL) was added. The stirring was continued for another 12 h at room temperature. The reaction mixture was acidified with 3 N aqueous hydrochloric acid until the solution turned cloudy. The cloudy aqueous layer was extracted with diethyl ether. The combined organic layer was stirred at room temperature for 4 h. The solvent was evaporated under reduced pressure to get the title compound [1.5 g, 35 %]. LC-MS: 223.1 $[M+H]^+$.

Step iii: 2-bromo-5-(2-chlorophenyl)cyclohexane-1,3-dione

To a 50 mL round bottom flask, were added 5-(2-chlorophenyl)cyclohexane-1,3-dione (1 g,0.0045mol), sodium acetate (0.405 g, 0.0045 mol) and chloroform (25 mL). The reaction mixture was cooled to -10 °C. To the same flask, a solution of bromine (0.72 g, 0.0045 mol) was added drop wise. The resulting reaction mixture was stirred at 0 °C for 1 h and at room temperature for 2 h. The reaction mixture was partitioned between chloroform and water. The organic layer was separated, washed with brine and dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to get the title compound [1.2 g, 92 %]. LC-MS: 301.5 $[M+H]^+$.

Step iv: 2-amino-5-(2-chlorophenyl)-5,6-dihydrobenzo[d]thiazol-7(4H)-one

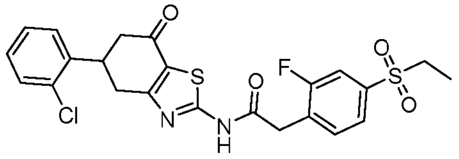
To a 25 mL round bottom flask, were added 2-bromo-5-(2-chlorophenyl)cyclohexane-1,3-dione (1.2 g, 0.004 mol), thiourea (0.36 g, 0.0048 mol) and THF (10 mL). The resulting reaction mixture was stirred at room temperature for 12 h and at reflux temperature for 2 h. The volatiles were evaporated under reduced to get residue. To this residue, pyridine (10 mL) was added. The reaction mixture was stirred at reflux temperature for 2 h. The volatiles were evaporated under reduced pressure to get residue. The residue was partitioned between chloroform and water. The organic layer was separated, washed with brine and dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to get the title compound [0.72 g, 65 %]. ^{1}H NMR (300 MHz, DMSO-d_6): δ 8.23 (brs, 2H), 7.56–7.26 (m, 4H), 3.86–3.82 (m, 1H), 2.98–2.94 (m, 2H), 2.88–2.78 (m, 1H), 2.49-2.46 (m, 1H); LC-MS: 279.0 $[M+H]^+$.

Step v: N-(5-(2-chlorophenyl)-7-oxo-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-(ethyl sulfonyl) phenyl)acetamide

To a 50 mL round bottom flask, were added 2-amino-5-(2-chlorophenyl)-5,6-dihydrobenzo[d]thiazol-7(4H)-one (0.1 g, 0.00036 mol), 2-(4-(ethylsulfonyl)phenyl)acetic acid

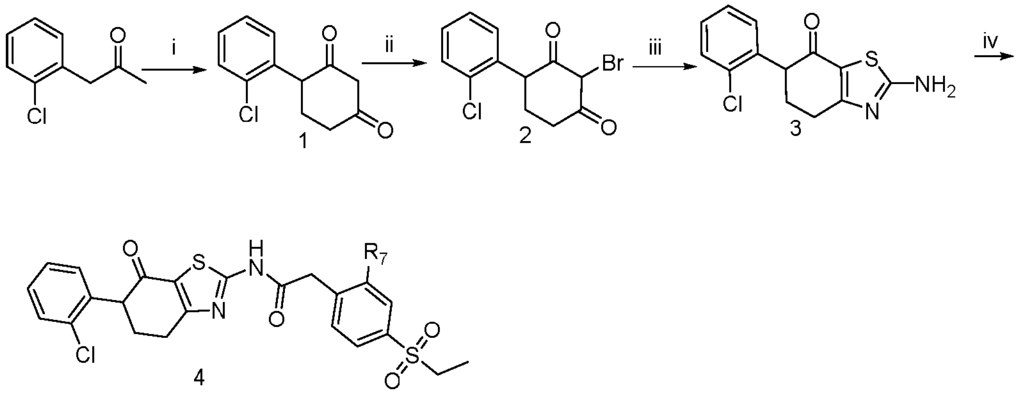
(0.12 g, 0.00054 mol) and dichloromethane (15 mL). To the same flask, EDCI.HCl (0.1 g, 0.00054 mol) and HOBt (0.073 g, 0.00054 mol) were added. The reaction mixture was stirred at room temperature for 12 h. The reaction mixture was diluted with dichloromethane and washed with water followed by saturated aqueous sodium bicarbonate. The organic layer was separated, washed with brine and dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to get crude product. The crude product was purified by flash column chromatography using 0–1.5 % chloroform in methanol followed by preparative thin layer chromatography using 2 % methanol in chloroform to get the title compound [0.078 g, 45 %]. ^{1}H NMR (400 MHz, DMSO-d$_6$): δ 12.98 (brs, 1H), 7.84 (d, 2H), 7.58 (d, 2H), 7.55-7.43 (m, 1H), 7.46–7.44 (m, 1H), 7.34–7.27 (m, 2H), 3.97 (s, 2H), 3.95-3.80 (m, 1H), 3.30–3.24 (m, 2H), 3.14–3.11 (m, 2H), 3.00–2.93 (m, 1H), 2.61–2.56 (m, 1H), 1.08 (t, 3H); LC-MS: 489.1 [M+H]$^+$.

Compound-99: N-(5-(2-chlorophenyl)-7-oxo-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-(ethylsulfonyl)-2-fluorophenyl)acetamide



This compound was prepared by procedure similar to the one described in Example-25 [SchemeII(u)], with appropriate variations in reactants, quantities of reagents, solvents and reaction conditions. ^{1}H NMR (400 MHz, DMSO-d$_6$): δ 13.00 (brs,1H), 7.73-7.56 (m, 3H), 7.56 (d, 1H), 7.54 (d, 1H), 7.36-7.25 (m, 2H), 4.64 (s, 1H), 3.96-3.88 (m, 1H), 3.40 (q, 2H), 3.19-3.15 (m, 2H), 3.00-2.93 (m, 1H), 2.64-2.52 (m, 1H), 1.19 (t, 3H).). LC-MS: 507.1 [M+H]$^+$.

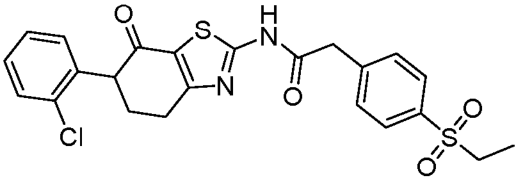
Scheme II(v)



R$_7$ is hydrogen or halo

Reagents and conditions: i) Methyl acrylate, sodium metal, methanol, xylene, reflux, 3 h; ii) bromine, sodium acetate, chloroform, room temperature, 1 h; iii) (a) thiourea, THF, room temperature, 12 h followed by reflux, 2 h (b) pyridine, reflux, 2 h; iv) appropriate acid, EDCI.HCl, HOBt, DCM, 12 h.

Example 26: Synthesis of N-(6-(2-chlorophenyl)-7-oxo-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide (Compound-100)



Step i: 4-(2-chlorophenyl)cyclohexane-1,3-dione

To a 100 mL round bottom flask, was added methanol (3.5 mL). To the same flask, sodium metal (0.45 g, 0.0196 mol) was added portion wise. The reaction mixture was stirred at room temperature until all sodium metal had dissolved. To the same flask, xylene (15 mL), 1-(2-chlorophenyl)propan-2-one (3 g, 0.0178 mol) and methyl acrylate (0.984 g, 0.0178 mol) were added. The resulting solution was stirred at reflux temperature for 3 h. The volatiles were evaporated under reduced pressure to get residue. The residue was partitioned between diethyl ether and water. The aqueous layer was separated and acidified with conc. hydrochloric acid. The aqueous layer was extracted with chloroform. The organic layer was separated, washed with brine and dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to get the title compound [2.5 g, 63 %]. ^{1}H NMR (300 MHz, $CDCl_3$): δ 7.44–7.16 (m, 4H), 4.24–4.10 (m, 1H), 3.17–3.59 (m, 1H), 2.85–2.73 (m, 1H), 2.47–2.07 (m, 4H); LC-MS: 223.1 $[M+H]^+$.

Step ii: 2-bromo-4-(2-chlorophenyl)cyclohexane-1,3-dione

To a 25 mL round bottom flask, were added 4-(2-chlorophenyl)cyclohexane-1,3-dione (1.3 g, 0.0058 mol), sodium acetate (0.53 g, 0.0064 and chloroform (10 mL). To the same flask, bromine (0.93 g, 0.0058 mol) was added drop wise. The resulting reaction mixture was stirred at room temperature for 1 h. The volatiles were evaporated under reduced pressure to get residue. The residue was partitioned between ethyl acetate and water. The organic layer was separated, washed with brine, dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to get the title compound [0.6 g, 34 %].LC-MS: 300.9 $[M+H]^+$.

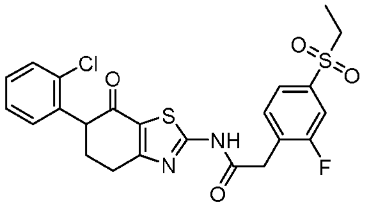
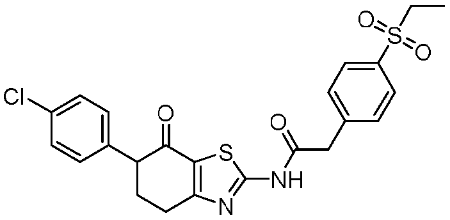
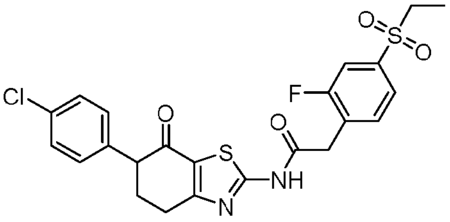
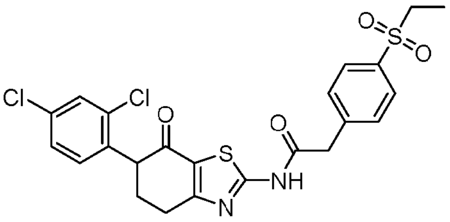
Step iii: 2-amino-6-(2-chlorophenyl)-5,6-dihydrobenzo[d]thiazol-7(4H)-one

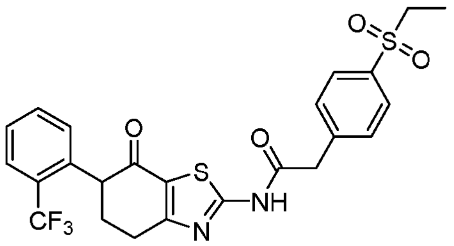
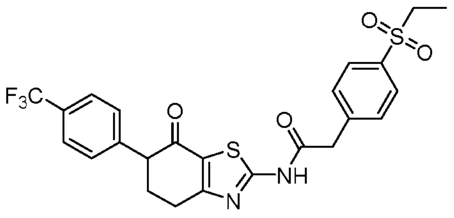
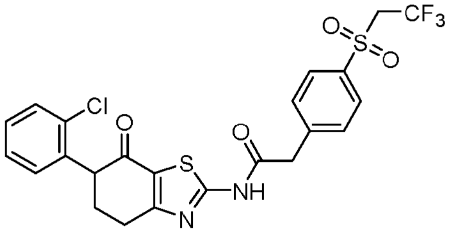
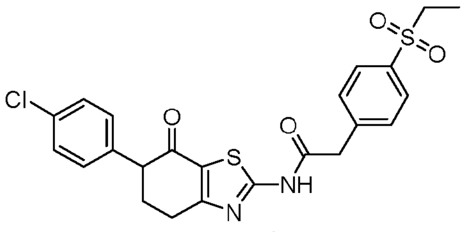
To a 25 mL round bottom flask, were added 2-bromo-4-(2-chlorophenyl)cyclohexane-1,3-dione (0.4 g, 0.0013 mol), thiourea (0.12 g, 0.0016 mol) and THF (10 mL). The resulting reaction mixture was stirred at room temperature for 12 h and at reflux temperature for 2 h. The volatiles were evaporated under reduced to get residue. The residue was dissolved in pyridine (10 mL) and stirred at reflux temperature for 2 h. The volatiles were evaporated under reduced pressure to get residue. The residue was partitioned between chloroform and water. The organic layer was separated, washed with brine and dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to get the title compound [0.27 g, 74 %]. ^{1}H NMR (400 MHz, DMSO-d_6): δ 8.22 (brs, 2H), 7.45–7.43 (m, 1H), 7.29–7.22 (m, 3H), 4.13–4.09 (m, 1H), 2.92–2.50 (m, 2H), 2.42–2.33 (m, 1H), 2.18–2.14 (m, 1H); LC-MS: 279.1 [M+H]$^+$.

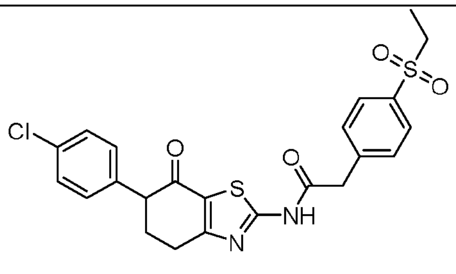
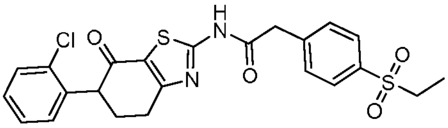
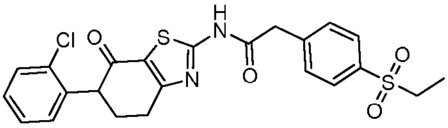
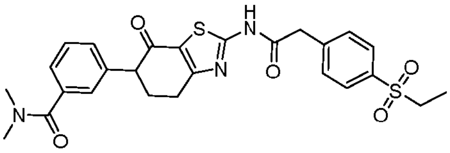
Step iv: N-(6-(2-chlorophenyl)-7-oxo-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-(ethyl sulfonyl)phenyl)acetamide

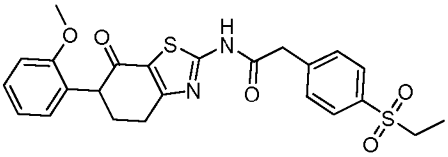
To a 50 mL round bottom flask, were added 2-amino-6-(2-chlorophenyl)-5,6-dihydro benzo[d]thiazol-7(4H)-one (0.085 g, 0.0003 mol), 2-(4-(ethylsulfonyl)phenyl)acetic acid (0.084 g, 0.00036 mol) and dichloromethane (10 mL). To the same flask, EDCI.HCl (0.087 g, 0.00045 mol) and HOBt (0.062 g, 0.00045 mol) were added. The reaction mixture was stirred at room temperature for 12 h. The reaction mixture was diluted with dichloromethane, washed with water followed by saturated aqueous sodium bicarbonate. The organic layer was separated, washed with brine and dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to get crude product. The crude product was purified by flash column chromatography using 0–1.5 %methanol in chloroform followed by preparative thin layer chromatography using 2 % methanol in chloroform to get the title compound [0.038 g, 25 %]. ^{1}H NMR (400 MHz, DMSO-d_6): δ 13.0 (brs, 1H), 7.87 (d, 2H), 7.62 (d, 2H), 7.47–7.75 (m, 1H), 7.31–7.30 (m, 3H), 4.31–4.28 (m, 1H), 4.00 (s, 2H), 3.33–3.27 (m, 3H), 3.15–2.96 (m, 2H), 2.26–2.29 (m, 1H), 1.11 (t, 3H); LC-MS: 489.0 [M+H]$^+$.

The below compounds were prepared by procedure similar to the one described in Example-26 [Scheme II(v)], with appropriate variations in reactants, quantities of reagents, solvents and reaction conditions. The characterization data of the compounds are summarized herein below table.

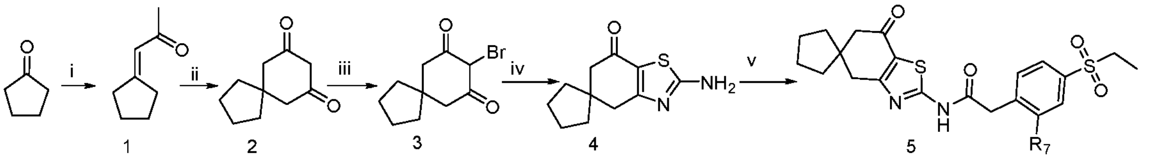
Compound No.	Structure	Characterization data
101		^{1}H NMR (400 MHz, $CDCl_3$): δ 9.15 (brs, 1H), 7.75 (d, 1H), 7.71 (d, 1H), 7.41-7.39 (m, 1H), 7.23 (t, 2H), 7.16-7.15 (m, 1H), 4.29-4.25 (m, 1H), 3.95 (s , 2H), 3.18 (q, 2H), 3.05-3.02 (m, 2H), 2.52-2.37 (m, 2H), 1.34 (t, 3H). LC-MS: 507.2 [M+H]$^+$.
102		^{1}H NMR (400 MHz, $CDCl_3$): δ 9.09 (brs, 1H), 7.95 (d, 2H), 7.55 (d, 2H), 7.32 (d, 2H), 7.13 (d, 2H), 3.94 (s, 2H), 3.78-3.74 (m, 1H), 3.17 (q, 2H), 2.99 (t, 2H), 2.45-2.41 (m, 2H), 1.31 (t, 3H). LC-MS: [M+H]$^+$.
103		^{1}H NMR (400 MHz, $CDCl_3$): δ 9.15 (s, 1H), 7.78 (dd, 2H), 7.63 (t, 1H), 7.32 (d, 2H), 7.13 (d, 2H), 3.98 (s, 1H), 3.95 (s, 2H), 3.81-3.64 (m, 1H), 3.20 (q, 2H), 3.02 (d, 2H), 2.44 (d, 2H), 1.34 (t, 3H). LC-MS: 507.0 [M+H]$^+$.
104		^{1}H NMR (400 MHz DMSO-d_6): δ 13.00 (brs, 1H), 7.87 (d, 2H), 7.63-7.60 (m, 3H), 7.42 (d, 1H), 7.36 (d, 1H), 4.30-4.26 (m, 1H), 4.01 (s, 2H), 3.37 (q, 2H), 3.11-2.98 (m, 3H), 2.24-2.22 (m, 1H), 1.11 (t, 3H). LC-MS: 507 [M+H]$^+$.

Compound No.	Structure	Characterization data
105		^{1}H NMR (400 MHz, $CDCl_3$): δ 9.19 (s, 1H), 7.95 (d, 2H), 7.70 (d, 1H), 7.56 (t, 3H), 7.41 (t, 1H), 4.25-4.12 (m, 1H), 3.95 (s, 2H), 3.17 (q, 2H), 3.07-3.04 (m, 2H), 2.45-2.36 (m, 2H), 1.33 (t, 3H). LC-MS: 523.1 [M+H]$^+$.
106		^{1}H NMR (400 MHz, $CDCl_3$): δ 9.00 (s, 1H), 7.91-7.89 (d, 2H), 7.60-7.58 (m, 2H), 7.50-7.48 (m, 2H), 7.26-7.22 (m, 2H), 4.30-4.26 (m, 1H), 3.88 (s, 2H), 3.13-3.08 (m, 2H), 2.68-2.62 (m, 1H), 2.52 2.50 (m, 1H), 2.24 2.22 (m, 1H), 1.26 (t, 3H). LC-MS: 523.2 [M+H]$^+$.
107		^{1}H NMR (400 MHz, $CDCl_3$): δ 10.22 (s, 1H), 7.93 (d, 2H), 7.55 (d, 2H), 7.36 (d, 1H), 7.18 (d, 3H), 4.30-4.27 (m, 1H), 4.00 (q, 2H), 3.88 (s, 2H), 3.02 (s, 2H), 2.48-2.35 (m, 2H), 1.27 (d, 1H). LC-MS: 543.2 [M+H]$^+$.
108	 Isomer-2	^{1}H NMR (400 MHz, $CDCl_3$): δ 9.09 (brs, 1H), 7.95 (d, 2H), 7.55 (d, 2H), 7.32 (d, 2H), 7.13 (d, 2H), 3.94 (s, 2H), 3.78-3.74 (m, 1H), 3.17 (q, 2H), 2.99 (t, 2H), 2.45-2.41 (m, 2H), 1.31 (t, 3H).). LC-MS: 488.6 [M+H]$^+$.

Compound No.	Structure	Characterization data
109	 Isomer-1	^{1}H NMR (400 MHz, CDCl$_3$): δ 9.09 (brs, 1H), 7.95 (d, 2H), 7.55 (d, 2H), 7.32 (d, 2H), 7.13 (d, 2H), 3.94 (s, 2H), 3.78-3.74 (m, 1H), 3.17 (q, 2H), 2.99 (t, 2H), 2.45-2.41 (m, 2H), 1.31 (t, 3H).). LC-MS: 488.6 [M+H]$^+$.
110	 Isomer-1	^{1}H NMR (400 MHz, CDCl$_3$): δ 9.00 (brs, 1H), 7.97 (d, 2H), 7.57 (d, 2H), 7.44-7.41 (m, 1H), 7.25-7.24 (m, 2H), 7.18-7.16 (m, 1H), 4.30-4.27 (m, 1H), 3.97 (s ,2H), 3.19 (q, 2H), 3.05-3.02 (m, 2H), 2.50-2.41 (m, 2H), 1.35 (t, 3H). LC-MS: 489 [M+H]$^+$.
111	 Isomer-2	^{1}H NMR (400 MHz, CDCl$_3$): δ 9.00 (brs, 1H), 7.97 (d, 2H), 7.57 (d, 2H), 7.44-7.41 (m, 1H), 7.25-7.24 (m, 2H), 7.18-7.16 (m, 1H), 4.30-4.27 (m, 1H), 3.97 (s, 2H), 3.19 (q, 2H), 3.05-3.02 (m, 2H), 2.50-2.41 (m, 2H), 1.35 (t, 3H). LC-MS: 489 [M+H]$^+$.
112		^{1}H NMR (400 MHz, CDCl$_3$): δ 7.84 (d, 2H), 7.64-7.61 (m, 2H), 7.33-7.28 (m, 4H), 3.74 (s, 2H), 3.14-3.09 (m, 4H), 3.03 (s, 3H), 2.73-2.70 (m, 2H), 2.57-2.54 (m, 2H), 2.13-2.10 (m, H), 1.30 (t, 3H). LCMS: 526.3 [M+H]$^+$.

Compound No.	Structure	Characterization data
113		^{1}H NMR (400 MHz, CDCl$_3$): δ 7.93 (d, 2H), 7.56 (d, 2H), 7.08-7.05 (m, 1H), 6.91 (t, 2H), 4.05-3.99 (m, 1H), 3.94 (s, 2H), 3.76 (s, 3H), 3.15 (q, 2H), 3.01-2.96 (m, 1H), 2.71-2.49 (m, 4H), 2.32-2.25 (m, 1H), 1.32-1.27 (t, 3H). LC-MS: 485.3 [M+H]$^+$.

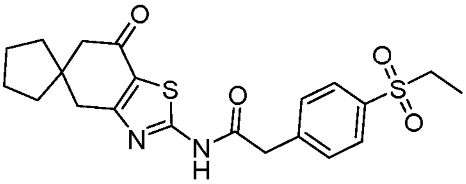
Scheme II(w)



R$_7$ is hydogen or halo

Reagents and conditions: i) dimethyl (2-oxoprop-1-yl)phosphonate, potassium hydroxide, ethanol, water, room temperature, 72 h; ii) (a) diethyl malonate, sodium metal, methanol, reflux, 2 h (b) barium hydroxide, water, reflux, 24 h; iii) bromine, sodium acetate, chloroform, 0 °C - room temperature, 2 h; iv) (a) thiourea, THF, room temperature, 12 h followed by reflux, 1 h (b) pyridine, reflux, 2 h; v) appropriate acid, EDCI.HCl, HOBt, DCM, 2 - 12 h.

Example 27: 2-(4-(ethylsulfonyl)phenyl)-N-(7-oxo-6,7-dihydro-4H-spiro[benzo[d]thiazole-5,1'-cyclopentan]-2-yl)acetamide (Compound-114)



Step i: 1-cyclopentylidenepropan-2-one

To a 500 mL round bottom flask, were added potassium hydroxide (6 g, 0.107 mol), ethanol (173 mL) and water (44 mL). To the same flask, cyclopentanone (6 g, 0.0713 mol) and dimethyl (2-oxoprop-1-yl)phosphonate (15.3 g, 0.0927 mol) were added. The resulting reaction mixture was stirred at room temperature for 72 h. The reaction mixture was extracted with diethyl ether. The organic layer was separated, washed with brine and dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to get crude product. The crude product was purified by flash column chromatography using 0–5 % ethyl acetate in hexane to get the title compound [2.5 g, 28 %]. LC-MS: 125.0 $[M+H]^+$.

Step ii: spiro[4.5]decane-7,9-dione

To a 250 mL round bottom flask, was added methanol (3 mL). To the same flask, sodium metal (0.25 g, 0.008 mol) was added portion wise. The reaction mixture was stirred at room temperature until all sodium metal had dissolved. To the same flask, 1-cyclopentylidenepropan-2-one (1 g, 0.008 mol) and diethyl malonate (1.75 g, 0.0096 mol) were added drop wise. The resulting mixture was stirred at reflux temperature for 2 h. To the reaction mixture, a solution of barium hydroxide (11.23 g, 0.064 mol) in water (100 mL) was added. The hot reaction mixture was stirred at reflux temperature for 24 h and acidified to pH 6.0 with dil. hydrochloric acid to get the suspension. The hot suspension was filtered to get a clear filtrate. The filtrate was acidified to pH 1.0 with dil. hydrochloric acid and stirred at reflux temperature for 15 min. The hot reaction mixture was filtered to get the filtrate. The filtrate was cooled to room temperature and extracted with ethyl acetate. The organic layer was separated, washed with brine and dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to get the title compound [0.65 g, 46 %]. ^{1}H NMR (300 MHz, $CDCl_3$): δ 3.63 (s, 2H), 2.61 (s, 4H), 1.73 - 1.67 (m, 4H), 1.49–1.45 (m, 4H); LC-MS: 167.2 $[M+H]^+$.

Step iii & iv: 2-amino-4H-spiro[benzo[d]thiazole-5,1'-cyclopentan]-7(6H)-one

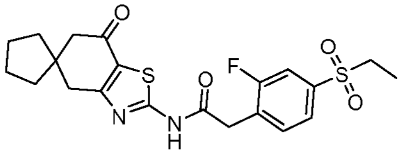
To a 50 mL round bottom flask, were added spiro[4.5]decane-7,9-dione (0.65 g, 0.0039 mol), sodium acetate (0.352 g, 0.0043 mol) and chloroform (10 mL). The reaction mixture was cooled to 0 °C. To the same flask, bromine (0.624 g, 0.0039 mol) in chloroform (5 mL) was added drop wise. The reaction mixture was stirred at room temperature for 1 h. The reaction mixture was diluted with chloroform and washed with water. The organic layer was separated, washed with brine and dried over anhydrous sodium sulfate. The organic layer was evaporated under reduced pressure to get 8-bromospiro[4.5]decane-7,9-dione.

This bromo intermediate was stirred with thiourea (0.36 g, 0.0047 mol) in THF (10 mL) at room temperature for 12 h and at reflux temperature for 1 h. The volatiles were evaporated under reduced pressure to get residue. The residue was dissolved in pyridine and stirred at reflux temperature for 2 h. The volatiles were evaporated under reduced pressure to get residue. The residue was partitioned between chloroform and water. The organic layer was separated, washed with brine and dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to get the title compound [0.45 g, 52 %]. LC-MS: 223.1 $[M+H]^+$.

Step v: 2-(4-(ethylsulfonyl)phenyl)-N-(7-oxo-6,7-dihydro-4H-spiro[benzo[d]thiazole-5,1'-cyclopentan]-2-yl)acetamide

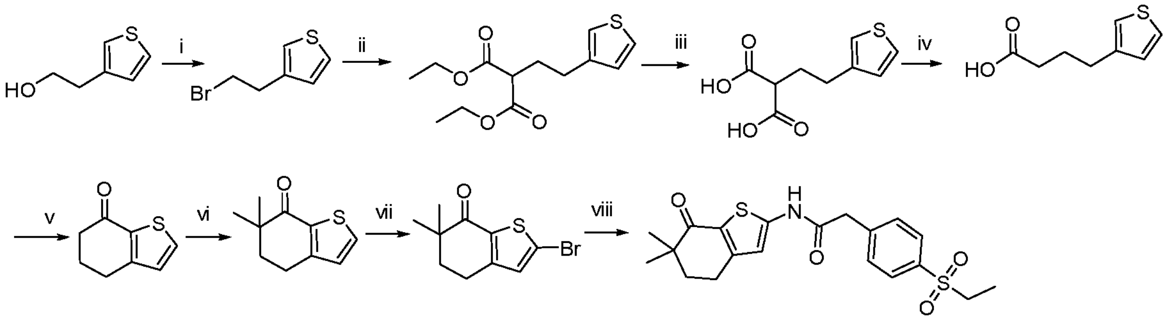
To a 50 mL round bottom flask, were added 2-amino-4H-spiro[benzo[d]thiazole-5,1'-cyclopentan]-7(6H)-one (0.1 g, 0.00045 mol), 2-(4-(ethylsulfonyl)phenyl)acetic acid (0.123 g, 0.00054 mol) and dichloromethane (15 mL). To the same flask, EDCI.HCl (0.13 g, 0.0007 mol) and HOBt (0.09 g, 0.0007 mol) were added. The reaction mixture was stirred at room temperature for 2 h. The reaction mixture was diluted with dichloromethane and washed with water. The organic layer was separated, washed with brine and dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to get crude product. The crude product was purified by flash column chromatography using 0–1 % methanol in chloroform followed by preparative thin layer chromatography using 1 % methanol in chloroform to get the title compound [0.05 g, 26 %]. ^{1}H NMR (400 MHz, $CDCl_3$): δ 9.28 (brs, 1H), 7.93 (d, 2H), 7.55 (d, 2H), 3.94 (s, 2H), 3.16–3.14 (m, 2H), 2.83 (s, 2H), 2.57 (s, 2H), 1.70–1.67 (m, 4H), 1.55 (brs, 4H), 1.33 (t, 3H); LC-MS: 433.4 $[M+H]^+$.

Compound-115: 2-(4-(ethylsulfonyl)-2-fluorophenyl)-N-(7-oxo-6,7-dihydro-4H-spiro[benzo[d]thiazole-5,1'-cyclopentan]-2-yl)acetamide



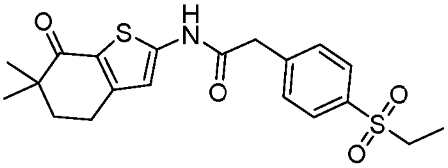
This compound was prepared by procedure similar to the one described in Example-27 [Scheme II(w)], with appropriate variations in reactants, quantities of reagents, solvents and reaction conditions. ^{1}H NMR (400 MHz, DMSO-d_6): δ 12.98 (brs, 1H), 7.75-7.71 (m, 3H), 4.05 (s, 2H), 3.40 (q, 2H), 2.87 (s, 2H), 2.50 (s, 2H), 1.64-1.63 (m, 4H), 1.51-1.44 (m, 4H), 1.14 (t, 3H). LC-MS: 451.4 $[M+H]^+$.

Scheme II(x)



Reagents and conditions: i) Carbon tetrabromide, triphenyl phosphine, THF, 70 °C, 3 h; ii) diethyl malonate, sodium iodide, 60 % sodium hydride in mineral oil, THF, 0 °C – room temperature, 48 h; iii) 20 % aqueous potassium hydroxide, 60 °C, 3 h; iv) diglyme, 162 °C, 24 h; v) polyphosphoric acid, 1,2-dichloroethane, 60 °C, 12 h; vi) methyl iodide, 1.0 M lithium bis(trimethylsilyl)amide in THF, THF, -78 °C – room temperature, 2 h; vii) bromine, acetic acid, water, room temperature, 1 h; viii) 2-(4-(ethylsulfonyl)phenyl)acetamide, potassium phosphate tribasic, copper iodide, *N*, *N'*-dimethylethylenediamine, 1,4-dioxane,100 °C, 12 h.

Example 28: N-(6,6-dimethyl-7-oxo-4,5,6,7-tetrahydrobenzo[b]thiophen-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide (Compound-116)



Step i: 3-(2-bromoethyl)thiophene

To a 500 mL round bottom flask, were added 2-(thiophen-3-yl)ethanol (18 g, 0.1406 mol) and THF (250 mL). The reaction mixture was cooled to 0 °C. To the same flask, triphenylphosphine (44.26 g, 0.1687 mol) and carbon tetrabromide (55 g, 0.1687 mol) were added. The reaction mixture was stirred at 70 °C for 3 h. The reaction mixture was cooled to room temperature and filtered through a pad of celite®. The filtrate was evaporated under reduced pressure to get crude product. The crude product was purified by column chromatography using 60–120 silica gel and 5 % ethyl acetate in hexane to get the title compound [23 g, 86 %]. ^{1}H NMR (300 MHz, $CDCl_3$): δ 7.30–7.28 (m, 1H), 7.07–7.06 (m, 1H), 6.99–6.97 (m, 1H), 3.59 (t, 2H), 3.23 (t, 2H).

Step ii: diethyl 2-(2-(thiophen-3-yl)ethyl)malonate

To a 500 mL round bottom flask, were added diethyl malonate (25.17 g, 0.1573 mol) and THF (300 mL). The reaction mixture was cooled to 0 °C. To the same flask, 60 % sodium hydride in mineral oil (5.81 g, 0.242 mol) was added. The resulting reaction mixture was stirred at room temperature for 1 h. To the same flask, 3-(2-bromoethyl)thiophene (23 g, 0.12 mol) and sodium iodide (0.1 g) were added. The reaction mixture was stirred at room temperature for 48 h. The reaction mixture was cooled to 0 °C and quenched with ice cold water. The reaction mixture was extracted with ethyl acetate. The organic layer was separated, washed with brine and dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to get crude product. The crude product was purified by column chromatography using 60–120 silica gel and 0–10 % ethyl acetate in hexane to get the title compound [13 g, 40 %]. ^{1}H NMR (400 MHz, $CDCl_3$): δ 7.24–7.22 (m, 1H), 6.95–6.92 (m, 2H), 4.21-4.14 (m, 4H), 3.34 (t, 1H), 2.69 (t, 2H), 2.23–2.15 (m, 2H), 1.28–1.20 (m, 6H).

Step iii: 2-(2-(thiophen-3-yl)ethyl)malonic acid

To a 250 mL round bottom flask, were added diethyl 2-(2-(thiophen-3-yl)ethyl)malonate (13 g, 0.0481 mol) and ethanol (80 mL). To the same flask, 20 % aqueous potassium hydroxide (80 mL) was added. The reaction mixture was stirred at 60 °C for 3 h. The reaction mixture was cooled to 0 - 5 °C and acidified to pH 2.0 using 6.0 N aqueous hydrochloric acid. To the reaction mixture, diethyl ether was added and stirred at 40 °C for 12 h. The organic layer was separated. The aqueous layer was again extracted with diethyl ether. The combined organic layer was washed with brine and dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to get the title compound [8 g, 80 %]. ^{1}H NMR (300 MHz, DMSO-d_6): δ 12.66 (brs, 2H), 7.45-7.42 (m, 1H), 7.15-7.14 (m, 1H), 6.97-6.95 (m, 1H), 3.22 (m, 1H), 2.60 (m, 2H), 2.02 (m, 2H); LC-MS: 213.1 $[M-H]^+$.

Step iv: 4-(thiophen-3-yl)butanoic acid

To a 250 mL round bottom flask, were added 2-(2-(thiophen-3-yl)ethyl)malonic acid (8 g, 0.0373 mol) and diglyme (80 mL). The reaction mixture was stirred at 162 °C for 24 h. The reaction mixture was cooled to room temperature and basified to pH 9.0 using conc. ammonium hydroxide. The reaction mixture was partitioned with diethyl ether. The aqueous layer was separated and acidified with conc. hydrochloric acid. The aqueous layer was extracted with diethyl ether. The organic layer was separated, washed with brine and dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to get the title compound [5 g, 79 %].

Step v: 5,6-dihydrobenzo[b]thiophen-7(4H)-one

To a 100 mL round bottom flask, were added 4-(thiophen-3-yl)butanoic acid (5 g, 0.0294 mol), polyphosphoric acid (30 g) and 1,2-dichloroethane (30 mL). The reaction mixture was stirred at 80 °C for 12 h. The volatiles were evaporated under reduced pressure to get residue. The residue was neutralized with solid sodium hydroxide and diluted with water at 0 °C. The reaction mixture was stirred at room temperature for 30 min. and extracted with dichloromethane. The organic layer was separated, washed with brine and dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to get crude product. The crude product was purified by column chromatography using 60–120 silica gel and 5 % ethyl acetate in hexane to get the title compound [1.7 g, 38 %]. ^{1}H NMR (300 MHz, $CDCl_3$): δ 7.60 (d, 1H), 6.97 (d, 1H), 2.89 (t, 2H), 2.62 (d, 2H), 2.21–2.13 (m, 2H); LC-MS: 153.1 $[M+H]^+$.

Step vi: 6,6-dimethyl-5,6-dihydrobenzo[b]thiophen-7(4H)-one

To a 50 mL round bottom flask, were added 6,6-dimethyl-5,6-dihydrobenzo[b]thiophen-7(4H)-one (0.5 g, 0.0033 mol) and anhydrous THF (20 mL). The reaction mixture was cooled to -78 °C under N_2 atmosphere. To the same flask, 1.0 M lithium bis(trimethylsilyl)amide in THF (1.2 mL, 0.0073 mol) was added. The reaction mixture was stirred at -78 °C for 30 min. To the same flask, methyl iodide (0.934 g, 0.0065 mol) was added at -78 °C. The reaction mixture was stirred at room temperature for 2 h. The reaction mixture was cooled to 0 °C and quenched with 10 % aqueous ammonium chloride. The reaction mixture was extracted with diethyl ether. The organic layer was separated, washed with brine and dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to get crude product. The crude product was purified by column chromatography using 60-120 silica gel and 5 % ethyl acetate in hexane to get the title compound [0.3 g, 50 %]. ^{1}H NMR (300 MHz, $CDCl_3$): δ 7.59 (d, 1H), 6.93 (d, 1H), 2.90 (t, 2H), 2.03 (t, 2H), 1.22 (s, 6H); LC-MS: 181.2 $[M+H]^+$.

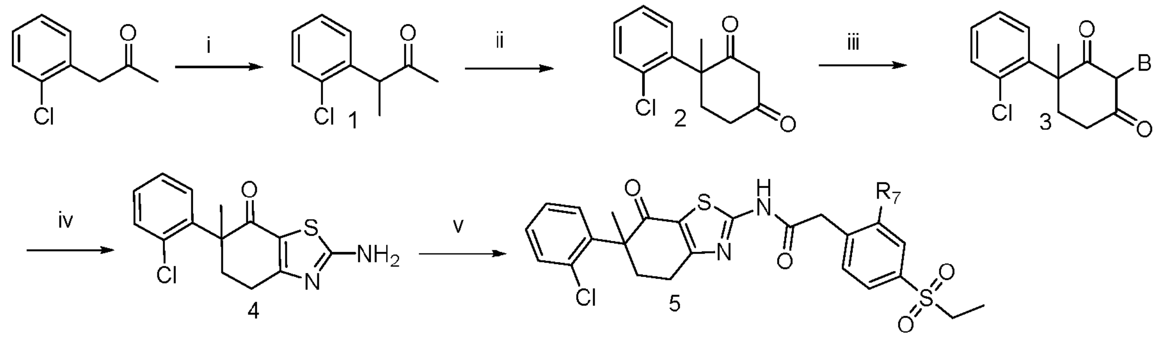
Step vii: 2-bromo-6,6-dimethyl-5,6-dihydrobenzo[b]thiophen-7(4H)-one

To a 25 mL round bottom flask, were added 6,6-dimethyl-5,6-dihydrobenzo[b]thiophen-7(4H)-one(0.15 g, 0.00083 mol), acetic acid (2 mL) and water (2 mL). The reaction mixture was cooled to 0 °C. To the same flask, bromine (0.16 g, 0.00099 mol) was added. The reaction mixture was stirred at room temperature for 1 h. The reaction mixture was diluted with water and extracted with diethyl ether. The organic layer was separated, washed with brine and dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to get crude product. The crude product was purified by column chromatography using 60–120 silica gel and 5 % ethyl acetate in hexane to get the title compound [0.04 g, 19 %]. ^{1}H NMR (300 MHz, CDCl$_3$): δ 7.56 (s, 1H), 2.80 (t, 2H), 2.06 (t, 2H), 1.22 (s, 6H); LC-MS: 260.0 [M+2H]$^+$.

Step viii: N-(6,6-dimethyl-7-oxo-4,5,6,7-tetrahydrobenzo[b]thiophen-2-yl)-2-(4-(ethylsulfonyl) phenyl)acetamide

A 25 mL sealed tube was charged with 2-bromo-6,6-dimethyl-5,6-dihydrobenzo[b]thiophen-7(4H)-one (0.04 g, 0.000154 mol), 2-(4-(ethylsulfonyl)phenyl)acetamide (0.038 g, 0.000169 mol), copper iodide (0.0015 g, 0.0000077 mol) potassium phosphate tribasic (0.033 g, 0.000154 mol) and 1,4-dioxane (5 mL). The reaction mixture was degassed for 5 min. with argon. To the same tube, *N, N'*-dimethylethylenediamine (0.019 g, 0.000169 mol) was added. The reaction mixture was again degassed for 5 min. with argon. The reaction was stirred at 100 °C for 12 h. The reaction mixture was cooled to room temperature and partitioned between ethyl acetate and water. The organic layer was separated, washed with brine and dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to get crude product. The crude product was purified by preparative thin layer chromatography using 40 % ethyl acetate in hexane to get the title compound [0.02 g, 32 %]. ^{1}H NMR (400 MHz, CDCl$_3$): δ 8.03 (brs, 1H), 7.95 (d, 2H), 7.57 (d, 2H), 7.13 (brs, 1H), 3.85 (s, 2H), 3.14-3.12 (m, 2H), 2.55 (t, 2H), 2.03 (t, 2H), 1.31 (t, 3H), 1.21 (s, 6H); LC-MS: 406.3 [M+H]$^+$.

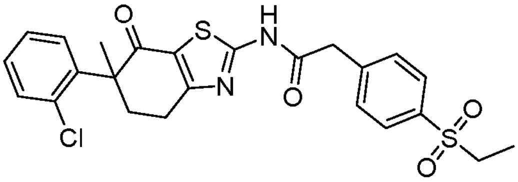
Scheme II(y)



R$_7$ is hydrogen or halo

Reagents and conditions: i) Methyl iodide, 50 % aqueous sodium hydroxide, benzyltrimethylammonium chloride, 0 °C – room temperature, 2 h; ii) methyl acrylate, sodium metal, methanol, xylene, reflux, 3 h; iii) bromine, sodium acetate, chloroform, room temperature, 2 h; iv) (a) thiourea, THF, room temperature, 16 h, followed by reflux, 3 h (b) pyridine, reflux, 2 h; v) appropriate acid, EDCI.HCl, HOBt, DCM, 2 - 12 h.

Example 29: N-(6-(2-chlorophenyl)-6-methyl-7-oxo-4,5,6,7-tetrahydro benzo[d]thiazol-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide (Compound-117)



Step i: 3-(2-chlorophenyl)butan-2-one

To a 25 mL round bottom flask, were added 1-(2-chlorophenyl)propan-2-one (2 g, 0.0118 mol) and cooled to 0 °C. To the same flask, 50 % aqueous sodium hydroxide (10 mL) and benzyl trimethylammonium chloride (0.22 g, 0.0011 mol) were added. The reaction mixture was stirred at 0 °C for 10 min. To the same reaction mixture, methyl iodide (2.02 g, 0.0142 mol) was added and stirred at room temperature for 2 h. The reaction mixture was diluted with water and extracted with dichloromethane. The organic layer was separated, washed with brine and dried over anhydrous sodium sulfate. The organic layer was evaporated under reduced pressure to get crude product. The crude product was purified by column chromatography using 60–120 silica gel and 3 % ethyl acetate in hexane to get the title compound [1.5 g, 69 %]. ^{1}H NMR (300 MHz, $CDCl_3$): δ 7.43–7.40 (m, 1H), 7.27–7.14 (m, 3H), 4.30 (q, 1H), 2.08 (s, 3H), 1.39 (d, 3H).

Step ii: 4-(2-chlorophenyl)-4-methylcyclohexane-1,3-dione

To a 100 mL round bottom flask, was added methanol (10 mL). To the same flask, sodium metal (0.289 g, 0.0126 mol) was added portion wise. The reaction mixture was stirred at room temperature until all sodium metal had dissolved. To the same flask, xylene (50 mL), 3-(2-chlorophenyl)butan-2-one (2.1 g, 0.0114 mol) and methyl acrylate (0.984 g, 0.0114 mol) were added. The resulting solution was stirred at reflux temperature for 3 h. The volatiles were evaporated under reduced pressure to get residue. The residue was partitioned between diethyl ether and water. The aqueous layer was separated and acidified with conc. hydrochloric acid. The aqueous layer was extracted with chloroform. The organic layer was separated, washed with brine and dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to get desired product [2 g, 74 %]. The obtained desired product was used in next step without any further purification. LC-MS: 237.9 $[M+H]^+$.

Step iii: 2-bromo-4-(2-chlorophenyl)-4-methylcyclohexane-1,3-dione

To a 50 mL round bottom flask, were added 4-(2-chlorophenyl)-4-methylcyclohexane-1,3-dione (1.7 g, 0.0072 mol), sodium acetate (0.59 g, 0.0072 and chloroform (20 mL). The reaction mixture was cooled to 0 °C. To the same flask, bromine (1.15 g, 0.0072 mol) was added drop wise. The resulting reaction mixture was stirred at room temperature for 2 h. The volatiles were evaporated under reduced pressure to get residue. The residue was partitioned between ethyl acetate and water. The organic layer was separated, washed with brine and dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to get the title compound [2 g, 88 %]. The obtained product was used in next step without any further purification. LC-MS: 315.0 $[M+H]^+$.

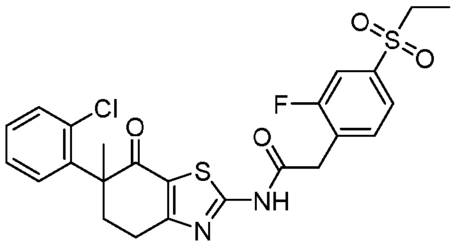
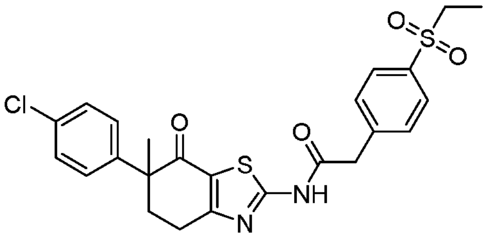
Step iv: 2-amino-6-(2-chlorophenyl)-6-methyl-5,6-dihydrobenzo[d]thiazol-7(4H)-one

To a 50 mL round bottom flask, was added 2-bromo-4-(2-chlorophenyl)-4-methylcyclohexane-1,3-dione (2 g, 0.0063 mol), thiourea (0.726 g, 0.0095 mol) and THF (20 mL). The reaction mixture was stirred at room temperature for 16 h and at reflux temperature for 3 h. The volatiles were evaporated under reduced pressure to get residue. The residue was dissolved in pyridine (10 mL) and stirred at reflux temperature for 2 h. The residue was partitioned between chloroform and water. The organic layer was separated, washed with brine, dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to get the crude product. The crude product was purified by column chromatography using 60–120 silica gel and 60 % ethyl acetate in hexane to get the title compound [0.75 g, 40 %]. ^{1}H NMR (300 MHz, CD_3OD): δ 7.55–7.48 (m, 1H), 7.40–7.24 (m, 3H), 3.03–2.80 (m, 3H), 2.16–1.82 (m, 1H), 1.70 (s, 3H); LC-MS: 293.0 $[M+H]^+$.

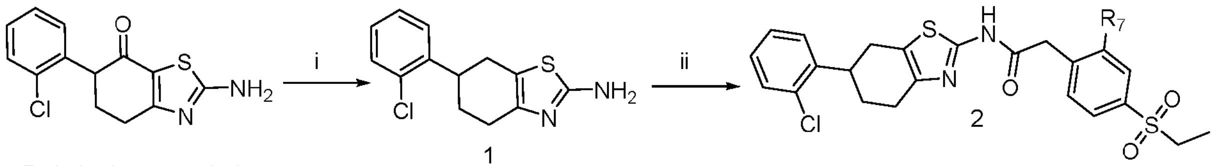
Step v: N-(6-(2-chlorophenyl)-6-methyl-7-oxo-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide

To a 50 mL round bottom flask, were added 2-amino-6-(2-chlorophenyl)-6-methyl-5,6-dihydrobenzo[d]thiazol-7(4H)-one (0.2 g, 0.684 mmol), 2-(4-(ethylsulfonyl)phenyl)acetic acid (0.065 g, 1.027 mmol) and dichloromethane (20 mL). To the same flask, EDCI.HCl (0.195 g, 1.027 mol) and HOBt (0.139 g, 1.027mmol) were added. The reaction mixture was stirred at room temperature for 12 h. The reaction mixture was diluted with dichloromethane and washed with water. The organic layer was separated, washed with brine and dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to get crude product. The crude product was purified by column chromatography using 60–120 silica gel and 70 % ethyl acetate in hexane to get the title compound [0.13 g, 38 %]. ^{1}H NMR (300 MHz, CDCl$_3$): δ 9.47 (brs, 1H), 7.90 (d, 2H), 7.52 (d, 2H), 7.44–740 (m, 1H), 7.35–7.7.32 (m, 1H), 7.28–7.17 (m, 2H), 3.90 (s, 2H), 3.18 (q, 2H), 3.08–2.96 (m, 3H), 1.88–1.70 (m, 1H), 1.70 (s, 3H), 1.32 (t, 3H); LC-MS: 502.9 [M+H]$^+$.

The compounds listed in below table were prepared by procedure similar to the one described in Example-29 [Scheme II(y)], with appropriate variations in reactants, quantities of reagents, solvents and reaction conditions. The characterization data of the compounds are summarized herein below table.

Compound No.	Structure	Characterization data
118		^{1}H NMR (300 MHz, CDCl$_3$): δ 9.30 (s, 1H), 7.75-7.66 (m, 2H), 7.59 (t, 1H), 7.44-7.41 (m, 1H), 7.37-7.34 (m, 1H), 7.30-7.24 (m, 1H), 7.19-7.18 (m, 1H), 3.93 (s, 2H), 3.18-3.07 (m, 2H), 3.04-2.97 (m, 3H), 1.89-1.83 (m, 1H), 1.69 (s, 3H), 1.32 (t, 3H). LC-MS: 504.40 [M+H]$^+$.
119		^{1}H NMR (300 MHz, CDCl$_3$): δ 9.09 (s, 1H), 7.92 (d, 2H), 7.52 (d, 2H), 7.26 (d, 2H), 7.18 (d, 2H), 3.91 (s, 2H), 3.16 (q, 2H), 2.86-2.78 (m, 1H), 2.69-2.56 (m, 2H), 2.33-2.26 (m, 1H), 1.49 (s, 3H), 1.32 (t, 3H). LC-MS: 503.3 [M+H]$^+$.

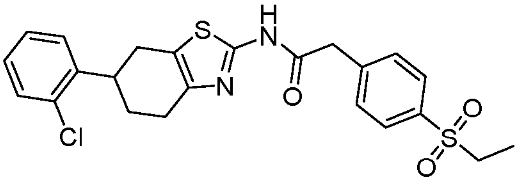
Scheme II(z)



R_7 is hydrogen or halo

Reagents and conditions: i) Sodium borohydride, trifluoroacetic acid, dichloromethane, room temperature, 12 h; ii) appropriate acid, EDCI.HCl, HOBt, DCM, 2 - 12 h.

Example 30: Synthesis of N-(6-(2-chlorophenyl)-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide (Comopund-120)



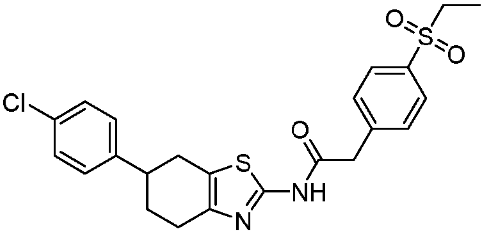
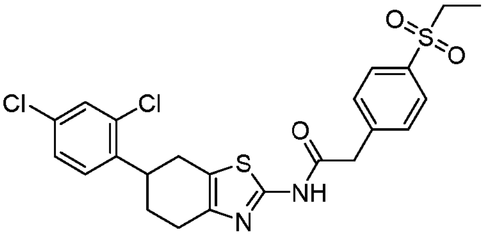
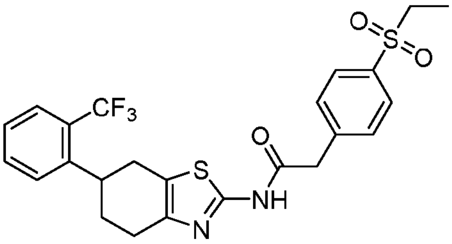
Step i: 6-(2-chlorophenyl)-4,5,6,7-tetrahydrobenzo[d]thiazol-2-amine

To a 25 mL round bottom flask, were added 2-amino-6-(2-chlorophenyl)-5,6-dihydro benzo[d]thiazol-7(4H)-one [Step iii of Example 26] (0.2 g, 0.0071 mol), sodium borohydride (0.163 g, 0.0436 mol) and dichloromethane (10 mL). To the same flask, trifluoroacetic acid (0.2 mL) was added drop wise. The reaction mixture was stirred at room temperature for 12 h. The reaction mixture was diluted with dichloromethane and washed with water. The organic layer was separated, washed with brine and dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to get crude product. The crude product was purified by column chromatography using 60–120 silica gel and 25 % ethyl acetate in hexane to get the title compound [0.07 g, 37 %]. ^{1}H NMR (400 MHz, $CDCl_3$): δ 7.39–7.27 (m, 2H), 7.24–7.14 (m, 2H), 5.43 (brs, 2H), 2.95–2.91 (m, 1H), 2.72–2.71 (m, 2H), 2.65–2.58 (m, 2H), 2.12–2.09 (m, 2H); LC-MS: 265.0 $[M+H]^+$.

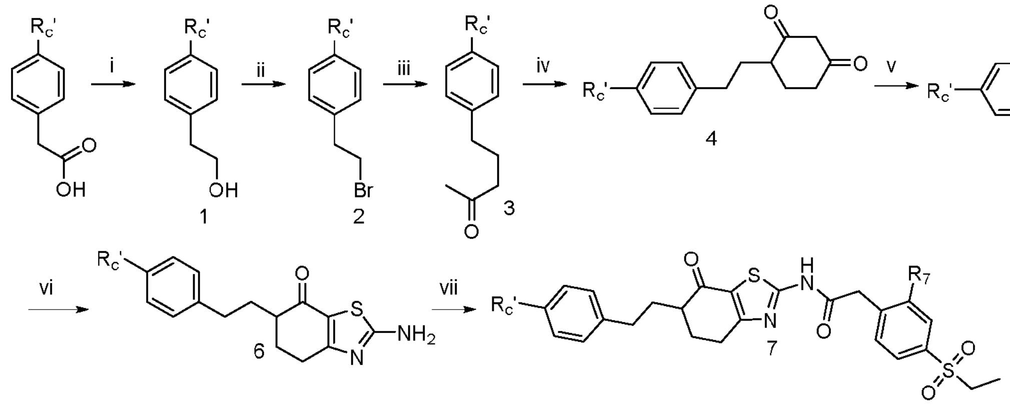
Step ii: N-(6-(2-chlorophenyl)-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-(ethylsulfonyl) phenyl) acetamide

To a 50 mL round bottom flask, were added 6-(2-chlorophenyl)-4,5,6,7-tetrahydro benzo[d]thiazol-2-amine (0.04 g, 0.00015 mol), 2-(4-(ethylsulfonyl)phenyl)acetic acid (0.065 g, 0.00022 mol) and dichloromethane (5 mL). To the same flask, EDCI.HCl (0.043 g, 0.00022 mol) and HOBt (0.03 g, 0.00022 mol) were added. The reaction mixture was stirred at room temperature for 12 h. The reaction mixture was diluted with dichloromethane. The diluted reaction mixture was washed with water. The organic layer was separated, washed with brine and dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to get crude product. The crude product was purified by flash column chromatography using 0–50 % ethyl acetate in hexane followed by preparative thin layer chromatography using 40 % ethyl acetate in hexane to get the title compound [0.022 g, 31 %]. ^{1}H NMR (400 MHz, DMSO-d$_6$): δ 12.28 (brs, 1H), 7.86 (d, 2H), 7.60 (d, 2H), 7.46-7.44 (m, 2H), 7.53-7.31 (m, 1H), 7.35-7.24 (m, 1H), 3.90 (s, 2H), 3.41-3.93 (m, 1H), 3.29-3.25 (m, 2H), 2.97-2.92 (m, 1H), 2.76-2.66 (m, 4H), 2.03-1.99 (m, 1H), 1.11 (t, 3H); LC-MS: 475.3 [M+H]$^+$.

The below compounds were prepared by procedure similar to the one described in Example 30 [Scheme II(z)], with appropriate variations in reactants, quantities of reagents, solvents and reaction conditions. The characterization data of the compounds are summarized herein below table.

Compound No.	Structure	Characterization data
121		^{1}H NMR (400 MHz, CDCl$_3$): δ 9.20 (s, 1H), 7.88 (d, 2H), 7.48 (d, 2H), 7.22 (d, 2H), 6.97 (d, 2H), 3.98 (s, 1H), 3.79 (s, 2H), 3.12 (q, 2H), 2.80 (t, 2H), 2.21-2.17 (m, 1H), 1.92-1.83 (m, 1H), 1.29 (t, 3H). LCMS: 475.1 [M+H]$^+$.
122		^{1}H NMR (400 MHz, CDCl$_3$): δ 7.93 (d, 2H), 7.55 (d, 2H), 7.40 (s, 1H), 7.21 (d, 2H), 3.88 (s, 2H), 3.52-3.49 (m, 2H), 3.16 (q, 2H), 3.07-3.01 (m, 1H), 2.75-2.70 (m, 2H), 2.09-2.02 (m, 2H), 1.33 (t, 3H). LC-MS: 509 [M+H]$^+$.
123		^{1}H NMR (400 MHz, CDCl$_3$): δ 7.93 (d, 2H), 7.67 (d, 1H), 7.54 (d, 3H), 7.48 (d, 1H), 7.33 (t, 1H), 3.89 (s, 2H), 3.43 (s, 2H), 3.14 (q, 2H), 3.01-2.96 (m, 1H), 2.83 (t, 3H), 2.07 (t, 3H). LC-MS: 509 [M+H]$^+$.

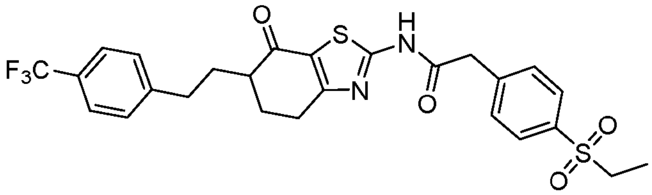
Scheme II(aa)



R_c' is hydrogen or halo;
R_7 is halo or haloalkyl

Reagents and conditions: i) 1.0 M Borane tetrahydrofuran complex, THF, room temperature, 16 h; ii) phosphorous tribromide, 100 °C, 2 h; iii) (a) ethyl acetoacetate, sodium metal, ethanol, reflux, 13 h (b) 5 % aqueous sodium hydroxide, 90 °C, 3 h (c) 50 % aqueous sulfuric acid, 90 °C, 3 h; iv) methyl acrylate, sodium metal, methanol, xylene, reflux, 3 h; v) bromine, sodium acetate, chloroform, 0 °C- room temperature, 3 h; vi) (a) thiourea, THF, room temperature, 12 h, followed by reflux, 1 h; (b) pyridine, reflux, 1 h; vii) appropriate acid, EDCI.HCl, HOBt, DCM, 1 - 12 h.

Example 31: 2-(4-(ethylsulfonyl)phenyl)-N-(7-oxo-6-(4-(trifluoro methyl)phenethyl)-4,5,6,7-tetrahydrobenzo [d]thiazol-2-yl)acetamide (Compound-124)



Step i: 2-(4-(trifluoromethyl)phenyl)ethanol

To a 500 mL round bottom flask, were added 2-(4-(trifluoromethyl)phenyl)acetic acid (10 g, 0.049 mol) and THF (90 mL) . To the same flask, 1.0 M borane tetrahydrofuran complex (54 mL, 0.054 mol) was added at room temperature. The reaction mixture was stirred at room temperature for 16 h. The reaction mixture was quenched with 2.0 N aqueous sodium hydroxide (145 mL) and stirred at room temperature for 1 h. The reaction mixture was extracted with ethyl acetate. The organic layer was separated, washed with brine and dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to get the title compound [7.9 g, 85 %]. ^{1}H NMR (300 MHz, $CDCl_3$): δ 7.58 (d, 2H), 7.36 (d, 2H), 3.91 (t, 2H), 3.91 (t, 2H).

Step ii: 1-(2-bromoethyl)-4-(trifluoromethyl)benzene

To a 50 mL round bottom flask, were added 2-(4-(trifluoromethyl)phenyl)ethanol (7.9 g, 0.0415 mol) and phosphorous tribromide (5.6 g, 0.0207 mol). The reaction mixture was stirred at 100 °C for 2 h. To the reaction mixture, ice cold water was added. The reaction mixture was extracted with hexane. The organic layer was separated, washed with brine and dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to get crude product. The crude product was purified by column chromatography using 60–120 silica gel and 0–5 % ethyl acetate in hexane to get the title compound [7.8 g, 74 %]. ^{1}H NMR (300 MHz, $CDCl_3$): δ 7.60 (d, 2H), 7.35 (d, 2H), 3.61 (t, 2H), 3.25 (t, 2H).

Step iii: 5-(4-(trifluoromethyl)phenyl)pentan-2-one

A 250 mL round bottom flask was charged with sodium (0.65 g, 0.0282 mol) and absolute ethanol (20 mL) and. To the same flask, ethyl acetoacetate (3.7 g, 0.0282 mol) was added. The resulting reaction mixture was stirred at reflux temperature for 1 h. The reaction mixture was cooled to room temperature. To the same flask, 1-(2-bromoethyl)-4-(trifluoromethyl)benzene (7.5 g, 0.0296 mol) was added. The reaction mixture was stirred at reflux temperature for 12 h. The reaction mixture was cooled to room temperature to get solid. The solid was removed by filtration. The filtrate was evaporated under reduced pressure to get residue. To the residue, 5 % aqueous sodium hydroxide (30 mL) was added. The reaction mixture was stirred at 90 °C for 5 h and cooled to room temperature. To the same flask, 50 % aqueous sulfuric acid (13 mL) was added. The reaction mixture was stirred at 90 °C for 5 h and cooled to room temperature. The reaction mixture was diluted with water and extracted with hexane. The reaction mixture was extracted with diethyl ether. The organic layer was separated, washed with brine and dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to get crude product. The crude product was purified by column chromatography using 60–120 silica gel and 0–10 % ethyl acetate in hexane to get the title compound [4.5 g, 66 %]. ^{1}H NMR (300 MHz, $CDCl_3$): δ 7.55 (d, 2H), 7.29 (d, 2H), 2.70 (t, 2H), 2.47 (t, 2H), 1.96–1.86 (m, 2H), 2.13 (s, 3H).

Step iv: 4-(4-(trifluoromethyl)phenethyl)cyclohexane-1,3-dione

To a 50 mL round bottom flask, was added methanol (2.5 mL). To the same flask, sodium metal (0.494 g, 0.0215 mol) was added portion wise. The reaction mixture was stirred at room temperature until all sodium metal had dissolved. To the same flask, xylene (20 mL), 5-(4-(trifluoromethyl)phenyl)pentan-2-one (4.5 g, 0.0195 mol) and methyl acrylate (1.85 g, 0.0215 mol) were added. The resulting solution was stirred at reflux temperature for 3 h. The volatiles were evaporated under reduced pressure to get residue. The residue was partitioned between diethyl ether and water. The aqueous layer was separated and acidified with conc. hydrochloric acid. The aqueous layer was extracted with chloroform. The organic layer was separated, washed with brine and dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to get the title compound [2.2 g, 40 %]. ^{1}H NMR (300 MHz, $CDCl_3$): δ 7.56 (d, 2H), 7.33 (d, 2H), 3.43 (s, 2H), 2.81–2.19 (m, 7H), 1.75–1.58 (m, 2H); LC-MS: 285.0 $[M+H]^+$.

Step v & vi: 2-amino-6-(4-(trifluoromethyl)phenethyl)-5,6-dihydrobenzo[d]thiazol-7(4H)-one

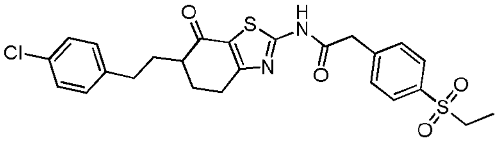
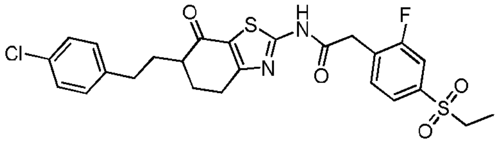
To a 50 mL round bottom flask, were added 4-(4-(trifluoromethyl)phenethyl)cyclohexane-1,3-dione (0.5 g, 0.00176 mol), sodium acetate (0.158 g, 0.00176) and chloroform (15 mL). The reaction mixture was cooled to 0 °C. To the same flask, bromine (0.28 g, 0.00176 mol) was added drop wise. The resulting reaction mixture was stirred at room temperature for 2 h. The volatiles were evaporated under reduced pressure to get residue. The residue was partitioned between ethyl acetate and water. The organic layer was separated, washed with brine and dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to get 2-bromo-4-(4-(trifluoromethyl)phenethyl)cyclohexane-1,3-dione.

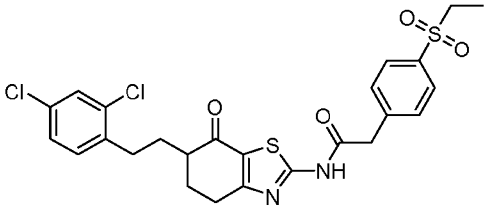
This bromo intermediate was treated with thiourea (0.2 g, 0.0026 mol) in THF (15 mL) at room temperature for 12 h and at reflux temperature for 1 h. The volatiles were evaporated under reduced pressure to get residue. The residue was dissolved in pyridine and stirred at reflux temperature for 1 h. The volatiles were evaporated under reduced pressure to get residue. The residue was partitioned between chloroform and water. The organic layer was separated, washed with brine and dried over anhydrous sodium sulfate. The organic layer was evaporated under reduced pressure to get solid. The solid was triturated with diethyl ether to get the title compound [0.13 g, 22 %]. ^{1}H NMR (400 MHz, $CDCl_3$): δ 7.56 (d, 2H), 7.37 (d, 2H), 5.57 (brs, 2H), 2.95–2.79 (m, 4H), 2.46–2.26 (m, 3H), 2.01–1.99 (m, 1H), 1.82–1.79 (m, 1H); LC-MS: 341.0 $[M+H]^+$.

Step vii: 2-(4-(ethylsulfonyl)phenyl)-N-(7-oxo-6-(4-(trifluoromethyl)phenethyl)-4,5,6,7-tetrahydrobenzo [d]thiazol-2-yl)acetamide

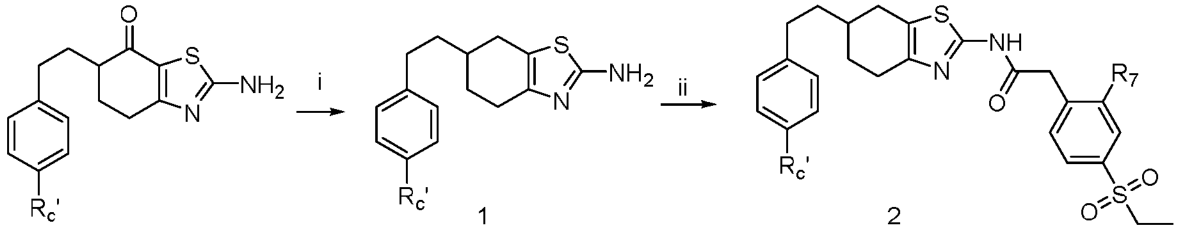
To a 50 mL round bottom flask, were added 2-amino-6-(4-(trifluoromethyl)phenethyl)-5,6-dihydrobenzo[d]thiazol-7(4H)-one (0.065 g, 0.00019 mol), 2-(4-(ethylsulfonyl)phenyl)acetic acid (0.065 g, 0.00029 mol) and dichloromethane (10 mL). To the same flask, EDCI.HCl (0.0.054 g, 0.00029 mol) and HOBt (0.0.038 g, 0.00029 mol) were added. The reaction mixture was stirred at room temperature for 4 h. The reaction mixture was diluted with dichloromethane and washed with water. The organic layer was separated, washed with brine and dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to get crude product. The crude product was purified by flash column chromatography using 0-1 % methanol in chloroform followed by preparative thin layer chromatography using 1.5 % methanol in chloroform to get the title compound [0.065 g, 62 %]. ^{1}H NMR (400 MHz, DMSO-d_6): δ 12.98 (brs, 1H), 7.89 (d, 2H), 7.68 (d, 2H), 7.63 (d, 2H), 7.50 (d, 2H), 4.01 (s, 2H), 3.31-3.28 (m, 2H), 3.00-2.72 (m, 4H), 2.35-2.29 (m, 2H), 2.28-2.10 (m, 1H), 2.00-1.95 (m, 1H), 1.77-1.35 (m, 1H), 1.13 (t, 3H); LC-MS: 551.2 [M+H]$^+$.

The below compounds were prepared by procedure similar to the one described in Example 31 [Scheme II(aa)], with appropriate variations in reactants, quantities of reagents, solvents and reaction conditions. The characterization data of the compounds are summarized herein below table.

Compound No.	Structure	Characterization data
125		^{1}H NMR (400 MHz, CDCl$_3$): δ 9.05 (s, 1H), 7.94 (d, 2H), 7.54 (d, 2H), 7.27 (m, 2H), 7.16 (d, 2H), 3.93 (s, 2H), 3.17 (q, 2H), 2.97-2.91 (m, 1H), 2.87-2.79 (m, 1H), 2.76-2.66 (m, 2H), 2.49-2.45 (m, 1H), 2.31-2.22 (m, 2H), 2.03-1.96 (m, 1H), 1.78-1.68 (m, 1H), 1.31 (t, 3H). LC-MS: 517.0 [M+H]$^+$.
126		^{1}H NMR (400 MHz, CDCl$_3$): δ 9.06 (s, 1H), 7.75 (d, 1H), 7.70 (d, 1H), 7.61 (t, 1H), 7.23 (s, 1H), 7.16 (d, 2H), 3.94 (s, 2H), 3.17 (q, 2H), 3.01-2.94 (m, 1H), 2.90-2.82 (m, 1H),

Compound No.	Structure	Characterization data
		2.79-2.65 (m, 2H), 2.48-2.44 (m, 1H), 2.33-2.22 (m, 2H), 2.04-1.95 (m, 1H), 1.78-1.69 (m, 1H), 1.34 (t, 3H). LC-MS: 534.9 $[M+H]^+$.
127		^1H NMR (400 MHz,$CDCl_3$): δ 8.94 (brs,1H), 7.94 (d, 2H), 7.54 (d, 2H), 7.34 (s, 1H), 7.17-7.15 (m, 2H), 3.94 (s, 2H), 3.17 (q, 2H), 3.00-2.80 (m, 2H), 2.51-2.48 (m, 1H), 2.36-2.31 (m, 1H), 2.24-2.17 (m, 1H), 2.08-2.00 (m, 2H), 1.80-1.72 (m,2H), 1.32 (t, 3H). LC-MS: 552.8 $[M+H]^+$.

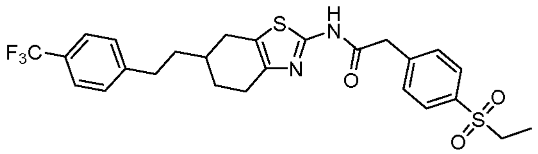
Scheme II(ab)



R_c' is halo or haloalkyl
R_7 is hydrogen or halo

Reagents and conditions: i) Sodium borohydride, trifluoroacetic acid, dichloromethane, room temperature, 12 h; ii) appropriate acid, EDCI.HCl, HOBt, DCM, 1 - 12 h.

Example 32: 2-(4-(ethylsulfonyl)phenyl)-N-(6-(4-(trifluoromethyl)phenethyl)-4,5,6,7-tetrahydro benzo[d]thiazol-2-yl)acetamide (Compound-128)



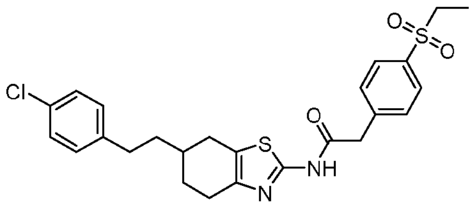
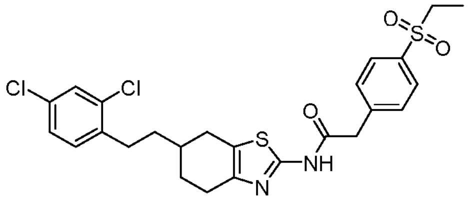
Step i: 6-(4-(trifluoromethyl)phenethyl)-4,5,6,7-tetrahydrobenzo[d]thiazol-2-amine

To a 50 mL round bottom flask, were added 2-amino-6-(4-(trifluoromethyl)phenethyl)-5,6-dihydrobenzo[d]thiazol-7(4H)-one [Step vi of Example 31] (0.1 g, 0.0003 mol), sodium borohydride (0.067 g, 0.0018 mol) and dichloromethane (10 mL). To the same flask, trifluoroacetic acid (1 mL) was added drop wise. The reaction mixture was stirred at room temperature for 12 h. The reaction mixture was neutralized with saturated aqueous sodium bicarbonate and extracted with dichloromethane. The organic layer was separated, washed with brine and dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to get the title compound [0.05 g, 52%]. LC-MS: 327.1 $[M+H]^+$.

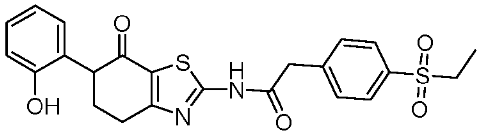
Step ii: 2-(4-(ethylsulfonyl)phenyl)-N-(6-(4-(trifluoromethyl)phenethyl)-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)acetamide

To a 50 mL round bottom flask, were added 6-(4-(trifluoromethyl)phenethyl)-4,5,6,7-tetrahydrobenzo[d]thiazol-2-amine (0.05 g, 0.00015 mol), 2-(4-(ethylsulfonyl)phenyl)acetic acid (0.042 g, 0.00018 mol) and dichloromethane (10 mL). To the same flask, EDCI.HCl (0.043 g, 0.00023 mol) and HOBt (0.031 g, 0.00023 mol) were added. The reaction mixture was stirred at room temperature for 12 h. The reaction mixture was diluted with dichloromethane and washed with water. The organic layer was separated, washed with brine and dried over anhydrous sodium sulfate. The solvent was evaporated under reduced pressure to get crude product. The crude product was purified by flash column chromatography using 0–70 % ethyl acetate in hexane followed by preparative thin layer chromatography using 1 % methanol in chloroform to get the title compound [0.022 g, 27 %]. ^{1}H NMR (400 MHz, $CDCl_3$): δ 7.92 (d, 2H), 7.54–7.51 (m, 4H), 7.30 (d, 2H), 3.86 (s, 2H), 3.15 (q, 2H), 2.88–2.59 (m, 5H), 2.42–2.36 (m, 1H), 2.03-2.00 (m, 1H), 1.78–1.68 (m, 4H), 1.33 (t, 3H); LC-MS: 537.0 $[M+H]^+$.

The below compounds were prepared by procedure similar to the one described in Example-32 [Scheme II(ab)], with appropriate variations in reactants, quantities of reagents, solvents and reaction conditions. The characterization data of the compounds are summarized herein below table.

Compound No.	Structure	Characterization data
129		^{1}H NMR (400 MHz, CDCl$_3$): δ 10.20 (s, 1H), 7.87 (d, 2H), 7.47 (d, 2H), 7.26 (t, 2H), 7.11 (d, 2H), 3.84 (s, 2H), 3.17 (q, 3H), 2.86 (d, 1H), 2.66 (s, 4H), 2.40 (t, 1H), 1.98 (s, 1H), 1.80 (d, 3H), 1.53 (s, 1H), 1.34 (t, 3H). LC-MS: 503.1 [M+H]$^+$.
130		^{1}H NMR (400 MHz, CDCl$_3$): δ 8.80 (brs, 1H), 7.92 (d, 2H), 7.53 (d, 2H), 7.35 (s, 1H), 7.15-7.12 (m, 2H), 3.86 (s, 1H), 3.15 (q, 2H), 2.90-2.86 (m, 1H), 2.79 (t, 2H), 2.72-2.63 (m, 2H), 2.43-2.37 (m, 1H), 2.05 -2.02 (m, 1H), 1.85-1.80 (m, 2H), 1.70-1.65 (m, 2H), 1.32 (t, 3H). LC-MS: 537 [M+H]$^+$.

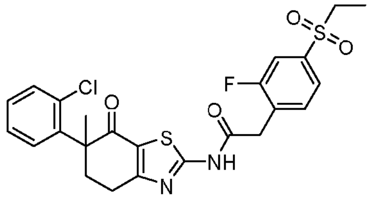
Example 33: 2-(4-(ethylsulfonyl)phenyl)-N-(6-(2-hydroxyphenyl)-7-oxo-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)acetamide (Compound-131)

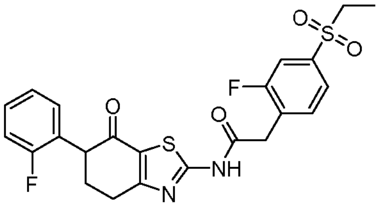


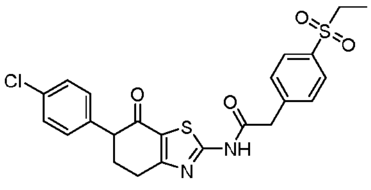
The titled compound was prepared by procedure similar to the one described in Example-26 [Scheme II(v)], with appropriate variations in reactants, quantities of reagents, solvents.

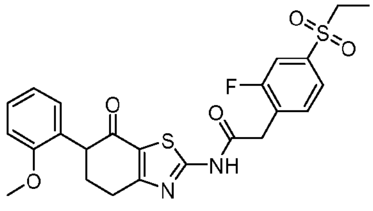
^{1}H NMR (400 MHz, CDCl$_3$): δ 9.43 (s, 1H), 7.87 (d, 2H), 7.62 (d, 2H), 7.06 (t, 1H), 6.98 (d, 1H), 6.80 (d, 1H), 6.72 (t, 1H), 4.00 (s, 2H), 3.96-3.92 (m, 1H), 3.34-3.32 (m, 4H), 3.04-2.90 (m, 2H), 2.16-2.12 (m, 1H), 1.10 (t, 3H). LC-MS: 471.4 [M+H]$^+$.

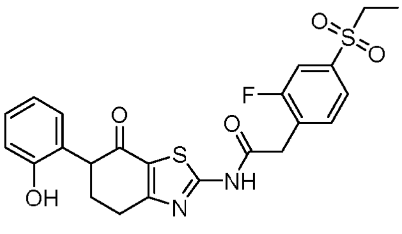
Although the present application has been illustrated by certain preceding examples, it is not to be construed as being limited thereby; but rather, the present application encompasses the generic area as hereinbefore disclosed. Various modifications and embodiments can be made without departing from the spirit and scope thereof. For example, the following compounds which can be prepared by following similar procedure as described above with suitable modification known to the one ordinary skilled in the art are also included in the scope of the present application:

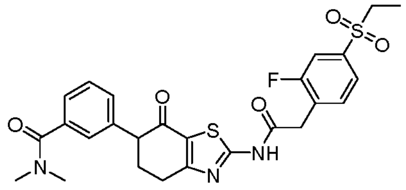

Compound-132

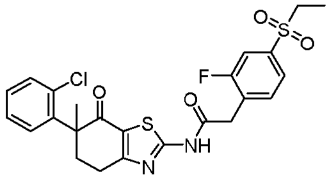

Compound-133

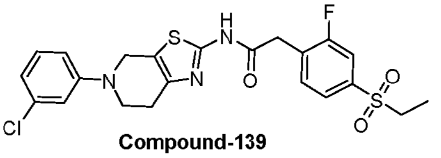

Compound-134

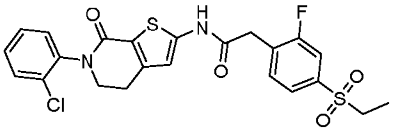

Compound-135


Compound-136


Compound-137


Compound-138


Compound-139


Compound-140

Example 34: Expression and Purification of RORγ

Gene corresponding to the ligand binding domain of RORγ (247-497 amino acids) was sub-cloned into pGEX4T1 vector. Transformants of *E.coli* BL21 (DE3) containing pGEX4T1-RORγ (247-497) were grown to an OD of 0.8 at 37 °C and induced with 0.5 mM isopropyl- β-D-thiogalactopyranoside (IPTG) for 18 hours at 18 °C. Cells were harvested and resuspended in 20 mM Tris- HCl (pH 8.5), 0.3 M NaCl, 10% Glycerol, 2 mM β -Me (β -Mercaptoethanol), 2 mM CHAPS, protease inhibitors, 0.6 mM PMSF and Lysozyme. Supernatant of lysate was passed through glutathione sepharose 4B affinity beads (GE health care) pre-equilibrated with 20 mM Tris- HCl (pH 8.5), 0.3 M NaCl, 10 % Glycerol, 2 mM β -Me. RORγ was eluted using a gradient of reduced glutathione (3 - 20 mM). Fractions containing RORγ protein were pooled, concentrated and passed through Superdex 75 gel filtration (GE health care) column equilibrated with 20 mM Na-phosphate pH 8.0, 0.2 M NaCl, 10 % glycerol. The peak fractions from gel filtration column were pooled and stored at -80 °C for Binding assay.

***In-Vitro* Biochemical Data:**

RORγ radioligand binding assay

RORγ radioligand binding was performed using ^{3}H 25- Hydroxycholesterol in a competitive displacement assay using dextran charcoal method. 5 nM ^{3}H 25- Hydroxycholesterol was incubated with 300 ng RORγ LBD (in house expressed in *E.coli*) along with the compound in the binding buffer (50 mM HEPES, pH 7.5, 150 mM NaCl, 0.01 % BSA and 5 mM $MgCl_2$) for 30 min at room temperature. Then dextran-charcoal mixture (0.5 % charcoal: 0.05 % dextran) was used for separation and the supernatant was read on the Perkin Elmer Trilux Microbeta counter. Dose response curves were generated for 10 compound concentrations using GraphPad Prism software Version 5 (San Diego, California, USA) using non linear regression curve fit for sigmoidal dose response (variable slope).

The compounds were screened at 1 µM /10 µM concentrations followed by IC_{50} measurement and the results are summarized in table below along with the IC_{50} (nM) details for selected examples; wherein “A” refers to an IC_{50} value in range of 0 to 100 nM, “B” refers to IC_{50} value in range of 100.01 to 250 nM and “C” refers to IC_{50} value of greater than 250 nM.

Compound No.	RORγ ligand binding assay: % inhibition @ 1 µM	RORγ ligand binding assay: % inhibition @ 10 µM	RORγ ligand binding assay: IC_{50} (nM)
1	7	0	-
2	67	84	A
3	0	48	-
4	65	77	B
5	21	76	-
6	44	56	-
7	76	86	B
8	13	41	-
9	61	80	C

Compound No.	RORγ ligand binding assay: % inhibition @ 1 μM	RORγ ligand binding assay: % inhibition @ 10 μM	RORγ ligand binding assay: IC_{50} (nM)
10	0	33	-
11	18	37	-
12	0	4	-
13	17	39	-
14	65	91	A
15	31	62	-
16	38	62	-
17	4	19	-
18	58	74	C
19	0	23	-
20	61	77	C
21	0	44	-
22	3	68	-
23	36	60	-
24	50	83	A
25	82	100	B
26	15	0	-
28	75	77	B
29	64	71	C
33	40	58	-
39	-	-	C
40	-	33	-
41	-	-	B
43	-	-	C
45	14	24	-

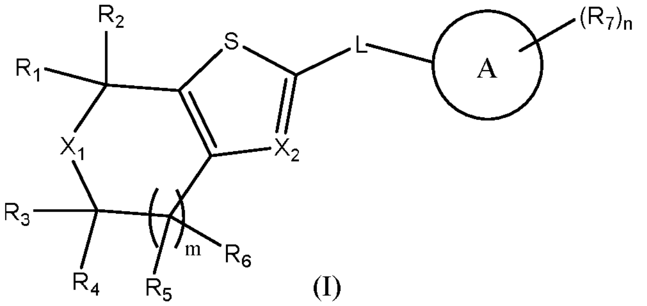
Compound No.	RORγ ligand binding assay: % inhibition @ 1 μM	RORγ ligand binding assay: % inhibition @ 10 μM	RORγ ligand binding assay: IC_{50} (nM)
46	77	100	-
51	-	-	C
52	-	-	C
53	-	40	-
54	-	41	-
55	-	-	C
56	-	-	B
57	-	-	A
58	-	-	A
59	-	37	-
60	-	50	C
61	-	-	A
62	-	-	B
63	53	77	C
66	-	-	C
68	-	-	B
69	-	-	A
70	0	18	-
72	-	-	C
75	51	74	A
76	96	100	-
77	75	100	-
78	65	97	-
79	66	93	A

Compound No.	RORγ ligand binding assay: % inhibition @ 1 μM	RORγ ligand binding assay: % inhibition @ 10 μM	RORγ ligand binding assay: IC_{50} (nM)
80	8	21	-
81	4	24	-
82	33	74	-
83	31	39	-
84	8	40	-
85	27	55	-
86	62	72	C
87	54	81	C
88	2	18	-
89	31	40	
90	37	56	C
91	9	36	-
92	35	68	-
93	40	69	C
98	-	-	B
99	-	-	C
100	-	-	A
101	-	-	A
104	100	100	-
108	70	69	-
109	87	100	-
112	59	86	-
113	100	99	A
114	-	-	B

Compound No.	**RORγ ligand binding assay: % inhibition @ 1 µM**	**RORγ ligand binding assay: % inhibition @ 10 µM**	**RORγ ligand binding assay: IC_{50} (nM)**
115	-	50	-
116	-	-	C
117	45	86	-
118	100	100	A
124	-	-	A
125	-	-	B
127	80	93	-
128	53	78	-
129	66	90	-
130	80	100	-
131	96	90	A

WE CLAIM:

1. A compound of formula (I):



(I)

or a pharmaceutically acceptable salt or a stereoisomer thereof;

wherein,

X_1 is $-CR_8R_9-$ or $-NR_{10}$;

X_2 is CR_{11} or N;

L is $-NR_a-C(O)-(CR_aR_b)_p-$, $-C(O)-NR_a-(CR_aR_b)_p-$ or $-NR_a-C(O)-NR_a-$;

ring A is aryl, heteroaryl or heterocycloalkyl;

R_1 and R_2 independently are hydrogen, halo, alkyl or arylalkyl; wherein the said arylalkyl is optionally substituted with one or more halo or haloalkyl;

or R_1 and R_2 together represent an oxo (=O) or a thioxo (=S) group;

R_3 and R_4 independently are hydrogen, alkyl, $-(CH_2)_p$-aryl, $-CO_2R_a$, -CO-aryl or $-CONR_cR_d$; wherein the said aryl is optionally substituted with one or more hydroxy, halo or haloalkyl;

or R_3 and R_4 on the same carbon atom can be combined together to form a 5-8 membered spiro ring;

R_5 and R_6 independently are hydrogen or alkyl;

R_7, at each occurrence, independently is hydrogen, -$S(O)_qR_e$, -$CONR_aR_b$, halo, cyano, haloalkyl or alkyl; wherein the said haloalkyl and alkyl are optionally substitued with hydroxy;

R_8 and R_9 independently are hydrogen, alkyl, -$(CH_2)_p$-aryl, -CO_2R_a, -CO-aryl or -$CONR_cR_d$; wherein the said aryl is optionally substituted with one or more hydroxy, halo, alkoxy, haloalkyl or -$CONR_aR_b$;

or R_8 and R_9 on the same carbon atom can be combined together to form a 5-8 membered spiro ring;

R_{10} is hydrogen, alkyl, -$(CH_2)_p$-aryl, -CO-$(CH_2)_q$-aryl or -$S(O)_q$-aryl; wherein the said aryl at each occurrence is optionally substituted with one or more halo, alkyl, haloalkyl, phenyl, -CO_2R_a or -$CONH(CH_2)_q(OH)$;

R_{11} is hydrogen, alkyl, cycloalkyl or aryl;

R_a and R_b independently are hydrogen or alkyl;

or R_a and R_b on the same atom can be combined together to form a 3-7 membered ring;

R_c and R_d independently are hydrogen, alkyl, alkoxy or heteroaryl;

or R_c and R_d on the same atom can be combined together to form a 3-8 membered ring containing one or more additional heteroatoms selected from N, O and S; wherein the said ring is optionally substituted with one or more alkyl;

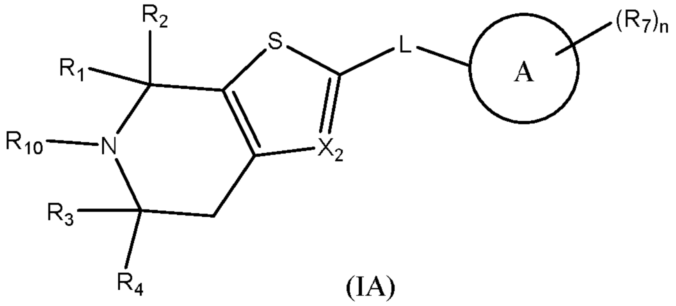
R_e is alkyl, haloalkyl, alkylamino or hydroxyalkyl; wherein the said alkyl is optionally substituted with heterocycloalkyl or -NR_aR_b;

m and p are independently 0, 1 or 2;

q is 1 or 2; and

n is 1 to 5.

2. The compound according to claim 1 is a compound of formula (IA):

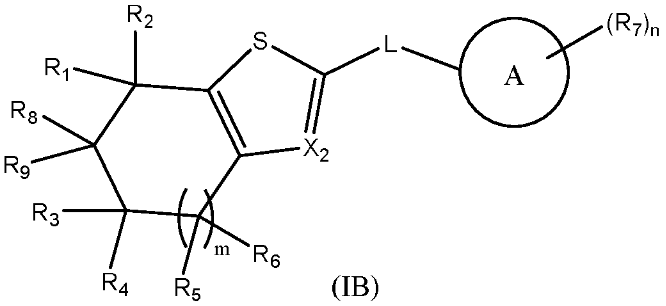


(IA)

or a pharmaceutically acceptable salt or a stereoisomer thereof; wherein,

R_1, R_2, R_3, R_4, R_7, R_{10}, X_2, L, n and ring A are same as defined in claim 1.

3. The compound according to claim 1 is a compound of formula (IB):

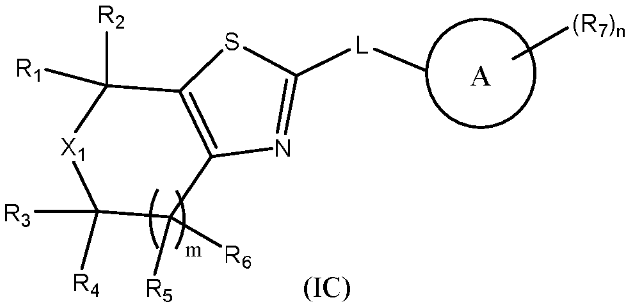


(IB)

or a pharmaceutically acceptable salt or a stereoisomer thereof; wherein,

R_1, R_2, R_3, R_4, R_5, R_6, R_7, R_8, R_9, X_2, L, m, n and ring A are same as defined in claim 1.

4. The compound according to claim 1 is a compound of formula (IC):

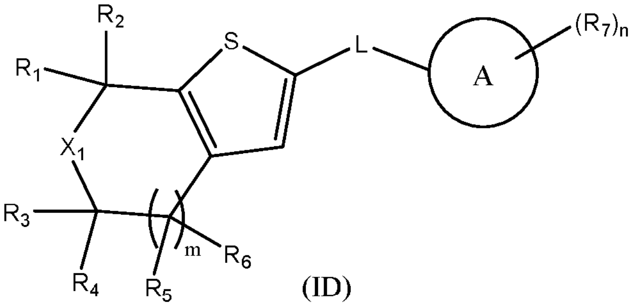


(IC)

or a pharmaceutically acceptable salt or a stereoisomer thereof; wherein,

R_1, R_2, R_3, R_4, R_5, R_6, R_7, X_1, L, m, n and ring A are same as defined in claim 1.

5. The compound according to claim 1 is a compound of formula (ID):

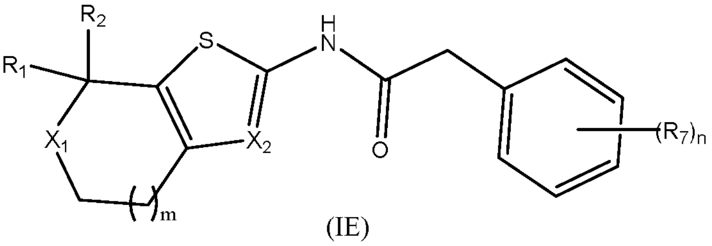


(ID)

or a pharmaceutically acceptable salt or a stereoisomer thereof; wherein,

R_1, R_2, R_3, R_4, R_5, R_6, R_7, X_1, L, m, n and ring A are same as defined in claim 1.

6. The compound according to claim 1 is a compound of formula (IE):

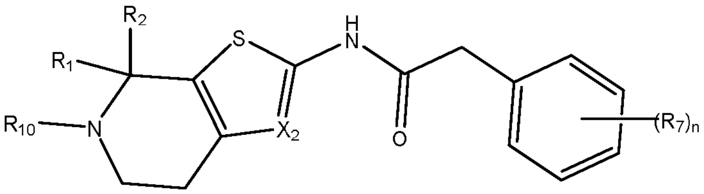


(IE)

or a pharmaceutically acceptable salt or a stereoisomer thereof; wherein,

R_1, R_2, R_7, X_1, X_2, m and n are same as defined in claim 1.

7. The compound according to any one of claims 1, 2 or 6 is a compound of formula (IF):



(IF)

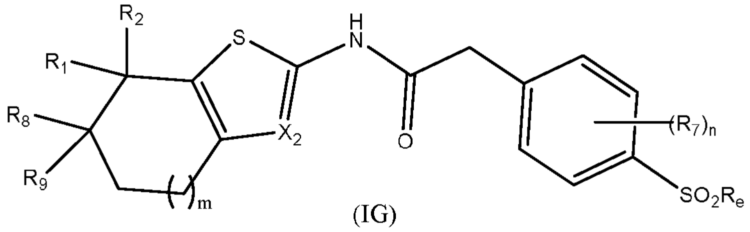
or a pharmaceutically acceptable salt or a stereoisomer thereof; wherein,

R_1 and R_2 are independently hydrogen;

or R_1 and R_2 together represent an oxo (=O) or a thioxo (=S) group; and

R_7, R_{10}, X_2 and n are same as defined in claim 1.

8. The compound according to any one of claims 1, 3 or 6 is a compound of formula (IG):



(IG)

or a pharmaceutically acceptable salt or a stereoisomer thereof; wherein,

R_7, for each occurrence, is independently hydrogen, or halo;

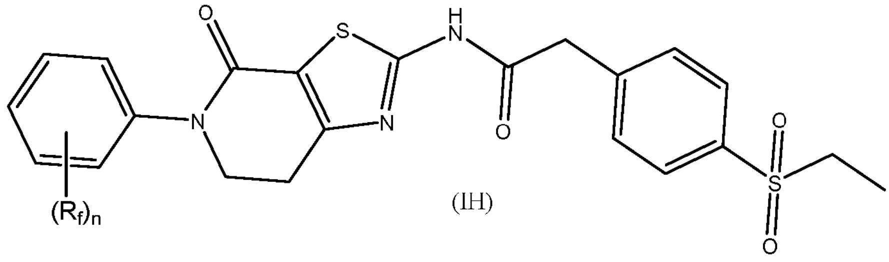
R_e is optionally substituted alkyl or haloalkyl; wherein the optional substituent is -NR_aR_b;

m is 0 or 1;

n is 1 to 4; and

R_1, R_2, R_8, R_9, R_a, R_b and X_2 are same as defined in claim 1.

9. The compound according to any one of claims 1, 2, 4, 6 or 7 is a compound of formula (IH):



(IH)

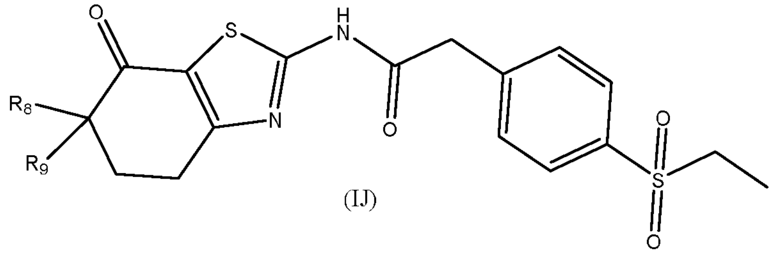
or a pharmaceutically acceptable salt or a stereoisomer thereof; wherein,

R_f, for each occurrence, is hydrogen, halo, alkyl, haloalkyl, phenyl, $-CO_2R_a$ or $-CONH(CH_2)_q(OH)$;

n is 1 to 4; and

R_a and q are same as defined in claim 1.

10. The compound according to any one of claims 1, 3, 4, 6 or 8 is a compound of formula (IJ):

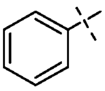


(IJ)

or a pharmaceutically acceptable salt or a stereoisomer thereof; wherein,

R_8 and R_9 are same as defined in claim 1.

11. The compound according to any one of claims 1, 2, 4, 5, 6 or 7, wherein R_{10} is hydrogen,

$-CH_2CH_3$,

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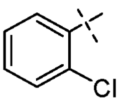

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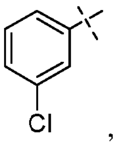

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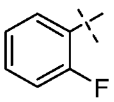

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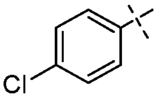

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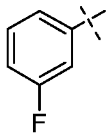

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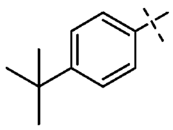
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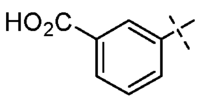

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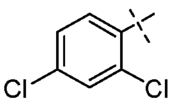

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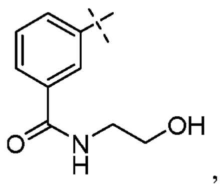

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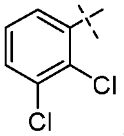

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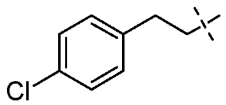

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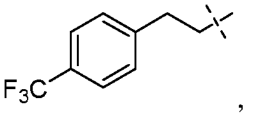

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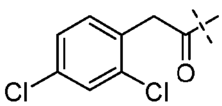

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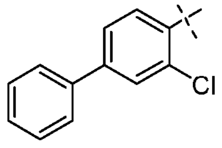

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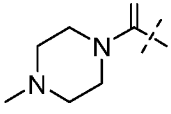
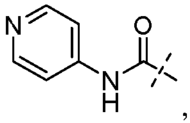
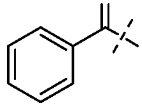
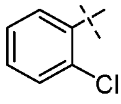
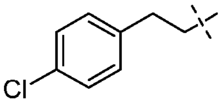
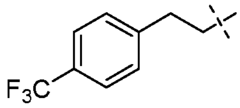
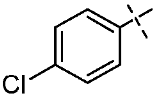
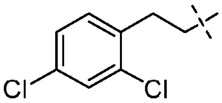
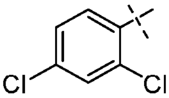
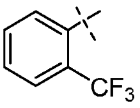
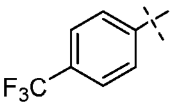
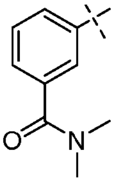
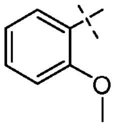
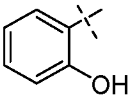
12. The compound according to any one of claims 1, 3, 4, 5, 6, 8 or 10 wherein R_8 is hydrogen or methyl; and R_9 is hydrogen, methyl, $-CO_2H$, $-CO_2CH_2CH_3$, -CONH(O

CH_2CH_3), -CONH(CH_2CH_3), , , , ,

, , , , ,

, , ,  or .

13. The compound of any one of claims 1 to 12, or a pharmaceutically acceptable salt or a stereoisomer thereof; is selected from the group consisting of:

Compound No.	IUPAC Name
1	2-(4-(ethylsulfonyl)phenyl)-N-(4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)acetamide;
2	N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide;
3	N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(ethylsulfonyl)phenyl)-2-methylpropanamide;
4	N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-((2,2,2-trifluoroethyl)sulfonyl)phenyl)acetamide;
5	N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(methylsulfonyl)phenyl)acetamide;
6	N-(5-(3-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide;
7	N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(N-methylsulfamoyl)phenyl)acetamide;
8	2-(4-(ethylsulfonyl)phenyl)-N-(4-oxo-5-phenyl-4,5,6,7-tetrahydrothiazolo[5,4-

Compound No.	IUPAC Name
	c]pyridin-2-yl)acetamide;
9	2-(4-(ethylsulfonyl)phenyl)-N-(5-(2-fluorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)acetamide;
10	N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(ethylsulfonyl)piperazin-1-yl)acetamide;
11	N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-3-(4-(ethylsulfonyl)phenyl)propanamide;
12	N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-4-(1,1,1,3,3,3-hexafluoro-2-hydroxypropan-2-yl)benzamide;
13	N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(1,1-dioxido-2,3-dihydrobenzo[b]thiophen-5-yl)acetamide;
14	N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(ethylsulfonyl)-2-fluorophenyl)acetamide;
15	N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(5-(ethylsulfonyl)thiophen-2-yl)acetamide;
16	2-(4-(ethylsulfonyl)-2-fluorophenyl)-N-(5-(2-fluorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)acetamide;
17	N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(ethylsulfonyl)-2-oxopyridin-1(2H)-yl)acetamide;
18	N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-((2-hydroxyethyl)sulfonyl)phenyl)acetamide;
19	4-(2-((5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)amino)-2-oxoethyl)-N-methylbenzamide;
20	N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(2-fluoro-4-((2-hydroxyethyl)sulfonyl)phenyl)acetamide;
21	N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(ethylsulfinyl)phenyl)acetamide;

Compound No.	IUPAC Name
22	N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(pyridin-4-yl)acetamide;
23	N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-cyanophenyl)acetamide;
24	N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(1-(ethylsulfonyl)piperidin-4-yl)acetamide;
25	N-(5-(3-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(ethylsulfonyl)-2-fluorophenyl)acetamide;
26	N-(5-(4-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(ethylsulfonyl)-2-fluorophenyl)acetamide;
27	N-(5-(4-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide;
28	2-(2-chloro-4-(ethylsulfonyl)phenyl)-N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)acetamide;
29	N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(ethylsulfonyl)-2-methylphenyl)acetamide;
30	2-(4-(ethylsulfonyl)phenyl)-N-(5-(3-fluorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)acetamide;
31	2-(4-(ethylsulfonyl)-2-fluorophenyl)-N-(5-(3-fluorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)acetamide;
32	N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(isopropylsulfonyl)phenyl)acetamide;
33	N-(5-(4-(tert-butyl)phenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide;
34	N-(5-(4-(tert-butyl)phenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(ethylsulfonyl)-2-fluorophenyl)acetamide;
35	2-(2-chloro-4-(ethylsulfonyl)phenyl)-N-(5-(3-fluorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)acetamide;

Compound No.	IUPAC Name
36	2-(2-chloro-4-(ethylsulfonyl)phenyl)-N-(5-(3-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)acetamide;
37	3-(2-(2-(4-(ethylsulfonyl)-2-fluorophenyl)acetamido)-4-oxo-6,7-dihydrothiazolo[5,4-c]pyridin-5(4H)-yl)benzoic acid;
38	N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(3-(ethylsulfonyl)phenyl)acetamide;
39	N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(ethylsulfonyl)-2,6-difluorophenyl)acetamide;
40	N-(5-(2,4-dichlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(ethylsulfonyl)-2-fluorophenyl)acetamide;
41	N-(5-(2,3-dichlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(ethylsulfonyl)-2-fluorophenyl)acetamide;
42	N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(trifluoromethyl)phenyl)acetamide;
43	N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(2-fluoro-4-(isopropylsulfonyl)phenyl)acetamide;
44	N-(5-(3-chloro-[1,1'-biphenyl]-4-yl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(ethylsulfonyl)-2-fluorophenyl)acetamide;
45	N-(5-ethyl-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide;
46	N-(5-(4-chlorophenethyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(ethylsulfonyl)-2-fluorophenyl)acetamide;
47	N-(5-(4-chlorophenethyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide;
48	3-(2-(2-(4-(ethylsulfonyl)phenyl)acetamido)-4-oxo-6,7-dihydrothiazolo[5,4-c]pyridin-5(4H)-yl)benzoic acid;
49	3-(2-(2-(4-(ethylsulfonyl)phenyl)acetamido)-4-oxo-6,7-dihydrothiazolo[5,4-c]pyridin-5(4H)-yl)-N-(2-hydroxyethyl)benzamide;

Compound No.	IUPAC Name
50	1-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-3-(4-(ethylsulfonyl)phenyl)urea;
51	N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-((2-(dimethylamino)ethyl)sulfonyl)-2-fluorophenyl)acetamide;
52	N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(2-fluoro-4-((2-(piperidin-1-yl)ethyl)sulfonyl)phenyl)acetamide;
53	N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(2-fluoro-4-((2-hydroxyethyl)sulfonyl)phenyl)-N-methylacetamide;
54	N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(2-fluoro-4-((2-methoxyethyl)sulfonyl)phenyl)-N-methylacetamide;
55	N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(2,6-difluoro-4-((2-hydroxyethyl)sulfonyl)phenyl)acetamide;
56	N-(5-(2,3-dichlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(2-fluoro-4-((2-hydroxyethyl)sulfonyl)phenyl)acetamide;
57	N-(5-(3-chlorophenyl)-4-oxo-5,6,7,8-tetrahydro-4H-thiazolo[5,4-c]azepin-2-yl)-2-(4-(ethylsulfonyl)-2-fluorophenyl)acetamide;
58	N-(5-(3-chlorophenyl)-4-oxo-5,6,7,8-tetrahydro-4H-thiazolo[5,4-c]azepin-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide;
59	N-(5-(2-chlorophenyl)-4-oxo-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(2-fluoro-4-((2-hydroxy-2-methylpropyl)sulfonyl)phenyl)acetamide;
60	N-(6-(3-chlorophenyl)-7-oxo-4,5,6,7-tetrahydrothieno[2,3-c]pyridin-2-yl)-2-(4-(ethylsulfonyl)-2-fluorophenyl)acetamide;
61	N-(6-(2-chlorophenyl)-7-oxo-4,5,6,7-tetrahydrothieno[2,3-c]pyridin-2-yl)-2-(4-(ethylsulfonyl)-2-fluorophenyl)acetamide;
62	N-(5-(2-chlorophenyl)-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(ethylsulfonyl)-2-fluorophenyl)acetamide;
63	N-(5-(2-chlorophenyl)-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide;

Compound No.	IUPAC Name
64	2-(4-(ethylsulfonyl)-2-fluorophenyl)-N-(5-(3-fluorophenyl)-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)acetamide;
65	2-(4-(ethylsulfonyl)phenyl)-N-(5-(3-fluorophenyl)-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)acetamide;
66	2-(2-chloro-4-(ethylsulfonyl)phenyl)-N-(5-(2-chlorophenyl)-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)acetamide;
67	2-(4-(ethylsulfonyl)phenyl)-N-(5-(2-fluorophenyl)-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)acetamide;
68	2-(4-(ethylsulfonyl)-2-fluorophenyl)-N-(5-(2-fluorophenyl)-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)acetamide;
69	N-(5-(3-chlorophenyl)-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(ethylsulfonyl)-2-fluorophenyl)acetamide;
70	N-(5-(4-(tert-butyl)phenyl)-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(ethylsulfonyl)-2-fluorophenyl)acetamide;
71	N-(5-(2-chlorophenyl)-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(trifluoromethyl)phenyl)acetamide;
72	N-(5-(4-(tert-butyl)phenyl)-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide;
73	N-(5-(2,3-dichlorophenyl)-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(ethylsulfonyl)-2-fluorophenyl)acetamide;
74	2-(4-(ethylsulfonyl)-2-fluorophenyl)-N-(4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)acetamide;
75	N-(5-((2-chlorophenyl)sulfonyl)-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(ethylsulfonyl)-2-fluorophenyl)acetamide;
76	N-(5-(2-(2,4-dichlorophenyl)acetyl)-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide;
77	N-(5-(2,4-dichlorophenethyl)-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide;

Compound No.	IUPAC Name
78	2-(4-(ethylsulfonyl)-2-fluorophenyl)-N-(5-(4-(trifluoromethyl)phenethyl)-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl)acetamide;
79	ethyl 2-(2-(4-(ethylsulfonyl)phenyl)acetamido)-4,5,6,7-tetrahydrobenzo[d]thiazole-6-carboxylate;
80	2-(2-(4-(ethylsulfonyl)phenyl)acetamido)-4,5,6,7-tetrahydrobenzo[d]thiazole-6-carboxylic acid;
81	2-(4-(ethylsulfonyl)phenyl)-N-(6-(4-methylpiperazine-1-carbonyl)-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)acetamide;
82	N-ethoxy-2-(2-(4-(ethylsulfonyl)phenyl)acetamido)-4,5,6,7-tetrahydrobenzo[d]thiazole-6-carboxamide;
83	N-ethyl-2-(2-(4-(ethylsulfonyl)phenyl)acetamido)-4,5,6,7-tetrahydrobenzo[d]thiazole-6-carboxamide;
84	ethyl 2-(3-(4-(ethylsulfonyl)phenyl)propanamido)-4,5,6,7-tetrahydrobenzo[d]thiazole-6-carboxylate;
85	2-(2-(4-(ethylsulfonyl)phenyl)acetamido)-N-(pyridin-4-yl)-4,5,6,7-tetrahydrobenzo[d]thiazole-6-carboxamide;
86	N-(6-benzoyl-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide;
87	2-(4-(ethylsulfonyl)phenyl)-N-(7-oxo-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)acetamide;
88	1-(4-(ethylsulfonyl)phenyl)-N-(7-oxo-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)cyclopropane-1-carboxamide;
89	2-(4-(ethylsulfonyl)phenyl)-2-methyl-N-(7-oxo-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)propanamide;
90	N-(7-oxo-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-((2,2,2-trifluoroethyl)sulfonyl)phenyl)acetamide;
91	2-(4-(ethylsulfonyl)phenyl)-N-(6-oxo-5,6-dihydro-4H-cyclopenta[d]thiazol-2-yl)acetamide;

Compound No.	IUPAC Name
92	N-(4,4-dimethyl-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide;
93	N-(6,6-dimethyl-7-oxo-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide;
94	N-(6,6-dimethyl-7-oxo-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-(ethylsulfonyl)-2-fluorophenyl)acetamide;
95	N-(6,6-dimethyl-7-oxo-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-(ethylsulfonyl)-2,6-difluorophenyl)acetamide;
96	2-(4-(ethylsulfonyl)phenyl)-N-(7-oxo-4,7-dihydro-5H-spiro[benzo[d]thiazole-6,1'-cyclopentan]-2-yl)acetamide;
97	2-(4-(ethylsulfonyl)-2-fluorophenyl)-N-(7-oxo-4,7-dihydro-5H-spiro[benzo[d]thiazole-6,1'-cyclopentan]-2-yl)acetamide;
98	N-(5-(2-chlorophenyl)-7-oxo-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide;
99	N-(5-(2-chlorophenyl)-7-oxo-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-(ethylsulfonyl)-2-fluorophenyl)acetamide;
100	N-(6-(2-chlorophenyl)-7-oxo-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide;
101	N-(6-(2-chlorophenyl)-7-oxo-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-(ethylsulfonyl)-2-fluorophenyl)acetamide;
102	N-(6-(4-chlorophenyl)-7-oxo-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide;
103	N-(6-(4-chlorophenyl)-7-oxo-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-(ethylsulfonyl)-2-fluorophenyl)acetamide;
104	N-(6-(2,4-dichlorophenyl)-7-oxo-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide;
105	2-(4-(ethylsulfonyl)phenyl)-N-(7-oxo-6-(2-(trifluoromethyl)phenyl)-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)acetamide;

Compound No.	IUPAC Name
106	2-(4-(ethylsulfonyl)phenyl)-N-(7-oxo-6-(4-(trifluoromethyl)phenyl)-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)acetamide;
107	N-(6-(2-chlorophenyl)-7-oxo-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-((2,2,2-trifluoroethyl)sulfonyl)phenyl)acetamide;
108	N-(6-(4-chlorophenyl)-7-oxo-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide (Isomer-2);
109	N-(6-(4-chlorophenyl)-7-oxo-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide (Isomer-1);
110	N-(6-(2-chlorophenyl)-7-oxo-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide (Isomer-1);
111	N-(6-(2-chlorophenyl)-7-oxo-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide (Isomer-2);
112	3-(2-(2-(4-(ethylsulfonyl)phenyl)acetamido)-7-oxo-4,5,6,7-tetrahydrobenzo[d]thiazol-6-yl)-N,N-dimethylbenzamide;
113	2-(4-(ethylsulfonyl)phenyl)-N-(6-(2-methoxyphenyl)-7-oxo-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)acetamide;
114	2-(4-(ethylsulfonyl)phenyl)-N-(7-oxo-6,7-dihydro-4H-spiro[benzo[d]thiazole-5,1'-cyclopentan]-2-yl)acetamide;
115	2-(4-(ethylsulfonyl)-2-fluorophenyl)-N-(7-oxo-6,7-dihydro-4H-spiro[benzo[d]thiazole-5,1'-cyclopentan]-2-yl)acetamide;
116	N-(6,6-dimethyl-7-oxo-4,5,6,7-tetrahydrobenzo[b]thiophen-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide;
117	N-(6-(2-chlorophenyl)-6-methyl-7-oxo-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide;
118	N-(6-(2-chlorophenyl)-6-methyl-7-oxo-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-(ethylsulfonyl)-2-fluorophenyl)acetamide;
119	N-(6-(4-chlorophenyl)-6-methyl-7-oxo-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide;

Compound No.	IUPAC Name
120	N-(6-(2-chlorophenyl)-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide;
121	N-(6-(4-chlorophenyl)-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide;
122	N-(6-(2,4-dichlorophenyl)-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide;
123	2-(4-(ethylsulfonyl)phenyl)-N-(6-(2-(trifluoromethyl)phenyl)-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)acetamide;
124	2-(4-(ethylsulfonyl)phenyl)-N-(7-oxo-6-(4-(trifluoromethyl)phenethyl)-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)acetamide;
125	N-(6-(4-chlorophenethyl)-7-oxo-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide;
126	N-(6-(4-chlorophenethyl)-7-oxo-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-(ethylsulfonyl)-2-fluorophenyl)acetamide;
127	N-(6-(2,4-dichlorophenethyl)-7-oxo-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide;
128	2-(4-(ethylsulfonyl)phenyl)-N-(6-(4-(trifluoromethyl)phenethyl)-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)acetamide;
129	N-(6-(4-chlorophenethyl)-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide;
130	N-(6-(2,4-dichlorophenethyl)-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)-2-(4-(ethylsulfonyl)phenyl)acetamide; and
131	2-(4-(ethylsulfonyl)phenyl)-N-(6-(2-hydroxyphenyl)-7-oxo-4,5,6,7-tetrahydrobenzo[d]thiazol-2-yl)acetamide;

or a pharmaceutically acceptable salt or a stereoisomer thereof.

14. A pharmaceutical composition, comprising at least one compound according to any one of claims 1 to 13, or a pharmaceutically acceptable salt or a stereoisomer thereof, and a pharmaceutically acceptable carrier or excipient.

15. The compound according to any one of claims 1 to 13, or a pharmaceutically acceptable salt or a stereoisomer thereof, for use as a medicament.

16. The compound according to any one of claims 1 to 13, or a pharmaceutically acceptable salt or a stereoisomer thereof, for use as a medicament for the treatment of an immune disorder or an inflammatory disorder.

17. A method of treating a RORγ mediated disorder or disease in a subject comprising administering a therapeutically effective amount of a compound according to any one of claims 1 to 13.

18. The method according to claim 17, wherein the RORγ mediated disorder is an immune disorder or an inflammatory disorder.

19. The method according to claim 18, wherein the disease or disorder is rheumatoid arthritis, psoriasis, chronic graft-versus-host disease, acute graft-versus-host disease, Crohn's disease, inflammatory bowel disease, multiple sclerosis, systemic lupus erythematosus, Celiac Sprue, idiopathic thrombocytopenic thrombotic purpura, myasthenia gravis, Sjogren's syndrome, asthma, epidermal hyperplasia, scleroderma or ulcerative colitis.

20. The method according to claim 18, wherein the disease or disorder is cartilage inflammation, bone degradation, arthritis, juvenile arthritis, juvenile rheumatoid arthritis, pauciarticular juvenile rheumatoid arthritis, polyarticular juvenile rheumatoid arthritis, systemic onset juvenile rheumatoid arthritis, juvenile ankylosing spondylitis, juvenile enteropathic arthritis, juvenile reactive arthritis, juvenile Reter's Syndrome, SEA Syndrome, juvenile dermatomyositis, juvenile psoriatic arthritis, juvenile scleroderma, juvenile systemic lupus erythematosus, juvenile vasculitis, pauciarticular rheumatoid arthritis, polyarticular rheumatoid arthritis, systemic onset rheumatoid arthritis, ankylosing spondylitis, enteropathic arthritis, reactive arthritis, Reter's Syndrome, dermatomyositis, psoriatic arthritis, vasculitis, myolitis, polymyolitis, dermatomyolitis, osteoarthritis, polyarteritis nodossa, Wegener's granulomatosis, arteritis, polymyalgia rheumatica, sarcoidosis, sclerosis, primary biliary sclerosis, sclerosing cholangitis,

dermatitis, atopic dermatitis, atherosclerosis, Still's disease, chronic obstructive pulmonary disease, Guillain-Barre disease, Type I diabetes mellitus, Graves' disease, Addison's disease, Raynaud's phenomenon, autoimmune hepatitis, psoriatic epidermal hyperplasia, plaque psoriasis, guttate psoriasis, inverse psoriasis, pustular psoriasis, erythrodermic psoriasis or an immune disorder associated with or arising from activity of pathogenic lymphocytes.

21. A method of reducing amount of IL-17 and other effector cytokines of Th17 cells in a subject, comprising administering to a subject an effective amount of a compound according to any one of claims 1 to 13.

22. Use of a compound according to any one of claims 1 to 13, or a pharmaceutically acceptable salt or a stereoisomer thereof, in the manufacture of a medicament for the treatment of an immune disorder or an inflammatory disorder.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB2014/067408

A. CLASSIFICATION OF SUBJECT MATTER
A61K31/496,A61K31/429,C07D279/08 Version=2014.01

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A61K,C07D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

Patseer,STN

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO2012106995 A1 (MERCK SHARP & DOHME[US]) 16 AUGUST 2012 (16/08/2012). Claims & Abstract	1-16,22
A	WO2012106995 A1 (MERCK SHARP & DOHME[US]) 16 AUGUST 2012 (16/08/2012). Claims	1-16,22
A	WO2012027965 A1 (GLAXO GROUP LTD[GB]) 08 MARCH 2012 (08/03/2012). The whole document	1-16,22
A	WO2012028100 A1 (GLAXO GROUP LTD[GB]) 08 MARCH 2012 (08/03/2012). The whole document	1-16,22
X,P	WO2014179564 A8 (VITAE PHARMACEUTICALS INC[US]) 04 DECEMBER 2014 (04/12/2014). Claims	1,3-6

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be of particular relevance		
"E"	earlier application or patent but published on or after the international filing date	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed	"&"	document member of the same patent family

Date of the actual completion of the international search 20-05-2015	Date of mailing of the international search report 20-05-2015
Name and mailing address of the ISA/ Indian Patent Office Plot No.32, Sector 14,Dwarka,New Delhi-110075 Facsimile No.	Authorized officer K Janardana Telephone No. +91-1125300200

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB2014/067408

Box No. II **Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)**

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☒ Claims Nos.: 17-21
because they relate to subject matter not required to be searched by this Authority, namely:
Claims 17-21 relate to subject-matter considered by this Authority to
be covered by the provisions of Rule 39.1 (iv) PCT.

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III **Observations where unity of invention is lacking (Continuation of item 3 of first sheet)**

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest
☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/IB2014/067408

Citation	Pub.Date	Family	Pub.Date
WO 2012106995 A1	16-08-2012	US 2014038942 A1	06-02-2014
		KR 20140044791 A	15-04-2014
		JP 2014509316 A	17-04-2014
		CN 103748076 A	23-04-2014
WO 2010024258 A1	04-03-2010	EP 2327704 A1	01-06-2011
		EP 2327704 A4	09-05-2012
		TW 201018691 A	16-05-2010
		US 2011230472 A1	22-09-2011