

Міністерство охорони здоров'я України
Національний фармацевтичний університет
ДНТ «Львівський національний медичний університет імені Короля Данила»
Українське товариство медичної хімії

Міжнародна наукова конференція

Modern chemistry of medicines

15-17 жовтня 2026 р.
м. Харків, м. Львів, Україна

Посвідчення Державної наукової установи «Український інститут науково-технічної експертизи та інформації» № 828 від 17.11.2025 р.

Synthesis and Antiradical Activity of Pyrazole-Containing Heterocyclic Hybrids

Inna Nosulenko*, Anna Kinichenko, Galyna Berest, Kostiantyn Shabelnyk

Zaporizhzhia State Medical and Pharmaceutical University, Mariia Pryimachenko av. 26, Zaporizhzhia, 69035, Ukraine
**e-mail: nosulinna@gmail.com*

Introduction. Combining pyrazole with other nitrogen-containing heterocycles provides opportunities for developing new radical-scavenging agents. Structural modification of such hybrids allows the influence of heterocyclic fragments and their connectivity on antiradical activity to be evaluated. This study aimed to synthesize pyrazole-containing hybrids incorporating quinazoline, triazoloquinazoline, or triazole moieties and to assess their radical-scavenging properties. Comparison of the initial carbohydrazides with their cyclized and ring-opened derivatives enabled the identification of structural features favorable for radical scavenging.
Materials and methods. The compounds were prepared by nucleophilic substitution, cyclization, and hydrolytic ring cleavage. Their structures and purity were verified by ^{1}H NMR spectroscopy and LC–MS. Antiradical activity was determined using the DPPH assay at final compound concentrations of 1 and 0.1 mM after incubation for 30 min at room temperature. Ascorbic acid served as the reference compound.
Results and discussion. Reaction of 4-chloroquinazoline with substituted 1H-pyrazole-3-carbohydrazides in refluxing dioxane in the presence of triethylamine afforded pyrazole–quinazoline hybrids in 71–95% yields. Heating these products in glacial acetic acid yielded the corresponding 2-(5-R-1H-pyrazol-3-yl)-[1,2,4]triazolo[1,5-c]quinazolines in 75–90% yields. This transformation involved cyclization followed by ANRORC rearrangement. Subsequent refluxing in 10% aqueous hydrochloric acid caused cleavage of the pyrimidine ring, providing pyrazole–triazole hybrids bearing a 2-aminophenyl group in 75–87% yields.
The tested pyrazole–quinazoline carbohydrazides exhibited the highest antiradical activity, scavenging 83–93% of DPPH radicals at 1 mM and 51–68% at 0.1 mM, compared with 95% and 82%, respectively, for ascorbic acid. The 4-methoxyphenyl-substituted derivative showed 93% and 68% activity, respectively. The 2,4-difluorophenyl-substituted carbohydrazide also exhibited high activity, reaching 93% at 1 mM and 64% at 0.1 mM, indicating that pronounced radical-scavenging properties were retained with different substituents on the phenyl ring. Cyclization into the fused triazoloquinazoline system markedly reduced activity to 0–51% at 1 mM and 0–9% at 0.1 mM. Hydrolytic ring cleavage partially restored radical-scavenging activity: the tested pyrazole–triazole derivatives exhibited values of 79–89% and 9–45%, respectively. The 4-methoxyphenyl-substituted member of this series was the most active at 0.1 mM (45%). These results demonstrate that antiradical activity depends strongly on the structural organization of the heterocyclic hybrid.
Conclusions. The synthetic sequence provided access to three structurally related classes of pyrazole-containing hybrids. The quinazoline-containing carbohydrazides displayed the most favourable DPPH radical-scavenging activity, whereas formation of the fused tricyclic system reduced this activity. These findings identify promising compounds for further antioxidant evaluation and provide a basis for subsequent structural optimization.

References

1. Shabelnyk K, Zaika Y, Skoryna D, Nosulenko I, Kinichenko A, Voskoboinik O, Kovalenko S. Novel pyrazole bearing heterocyclic hybrids as promising biologically active compounds. Čes. slov. Farm. 2024;73(3):E7–E12. doi:10.36290/csf.2024.032.

PRODUCTION AND STUDY OF HEMOSTATIC PROPERTIES OF CELLULOSE DERIVATIVES **62**
Nilufar Ismoilova, Oliy Akhmedov

Synthesis and Antiradical Activity of Pyrazole-Containing Heterocyclic Hybrids **63**
Inna Nosulenko, Anna Kinichenko, Galyna Berest, Kostiantyn Shabelnyk

EFFECT OF COMPONENT RATIO ON THE PHYSICOMECHANICAL PROPERTIES OF FILMS **64**
Orazova Sh., Zokirov B., Xusenov A., Raxmanberdiev G.

Evaluation of the Biological Properties of *Hypericum perforatum* L. Plant Extracts and Their Application in the Biosynthesis of Silver Nanoparticles **65**
Neringa Petrašauskienė, Madiha Ashraf, Kristina Kantminienė, Ingrida Tumosienė, Ilona Jonuškienė

1,2,3-Triazole-4-carboxamides and Their Heterocyclic Bioisosteres: A Versatile Platform for Drug Discovery against Diverse Biological Targets **66**
Nazariy Pokhodylo, Nataliya Finiuk, Daria Zakopailo, Mykola Tupychak, Nazar Manko, Olha Klyuchivska, Mykola Obushak, Rostyslav Stoika

Dihydro-2H-thiopyran-3(4H)-one-1,1-dioxide: a promising scaffold for the design and synthesis of biologically active compounds **67**
Marian Popadyuk, Kateryna Dil

Molecular dynamics of a repurposing candidate bound in the adenosine subsite of human ADP-ribosylserine hydrolase **68**
M. V. Prud

Different targets, different scaffolds – similar design logic? Medicinal chemistry convergence in contemporary oncology drugs **69**
Marta Rusek, Monika Pitucha

Synthesis and molecular docking of a series of 1-benzyl-4-(1,2,4-oxadiazolyl)pyrrolidin-2-ones as potential M1 receptor agonists **70**
Rustam Suleiman, Illya Podolsky, Sergiy M. Kovalenko, Victoriya Georgiyants, Lina Perekhoda

In silico smoothening of calcium oscillations within esophageal squamous cell carcinoma under magnetic field by afatinib **71**
Ye. A. Salatskyi, S. V. Gorobets, O. Yu. Gorobets

Synthesis And Functionalization of Substituted Carboxylic Acids Via Classical and Electrochemical Methods **72**
Aida Sermuksnyte, Kristina Kantminiene, Jaime A. S. Coelho, Ingrida Tumosiene

SYNTHESIS OF A MIXED-LIGAND Ni (II) COORDINATION COMPOUND WITH SUCCINIC ACID AND GLYCINE **73**
M.R. Shamsutdinova, M. Fatkhullaeva

Structure-activity relationships of isatin derivatives - from scaffold modification to pharmacological diversity **74**
Tatiana Shtefanets

Influence of the degree of quaternization and substituent structure on the antibacterial activity of chitosan derivatives **75**
Tatiana Sîlnic, Ecaterina Mazur, Ludmila Lungu, Cristina Ciobanu