De Remediis
ISSN: 3058-0358
Official Scientific Journal of Faculty of Pharmacy UD

Review

New anticancer medicines approved by the EMA in 2025

Miklós Bege[1], Anikó Borbás[1*]

[1] Department of Pharmaceutical Chemistry, Faculty of Pharmacy, University of Debrecen, Debrecen, Hungary
*****Correspondence: borbas.aniko@pharm.unideb.hu;
Miklós Bege: https://orcid.org/0000-0002-2424-4523
Anikó Borbás: https://orcid.org/0000-0001-8462-4547

Abstract

Despite the serious progress in the antitumor therapy, cancer did not cease to be one of the leading causes of death in the developed world. Hence still there is high interest for new anticancer agents. In 2025, the EMA approved 104 new medicines, 37 of them containing new active substances. 18 new anticancer medicines were approved (14 new active substances). In this review, we aim to shortly summarize the mechanism of action and use of the new drugs approved by the EMA in the year 2025.

1. Introduction

Cancer is a common term for diseases with different pathogenesis and prognosis, showing some common traits, mainly the abnormal, immoderate cell proliferation. Despite the rapidly evolving antitumor treatments, cancer is still one of the leading causes of death in the developed world (alongside with cardiovascular diseases), casing 19% of deaths in the USA in 2022[1,2].

In 2025, the EMA (European Medicines Agency) recommended the marketing authorisation of 104 medicines, including 38 new active substances (a slight decrease compared to the figures of 114 and 46 in 2024, respectively). Eighteen new anticancer medicine were approved (fourteen with new active substances), which means that 17% of all approved medicines and 37% of the new active substances are anticancer agents. Compared to 2024, the number of approved anticancer medicines is significantly lower (18 vs 28), but the number of new active substances has not decreased, but has increased by one (14 vs 13). Six of the new antitcancer medicines are also orphan drugs[3].

In this brief review, we would like to summarize the most important pharmaceutical information on the new active substance anticancer therapeutics approved by the EMA in 2025.

2. Approved medicines

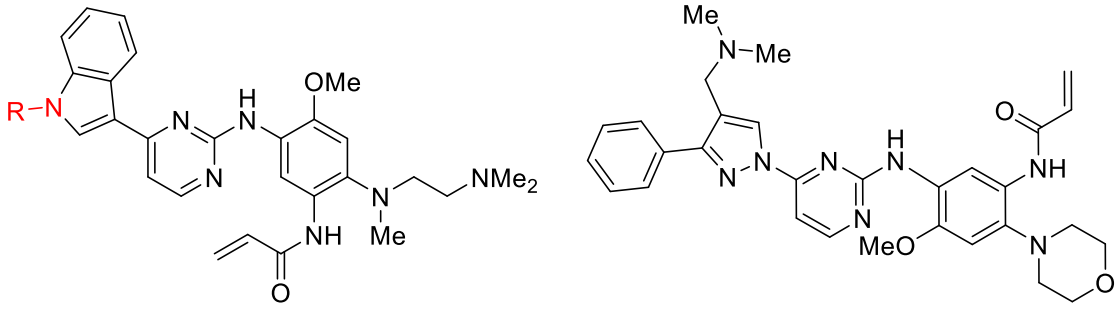
2.1 Kinase inhibitors

Kinases are enzymes, which catalyze the transfer of a phosphate group from one molecule, usually ATP, to another, a target molecule. As phosphorylation can significantly influence the activity of proteins, kinases play an important role in several biological processes. Many kinases are growth factor receptors, and their gain-of-function mutations can lead to excessive cell proliferation, and are therefore considered proto-oncogens. Currently, dozens of kinase inhibitors have been approved for cancer therapy, making kinase inhibitors (KIs) the largest group of anticancer agents.

2.1.1 Aumolertinib (AumseqaTM)

First generation EGFR (epidermal growth factor receptor) inhibitors, such as erlotinib or gefitinib, have been important milestones in cancer therapy. Unfortunately, high percentage of patients develop resistance against first- and second-generation EGFR inhibitors through resistance mutations such as T790M. Another problem is the lack of effective therapeutic options for the uncommon EGFR mutations (e.g. Ex19del, or L858R)[4].

Aumolertinib is a third-generation EGFR inhibitor, similarly to lazertinib and osimertinib. Its structure is similar to osimertinib, except that it bears a cyclopropyl substituent on the indole moiety instead of a methyl group. This modification increases blood-brain barrier (BBB) penetration, metabolic stability and selectivity. By fitting into a hydrophobic pocket of the target enzyme, the cyclopropyl group also increases the binding affinity to the enzyme. Aumolertinib is a type V (irreversible) inhibitor of the EGFR, because the acrylamido group binds to the SH group of the Cys797 covalently. Aumolertinib inhibits EGFR T790M, Ex19del and L858R mutants. It is approved in China and the EU for the treatment of locally advanced or metastatic NSCLC with appropriate EGFR mutation[4-6].



aumolertinib: R = cyclopropyl
osimertinib: R = Me

lazertinib

***Figure 1**.:* The structure of third-generation EGFR inhibitors.

2.1.2 Mirdametinib (EzmeklyTM)

The RAS protein is the so-called master regulator of the RAS-RAF-MEK-ERK signaling pathway (also known as the MAPK/ERK pathway), which regulates cell proliferation, differentiation and survival. The NF1 gene regulates the function of RAS. Therefore, mutations in NF1 gene can lead to constitutive RAS activation, causing tumor growth. Type 1 neurofibromatosis (NF1) is a disease associated with NF1 mutation that can be manifest in different forms. The most common form is NF1, the plexiform neurofibroma (PN).

Mirdamitinib is an inhibitor of mitogen-activated protein kinase 1 and 2 (MEK1/2), which kinases are part of the abovementioned downstream RAS pathway. It was approved in 2025 in the USA and the EU for the treatment of NF1-PN. It is designated as an orphan drug[7,8].

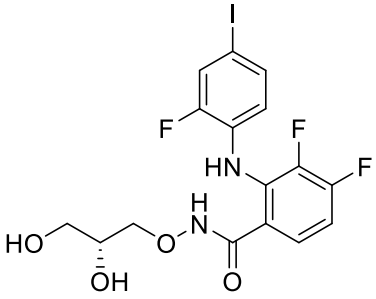


***Figure 2**.:* The structure of mirdametinib

2.1.3 Inavolisib (ItovebiTM)

Phosphatidylinositol-3-kinase (PI3K) mutations are very common in breast and endometrial cancer. Unlike first-generation PI3K inhibitors ("*-lisibs*"), inavolisib is a selective inhibitor of the alpha isoform of the p110 catalytic subunit within the PI3K complex. It also facilitates the degradation of mutated p110α. It has been approved by the FDA and EMA for the treatment of ER+ HER2- locally advanced or metastatic

breast cancer in the presence of relevant PI3K mutation by FDA and EMA, in combination with palbociclib, a CDK inhibitor, and fulvestrant, a selective estrogen receptor antagonist[9,10].

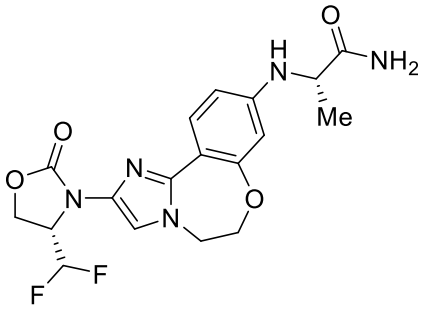


***Figure 3**.:* The structure of inavolisib

2.1.4 Vimseltinib (RomvimzaTM)

Vimseltinib is a colony stimulating factor 1 receptor (CSF1R) inhibitor. This is a relatively new group of kinase inhibitors, with the first member, pexidartinib, being approved in 2019. Vimseltinib acts by stabilizing CSF1R in the inactive conformation, therefore it prevents the differentiation of osteoclasts. It is approved by the FDA and EMA for the treatment of tenosynovial giant cell tumour (TGCT – a tumor type affecting joints, tendons and surrounding tissues) [11,12].

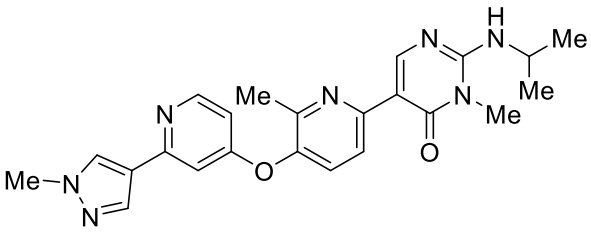


***Figure 4**.:* The structure of vimseltinib

2.2 Monoclonal antibodies (MABs)

2 of the approved monoclonal antibodies are immunoconjugates. In these derivatives, a cytotoxic agent is linked to the monoclonal antibody via a linker. The antibody is responsible for selectively targeting the tumor cells, while the cytotoxin destroys them. While the other two derivatives are bispecific antibodies.

2.2.1. Datopotamab deruxtecan (DatrowayTM)

The datopotamab is a humanized IgG1 monoclonal antibody that targets the trophoblast cell surface antigen 2 (TROP2), which is a membrane-bound glycoprotein. TROP2 plays a role in several signaling pathways and is overexpressed in a wide range of solid epithelial tumors, e.g. breast cancer. Deruxtecan contains a

topoisomerase I inhibitor (DXd, a derivative of exatecan), which is linked to the antibody via a cleavable maleimide-tetrapeptide (Gly-Gly-Phe-Gly) linker. The drug:antibody ratio is 4:1. Datopotamab deruxtecan was approved in 2024 in Japan for treating HR+, HER2- unresectable or recurrent breast cancer after prior chemotherapy. The FDA approved it in 2025 for treating unresectable or metastatic HR+, HER2- breast cancer in adults who have previously received endocrine-based therapy and chemotherapy for unresectable or metastatic disease. The EMA approved it in 2025 for the treatment of unresectable or metastatic HR+, HER2- breast cancer, in cases if the patient received endocrine therapy and at least one line of chemotherapy in the advanced setting[13,14]. It is worth to note that datopotamab is the first medicine approved by the FDA and EMA for the treatment of breast cancer, despite not increasing overall survival of the patients (but did improved progression-free survival)[15].

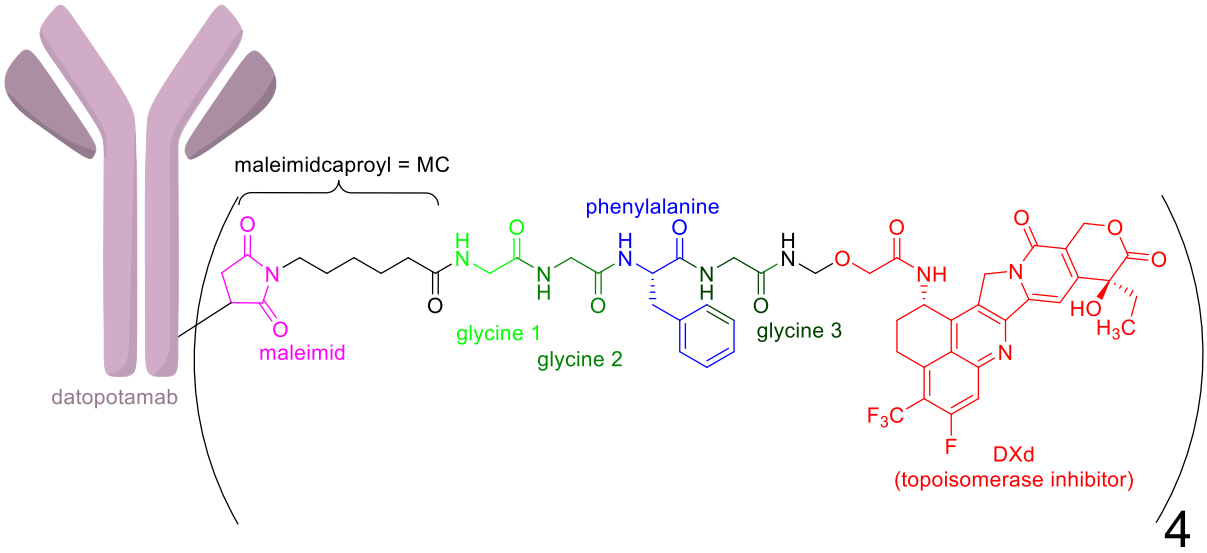


***Figure 5**.:* The structure of datopotamab deruxtecan

2.2.2. Tisotumab vidotin (TivdakTM)

The antibody component of tisotumab vedotin is a fully human IgG1 monoclonal antibody, that targets the tissue factor (TF-011, or CD142, or factor III or thromboplastin). The transmembrane glycoprotein TF-011 plays a role in blood coagulation and is overexpressed in several cancer types, including cervical and endometrial cancer, andnon-small cell lung cancer (NSCLC). It promotes metastasis by trapping the TF+ cancer cells on fibrin. It helps tumor growth and angiogenesis through the TF:FVIIa:PAR2 pathway. Because of its procoagulant activity, it also contributes to cancer related thrombosis[16,17]. The cytotoxic agent is monomethyl

auristatin E (MMAE, an N-terminal N-demethylated derivative of auristatin E), a microtubule assembly inhibitor, which is linked to MAB via a cleavable linker. The valine-citrulline dipeptide moiety is cleaved by the endolysosomal cysteine protease enzyme cathepsin B. This is followed by a “self-immolative” loss of p-iminoquinone methide from the p-aminobenzyl alcohol part, and the loss of carbondioxide from the carbamic acid moiety, leading to the liberation of MMAE. The whole drug-linker is attached to a cysteine SH group of the antibody, with maleimidocaproyl group[18,19]. Tisotumab vidotin causes MMAE-mediated cell cycle arrest and apoptosis, also antibody dependent cellular toxicity and antibody dependent phagocytosis, as well as inhibition of PAR2 signaling mediated by the antibody component. The FDA approved it in 2021 for the treatment of adult patients with recurrent or metastatic cervical cancer with disease progression during or after chemotherapy[17].The EMA approved it for the same indication[20].

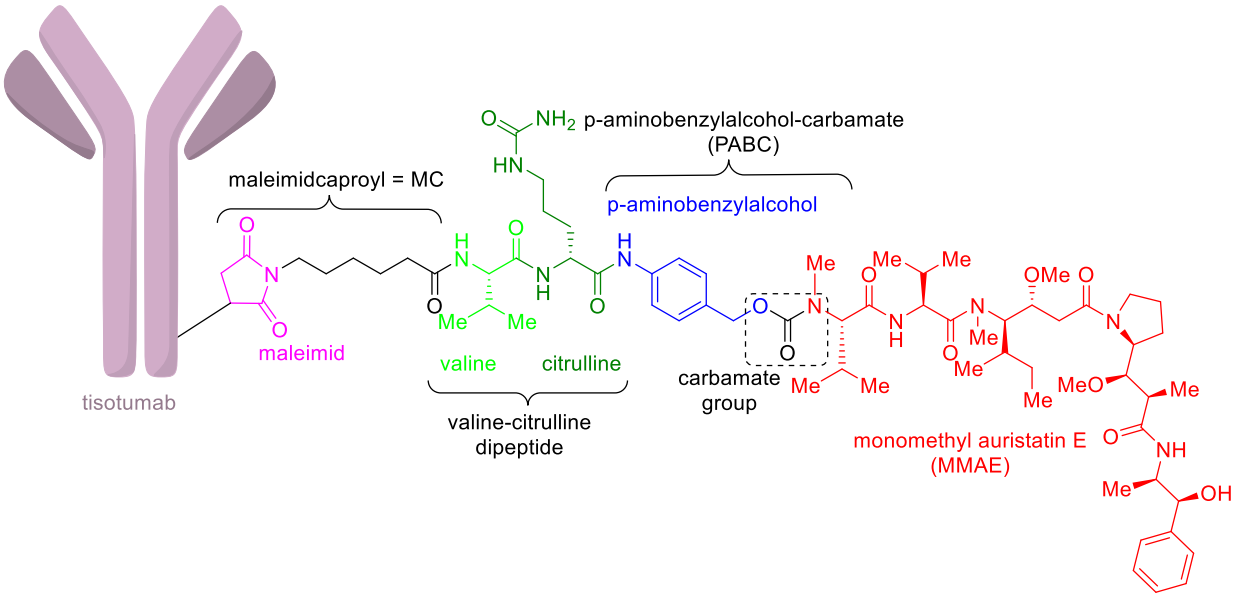


***Figure 6**.:* The structure of tisotumab vidotin

2.2.2. Linvoseltamab (LynozyficTM)

Linvoseltamab is a human bispecific antibody, targeting the human B cell maturation antigen (BCMA) and CD3. BCMA can be found on multiple myeloma cells, therefore linvoseltamab links together the multiple myeloma (MM) cells and T cells, promoting the T cell mediated destruction of tumor cells. It can be administered once every four weeks and needs 24-hour inpatient observation after administration, while earlier BCMAxCD3 bispecific antibodies require more frequent dosing and longer observation time. The EMA approved it as monotherapy for the treatment of relapsed or refractory MM in adult patients who have received 3 or more prior therapies, including a

proteasome inhibitor, an immunomodulatory agent and an anti-CD38 MAB, and who have demonstrated disease progression on their last therapy. Accelerated approval was granted by the FDA in 2025 for the treatment of relapsed or refractory MM in adult patients who have received at least 4 prior therapies, including a proteasome inhibitor, an immunomodulatory agent, and an anti-CD38 MAB[21].

2.2.2. Zanidatamab (ZiiheraTM)

Human epidermal growth factor receptor 2 (HER2) is a tyrosine kinase type receptor that promotes cell proliferation and is therefore overexpressed in a range of tumors, most significantly in a high percentage of breast cancer cells (HER2+ breast cancer). Zanidatamab is a bispecific antibody, which targets two non-overlapping epitopes of HER2, the extracellular domain 2 (ECD2) and juxtramembrane extracellular domain (ECD4), both are known targets of previously developed monospecific anti-HER2 antibodies (pertuzumab and trastuzumab respectively). Zanidatamab binds to HER2, preventing its dimerization and activation. In addition, crosslinking between HER2 receptors leads to formation of HER2 clusters. Zanidatamab also causes receptor internalization and antibody-dependent cellular toxicity and phagocytosis. The FDA granted accelerated approval in 2024 for treating adults with previously treated, unresectable or metastatic HER2+ (IHC3+) biliary tract cancer (BTC) [22]. The EMA approved it for the treatment of unresectable and locally advanced or metastatic BTC if it was already treated with at least one other systemic anticancer medicine[23].

2.3 Immunotherapies

T cells play a crucial role in destroying cancer cells, therefore T cell-based immunotherapy was an important milestone in cancer therapy[24].

2.3.1 Nogapendekin alfa inbakicept (AnktivaTM)

Interleukin 15 (IL15) stimulates CD8+ T cells and natural killer (NK) cells. Nogapendekin alfa is a high affinity mutant IL15. Inbakicept is a fusion protein of dimeric human IL-15Rα sushi domain and a human IgG1. Nogapendekin alfa inbakicept consists of 1 inbakicept bound with 2 nogapendekin alfa. It is an IL15 receptor superagonist, which therefore stimulates the proliferation and activation of CD8+ T cells, NK cells and memory T cells without affecting regulatory T cell proliferation. The FDA approved it in 2024 in combination with Bacillus Calmette-Guérin (BCG) for the treatment of adult patients with BCG-unresponsive non-muscle invasive bladder cancer (NMIBC) with carcinoma in situ (CIS) with or without papillary tumors[25]. The EMA approved it in 2025 for the same indication[26].

2.3.2 Obecabtagene autoleucel (AucatzylTM)

Chimeric antigen receptor T cells (CAR T cells) are genetically engineered T cells, which express synthetic chimeric receptors, targeting selected tumor antigens. Obecabtagene autoleucel is a CAR T cell-based medicine, targeting the CD19 antigen (on the surface of B cells), which shows more favorable safety than earlier CD19-directed CAR T therapies. It was approved in 2024 by the FDA and in 2025 by the EMA for the treatment of relapsed/refractory B cell precursor ALL[24,27,28].

2.4 Dorocubicel (ZemcelproTM)

Haematopoietic stem cell transplantation (HSCT) is used in therapy of haematological disorders. It includes the “clearing” (conditioning) the bone marrow, and repopulating it with new, healthy cells. The source of the new cells can be the patients themselves (autologous HSCT), or another person (allogenic HSCT, or allo-HSCT). UM171 is a pyrimidine-indole derivative, which increases the differentiation of CD34+ cells, via activation of the CULLIN3^{KBTBD4} ubiquitin ligase complex. ZemcelproTM consists of two types of stem cells (both obtained from umbilical cord blood): UM171 expanded CD34+ cells (dorocubicel itself) and unexpanded CD34- cells. Of course, ZemcelproTM is made uniquely for each patient. It was approved to treat adults with haematological malignancies, who need an allo-HSCT and for whom no other type of suitable donor cells is available. Myeloablative conditioning is used before treatment. ZemcelproTM is designated as an orphan drug[29,30].

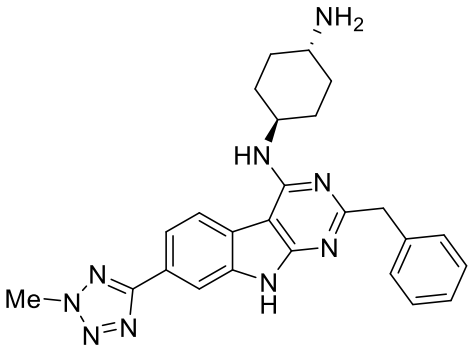


***Figure 7**.:* The structure of UM171

2.5 Imlunestrant (InluriyoTM)

HER2- ER+ (overexpressing estrogen receptors) cancer account for the majority of breast cancers. Antihormone therapeutic options against estrogen dependent tumors include aromatase inhibitors (AI), selective estrogen receptor modulators (SERM) and selective estrogen receptor degraders (SERD). A major problem with classical antihormone therapy is the occurrence of resistance, which is often caused by

mutations in estrogen receptor alpha (Erα, coded by ESR1gene). Imlunestrant is a new, high-affinity, oral SERD that binds to the ER and changes its conformation in a way, that facilitates its degradation. The FDA and EMA approved it in 2025 for the treatment of adults with ER+, HER2−, ESR1 mutated advanced or metastatic breast cancer with disease progression following at least one line of endocrine therapy. In men and premenopausal women, LHRH agonist is to be co-applied[31,32].

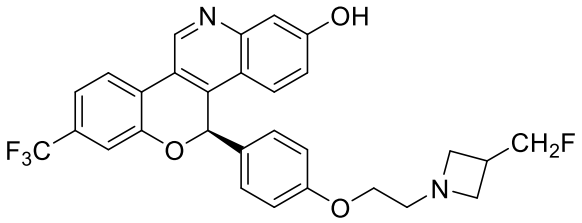


***Figure 8**.:* The structure of imlunestrant

2.6 Nirogacestat (OgsiveoTM)

γ-secretase is a protease complex that cleaves transmembrane protein complexes such as BCMA and Notch. The Notch signaling pathway's main function is to enable interactions between neighboring cells and thus plays important role in cell development, differentiation, migration, growth and tissue repair. Dysregulation of the pathway can lead to the development of desmoid tumors or ovarian granulosa cell tumors (OvGCT). γ-secretase is a key component in the activation of the Notch pathway, as cleavage of the Notch receptor by the enzyme is necessary to form the soluble intracellular form of Notch, which is then translocated to the nucleus and forms an activator complex to start the expression of target genes[33,34]. The FDA approved it in 2023 and the EMA in 2025 for the treatment of adult patients with progressing desmoid tumors requiring systemic treatment[34,35].

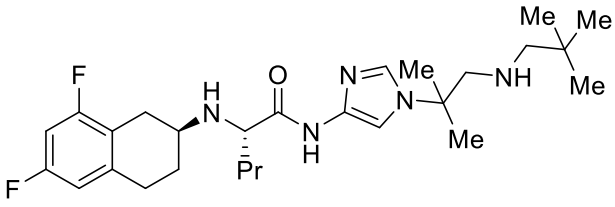


***Figure 9**.:* The structure of nirogacestat

2.7 Vorasidenib (VoranigoTM)

Isocitrate dehydrogenase (IDH) plays an important role in the energy balance of cells. Normally, it catalyses the conversion of isocitrate into alpha-ketoglutarate (α-KG). Mutant IDH, however, further converts α-KG into D-hydroxyglutaric acid (D-2-HG), which acts as an oncometabolite to promote tumor progression through various pathways[36]. Vorasidenib is a new, brain penetrant isocitrate dehydrogenase inhibitor

that inhibits mutant IDH1 and IDH2 isoforms. It was approved by the FDA in 2024 for the treatment of adult and pediatric patients aged ⩾ 12 years with grade 2 astrocytoma or oligodendroglioma with a susceptible IDH1 or IDH2 mutation following surgery, including biopsy, sub-total resection, or gross total resection[37]. The EMA approved it for the treatment of grade 2 astrocytoma or oligodendroglioma in adults and adolescents from 12 years of age weighing at least 40 kg, have had surgery as their only treatment and who do not immediately need other treatments such as radiotherapy or chemotherapy[38].

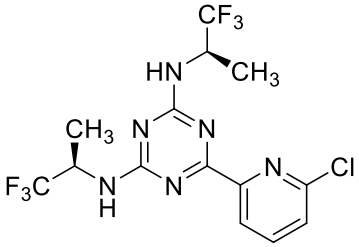


***Figure 10**.:* The structure of vorasidenib

3. Discussion

Modern antitumor therapies have opened up new opportunities for more effective treatment of cancer diseases. However, the development in this area is unbroken, still there are serious fields which are uncovered, or the approved therapeutic options are not highly effective. Therefore, it is important to keep our eyes on the development of this area.

Acknowledgements

Supported by the University of Debrecen Scientific Research Bridging Fund (DETKA).

References

1. Kiri S, Ryba T. Cancer, metastasis, and the epigenome. Molecular Cancer. 2024;23(1):154. DOI: doi: 10.1186/s12943-024-02069-w.
2. Siegel RL, Kratzer TB, Giaquinto AN, Sung H, Jemal A. Cancer statistics, 2025. Ca. 2025;75(1):10.
3. Agency EM. Human medicines in 2025: Publications Office of the European Union; 2026 [updated 2026. Available from: https://www.ema.europa.eu/en/documents/report/human-medicines-2025_en.pdf.
4. Shi C, Zhang C, Fu Z, Liu J, Zhou Y, Cheng B, et al. Antitumor activity of aumolertinib, a third-generation EGFR tyrosine kinase inhibitor, in non-small-cell lung cancer harboring uncommon EGFR mutations. Acta Pharmaceutica Sinica B. 2023;13(6):2613-27.
5. Zhang F, Zheng Z, Zhang H, Yan X, Liu Z, Yang F, et al. First-line Aumolertinib (EGFR tyrosine kinase inhibitor) plus apatinib (VEGFR inhibitor) versus aumolertinib in EGFR-mutant non-small cell lung cancer patients: a randomized, multicenter, phase II trial. Signal Transduction and Targeted Therapy. 2026;11(1):40.
6. Agency EM. Aumseqa (aumolertinib)

An overview of Aumseqa and why it is authorised in the EU 2025 [Available from: https://www.ema.europa.eu/en/documents/overview/aumseqa-epar-medicine-overview_en.pdf.
7. Hoy SM. Mirdametinib: First Approval: SM Hoy. Drugs. 2025;85(7):977-84.
8. Agency EM. Ezmekly (mirdametinib) An overview of Ezmekly and why it is authorised in the EU 2025 [Available from: https://www.ema.europa.eu/en/documents/overview/ezmekly-epar-medicine-overview_en.pdf.
9. Blair HA. Inavolisib: first approval. Drugs. 2025;85(2):271-8.
10. Agency EM. Itovebi (inavolisib) An overview of Itovebi and why it is authorised in the EU 2025 [Available from: https://www.ema.europa.eu/en/documents/overview/itovebi-epar-medicine-overview_en.pdf.
11. Lee A. Vimseltinib: First Approval: A. Lee. Drugs. 2025;85(7):985-9.
12. Agency EM. Romvimza (vimseltinib) An overview of Romvimza and why it is authorised in the EU 2025 [Available from: https://www.ema.europa.eu/en/documents/overview/romvimza-epar-medicine-overview_en.pdf.
13. Blair HA. Datopotamab Deruxtecan: First Approval: HA Blair. Drugs. 2025;85(7):965-75.
14. Schipilliti FM, Drittone D, Mazzuca F, La Forgia D, Guven DC, Rizzo A. Datopotamab deruxtecan: a novel antibody drug conjugate for triple-negative breast cancer. Heliyon. 2024;10(7).
15. Orlandi A. FDA and EMA approval of datopotamab-deruxtecan: A paradigm shift in breast cancer drug evaluation? The Breast. 2025:104589.
16. Kasthuri RS, Taubman MB, Mackman N. Role of tissue factor in cancer. Journal of Clinical Oncology. 2009;27(29):4834-8.
17. Markham A. Tisotumab vedotin: first approval. Drugs. 2021;81(18):2141-7.
18. Hingorani DV, Allevato MM, Camargo MF, Lesperance J, Quraishi MA, Aguilera J, et al. Monomethyl auristatin antibody and peptide drug conjugates for trimodal cancer chemo-radio-immunotherapy. Nature Communications. 2022;13(1):3869.
19. Kostova V, Désos P, Starck J-B, Kotschy A. The chemistry behind ADCs. Pharmaceuticals. 2021;14(5):442.
20. Agency EM. Tivdak (tisotumab vedotin) An overview of Tivdak and why it is authorised in the EU 2025 [Available from: https://www.ema.europa.eu/en/documents/overview/tivdak-epar-medicine-overview_en.pdf.
21. Lee A. Linvoseltamab: First Approval: A. Lee. Drugs. 2025;85(10):1329-33.
22. Keam SJ. Zanidatamab: First Approval. Drugs. 2025;85(5):707-14. DOI: 10.1007/s40265-025-02163-3.
23. Agency EM. Ziihera (zanidatamab) An overview of Ziihera and why it is authorised in the EU 2025 [Available from: https://www.ema.europa.eu/en/documents/overview/ziihera-epar-medicine-overview_en.pdf.
24. Want MY, Bashir Z, Najar RA. T cell based immunotherapy for cancer: approaches and strategies. Vaccines. 2023;11(4):835.
25. Keam SJ. Nogapendekin alfa Inbakicept: First Approval: SJ Keam. Drugs. 2024;84(7):867-74.
26. Agency EM. Anktiva (nogapendekin alfa inbakicept) An overview of Anktiva and why it is authorised in the EU 2025 [Available from:

https://www.ema.europa.eu/en/documents/overview/anktiva-epar-medicine-overview_en.pdf.
27. Lee A. Obecabtagene autoleucel: First approval. Molecular diagnosis & therapy. 2025;29(3):419-23.
28. Agency EM. Aucatzyl (obecabtagene autoleucel) An overview of Aucatzyl and why it is authorised in the EU 2025 [Available from: https://www.ema.europa.eu/en/documents/overview/aucatzyl-epar-medicine-overview_en.pdf.
29. Agency EM. Zemcelpro (dorocubicel / unexpanded CD34- cells) An overview of Zemcelpro and why it is authorised in the EU 2025 [Available from: https://www.ema.europa.eu/en/documents/overview/zemcelpro-epar-medicine-overview_en.pdf.
30. Lee A. Dorocubicel: First Approval: A. Lee. Molecular Diagnosis & Therapy. 2026;30(1):173-6.
31. Keam SJ. Imlunestrant: first approval. Drugs. 2026;86(1):135-41.
32. Agency EM. Inluriyo (imlunestrant) An overview of Inluriyo and why it is authorised in the EU 2025 [Available from: https://www.ema.europa.eu/en/documents/overview/inluriyo-epar-medicine-overview_en.pdf.
33. Chen C, Du Y, Nie R, Wang S, Wang H, Li P. Notch signaling in cancers: mechanism and potential therapy. Frontiers in Cell and Developmental Biology. 2025;13:1542967.
34. Keam SJ. Nirogacestat: First Approval. Drugs. 2024;84(3).
35. Agency EM. Ogsiveo (nirogacestat) An overview of Ogsiveo and why it is authorised in the EU 2025 [Available from: https://www.ema.europa.eu/en/documents/overview/ogsiveo-epar-medicine-overview_en.pdf.
36. Bege M, Borbás A. Medicines for influencing the posttranslational modifications of histones–a tutorial review. De Remediis. 2024;1(1):14-.
37. Lamb YN. Vorasidenib: first approval. Drugs. 2024;84(10):1325.
38. Agency EM. Voranigo (vorasidenib) An overview of Voranigo and why it is authorised in the EU 2025 [Available from: https://www.ema.europa.eu/en/documents/overview/voranigo-epar-medicine-overview_en.pdf.