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Hybrid molecularly imprinted nanomaterials for therapy and diagnostics

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Hybrid molecularly imprinted polymers combine features of molecularly imprinted polymers (MIPs) and other functional components such as inorganic materials (*e.g.*, nanoparticles), which provides enhanced selectivity, stability, and reactivity. This combination makes it possible to integrate benefits of MIPs (specific binding of a molecular template) with those of other materials such as high surface area, stability, and catalytic activity. Recent advances in nanotechnology have improved the production of new hybrid molecularly imprinted polymers, which resulted in rapid growth of the use of hybrid MIPs in biomedicine. Lately, the number of publications (including reviews) devoted to both classic and hybrid MIPs has been constantly increasing; however, none of the publications focuses on the preparation and use of hybrid MIPs for medicine and their possible contribution to this field. This review presents a detailed description of the latest research advances in molecular imprinting technology with the use of nanomaterials in diagnostics, therapeutics, and theranostics. The goal of the review is to provide a comprehensive picture of the diversity of currently available hybrid systems for molecular recognition and their applications in biomedicine.

Bibliography — 252 references.

Pyrimidine nucleoside analogues and antitumour drugs based on them: fifty years in therapy

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Most of the modern chemotherapeutic arsenal for the treatment of various types of cancer is based on pyrimidine nucleoside analogues. These include drugs that have been proven for decades (cytarabine, floxuridine, gemcitabine, capecitabine, azacitidine, and decitabine) as well as combinations of new antitumour agents (trifluorothymidine and tipiracil hydrochloride, decitabine and cedazuridine). New pyrimidine nucleoside analogues (doxyfluridine, tezacitabine, tiarabin, troxacitabine, *etc.*) and their depot forms (sapacitabine, MB-07133, *etc.*) are currently undergoing clinical trials for monotherapy or combination therapy for a wide range of oncological diseases. Over the past 15 years, publications have appeared describing various approaches to optimize the synthesis methods and structures of existing cancer drugs, as well as the design and synthesis of new pyrimidine nucleoside analogues with antitumour activity. This review summarizes new information and classical methods for synthesizing pyrimidine nucleoside analogues, as well as data on their antitumour activity, targets, and mechanisms of action. This review will be useful to a wide range of readers, including undergraduate and graduate students in chemistry and biology, and also specialists in chemistry, biology and medicine.

Bibliography — 216 references.

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Post-translational modifications of histones, the protein components of nucleosomes, regulate the local state of chromatin for optimal gene expression. Among these modifications, a balance of methylation and demethylation of particular lysine residues in histones is important, as under physiological conditions this balance provides the permissiveness of chromatin for template processes. An imbalance of methylation and demethylation leads to transcriptional deregulation, a characteristic feature of malignant cells. A specific feature of the author's concept is a multidisciplinary approach to the analysis of complex and contradictory data on epigenetic regulators. This review presents general information about human histone lysine demethylases (KDM). For the KDM2 subgroup, structural features, mechanism of catalysis (histone demethylation), and the role in tumour biology are considered. Since KDM2 functions are not limited to enzymatic activity, the pharmacological approach for anticancer therapy implies both the design of demethylation blockers, with KDM2 being retained in the cells, and the search for possible tools for total elimination of these proteins.

Bibliography — 174 references.

