



ISSN: 2306-6091

## International Journal of Pharmaceuticals and Health Care Research (IJPHR)

IJPHR | Vol.14 | Issue 4 | Oct - Dec 2026

www.ijphr.com

DOI : <https://doi.org/10.61096/ijphr.v14.iss4.2026.754-764>

### Design, Synthesis, Characterization, Invitro and Invivo Evaluation of Anticancer, Anti-Alzheimer's, Antibacterial Activity of Indole and Aza Indole Derivatives

Kamtam Vijaykumar\*<sup>1</sup>, S. Jyothi<sup>2</sup>

*Department of Chemistry, Princeton College of Pharmacy, Pocharam, Hyderabad, Telangana*

\*Corresponding Author: **Kamtam Vijaykumar**

Email: [princeton.pharmacy@gmail.com](mailto:princeton.pharmacy@gmail.com)



Published on:  
14.10.2026  
Published by:  
Futuristic  
Publications  
2026| All rights  
reserved.



Creative  
Commons  
Attribution 4.0  
International  
License.

**Abstract:** The indole and azaindole classes of heterocyclic compounds are among the most active and powerful classes of chemicals due to the great variety of biological and pharmacological effects they exhibit. As part of this research, we synthesized oxyindole hydrazine carboxymide, which inhibits ACHE and tyrosine kinase, and cyclized azaindole sulphonamide, which acts on Phosphotidyl Ionositide 3-kinase and Acetylchlorine Esterase. All of these chemicals were created synthetically and then analyzed using spectroscopic methods.

The chemicals that were synthesized were tested for several purposes, including anti-cancer activity using the MTT assay in HeLa and MCF cell lines, anti-bacterial activity using the cup plate agar diffusion method, in vivo behavioral pharmacological activity, and Alzheimer's activity using the Ellmans method and in vitro brain ACHES. Research into docking has revealed promising interactions with a variety of receptors.

Excellent anti-cancer, anti-Alzheimer's, and antibacterial action was exhibited by all of the compounds.

Oxindole hydrazine carboxymide, acetylchlorine esterase inhibitors, aza indole sulphonamide, cancer, bacteria, cup plate agar diffusion method, Ellman's method

## INTRODUCTION

Alzheimer's disease (AD) is a progressive and neurodegenerative brain disorder that affects many elderly people and accounts for one-fourth of all dementia cases. According to WHO, Alzheimer's disease will be much more prevalent in the next century than AIDS, cancer, and cardiovascular disease (Prince et al. 2015).

Alois Alzheimer, a German physician, first identified AD in 1906. Alois Alzheimer first met his patient Auguste D in November 1901. He became aware during that initial talk that the 51-year-old woman exhibited symptoms unlike any he had ever seen before. She also frequently stopped in the middle of sentences as if she had lost her way of thought. She was becoming increasingly confused and tense as her memory began to desert her. Auguste passed away in April 1906, and Alzheimer received her brain for histopathological examination (Alzheimer et al. 1906). By German psychiatrist Emil Kraepeline, who collaborated with Dr. Alois Alzheimer, the condition was first referred to as "Alzheimer's disease" (Moller et al. 1998).



Fig 1.1: Alois Alzheimer's long term study of the female patient Auguste D

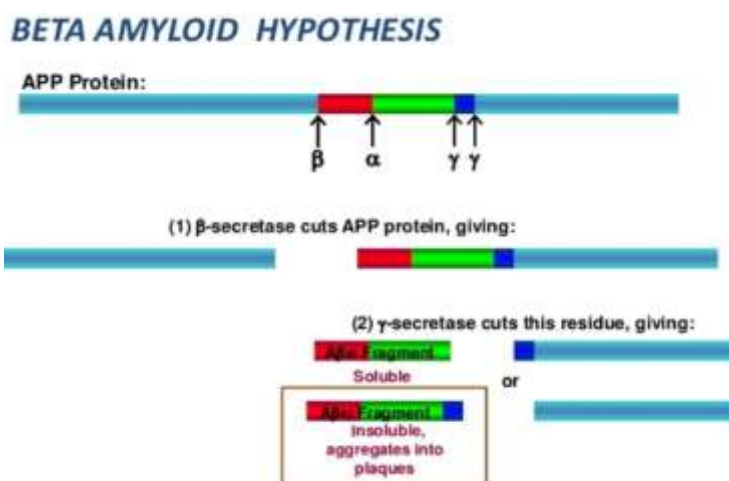
## 1.2. Pathophysiology of Alzheimer's disease:

### 1.2.1. Role of Amyloid Beta (A $\beta$ ) in neurodegeneration :

Amyloid Beta (A $\beta$ ), a heterogeneous combination of small peptides with 40–42 amino acids, is linked to a number of degenerative alterations in Alzheimer's disease (AD). According to the amyloid cascade hypothesis, the pathogenesis of AD is primarily caused by the aggregation of A $\beta$  into amyloid oligomers and plaques. These peptides (A $\beta$ ) are generated through the proteolytic cleavage of the large transmembrane APP by  $\beta$  and  $\gamma$  secretases. These A $\beta$  protein molecules may combine together to form soluble oligomeric bundles that can take on different forms. It is speculated that specific misfolded oligomers (sometimes referred to as "seeds") are responsible for triggering or causing other  $\beta$ -amyloid molecules to misfold in a series of chain reactions that result in their accumulation. The resulting amyloid deposition subsequently produces structural alterations in AD and a toxic effect on nerve cells. Tau proteins, which are also present in misfolded oligomers, are the other type of protein seen in AD. Misfolded A $\beta$  has been demonstrated to trigger tau protein misfolding. The specific physiological function of A $\beta$  is unknown, although animal studies have demonstrated that a lack of A $\beta$  proteins does not result in a loss of any physiological function (Wildburger et al 2017). A has been linked to a number of possible activities, including activation of the kinase family of enzymes, defense against oxidative stress, reduction or control of cholesterol transport, and anti-microbial activity (mostly connected to A $\beta$ 's pro-inflammatory activity).

### 1.2.2 Golgi body and Amyloid beta protein

Available experimental reports suggest that the inhibitors of plasminogen activator inhibitor-1 decrease the plasma and brain A $\beta$  levels in transgenic animals. Amyloid targeting immunotherapy can be done by bapineuzumab, gantenerumab etc. These monoclonal humanized antibodies mainly act on the CNS and reduce Tau proteins level either by inhibiting their phosphorylation or clearance mechanism (Folch et. al 2016).



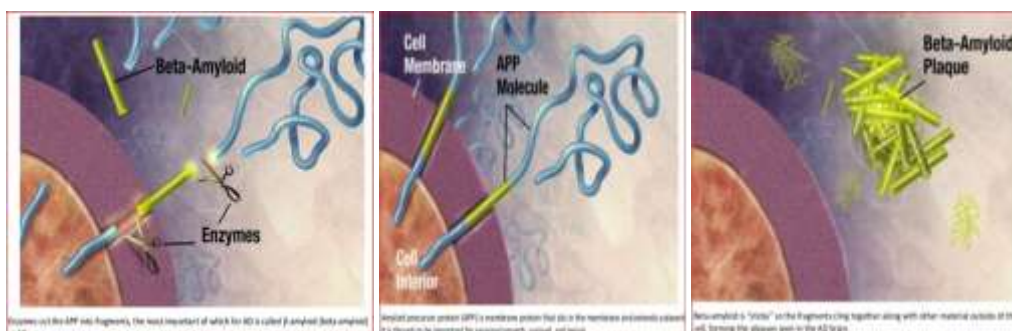


**Fig 1.2:** Formation of  $\beta$  amyloid plaques in Alzheimer's disease.

### 1.2.3 Role of Tau protein in Alzheimer's disease

Tau proteins are microtubule-associated proteins (MAP) that are primarily expressed in CNS and peripheral nervous system neurons. The tau proteins are an extended group of six highly soluble protein isoforms derived from the gene MAPT (microtubule-associated protein tau). By maintaining the microtubular cytoskeleton, they dynamically regulate essential functional activities such as axonal transport, neurite development, and synaptic plasticity.(Medina et al 2016).

Tau is a phosphoprotein, and the level of phosphorylation affects how active it is biologically. The development of Neurofibrillary Tangles (NFTs) is significantly influenced by abnormal hyperphosphorylation. This characteristic appears to be an important factor contributing to neuronal death in AD. It has been found that the phosphorylation level of tau is 3- to 4-fold higher in AD patients' brains than in healthy human brains. NFTs interfere with normal synaptic plasticity, which would reduce neurotransmission, cause the death of tangle-bearing neurons, and result in dementia (Simic et al. 2017). According to the tau hypothesis, any structural and functional tau protein imperfections cause a disease cascade or disease-like condition. When hyperphosphorylated tau accumulates inside nerve cell bodies, it causes microtubule disintegration, the destruction of the cell's cytoskeleton, and the collapse of the neuron transport system. This can create a breakdown in neurochemical communication between neurons, resulting in neuronal loss or death. Thus, the Tau hypothesis proposes that the aberrant aggregation of the tau protein is the etiology of AD (Lepeta et al. 2016). Researchers believe that neurofibrillary tangles form when tau breaks from microtubules because of a cause that is unknown. Some investigations showed that hyperphosphorylated tau accumulates as tangles even when tau levels have been reduced via transgenic suppression. This could be because tangles operate as a sink for tau intermediates that are thought to have developed as a result of the pathogenic process. Nevertheless, the absence of a direct correlation between tangle formation and cognitive decline raises the possibility that intermediates made of other proteins, such as Huntington or A protein, are the neurotoxic species (Singh et al. 2015).

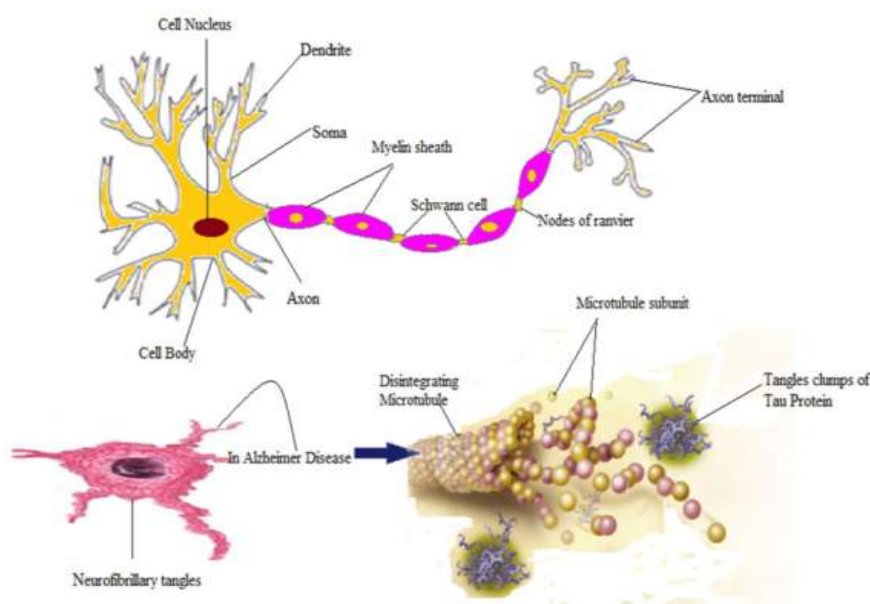


**Fig 1.3:** Formation of neurofibrillary tangles (NFTs) and tau protein clumps in Alzheimer's disease.

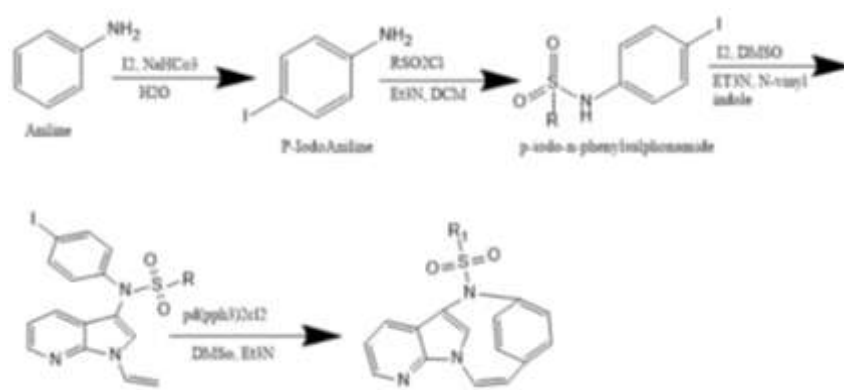
## MATERIAL AND METHODS

### DESIGN, SYNTHESIS AND PHARMACOLOGICAL EVALUATION OF NOVEL 7-AZAINDOLE DERIVATIVES

#### 3.3. EXPERIMENTAL METHODS:

##### 3.3.1. CHEMISTRY:

##### SCHEME1:



##### 3.3.1.1. General procedure for preparation of p-Iodoanilines (3a-d)

Add 11 milliliters of aniline (1.22 millimoles) and 15 milligrammes of sodium bicarbonate (1.8 millimoles) Add an effervescent flask and allow it to reflux for three hours. By gradually adding ice while stirring, The temperature of the reaction mixture is reduced until it reaches 12–15°C. Add 15-20 milligrams of powdered iodine (2) in increments of 2-3 minutes. Stirring is kept up for twenty to thirty minutes more. At the end of the process, the free iodine solution lost all of its color. The unprocessed P-Iodoaniline crystallizes into a black mass. Adding gasoline to the raw material in a flask makes it purer. The reflux condenser is placed in the flask, which is thereafter brought to a temperature of 75–80 degrees Celsius while immersed in water. Saturation should be achieved after approximately 15 minutes of vigorous shaking of the flask. Discarded gasoline solution. Filtered and dried, colorless needles of P-iodoaniline crystallize instantly.

##### 3.3.1.2. General protocol for synthesis of tosylated p-Iodoanilines (5):

Add 10.8 mmol of p-toluene sulfonyl chloride to a 9 mmol solution of 4-iodoaniline(3a-d) in 20 ml of anhydrous pyridine. Ethyl acetate was used to extract the reactants after stirring them for 10 hours at room temperature in a nitrogen environment. We concentrated mixed organic phases after washing them with 45 ml of brine, drying them over sodium sulfate, and filtering them. To obtain the white solid products, the residue was flash chromatographically purified using an eluent mixture of ethyl acetate and hexane (1:10).

##### 3.3.1.3. General procedure for coupling of vinyl indole with tosylated p-iodoaniline:

An 8-hour reflux process was carried out using a mixture of vinyl azaindole (0.5 mmol), tosylated P-iodo aniline (0.5 mmol), iodine, and triethyl amine. After being extracted with ethyl acetate, response concoction stayed satisfied with a 5 ml drenched resolution of  $Na_2S_2O_3$ . Following a brine solution wash (45 ml), the mixed animate the components were concentrated after being filtered and dried over sodium sulfate. What was left over was refined through the use of flash chromatography with an eluent mixture of ethyl acetate and hexane (6:4) to produce N-(4-chloro-2-iodophenyl)-N-(1-vinyl-1H-pyrrolo[2,3-b]pyridin-3-yl) sulfonamides, which are solid white particles (9a-p).

##### 3.3.1.4. General procedure for synthesis of (Z)-6-(sulfonyl)-6H-7,10-etheno-5,13-(metheno)pyrido[2,3-b] [1,5] diazacycloundecine derivatives (10a-p):

The compound N-(4-chloro-2-iodophenyl)-N-(1-vinyl-1H-pyrrolo [2,3-b] is named.-pyridin-3-yl alcohol A mixture of 0.7 mmol of sulfonamides (9a-p) and 0.06 gm or 0.4 mmol of bis(triphenylphosphine)palladium dichloride in 30 mL of ethanol was refluxed for 9 hours. After dissolving the residue in dichloromethane, it was rinsed with water to remove any remaining ethanol. The compounds

with the title (10a-p) were isolated by vacuum distillation of volatiles and subsequent flash chromatography purification in a solvent mixture of ethyl acetate and hexane (6:4).

### 3.3.2. DOCKING:

The Molecular docking is a strong tool that can be used in structural molecular biology as well as computational drug design. approach for predicting the most important binding mode of ligands with the known three-dimensional structures of proteins.

#### DOCKING TOOLS USED:

1. This research made use of a variety of modeling tools, including AutoDock Vina, Swiss Protein Data Base Viewer, Open Babel, PyRx, Discovery Studio Visualizer 3.0, Chem Office 16, and Discovery Studio.
2. Docking is a five-step process in its entirety.
3. Making protein
4. Preparation of the larva
5. generation for the grid
6. Docking with a Ligan
7. Points scored

#### 3.3.2.1. PROTEIN PREPARATION:

The protein with the crystal structure of Pi3K bound to its powerful inhibitor GSK2126458 (PDB ID: 3L08) was retrieved the Protein-Data-Bank is the source(RCSB) at a resolution of 2.7 Å. Protein preparation involved the removal of Hydrogen molecules, polarhydrogens added, and koll man united atom charges assigned. Using spdbv, we reduced the protein energy and saved the results in.pdb format.

#### 3.3.2.2. LIGAND PREPARATION:

The ligands were prepared using software like Chemdraw 16.0, which allowed for the conversion of 2D structures into 3D structures and the execution of energy minimization using MM2 for every ligand.

The SDF file was integrated into the ligprep program and adjusted using the ligprep filter according to a number of specified descriptors. Among these characteristics are the following: changes to structural elements like molecular weight (>650 were eliminated), number of H-bond acceptors (>5) and donor atoms (>5), creation of different stereoisomers and tautomers, and addition of potential ionization states.

#### 3.3.2.3. GRID GENERATION:

The 3L08 protein's grid center was set at X=35.09, Y=4.55, and Z=27.83. The grid size was 91.27 by 80.79 by 74.78, and the grid spacing was 0.5Å per grid. All docking parameters were left in their default values. Discovery Studio Visualizer 2020 was used to create the visualization of receptor-ligand interactions.

#### 3.3.2.4. LIGAND DOCKING:

The molecular docking process was executed using Pyrx0.8, a virtual screening tool.

### 3.3.3 BIOLOGICAL EVAUATION:

#### 3.3.3.1 ANTICANCER ACTIVITY

##### 3.3.3.1.1. MTT ASSAY:

**Procurement of cell line:** From NCCS, Pune, we obtained the HeLa and MCF-7 cell lines at passage 45.

**Media Preparation:** Dispense 20-30 milliliters of MEM medium into the centrifuge. Make a final volume of 50 ml by adding 10 ml using half a milliliter of antibiotic solution and half a milliliter of bovine serum, 1.25 ml of HEPES, and any other necessary media. When combined, keep the mixture at 208 degrees Celsius for a maximum of four weeks.

**Sub culturing cells:** Rinse with PBS after removing the media from the aforementioned solution. Take out the PBS and mix with 1 milliliter of trypsin-EDTA. Keep the flask in a CO<sub>2</sub> incubator set at 37 degrees Celsius.

## RESULTS AND DISCUSSION

The ingredients aniline (1) and sodium bicarbonate are refluxed for three hours in a round-bottom flask. By gradually adding ice while stirring, The reaction mixture consisted of cooled to a temperature of 12–15°C. For the synthesis of p-iodoaniline (3a-d), powdered iodine (2) was added. Mixing the compounds (3a-d) with 20 ml of anhydrous pyridine, 10.8 mmol of p-toluene sulfonyl chloride (4) was added. To obtain tosylated p-iodoanilines (5), the response blend was agitated for 10 hours and then extracted with ethylacetate. The following ingredients were refluxed for 8 hours at 250 °C: vinyl azaindole, tosylated P-iodo aniline (5), and triethyl amine. Ethyl acetate was used for extraction after quenching combining the reactant combination with a fully saturated Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub>. Following a brine solution wash and drying on sodium sulfate, the mixed organic phases were filtered to remove the N- (4- chloro- 2 -iodophenyl) -N-(1-vinyl-1H-pyrrolo[2,3-b]pyridin-3-yl) sulfonamides (9a-p). We finished by refluxing the compounds (9a-p) with bis (triphenyl phosphine) palladium in ethanol for 9 time blocks. Dichloromethane was used to dissolve the residue after ethanol was removed and subsequently rinsed with water. The compounds (10a-p) were isolated by removing the volatile components in a vacuum. They were thereafter made pure by flash chromatography with a solvent mixture of ethyl acetate and hexane (6:4).

The new compounds' structures were well-supported by their spectra; for example, the aromatic CH stretch was visible in the FTIR spectra of compounds 10a–10p, which ranged from 2976 to 3058 cm<sup>-1</sup>. Both the C= C and C-N stretches were detected at 1591 cm<sup>-1</sup> and 1222 cm<sup>-1</sup>, respectively. Aromatic protons reverberated as doublets and triplets in the range of 7.284-7.906 ppm, according to the compounds' 1H NMR data. At 3.066 ppm, methyl proton was determined to be a singlet. In addition to the FTIR and NMR spectra, the The data from the ESI mass spectrometry of each molecule confirmed the predicted structures by showing peaks at important M<sup>+</sup>, [M+H]<sup>+</sup>, and [M+2]<sup>+</sup> m/z.

**Table 3.2. Physical data of new Azaindole derivatives (10a-o)**

| S.No | Compound | M. Form                                                                         | M.Wt | M.P     | Rf* | % Yield |
|------|----------|---------------------------------------------------------------------------------|------|---------|-----|---------|
| 1    | 10a      | C <sub>16</sub> H <sub>13</sub> N <sub>3</sub> O <sub>2</sub> S                 | 311  | 235-237 | 0.7 | 57      |
| 2    | 10b      | C <sub>16</sub> H <sub>12</sub> ClN <sub>3</sub> O <sub>2</sub> S               | 345  | 268-270 | 0.4 | 60      |
| 3    | 10c      | C <sub>16</sub> H <sub>12</sub> BrN <sub>3</sub> O <sub>2</sub> S               | 390  | 203-205 | 0.6 | 75      |
| 4    | 10d      | C <sub>16</sub> H <sub>12</sub> N <sub>4</sub> O <sub>4</sub> S                 | 356  | 210-212 | 0.5 | 68      |
| 5    | 10e      | C <sub>21</sub> H <sub>15</sub> N <sub>3</sub> O <sub>2</sub> S                 | 373  | 198-200 | 0.8 | 52      |
| 6    | 10f      | C <sub>21</sub> H <sub>14</sub> ClN <sub>3</sub> O <sub>2</sub> S               | 407  | 248-250 | 0.6 | 61      |
| 7    | 10g      | C <sub>21</sub> H <sub>14</sub> BrN <sub>3</sub> O <sub>2</sub> S               | 452  | 263-265 | 0.4 | 38      |
| 8    | 10h      | C <sub>21</sub> H <sub>14</sub> N <sub>4</sub> O <sub>4</sub> S                 | 418  | 270-272 | 0.5 | 78      |
| 9    | 10i      | C <sub>19</sub> H <sub>13</sub> N <sub>3</sub> O <sub>2</sub> S <sub>2</sub>    | 379  | 169-171 | 0.7 | 57      |
| 10   | 10j      | C <sub>19</sub> H <sub>12</sub> ClN <sub>3</sub> O <sub>2</sub> S <sub>2</sub>  | 413  | 188-190 | 0.5 | 72      |
| 11   | 10k      | C <sub>19</sub> H <sub>12</sub> BrN <sub>3</sub> O <sub>2</sub> S <sub>2</sub>  | 458  | 230-232 | 0.5 | 84      |
| 12   | 10l      | C <sub>19</sub> H <sub>12</sub> N <sub>4</sub> O <sub>4</sub> S <sub>2</sub>    | 424  | 195-197 | 0.8 | 65      |
| 13   | 10m      | C <sub>21</sub> H <sub>13</sub> Cl <sub>2</sub> N <sub>3</sub> O <sub>2</sub> S | 441  | 263-265 | 0.4 | 59      |
| 14   | 10n      | C <sub>21</sub> H <sub>13</sub> Br <sub>2</sub> N <sub>3</sub> O <sub>2</sub> S | 531  | 190-192 | 0.8 | 81      |
| 15   | 10o      | C <sub>21</sub> H <sub>13</sub> N <sub>5</sub> O <sub>6</sub> S                 | 463  | 214-216 | 0.5 | 48      |

\*Mobile phase: hexane: ethyl acetate

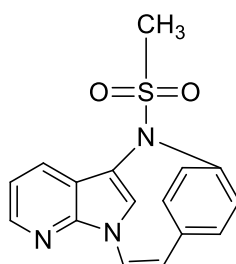
In a round-bottom flask, dissolve Aniline (1) and sodium bicarbonate. Reflux the mixture for three hours. Adding ice while stirring lowered the temperature of the reaction mixture to 12–15°C. Formulation of p-iodoaniline (3a-d) required the addition of powdered iodine (2). A solution of p-toluene sulfonyl chloride (4) (10.8 mmol) was included in the compounds (3a-d) in 20 ml of anhydrous pyridine. Tosylated p-iodoanilines (5) were obtained by stirring the reaction mixture for 10 hours and then extracting it with ethylacetate. Tosylated P-iodo aniline (5), vinyl azaindole, and triethyl amine were refluxed at 250 oC for 8 hours. After being extracted with ethyl acetate, A saturated solution was used to put an end to the reaction mixture of Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub>. The N -(4- chloro-2- iodophenyl) -N- (1-vinyl-1H-pyrrolo[2,3-b]pyridin-3-yl) sulfonamides (9a-p) were filtered from the mixed organic phases after they were brine solution was used to

wash the item, and sodium sulfate was used to dry it. The last step was a 9-hour reflux of the compounds (9a-p) with bis (triphenyl phosphine) palladium in ethanol. After dissolving the residue in dichloromethane, it was rinsed with water to remove any remaining ethanol. The volatile components were extracted using a vacuum to produce the active compounds (10a-p), which were subsequently refined by flash chromatography with a solvent mixture of ethyl acetate and hexane (6:4).

All of the newly synthesized compounds showed promising structurally-related spectral data; the FTIR spectra of the ten final compounds (10a–10p) revealed an aromatic CH stretch ranging from 2976 to 3058  $\text{cm}^{-1}$ . At 1591  $\text{cm}^{-1}$ , the C=C stretch was detected, while at 1222  $\text{cm}^{-1}$ , the C-N stretch was detected. In the range of 7.284–7.906 ppm, the compounds'  $^1\text{H}$  NMR data showed aromatic protons resonating as doublets and triplets. A singlet of methyl proton was detected in the 3.066 ppm range. All of the compounds' ESI mass spectrometric data corroborated the predicted structures using peaks at important  $\text{M}^+$ ,  $[\text{M}+\text{H}]^+$ , and  $[\text{M}+2]^+$   $m/z$ , complementing the findings from the FTIR and NMR spectra.

### 3.4.2 SPECTRAL DATA OF SYNTHESIZED COMPOUNDS:

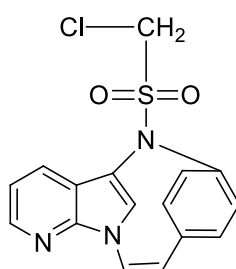
#### 3.4.2.1. (Z)-6-(methylsulfonyl)-6H-7,10etheno-5,13-(metheno)-pyrido[2,3b][1,5]di-azacycloundecine (10a) Compound 10a obtained as yellowish orange solid



#### $^1\text{H}$ NMR (400MHz DMSO, $\delta$ ppm):

The given intervals are as follows: 7.906–7.927 (d, 2 H,  $J=8.4$  Hz, Ar-H), 7.606–7.724 (t, 1H,  $J=4.0$ Hz, Ar-H), 7.284–7.586 (m, 6H, Ar-H), 5.370 (s, 1H, ethylene), 2.85 (s, 3H, methyl). The following chemical shifts were recorded by  $^{13}\text{C}$  NMR (100MHz, DMSO): 142.18, 132.54, 129.35, 129.09, 128.56, 128.41, 126.88, 125.27, 124.48, 114.02, 42.18. In the calculated MASS spectrum for  $\text{C}_{16}\text{H}_{13}\text{N}_3\text{O}_2\text{S}$ , the molecular weights are 313.14 $[\text{M}+2]^+$  and 443.25 $[\text{M}+4]^+$ . In the found spectrum, the molecular weights are 61.70, with H at 4.26, N at 13.55, and S at 10.25. 3058.56(C-H, Aromatic), 2976.58(C-H, Aliphatic), 1660 (C=N), 1591.59(C=C), 1222.35 (S=O), and 1080.34 (C-N) are infrared (KBr,  $\text{cm}^{-1}$ ).

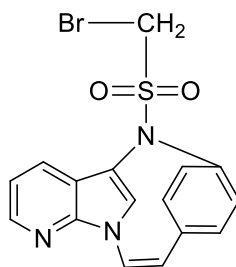
#### 3.4.2.2. (Z)-6-(chloromethyl)sulfonyl)-6H-7,10-etheno-5,13-(metheno) pyrido[2,3-b][1,5]di-azacycloundecine (10b) : Compound 10b obtained as white solid.



#### $^1\text{H}$ NMR (400MHz DMSO, $\delta$ ppm):

5.675–7.606 (t, 1H, Ar-H), 7.370–7.408 (m, 4H, Ar-H), 4.689 (s, 1H, ethylene), and 3.066 (s, 2H, methylene) are among the many vibrational frequencies seen in the presence of ar-H. The 13-dimensional Spectra of nuclear magnetic resonance were recorded at those locations. 100 MHz in DMSO as follows: 153.78, 152.34, 143.63, 142.44, 139.59, 138.74, 136.03, 129.96, 129.40, 127.96, 127.65, 126.73, 125.01, 119.01, 122.27, 119.01, 48.15, 38.66. The chemical shift MASS spectrum for  $\text{C}_{16}\text{H}_{12}\text{ClN}_3\text{O}_2\text{S}$  is 347.14 $[\text{M}+2]^+$ , with the following calculated values: CHN: C, 55.57; H, 3.50; N, 12.15; O, 9.25; S, 9.27; found: C, 55.50; H, 3.55; N, 12.18; O, 9.20; S, 9.22; IR (KBr,  $\text{cm}^{-1}$ ): 3081.56 (C-H, Aromatic), 2924.43 (C-H, Aliphatic), 1638.12 (C=N), 1572.70 (C=C), 1236.28 (S=O), and 1136.97 (C-N).

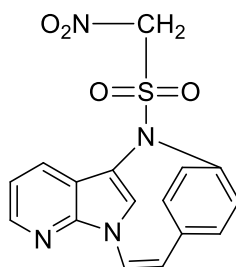
**3.4.2.3. (Z)-6-(bromomethyl) sulfonyl)-6H-7,10-etheno-5,13-(metheno)pyrido[2,3-b][1,5]diazacycloundecine (10c):** Compound 10c produced as a solid with a yellowish orange.



**<sup>1</sup>H NMR (400MHz DMSO, δ ppm):**

From 7.928 to 7.923 (d, 2H, J=8.4 Hz, Ar-H), from 7.659 to 7.724 (t, 1H, J=4.0 Hz, Ar-H), from 7.234 to 7.596 (m, 6H, Ar-H), from 5.371 (s, 1H, ethylene), and from 2.35 (s, 2H, methylene). <sup>1</sup>H NMR spectra (100 MHz, DMSO): 161.32, 140.18, 130.54, 126.35, 126.03, 125.16, 124.41, 123.88, 122.27, 116.48, 113.02, 48.18, The calculated MASS m/z for C<sub>16</sub>H<sub>13</sub>N<sub>3</sub>O<sub>2</sub>S is 392.14[M+2]<sup>+</sup>, with CHN at 49.24, H at 3.10, N at 10.77, and S at 8.22. The observed values are 49.53, H at 3.10, N at 10.70, and S at 8.20. 3106.26 (C-H, Aromatic), 2986.18 (C-H, Aliphatic), 1650 (C=N), 1585.19 (C=C), 1228.15 (S=O), and 1082.34 (C-N) are in the infrared spectrum (KBr, cm<sup>-1</sup>).

**3.4.2.4. (Z)-6-(nitromethyl)sulfonyl)-6H-7,10etheno5,13(metheno)pyrido[2,3b][1,5]diazacycloundecine(10d):** Compound 10d solid that is obtained as a yellowish-white color.

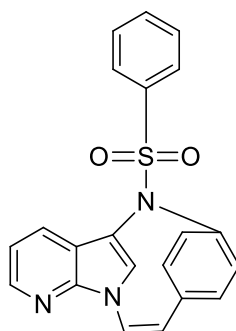


**<sup>1</sup>H NMR (400MHz DMSO, δ ppm):**

The frequency ranges are as follows: 7.918–7.921 (d, 3H, J=8.4 Hz, Ar–H), 7.661–7.664 (t, 1H, J=4.0 Hz, Ar–H), 7.230–7.595 (m, 5H, Ar–H), 5.370 (s, 1H, ethylene), 2.30 (s, 2H, methylene).

The following <sup>13</sup>C there was a recording of NMR spectra in DMSO. at 100 MHz: 150.25, 135.10, 128.54, 125.35, 124.03, 123.16, 120.41, 119.18, 115.27, 113.40, 110.02, 45.18. T The calculated MASS m/z for C<sub>16</sub>H<sub>13</sub>N<sub>3</sub>O<sub>2</sub>S is 392.14[M+2]<sup>+</sup>, with CHN at 49.24, H at 3.10, N at 10.77, and S at 8.22. The observed values are 49.53, H at 3.10, N at 10.70, and S at 8.20. 3106.26 (C-H, Aromatic), 2986.18 (C-H, Aliphatic), 1650 (C=N), 1585.19 (C= C), 1228.15 (S=O), and 1082.34 (C-N) are in the infrared spectrum (KBr, cm<sup>-1</sup>).

**3.4.2.5. (Z)-6-(phenylsulfonyl)-6H-7,10-etheno-5,13-(metheno)pyrido[2,3-b][1,5]diazacycloundecine (10e):** Compound 10e obtained as orange solid.

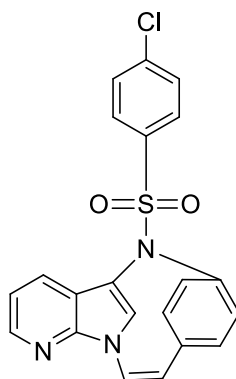


**<sup>1</sup>H NMR (400MHz DMSO,  $\delta$  ppm):**

(d, 2H, J=8.4 Hz, Ar-H) 7.926-7.928 6. 668–7. 721 (t, 1H, J=4.0 Hz, Ar–H), 7.238–7.535 (m, 6H, Ar–H), 5.376 (s, 1H, ethylene), 2.28 (s, 2H, methylene).

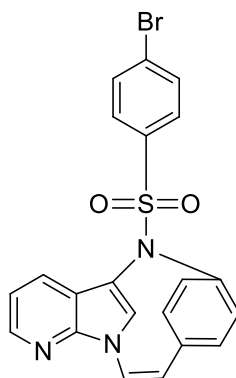
The following <sup>13</sup>C NMR spectra recorded in DMSO at 100 MHz: 140.18, 138.12, 130.54, 126.35, 126.03, 125.16, 124.41, 123.88, 122.27, 116.48, 113.02, 48.18. The calculated MASS m/z for C<sub>16</sub>H<sub>13</sub>N<sub>3</sub>O<sub>2</sub>S is 392.14[M+2]<sup>+</sup>, with CHN at 49.24, H at 3.10, N at 10.77, and S at 8.22. The observed values are 49.53, H at 3.10, N at 10.70, and S at 8.20. On the infrared spectrum, at 3051.89 KBr, we find C-H, aromatic; on the aliphatic, C-H, 1722.32 cm<sup>-1</sup>, 1588.12 cm<sup>-1</sup>, and 1253.72 cm<sup>-1</sup>, C-O.

**3.4.2.6. Z)-6-((4-chlorophenyl)sulfonyl)-6H-7,10-etheno-5,13-(metheno)pyrido[2,3-b][1,5]diazacycloundecine (10f):** Compound 10f gotten as yellowish white strong.

**<sup>1</sup>H NMR (400MHz DMSO,  $\delta$  ppm):**

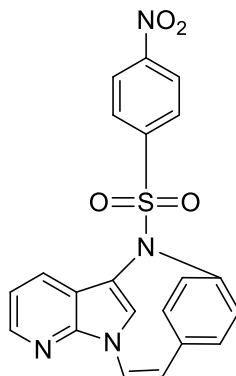
7.90–7.92 (d, 2H, Ar-H), 7.72–7.75 (t, 2H, J=4.0 Hz, Ar-H), 7.65–7.68 (m, 4H, J=4.0 Hz, Ar-H), 7.55–7.60 (m, 4H, J=4.0 Hz, Ar-H), 5.21 (s, 1H, amide), <sup>13</sup>C NMR (100MHz, DMSO): 150.10, 138.10, 135.01, 130.10, 129.42, 128.23, 126.14, 127.18, 126.75, 126.25, 126.18, 124.52, 118.70, 115.10, 114.3. The calculated chemical shift for C<sub>21</sub>H<sub>14</sub>ClN<sub>3</sub>O<sub>2</sub>S in the MASS spectra is 409.14 [M+2]<sup>+</sup>. The found shifts are C, 58.56, H, 3.55, N, 15.51, and O, 14.28. The CHN shifts are C, 61.84, H, 3.46, Cl, 8.69, N, 10.30, O, 7.85, and S, 7.86. On the infrared spectrum, at 3058.56 KBr, we find C-H, aromatic; on the aliphatic, C-H, 1724.84; on the C=O, aromatic; on the C=C, aromatic; & on the C-O, 1080.34.

**3.4.2.7. (Z)-6-((4-bromophenyl)sulfonyl)-6H-7,10-etheno-5,13-(metheno)pyrido[2,3-b][1,5]diazacycloundecine (10g):** Compound 10g obtained as white crastaline solid.

**<sup>1</sup>H NMR (400MHz DMSO,  $\delta$  ppm):**

7.94-7.96 (d, 2H, Ar- H), 7.84-7.87 (t, 2 H, J=4.0 Hz, A r-H), 7.62-7.68 (m, 4H, J=4.0 Hz, Ar-H), 7.54-7.60 (m, 4H, J=4.0 Hz, Ar-H), 5.35 (s, 1H, amide), <sup>13</sup>C NMR (100MHz, DMSO): 141.10, 139.20, 138.21, 135.35, 129.42, 128.23, 126.14, 127.18, 126.75, 126.25, 126.18, 124.52, 119.75, 117.18, 118.34. The calculated mass-to-charge ratio for C<sub>21</sub>H<sub>14</sub>BrN<sub>3</sub>O<sub>2</sub>S in the MASS spectra is 454.14 [M+2]<sup>+</sup>, while the observed values are C, 55.78, H, 3.22, N, 9.25, and S, 7.15. The following infrared bands were seen at 3060.21(C -H, Aromatic), 2968.10(C- H, Aliphatic), 1591.59 (C= C, Aromatic), and 1080.34 (C-O) (MBr, cm<sup>-1</sup>).

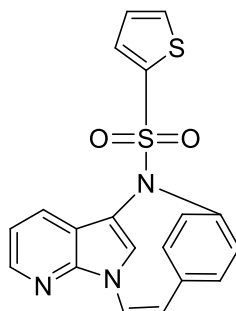
**3.4.2.8. (Z)-6-((4-nitrophenyl)sulfonyl)-6H-7,10-etheno-5,13-(metheno)pyrido[2,3-b][1,5]diazacycloundecine (10h):** Compound 10h acquired as cream variety colour.



**<sup>1</sup>H NMR (400MHz DMSO, δ ppm):**

7.92-7.94 (d, 2H, Ar-H), 7.86-7.89 (t, 2H, J=4.0 Hz, Ar-H), 7.65-7.70 (m, 4H, J= 4.0 Hz, Ar-H), 7.54-7.60 (m, 4H, J=4.0 Hz, Ar-H), 5.35 (s, 1H, amide), <sup>13</sup>C NMR (100MHz, DMSO): 140.32, 139.18, 138.21, 136.35, 129.42, 128.23 126.14, 127.18, 126.75, 126.25, 126.18, 124.52, 119.75, 117.18, 118.34. The calculated mass-to-charge ratio for C<sub>21</sub>H<sub>14</sub>N<sub>4</sub>O<sub>4</sub>S in the MASS spectra is 419.14 [M+1]<sup>+</sup>, while the observed values are C, 55.78, H, 3.22, N, 9.25, and S, 7.15. 3060.21 (C-H, Aromatic), 2968.10 (C-H, Aliphatic), 1591.59 (C= C, Aromatic), and 1080.34 (C-O) are infrared (KBr, cm<sup>-1</sup>).

**3.4.2.9. (Z)-6-(thiophen-2-ylsulfonyl)-6H-7,10-etheno-5,13-(metheno)pyrido[2,3-b][1,5]diazacycloundecine (10i):** Compound (10i) obtained as yellowish solid.



**CONCLUSION:**

The present work focuses on design, synthesis, biological evaluation of novel aza indole & indole derivatives.

This work aims to design, synthesize various azaindole sulphonamide & oxindole hydrazine carboxamide derivatives compounds & to purify by column chromatography. characterize them by analytical techniques followed by biological evaluation for anticancer activity by MTT assay, Anti Alzheimer's activity by invitro, invivo and behavioural studies & developing Structural activity relation studies correlating the structure of the compound.

**REFERENCES**

1. Akhtar J, Khan AA, Ali Z, Haider R, Shahar Yar M (2017). Structure-activity relationship (SAR) study and design strategies of nitrogen-containing heterocyclic moieties for their anticancer activities. *Eur J Med 31 Chem* 125;143-189.
2. Bray F, Ferlay J, Soerjomataram I, Siegel RL, Torre LA, Jemal A (2018). Global cancer statistics 2018: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA Cancer J Clin*, 68; 394-424.
3. Cacchi S., Fabrizi G (2005). *Chem. Rev* 105, 2873

4. Das Mukherjee D, Kumar NM, Tantak MP, Das A, Ganguli A, Datta S (2016). Development of novel bis(indolyl)-hydrazide-hydrazone derivatives as potent microtubule-targeting cytotoxic agents against A549 lung cancer cells. *Biochem* 55:3020–35.
5. De Martino G, La Regina G, Coluccia A, Edler MC, Barbera MC, Brancale A (2004). Arylthioindoles, potent inhibitors of tubulin polymerization. *J Med Chem.* 47:6120–3.
6. Fadeyi OO, Adamson ST, Myles EL, Okoro CO (2018). Novel fluorinated acridone derivatives. Part 1: synthesis and evaluation as potential anticancer agents. *Bioorg Med Chem Lett* 18; 4172-4176.
7. Florence P, Sylvain R, Benoît J, Jean-Yves M (2007). *Tetrahedron*, 63, 1031.
8. Greig SL. Osimertinib (2016). first global approval. *Drugs* 76:263–73.
9. Humphrey G. R., Kuethe J. T (2016). *Chem. Rev.* 106, 2875
10. Jacob AP, Nicole NM, Hadi DA, Andrey P, Kim RD, Mohan N, Manickam K, Sumathy M, Judith AW (2013). *J. Inorg. Biochem.* 127, 175.