Biomedical Applications of Aromatic Azo Compounds

By: Ali, Y (Ali, Yousaf)[1,2]; Abd Hamid, S (Abd Hamid, Shafida)[1]; Rashid, U (Rashid, Umer)[3]

MINI-REVIEWS IN MEDICINAL CHEMISTRY
Volume: 18 **Issue:** 18 **Pages:** 1548-1558
DOI: 10.2174/1389557518666180524113111
Published: 2018
Document Type: Review
View Journal Impact

Abstract

Azo dyes are widely used in textile, fiber, cosmetic, leather, paint and printing industries. Besides their characteristic coloring function, azo compounds are reported as antibacterial, antiviral, antifungal and cytotoxic agents. They have the ability to be used as drug carriers, either by acting as a 'cargo' that entrap therapeutic agents or by prodrug approach. The drug is released by internal or external stimuli in the region of interest, as observed in colon-targeted drug delivery. Besides drug-like and drug carrier properties, a number of azo dyes are used in cellular staining to visualize cellular components and metabolic processes. However, the biological significance of azo compounds, especially in cancer chemotherapy, is still in its infancy. This may be linked to early findings that declared azo compounds as one of the possible causes of cancer and mutagenesis. Currently, researchers are screening the aromatic azo compounds for their potential biomedical use, including cancer diagnosis and therapy. In this review, we highlight the medical applications of azo compounds, particularly related to cancer research. The biomedical significance of cis-trans interchange and negative implications of azo compounds are also discussed in brief.

Keywords

Author Keywords: Azo dyes; cancer; drug delivery; antimicrobial; Azo compounds; antiviral

KeyWords Plus: DRUG-DELIVERY SYSTEMS; CENTRAL-NERVOUS-SYSTEM; HIV-1 NEF ANTAGONISTS; STRUCTURAL-CHARACTERIZATION; SPECTRAL CHARACTERIZATION; ANTIMICROBIAL ACTIVITY; MICROBIAL-DEGRADATION; BIOLOGICAL-ACTIVITY; FLUORESCENT-PROBE; RED-LIGHT

Author Information

Reprint Address: Abd Hamid, S (reprint author)

Int Islamic Univ Malaysia, Kulliyyah Sci, Bandar Indera Mahkota 25200, Kuantan, Malaysia.

Addresses:

[1] Int Islamic Univ Malaysia, Kulliyyah Sci, Bandar Indera Mahkota 25200, Kuantan, Malaysia

[2] Sarhad Univ Sci & Informat Technol, Dept Chem, Peshawar, Pakistan

[3] COMSATS Univ Islamabad, Dept Chem, Abbottabad Campus 22060, Islamabad, Pakistan

E-mail Addresses: shafida@iium.edu.my

Funding

Funding Agency	Grant Number
MOSTI	06-01-08-SF0147
MOHE	ERGS12-017-0017

View funding text

Publisher

BENTHAM SCIENCE PUBL LTD, EXECUTIVE STE Y-2, PO BOX 7917, SAIF ZONE, 1200 BR SHARJAH, U ARAB EMIRATES

Categories / Classification

Research Areas: Pharmacology & Pharmacy

Web of Science Categories: Chemistry, Medicinal

See more data fields

Cited References: 128

Showing 30 of 128 View All in Cited References page *(from Web of Science Core Collection)*

1. **Synthesis and characterization of transition metal complexes with azo ligand derived from 4-hydroxy-6-methyl-2-pyranone** Times Cited: 4
By: Al-Jibouri, M.N.
Eur. Chem. Bull. Volume: 3 Issue: 5 Pages: 447 Published: 2014

2. **Synthesis, antimicrobial activity, computational and modeling studies of some new organotellurium compounds containing azo moities** Times Cited: 1
By: Al-Masoudi, W. A.; Al-Asadi, R. H.; Othman, R. M.; et al.
Eur. J. Chem Volume: 6 Issue: 4 Pages: 374-380 Published: 2015
[Show additional data]

3. **Synthesis, spectral characterization, thermal analysis, molecular modeling and antimicrobial activity of new potentially N2O2 azo-dye Schiff base complexes** Times Cited: 26
By: Alaghaz, Abdel-Nasser M. A.; Ammar, Yousry A.; Bayoumi, Hoda A.; et al.
JOURNAL OF MOLECULAR STRUCTURE Volume: 1074 Pages: 359-375 Published: SEP 25 2014

4. **CHEMICAL ASPECTS OF SELECTIVE TOXICITY** Times Cited: 195
By: ALBERT, A
NATURE Volume: 182 Issue: 4633 Pages: 421-423 Published: 1958

5. **Smart drug delivery systems: from fundamentals to the clinic** Times Cited: 129
By: Alvarez-Lorenzo, Carmen; Concheiro, Angel
CHEMICAL COMMUNICATIONS Volume: 50 Issue: 58 Pages: 7743-7765 Published: 2014

6. **Light-sensitive Intelligent Drug Delivery Systems** Times Cited: 251
By: Alvarez-Lorenzo, Carmen; Bromberg, Lev; Concheiro, Angel
PHOTOCHEMISTRY AND PHOTOBIOLOGY Volume: 85 Issue: 4 Pages: 848-860 Published: JUL-AUG 2009

7. **Azo dyes: past, present and the future** Times Cited: 136
By: Bafana, Amit; Devi, Sivanesan Saravana; Chakrabarti, Tapan
ENVIRONMENTAL REVIEWS Volume: 19 Pages: 350-370 Published: 2011

8. **Photoisomerization in different classes of azobenzene** Times Cited: 811
By: Bandara, H. M. Dhammika; Burdette, Shawn C.
CHEMICAL SOCIETY REVIEWS Volume: 41 Issue: 5 Pages: 1809-1825 Published: 2012

9. **Ultraviolet light-mediated drug delivery: Principles, applications, and challenges** Times Cited: 36
By: Barhoumi, Aoune; Liu, Qian; Kohane, Daniel S.
JOURNAL OF CONTROLLED RELEASE Volume: 219 Pages: 31-42 Published: DEC 10 2015

10. **Carcinogenicity of the aromatic amines: From structure-activity relationships to mechanisms of action and risk assessment** Times Cited: 93
By: Benigni, R; Passerini, L
MUTATION RESEARCH-REVIEWS IN MUTATION RESEARCH Volume: 511 Issue: 3 Pages: 191-206 Article Number: PII S1383-5742(02)00008-X Published: JUL 2002

11. **Different roads to discovery; Prontosil (hence sulfa drugs) and penicillin (hence beta-lactams)** Times Cited: 30
By: Bentley, Ronald
JOURNAL OF INDUSTRIAL MICROBIOLOGY & BIOTECHNOLOGY Volume: 36 Issue: 6 Pages: 775-786 Published: JUN 2009

12. **Photoswitchable Inhibitors of Microtubule Dynamics Optically Control Mitosis and Cell Death** Times Cited: 82
By: Borowiak, Malgorzata; Nahaboo, Wallis; Reynders, Martin; et al.
CELL Volume: 162 Issue: 2 Pages: 403-411 Published: JUL 16 2015

13. **Nile red: Alternative to physical developer for the detection of latent fingermarks on wet porous surfaces?** Times Cited: 11
By: Braasch, Karl; de la Hunty, Mackenzie; Deppe, Janina; et al.
FORENSIC SCIENCE INTERNATIONAL Volume: 230 Issue: 1-3 Pages: 74-80 Published: JUL 10 2013

14. **Light-Controlled Tools** Times Cited: 397
By: Brieke, Clara; Rohrbach, Falk; Gottschalk, Alexander; et al.
ANGEWANDTE CHEMIE-INTERNATIONAL EDITION Volume: 51 Issue: 34 Pages: 8446-8476 Published: 2012

15. **The present position of chemotherapy by drugs of the sulphanilamide group - The bacteriological and experimental aspect** Times Cited: 4
By: Browning, CH
BMJ-BRITISH MEDICAL JOURNAL Volume: 2 Pages: 265-269 Published: JUL-DEC 1939

16. **PHYSICAL PROPERTIES AND CHEMICAL CONSTITUTION .43. ELECTRIC DIPOLE MOMENTS OF AZOBENZENE AZOPYRIDINES AND AZOQUINOLINES** Times Cited: 83
By: BULLOCK, DJW; CUMPER, CWN; VOGEL, AI
JOURNAL OF THE CHEMICAL SOCIETY Issue: OCT Pages: 5316-& Published: 1965

17. **The microbial degradation of azo dyes: minireview** Times Cited: 41
By: Chengalroyen, M. D.; Dabbs, E. R.
WORLD JOURNAL OF MICROBIOLOGY & BIOTECHNOLOGY Volume: 29 Issue: 3 Pages: 389-399 Published: MAR 2013

18. Title: [not available] Times Cited: 3
By: Chequer, F. M. D; Dorta, D. J; de Oliveira, D. P.
Azo dyes and their metabolites: does the discharge of the azo dye into water bodies represent human and ecological risks? Published: 2011
Publisher: INTECH Open Access Publisher

19. **Pharmaceutical approaches to colon targeted drug delivery systems.** Times Cited: 447
By: Chourasia, MK; Jain, SK
JOURNAL OF PHARMACY AND PHARMACEUTICAL SCIENCES Volume: 6 Issue: 1 Pages: 33-66 Published: JAN-APR 2003

20. Title: [not available] Times Cited: 11
By: Christie, R.
Colour chemistry. Published: 2014
Publisher: Royal Society of Chemistry

21. **Review of the Salmonella typhimurium mutagenicity of benzidine, benzidine analogues, and benzidine-based dyes** Times Cited: 26
By: Chung, KT; Chen, SC; Claxton, LD
MUTATION RESEARCH-REVIEWS IN MUTATION RESEARCH Volume: 612 Issue: 1 Pages: 58-76 Published: JAN 2006

22. **Trans-Platinum Complexes in Cancer Therapy** Times Cited: 129
By: Coluccia, Mauro; Natile, Giovanni
ANTI-CANCER AGENTS IN MEDICINAL CHEMISTRY Volume: 7 Issue: 1 Pages: 111-123 Published: JAN 2007

23. **Dextran: A promising macromolecular drug carrier** Times Cited: 39
By: Dhaneshwar, Suneela S.; Kandpal, Mini; Gairola, Neha; et al.
Indian Journal of Pharmaceutical Sciences Volume: 68 Issue: 6 Pages: 705-714 Published: NOV-DEC 2006

24. **Molecular Docking, Potentiometric and Thermodynamic Studies of Some Azo Compounds** Times Cited: 1
By: El-Bindary, A. A.; Ghoneim, M. M.; Diab, M. A.; et al.
JOURNAL OF SOLUTION CHEMISTRY Volume: 45 Issue: 7 Pages: 990-1008 Published: JUL 2016

25. **Bioreductive fluorescent imaging agents: applications to tumour hypoxia** Times Cited: 26
By: Elmes, Robert B. P.
CHEMICAL COMMUNICATIONS Volume: 52 Issue: 58 Pages: 8935-8956 Published: 2016

26. **Synthesis and evaluation of orally active small molecule HIV-1 Nef antagonists** Times Cited: 2
By: Emert-Sedlak, Lori A.; Loughran, H. Marie; Shi, Haibin; et al.
BIOORGANIC & MEDICINAL CHEMISTRY LETTERS Volume: 26 Issue: 5 Pages: 1480-1484 Published: MAR 1 2016

27. **Effector Kinase Coupling Enables High-Throughput Screens for Direct HIV-1 Nef Antagonists with Antiretroviral Activity** Times Cited: 28
By: Emert-Sedlak, Lori A.; Narute, Purushottam; Shu, Sherry T.; et al.
CHEMISTRY & BIOLOGY Volume: 20 Issue: 1 Pages: 82-91 Published: JAN 24 2013

28. **Synthesis, Characterization, and Bioactivity of the Photoisomerizable Tubulin Polymerization Inhibitor azo-Combretastatin A4** Times Cited: 21
By: Engdahl, Ashton J.; Torres, Edith A.; Lock, Sarah E.; et al.
ORGANIC LETTERS Volume: 17 Issue: 18 Pages: 4546-4549 Published: SEP 18 2015

29. **Synthesis of some new 2-substituted-4-sulfamoylphenylazo-thiophene and/or thiazole derivatives as antibacterial agents** Times Cited: 3
By: Fadda, Ahmed A.; El-badraw, Afnan M.; Refat, Hala M.; et al.
PHOSPHORUS SULFUR AND SILICON AND THE RELATED ELEMENTS Volume: 191 Issue: 5 Pages: 778-785 Published: 2016

30. **Synthesis, azo-hydrazone tautomerism and antitumor screening of N-(3-ethoxycarbonyl-4,5,6,7-tetrahydro-benzo[b]thien-2-yl)-2-arylhydrazono-3-oxobutanamide derivatives** Times Cited: 26
By: Farghaly, Thoraya A.; Abdallah, Zeinab A.
ARKIVOC Pages: 295-305 Part: 17 Published: 2008

Showing 30 of 128 **View All in Cited References page**