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IMIDIAZOPYRIDINES AS AN ANTICANCER AGENTS: AN OVERVIEW AND UPDATES

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ABSTRACT

Background: Cancer affects people's life, poses a threat to world health, and has a number of negative side effects when treated. Both industrialized and developing nations struggle with a significant public health burden from cancer. The body's abnormal expansion of cells increases the chance of suffering from a tumor and the number of cancer patients worldwide is rising daily. The resistance of cancer cells to currently available treatments encouraged the quest for novel anticancer drugs. Pyridine, a preferred scaffold, is a component of living things and isimportant for many biological processes as well as the development of cancer. It is regarded asan important molecule in the therapy of cancer because of its structural similarities to the nucleotide base pair of DNA and RNA.

Main text: Many novel pyridine derivatives have been designed and developed for their anticancer activity within the previous few years. Many novel pyridine compounds have been created recently, and their potential anticancer properties have been investigated which includes Biological evaluation, QSAR and Molecular docking.

Conclusion: This review aims to aid in the creation of pyridine scaffold-based anticancer medications that are more effective and potent. This review article describes the Imidazopyridine ring's anticancer activity that has been noted in several different cancer cell lines. It will be helpful in directing researchers worldwide who are working on this moiety will be vital to the advancement of the chemistry of imidazopyridines.

KEYWORDS

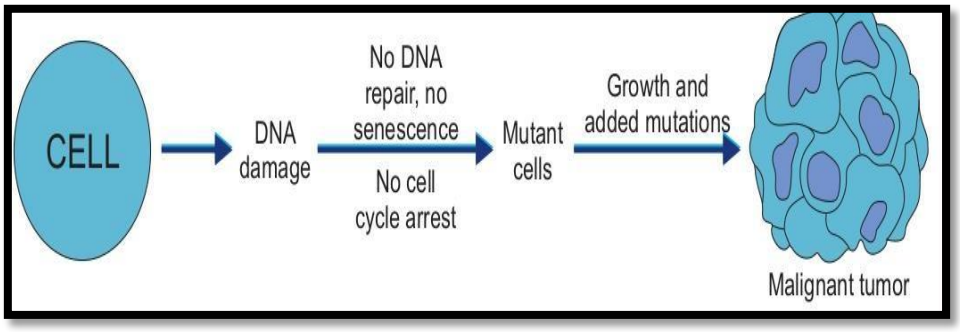
Cancer, Pyridine, Anticancer activity, Structure activity relationship (SAR) , Heterocyclic compound.

INTRODUCTION

The term cancer is used to refer to a variety of illnesses where the ability to govern cell growth and division has been lost, resulting in a primary tumor that invades and kills nearby tissues. Additionally, it has the potential to metastasize, which is the reason for 90% of cancer-related fatalities[1]. An estimated 14.5% of all fatalities globally are caused by cancer, which continues to be one of the most challenging diseases to treat. In women most commonly, breast cancer is observed. This illness is a serious public health issue because of the significant population impact it has, and farther molecular exploration is demanded to determine its prognostic and particular course of treatment. Breast cancer is the most often diagnosed cancer and the leading cause of cancer death in women, accounting for 23% of all cancer diagnoses and 14% of cancer deaths in this demographic. Thus, research in this area is necessary in order to reduce the financial and psychological strain[2]. The International Agency for Research on Cancer reported that 326 lakh people had survived cancer globally in 2012, whereas 141 lakh new cases of the disease were reported. In our own country, there are over 4.7 lakh new cases of cancer detected annually. In India alone, cancer claims the lives of over 3.5 lakh individuals each year. According to estimates, lung cancer accounts for roughly one in five cancer-related fatalities globally (19.4% of all deaths, or 15.9 lakh deaths). Breast cancer is the leading cause of mortality for women, taking the lives of 5.2 lakh of them annually. These figures just provide as a numerical representation of the immense damage that cancer causes in the world. According to WHO forecasts, the annual incidence of cancer may reach 220 lakhs in the next two decades[3].

As more individuals adopt modern lifestyles with dangerous behaviors including inactivity, a decline in fruit and vegetable consumption, and an increase in fast food, alcohol, and tobacco use, it is expected that the prevalence of cancer will grow even higher. The ability of a cancer cell to proliferate in the absence of growth signals, resistance to signals that would normally inhibit growth, resistance to normal cell death mechanisms, formation of a new blood supply, the ability to involve surroundingtissues, metastasis to distant organs, and failure to repair damaged DNA are just a few of the key changes that occur in a cancer cell (Figure 1).

Figure 1: Simple illustration of a cell's malignant transformation: DNA damage, no repair, and more mutations



CANCER TYPES INVOLVING CELL LINES

Table 1: Cancer types involving cell lines[4]

Cancer	Cell lines	Cancer	Cell lines
Leukemic	K-562	Non- Small Cell Lung	HOP-92
	SR		HOP-62

	CCRF-CEM		A549/ATCC
	RPMI-8226		NCI-H322M
	MOLT-4		NCI-H226
	HL-60(TB)		NCI-H460
			NCI-H522
			NCI-H23
Colon	HCT-116	CNS	SNB-75
	SW-620		SNB-19
	KM12		U251
	COLO 205		SF-539
	HT29		SF-268
	HCC-2998		SF-295
	HCT-15		
Melanoma	MALME-3M	Ovarian	NCI/ADR-RES
	MDA-MB-435		OVCAR-8
	LOX IMVI		IGROV1
	M14		OVCAR-3
	UACC-62		OVCAR-5
	UACC-257		SK-OV-3
	SK-MEL-5		OVCAR-4
	SK-MEL-28		
	SK-MEL-2		
Renal	A498	Breast	MDA-MB231/ATCC
	ACHN		MDA-MB-468
	786-0		HS 578T
	SN12C		MCF-7
	UO-31		
	CAKI-1		
	TK-10		
Prostate	DU-145		
	PC-3		

IMIDAZOPYRIDINE AS ANTI-CANCER AGENT

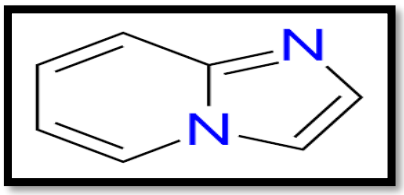


Figure 2: Structure of Imidazopyridine

Pyridine is an important pharmacophore, a highly valued scaffold, and a superior heterocyclic system that provides numerous of opportunities for investigating and analyzing this moiety as an anticancer drug through activation of multiple important receptors. According to reports, a number of pyridine derivatives can block the topoisomerase enzyme, human carbonic anhydrase, kinase and androgen receptors in addition to many other targets for preventing and

treating the cancer epidemic worldwide. Currently, research efforts are focused on creating novel entities containing pyridine for use in along with other molecules to treat cancer. In order to provide association between various manufactured newer derivatives and receptor sites, this review clarifies the molecular docking, structure-activity correlations, and recent biological expansions of pyridines[5].

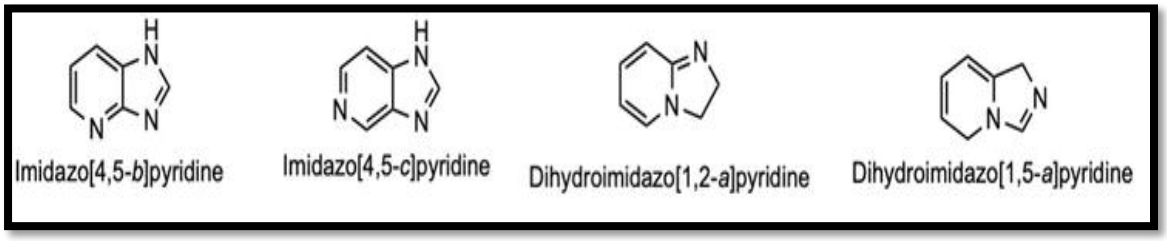


Figure 3: Imidazopyridine isomeric structures

Derivatives of imidazopyridines are a significant class of heterocyclic compounds with pharmacological and biological properties. There have been reports of several substituted imidazopyridines having anticancer properties. As the synthesis of imidazopyridine receives most of the attention derivatives. An imidazole ring and a pyridine ring fused together form an imidazopyridine, a heterocyclic molecule. The pyridine ring is a six-membered ring with five carbon atoms and one nitrogen atom, whereas the imidazole ring is a five-membered ring with two nitrogen atoms at positions 1 and 3. The fusion of these two rings creates a unique structure with diverse chemical and pharmacological properties. The molecular formula of Imidazopyridine is $C_7H_6N_2$. Imidazopyridine derivatives have broad spectrum biological profile, for anti-cancer[6]. Imidazopyridine shows well biological activity and used against cancer. Derivatives of imidazopyridines have a wide range of biological properties that make them anti-cancer. Imidazopyridine is used to treat cancer and exhibits good biological activity. Significant biological activity has been found for numerous substances, including those with antipyretic, analgesic, antiprotozoal, antibacterial, anticancer, antifungal, anti-inflammatory and antiapoptotic properties[5].

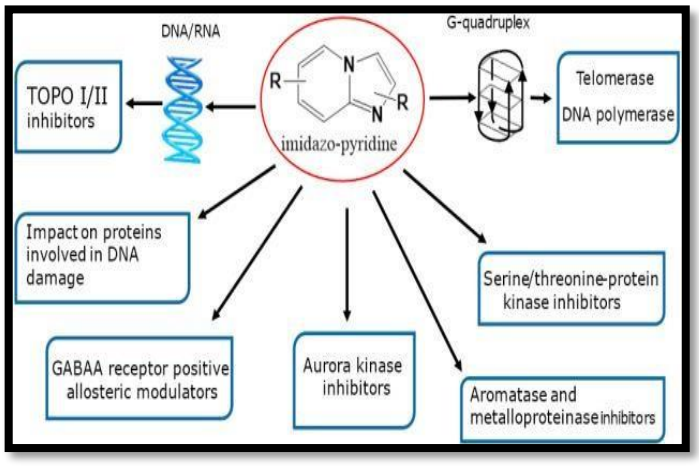


Figure 4: Activity of Imidazopyridine

CELL LINE K-562 (LEUKEMIC CANCER):

The cell line K-562 is another well-known and widely used cell line in scientific research, particularly in the fields of cancer biology, hematology, and immunology. Here's some information about the K-562 cell line:

Origin: The K-562 cell line was derived from a patient with chronic myelogenous leukemia (CML) in blast crisis. It was established in 1972 from the bone marrow of this patient.

Characteristics: K-562 cells are of myeloid origin and exhibit characteristics similar to immature blood cells. They are often used as a model for studying erythropoiesis (red blood cell development), hematopoiesis (blood cell formation), and leukemia.

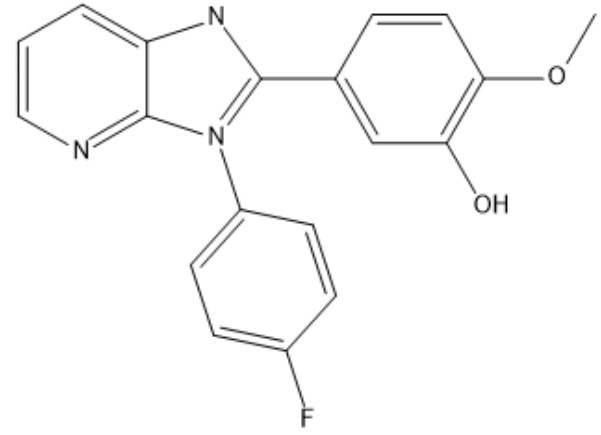
Applications: K-562 cells have been extensively utilized in research related to leukemia, hematopoiesis, and gene regulation. They have been used to study cell differentiation, proliferation, apoptosis, and response to various compounds.

Hematopoiesis Research: Because K-562 cells are derived from a leukemia patient's bone marrow, they provide insights into the behavior of leukemic cells and can be used to investigate how normal hematopoietic cells transform into cancerous cells.

Drug Testing and Cancer Research: K-562 cells have been used to screen potential drugs for leukemia treatment and to study drug resistance mechanisms in leukemia cells. They have also been used to investigate how various substances affect the proliferation and viability of cancer cells.

Genetic Studies: The K-562 cell line's genome has been well-characterized, making it valuable for genetic and molecular studies. It's often used as a model to investigate gene expression, transcriptional regulation, and epigenetic modifications.

Hemoglobin Production: K-562 cells can be induced to differentiate along the erythroid lineage, leading to the production of hemoglobin. This makes them useful for studying erythropoiesis and hemoglobin synthesis.



IC_{50} (57 Mmol/L) Tubulin Inhibitor

Compound 1

Figure 5: Potent anticancer molecules against K-562

Compound 1: {4-(3-(4-Fluorophenyl)-3H-Imidazo[4,5-B] Pyridin-2-yl)-2-Methoxyphenol}[7]

CELL LINE A-549 (NON- SMALL CELL LUNG):

A human lung carcinoma cell line known as A-549 has been widely employed in cancer research, especially in investigations on lung cancer and respiratory disorders. Here's some information about the A-549 cell line:

Origin: The 58-year-old Caucasian male patient with lung cancer provided lung tissue from which the A-549 cell line was developed. The cells were isolated in 1972.

Characteristics: Because A-549 cells originate from lung carcinomas, they are frequently utilized as models for investigating lung cancer. They are epithelial-like in morphology and exhibit characteristics similar to adenocarcinoma cells.

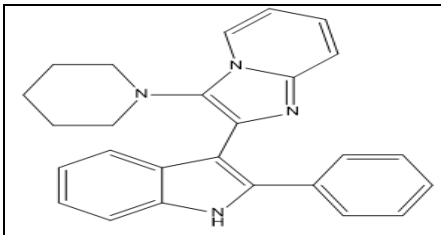
Applications: A-549 cells have been used in a wide range of studies, including cancer biology, drug testing, cell signaling, and viral infection research.

Cancer Research: Researchers often use A-549 cells to investigate the molecular mechanisms underlying lung cancer development, progression, and metastasis. They are particularly useful for studying the effects of potential anti-cancer drugs on lung cancer cells.

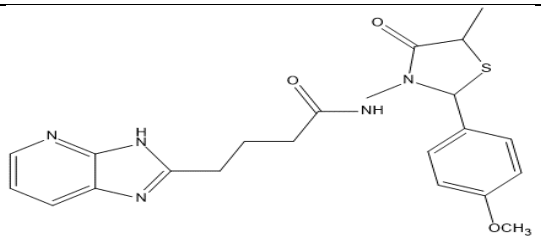
Drug Testing: A-549 cells have been used to evaluate the efficacy of various chemotherapy agents and targeted therapies for lung cancer treatment. Researchers can assess how different compounds affect cell viability, proliferation, and apoptosis in these cells.

Viral Infection Studies: In virology research, A-549 cells are frequently employed to examine the reproduction and pathogenesis of respiratory viruses, including respiratory syncytial virus (RSV) and influenza virus.

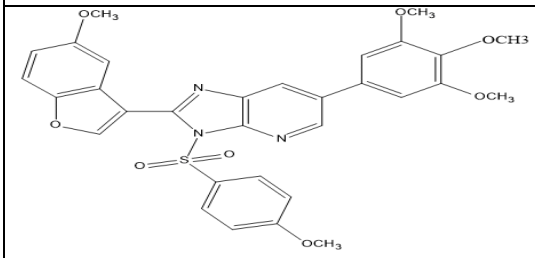
Toxicology and Inhalation Studies: Due to their lung origin, A-549 cells have been employed to study the toxic effects of airborne pollutants, environmental toxins, and inhaled substances on lung tissue.



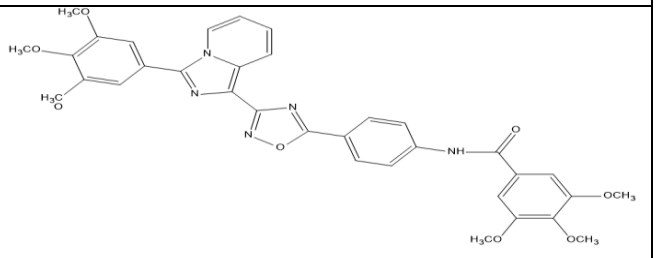
IC_{50} (11.48 µM) Tubulin Inhibitor
Compound 2



IC_{50} (6.9 µM) EGFR kinase inhibitor
Compound 3



IC_{50} (0.073 µM)
Compound 4



IC_{50} (0.022µM) CDK inhibitor
Compound 5

Figure 6: Potent anticancer molecules against A-549

Compound 2: {N-cyclohexyl-2-(2-phenyl-1H-indol-3-yl) H-imidazo[1,2-a] pyridin-3-amine}[8]
Compound 3: {4-(3H-Imidazo[4,5-b] pyridin-2-yl) -N-[2-(4-methoxyphenyl) -5- methyl-4-oxothiazolidin-3-yl] -4-oxobutanamide}[9]
Compound 4: {2-(5-Methoxybenzo[b]furan-3-yl)-3-[(4-methoxyphenyl) sulfonyl]-6-(3,4,5-trimethoxy phenyl)-3H-imidazo[4,5-b] pyridine}[10]
Compound 5: {3,4,5-Trimethoxy-N-(4-(3-(3-(3,4,5-trimethoxyphenyl) imidazo[1,5-a] pyridin-1-yl)- 1,2,4-oxadiazol-5-yl) phenyl) benzamide}[11]

MCF-7 CELL LINE (BREAST CANCER):
A prominent human breast cancer cell line that has been crucial to cancer research and medication development is MCF-7. Here's some information about the MCF-7 cell line:
Origin: In 1970, a woman with metastatic breast cancer gave rise to MCF-7. The cells were taken out of an effusion in the pleura.

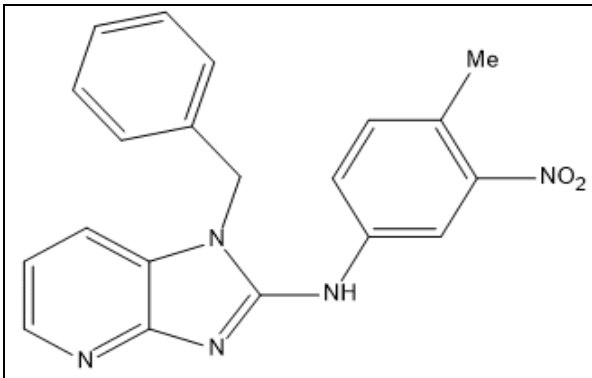
Characteristics: Because MCF-7 cells express both progesterone and estrogen receptors (ER and PR, respectively), they are sensitive to hormonal signals. Moreover, they are HER2-negative. MCF-7 cells are an invaluable resource for researching hormone-dependent breast cancer because of these properties.

Applications: In order to better understand hormone receptor signaling, the biology of breast cancer, and the impact of different treatments, MCF-7 cells have been employed extensively in cancer research. Researchers often use this cell line to test the efficacy of anti-cancer drugs, especially those that target hormone receptors.

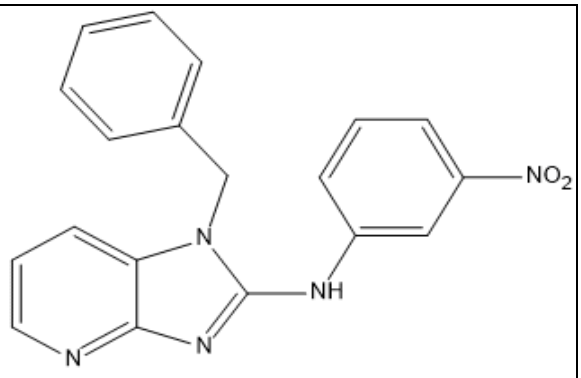
Drug Testing: MCF-7 cells are particularly useful for testing the effects of hormonal therapies and other targeted treatments for breast cancer. Their responsiveness to estrogen and progesterone allows researchers to investigate how these hormones influence cancer cell growth and how potential treatments could interfere with hormone signaling pathways.

Research: MCF-7 cells have been used by researchers to examine the proliferation, migration, invasion, and apoptosis (programmed cell death) of cancer cells. They have been crucial in identifying possible treatment candidates and have advanced our knowledge of the molecular pathways underlying breast cancer.
Limitations: While MCF-7 cells are valuable tools, they have limitations. They are an immortalized cell line, which means they don't perfectly replicate the behavior of primary cancer cells. Researchers often use multiple cell lines and experimental models to gain a comprehensive understanding of cancer biology.

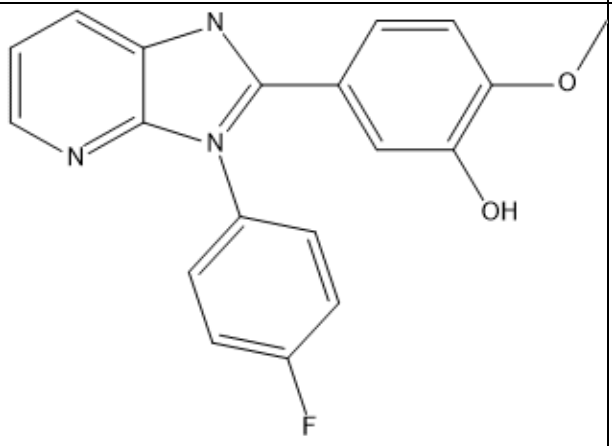
Media and Culture Conditions: Usually, fetal bovine serum, antibiotics, and particular growth media are used to cultivate MCF-7 cells. The culture conditions are carefully controlled to ensure their growth and maintain their characteristics.



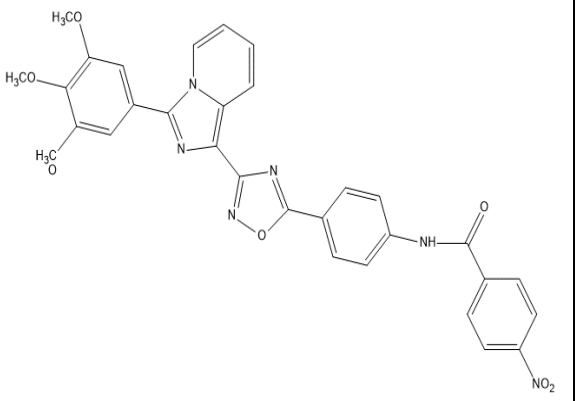
GI_{50} (27.84 µM) CDK-9 inhibitor
Compound 6



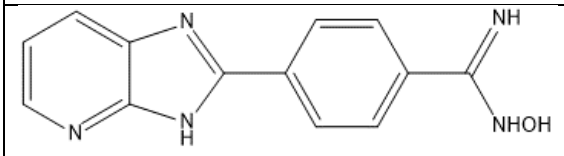
GI_{50} (24.24 µM) CDK-9 inhibitor
Compound 7



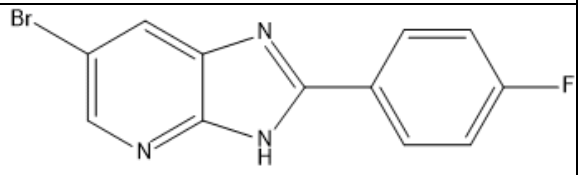
IC_{50} (57 µmol/L) Tubulin Inhibitor
Compound 8



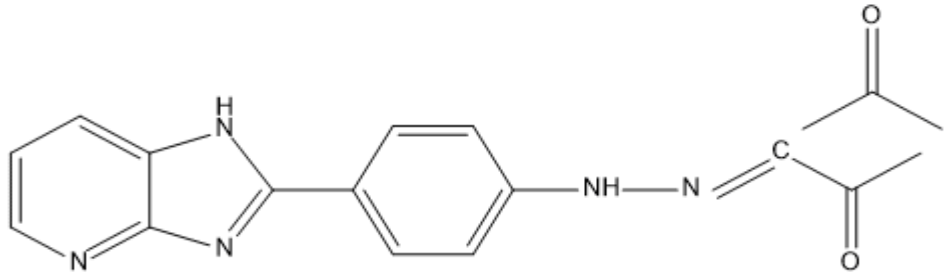
IC_{50} (0.013 µM) CDK inhibitor
Compound 9



IC_{50} (0.082 µM) PARP Inhibitor
Compound 10



IC_{50} (1.7 µM)
Compound 11



IC_{50} (2.11 µM) CDK9 inhibitor
Compound 12

Figure 7: Potent anticancer molecules against MCF-7

Compound 6: {1-Benzyl-N-(4-methyl-3-nitrophenyl)-1H-imidazo[4,5-b] pyridin-2-amine}[12]
Compound 7: {1-Benzyl-N-(3-nitrophenyl)-1H-imidazo[4,5-b] pyridin-2- amine}[7]
Compound 8: {4-(3-(4-Fluorophenyl)-3H-imidazo[4,5-b] pyridin-2-yl)-2-methoxyphenol}[13]

Compound 9: {N-(4-(3-(3-(3,4,5-Trimethoxyphenyl) imidazo[1,5-a] pyridin-1-yl)-1,2,4-oxadiazol-5- yl) phenyl)-4-nitrobenzamide}[14]
Compound 10: {3H-imidazo[4,5-b]-pyridin-2-yl)-phenyl-*N*-hydroxy- carboximidamide}[14]
Compound 11: {6-Bromo-2-(4-fluorophenyl) -3H-imidazo[4,5-b] pyridine}[15]
Compound 12: {3-{2-[4-(1H-imidazo[4,5-b] pyridin-2-yl) phenyl] hydrazono} pentane-2,4-dione}[16]

MDA-MB-468 CELL LINE (BREAST CANCER):
Human breast cancer cell line MDA-MB-468 has been extensively employed in cancer research, particularly in the study of triple-negative and aggressive breast cancer. Here's some information about the MDA-MB-468 cell line:
Origin: A patient with metastatic breast cancer provided the pleural effusion from which the MDA-MB-468 cell line was created. In 1977, the cells were separated.

Characteristics: MDA-MB-468 cells are known for being triple-negative breast cancer cells, meaning they lack the expression of estrogen receptors (ER-), progesterone receptors (PR-), and HER2/neu receptors (HER2-). This phenotype makes them particularly aggressive and difficult to target using conventional hormone-based therapies.

Applications: Triple-negative breast cancer cells, or MDA-MB-468 cells, are distinguished by their lack of expression of the estrogen (ER-), progesterone (PR-), and HER2/neu receptors (HER2-).

Breast Cancer Research: MDA-MB-468 cells are frequently used by researchers to investigate the molecular pathways underlying triple-negative breast cancer, which has a worse prognosis and fewer therapeutic choices. Scientists hope to discover novel treatment approaches and possible therapeutic targets by examining these cells.

Drug Testing: MDA-MB-468 cells are frequently used to evaluate the efficacy of various chemotherapy agents, targeted therapies, and experimental drugs for aggressive breast cancer. Researchers can investigate how different compounds impact cell growth, survival, and metastatic potential.

Signaling Pathways: The cell line has been used to explore various molecular signaling pathways that contribute to cancer progression. Understanding these pathways can help identify potential targets for therapeutic interventions.

Metastasis Research: MDA-MB-468 cells are often used to study the processes involved in cancer metastasis, such as cell migration, invasion, and interactions with the extracellular matrix.

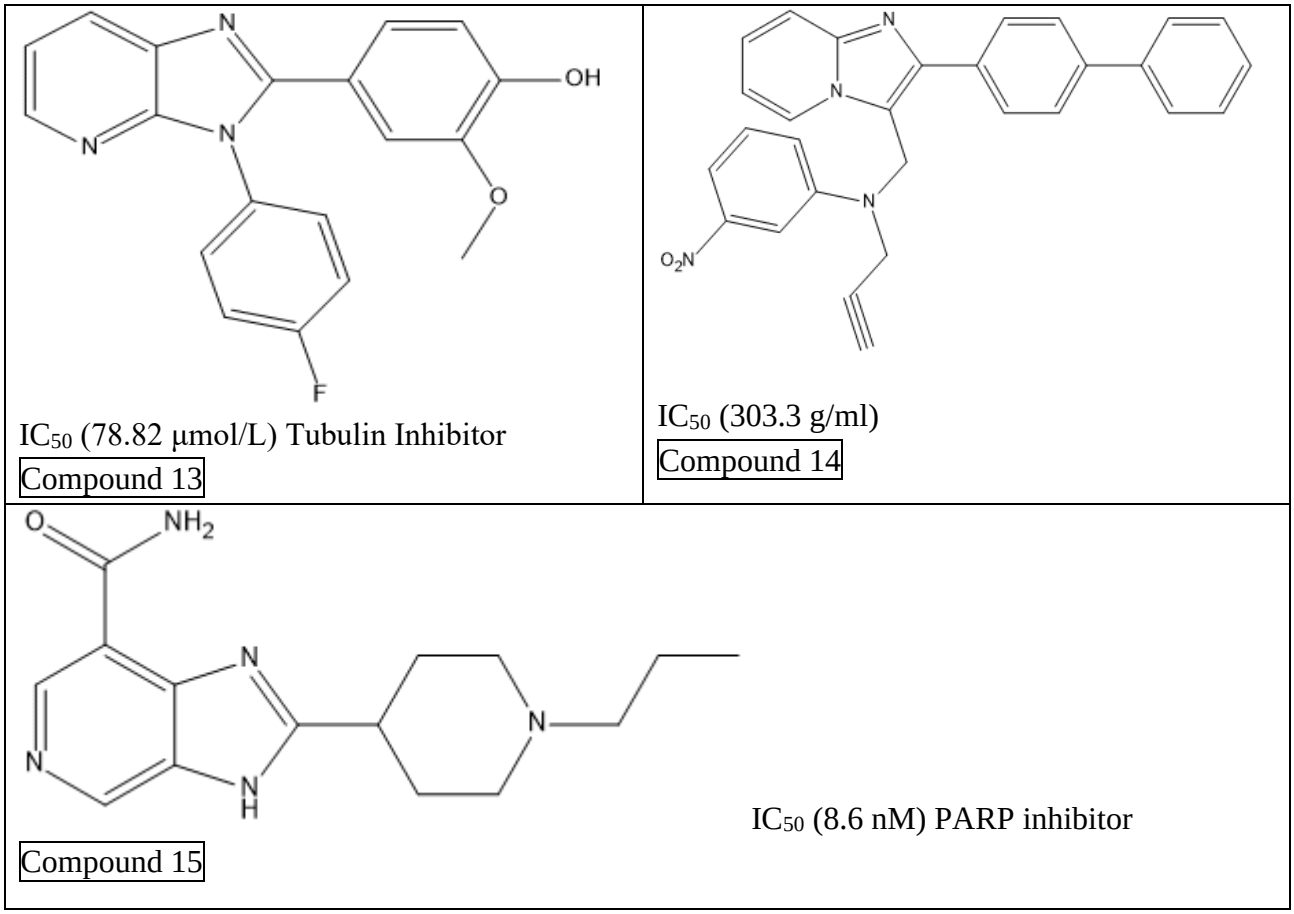


Figure 8: Potent anticancer molecules against MDA-MB-468

Compound 13: {5-(3-(4-Fluorophenyl)-3H-imidazo[4,5-b] pyridin-2-yl)-2-methoxyphenol}[7,13]
Compound 14: {N-((2-([1,1-biphenyl]-4-yl) imidazo [1,2-a] pyridin-3-yl) methyl) meta-nitro-N-(prop-2-yn-1-yl) aniline}[17]
Compound 15: {2-(piperidin-4-yl)-3H-imidazo[4,5-c] pyridine-7-carboxamide}[18]

HCT-116 CELL LINE (COLON CANCER):

The HCT-116 cell line is a widely studied human colorectal carcinoma cell line that has contributed significantly to cancer research, drug development, and various scientific investigations. Here's some information about the HCT-116 cell line:

Origin: A 35-year-old male patient with colorectal carcinoma had a primary colon tumor from which the HCT-116 cell line was created. The cells were isolated in 1979.HCT-116 cells are derived from colorectal cancer tissue, making them a valuable model for studying colorectal cancer biology and its associated molecular mechanisms.

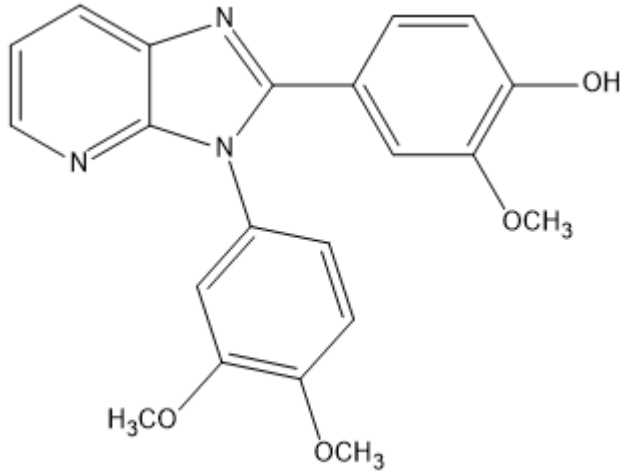
Applications: Several research fields have made use of HCT-116 cells, including cancer biology, drug testing, genetics, apoptosis (programmed cell death), and DNA repair studies.
Colorectal Cancer Research: Researchers frequently use HCT-116 cells to investigate the genetic and molecular basis of colorectal cancer. The cells are often employed to study the

effects of mutations and signaling pathways that contribute to cancer development and progression.

Drug Testing: HCT-116 cells are commonly used to evaluate the efficacy of chemotherapy agents, targeted therapies, and experimental drugs for colorectal cancer treatment. Researchers can assess how different compounds affect cell viability, growth, and sensitivity to treatment.

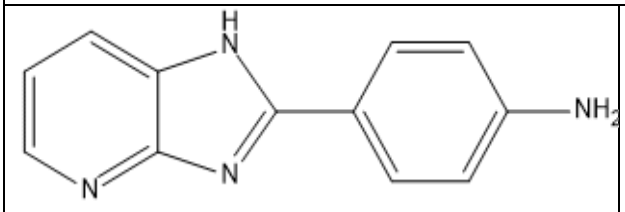
Genetic Studies: HCT-116 cells have been used extensively in genetic studies due to their well-characterized genomic profile. They have been used to investigate DNA mutations, gene expression, and DNA repair mechanisms.

Apoptosis Research: These cells have played a crucial role in apoptosis research, as they respond to apoptotic stimuli and have been used to study the mechanisms of programmed cell death.



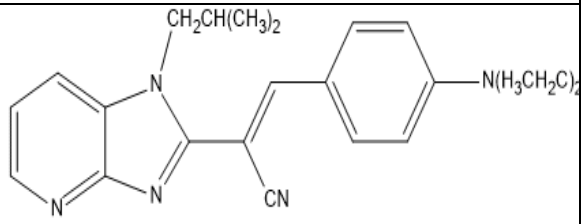
IC_{50} (66.92 µmol/L) Tubulin Inhibitor

Compound 16



IC_{50} (3.06 µM) CDK9 inhibitor

Compound 17



IC_{50} (0.4 µM) Tubulin inhibitor

Compound 18

Figure 9: Potent anticancer molecules against HCT-116

Compound 16: {5-(3-(3,4-Dimethoxyphenyl)-3H-imidazo[4,5-b] pyridin-2-yl)-2-methoxyphenol}[7]
Compound 17: {4-(1H-imidazo[4,5-b] pyridin-2-yl) aniline}[15]
Compound 18: {(E)-2-(3H-imidazo[4,5-b] pyridin-2-yl)-3-phenylacrylonitrile}[20]

SW-620 CELL LINE (COLON CANCER):

A cell line used to study human colon cancer is SW-620 that has been utilized in cancer research for studying colorectal cancer and its properties. Here's some information about the SW-620 cell line:

Origin: The SW-620 cell line was generated from a 50-year-old male patient's lymph node metastases of primary colon cancer. The cells were isolated in 1973.

Characteristics: SW-620 cells are commonly used in studies related to colorectal cancer due to their origin from metastatic colon cancer tissue.

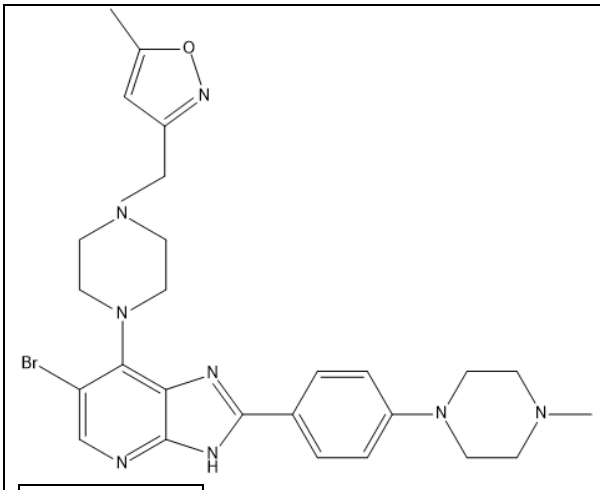
Applications: SW-620 cells have been employed in various research areas, including cancer biology, drug testing, invasion and metastasis studies, and molecular signaling investigations.

Colorectal Cancer Research: Researchers use SW-620 cells to explore the molecular mechanisms and genetic alterations underlying colorectal cancer progression, metastasis, and response to treatment.

Metastasis Studies: As a cell line generated from a metastasis of a lymph node, SW-620 cells are particularly valuable for studying the invasive and metastatic properties of cancer cells.

Drug Testing: SW-620 cells are often used to test the efficacy of chemotherapy drugs, targeted therapies, and experimental compounds for colorectal cancer treatment. Researchers can assess how these agents impact cell growth, survival, and metastatic potential.

Molecular Signaling: SW-620 cells have been employed to investigate various molecular signaling pathways that contribute to cancer development and progression, including those related to cell cycle regulation and apoptosis.



Compound 19

IC_{50} (0.025 μM) Aurora Kinase inhibitor

Figure 10: Potent anticancer molecules against SW-620

Compound 19: {3-((4-(6- bromo- 2-(4-(4- methylpiperazin-1-yl) phenyl)- 3H- imidazo (4,5-

b) pyridin-7-yl) piperazin-1-yl) methyl)-5-methylisoxazole}[21]

ACHN CELL LINE (RENAL CANCER):

Research on kidney cancer biology and possible treatments has been conducted using the ACHN cell line, a human renal cell carcinoma (RCC) cell line. Here's some information about the ACHN cell line:

Origin: A patient with kidney cancer that had clear cell carcinoma provided the ACHN cell line. The cells were isolated from a primary tumor in 1978.

Characteristics: ACHN cells are derived from kidney cancer tissue, specifically clear cell carcinoma, which is the most common histological subtype of renal cell carcinoma.

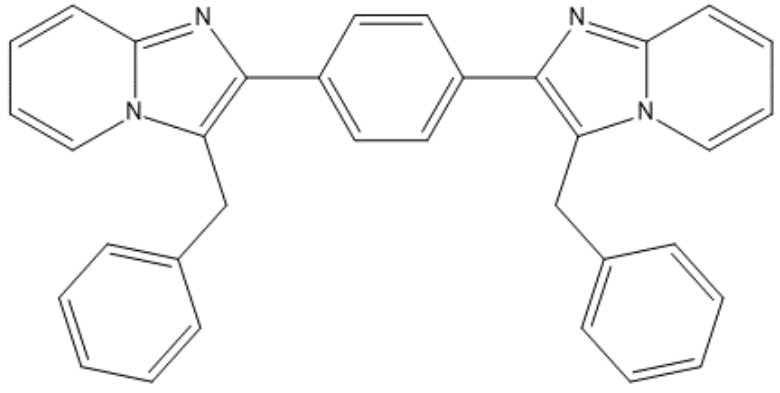
Applications: ACHN cells have been utilized in various research areas, including kidney cancer biology, drug testing, metastasis studies, and molecular signaling investigations.

Kidney Cancer Research: Researchers often use ACHN cells to study the genetic and molecular factors underlying renal cell carcinoma. Understanding the mechanisms behind kidney cancer genesis, progression, and therapy response can be obtained from these cells.

Drug Testing: ACHN cells are commonly used to assess the efficacy of potential drugs, chemotherapies, targeted therapies, and experimental compounds for renal cell carcinoma treatment. Researchers can evaluate how these agents affect cell growth, survival, and metastatic behavior.

Metastasis Studies: ACHN cells can be employed to investigate the invasive and metastatic properties of renal cell carcinoma cells, contributing to a better understanding of the disease's progression.

Molecular Signaling: These cells have been used to explore various molecular signaling pathways involved in kidney cancer, such as those related to angiogenesis, cell cycle regulation, and apoptosis.



GI_{50} (0.55 µM)

Compound 20

Figure 11: Potent anticancer molecules against ACHN

Compound 20: {1,4-bis-(3-benzylimidazo[1,2-*a*] pyridin-2-yl) benzene}[22]

DU145 CELL LINE (PROSTATE CANCER):

The human prostate cancer cell line DU145 is a well-established one, that has been extensively used in cancer research, particularly for studying prostate cancer biology and potential treatments. Here's some information about the DU145 cell line:

Origin: A patient's brain metastasis from prostate cancer was used to create the DU145 cell line. The cells were isolated in 1978.

Characteristics: DU145 cells are derived from prostate cancer tissue, making them a valuable model for studying prostate cancer and its associated molecular characteristics.

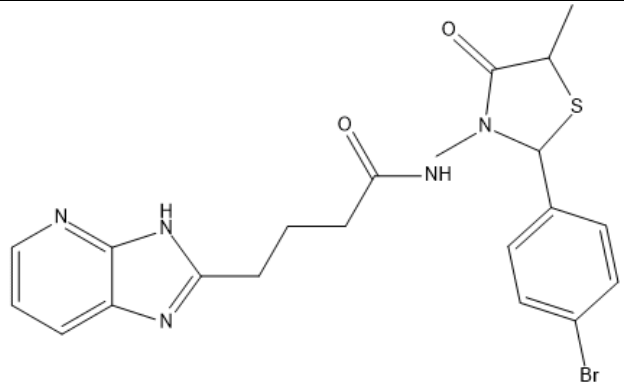
Applications: DU145 cells have been utilized in various research areas, including prostate cancer research, drug testing, molecular signaling studies, and investigations into cancer metastasis.

Prostate Cancer Research: Researchers often use DU145 cells to investigate the genetic and molecular factors underlying prostate cancer development, progression, and treatment resistance.

Drug Testing: DU145 cells are commonly used to evaluate the effectiveness of potential drugs, chemotherapies, targeted therapies, and experimental compounds for prostate cancer treatment. Researchers can examine how these agents impact cell growth, survival, and metastatic potential.

Molecular Signaling: These cells have been employed to explore various molecular signaling pathways that contribute to prostate cancer, such as those related to androgen receptor signaling, apoptosis, and angiogenesis.

Metastasis Studies: The invasive and metastatic characteristics of prostate cancer cells are investigated using DU145 cells, contributing to a better understanding of prostate cancer progression and metastasis.



IC_{50} (33.3 µM) EGFR kinase inhibitor

Compound 21

Figure 12: Potent anticancer molecules against DU145

Compound 21: {N-[2-(4-Bromophenyl) -5-methyl-4-oxothiazolidin-3-yl] -4-(3H-imidazo[4,5-b] pyridin-2-yl) -4-oxobutanamide}[22]

CONCLUSION

Both the imidazole ring, which is a five-membered ring with two nitrogen atoms and three carbon atoms, and the pyridine ring, which is a six-membered ring with five carbon atoms and one nitrogen atom, are present in imidazopyridine. These two rings combine to form a novel chemical structure with certain chemical characteristics. Chemists have modified imidazopyridine in a variety of ways to enhance its activity, selectivity, and pharmacological properties due to the ring's stability. Anticancer drugs that operate on different cell lines and have strong inhibitory concentrations are reviewed below. Pyrazolines have been selected by researchers for the production of these chemicals because of their powerful anticancer effects. Imidazo[1,2-a] pyridine derivatives make up the majority of them.

The compounds imidazo[4,5-b] and imidazo[4,5-c] pyridines have been developed as antitumor, antimicrobial, anti-inflammatory, antiviral, immunomodulatory, and antidiabetic modulators; however, despite their similar activities, they have not yet made it to the market or the clinic. This is the result of extensive and target-based research. In the future, this location might be useful for the synthesis of new chemicals. This review evaluated the high potency of anticancer compound on cell line as follow; compound 1 against K-562 (Leukemic cancer cell line) having IC_{50} value 57µmol/L; Compounds 2(IC_{50} = 11.48µM), 3(IC_{50} = 6.9µM), 4(IC_{50} = 0.073µM), 5(IC_{50} = 0.022µM) against A-549 (Non-small cell lung cancer); Compounds 6 (GI_{50} =27.84µM),7(GI_{50}=24.24 µM), 8(IC_{50}=57 µMol/L),9(IC_{50}= 0.082 µM), 10(IC_{50}=1.7 µM), 11(IC_{50}=2.11 µM), 12(IC_{50}=0.013 µM) against MCF-7 (Breast cancer cell line); Compounds 13 (IC_{50} =78.82 µMol/L), 14(IC_{50}=303.3g/ml), 15(IC_{50}=8.6nM) against MDA-MB-468 (Breast cancer cell line); Compounds16 (IC_{50}=66.92 µMol/L), 17(IC_{50}=3.06 µM),18 (IC_{50}=0.4 µM) against HCT-116 (Colon Cancer cell line) ; Compound 19(IC_{50}=0.025 µM) against SW-620 (Colon cancer cell line); Compound 20 (GI_{50}=0.55 µM) and Compound 21 (IC_{50}=33.3 µM) against ACHN(Renal Cancer cell line) and DU145(Prostate cancer cell line) shows most potent anticancer activity respectively. Therefore, it is conceivable to create and construct modified anticancer powerful compounds based on this review. In summary, imidazopyridine is likely to remain a unique scaffold in drug discovery because of its broad range of pharmacological activity and the various ways it may be structurally modified to create potent medications.

DECLARATION OF COMPETING INTEREST

The authors declare that none of the work reported in this study could have been influenced by any known competing financial interests or personal relationships.

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