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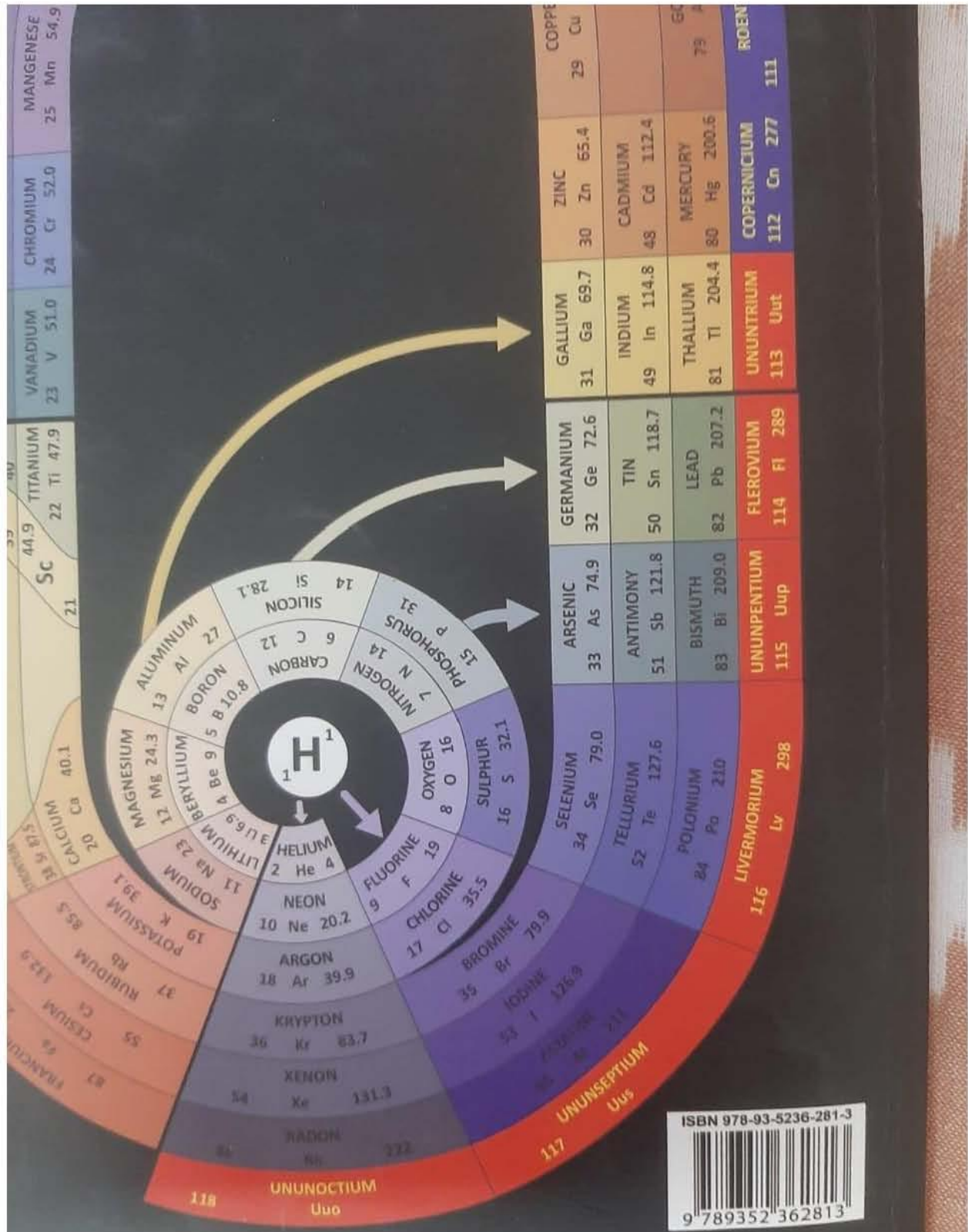
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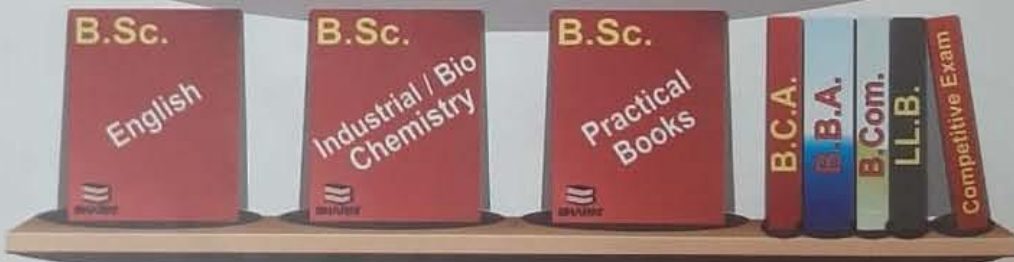


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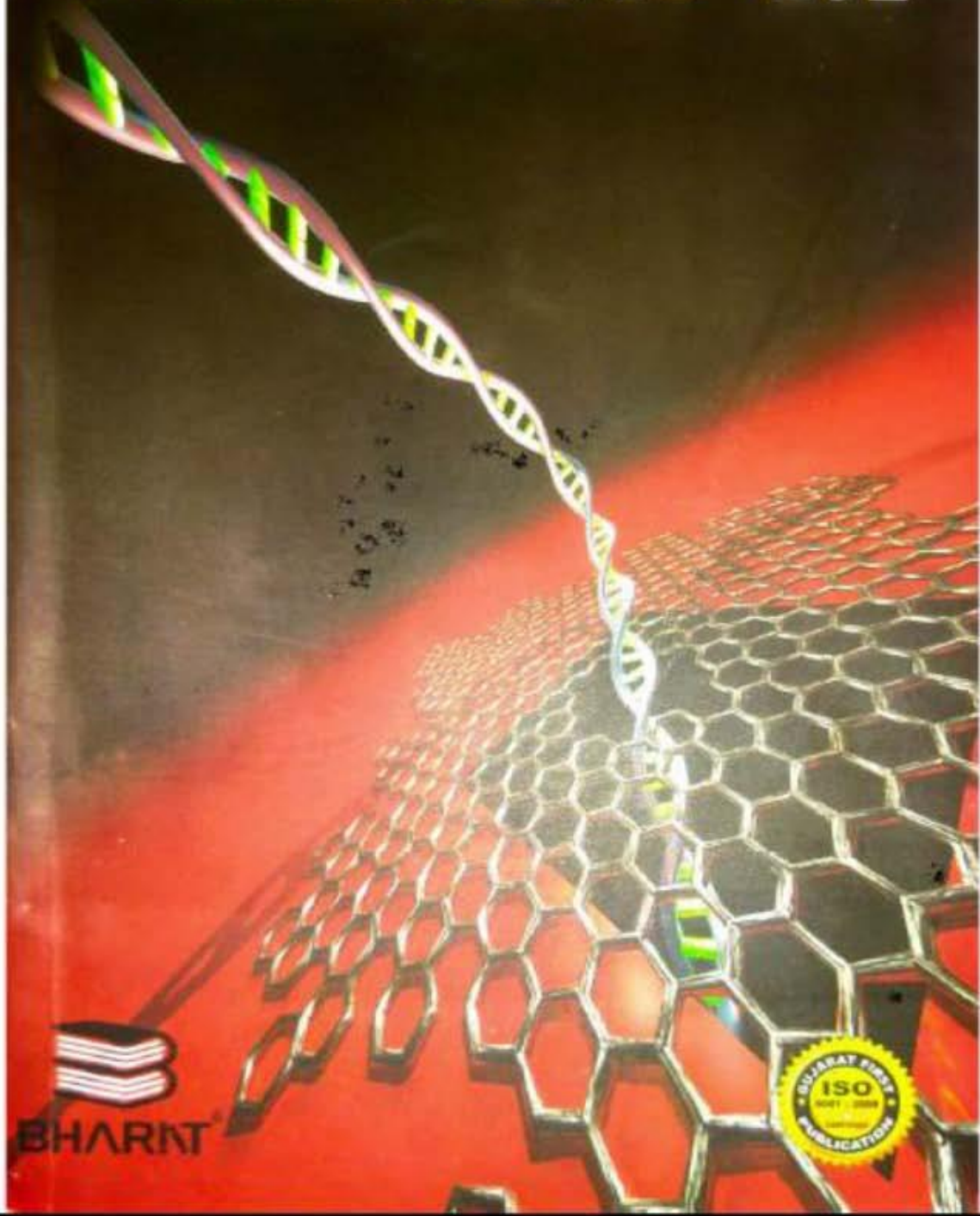


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Green synthesis of metal/metal oxide nanoparticles toward biomedical applications: Boon or bane

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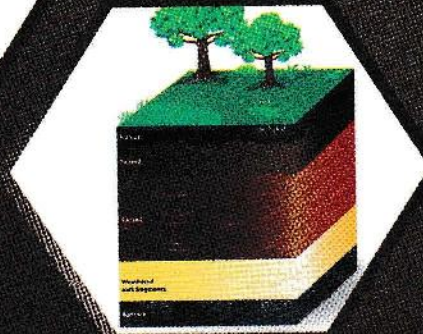
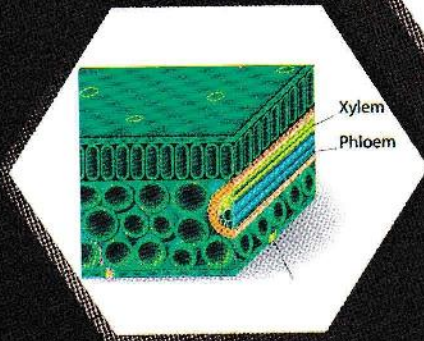
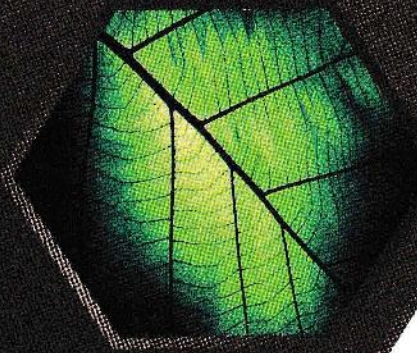
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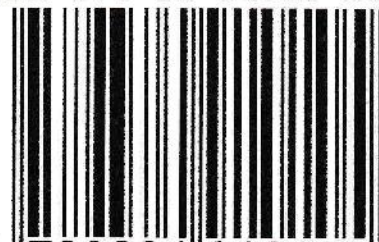
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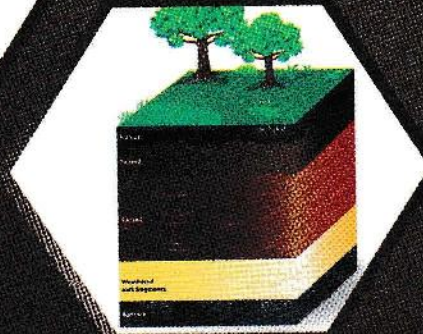
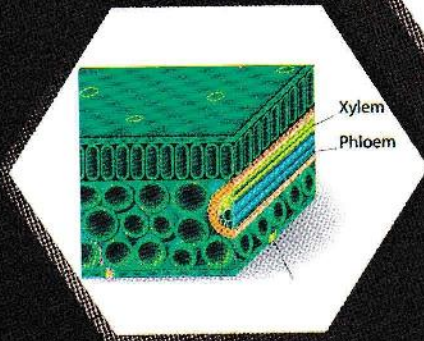
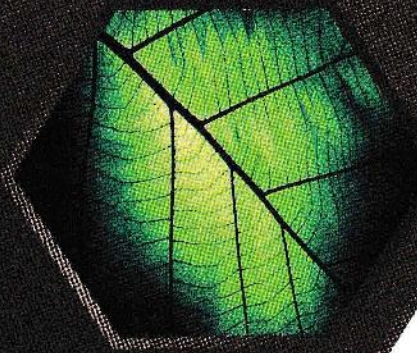
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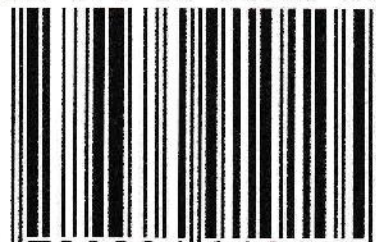
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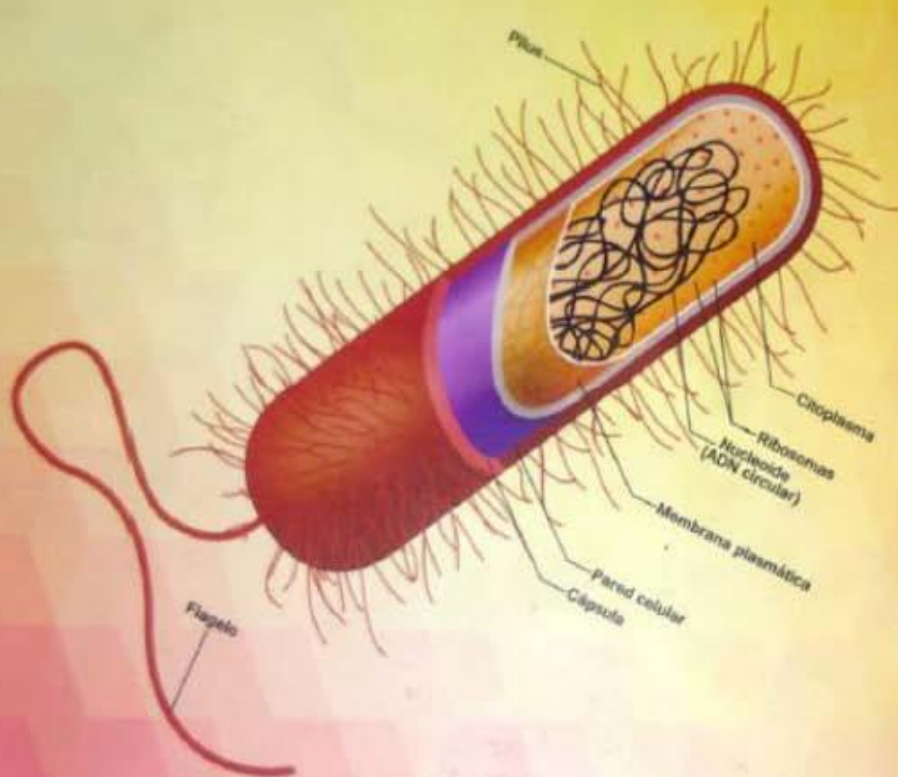
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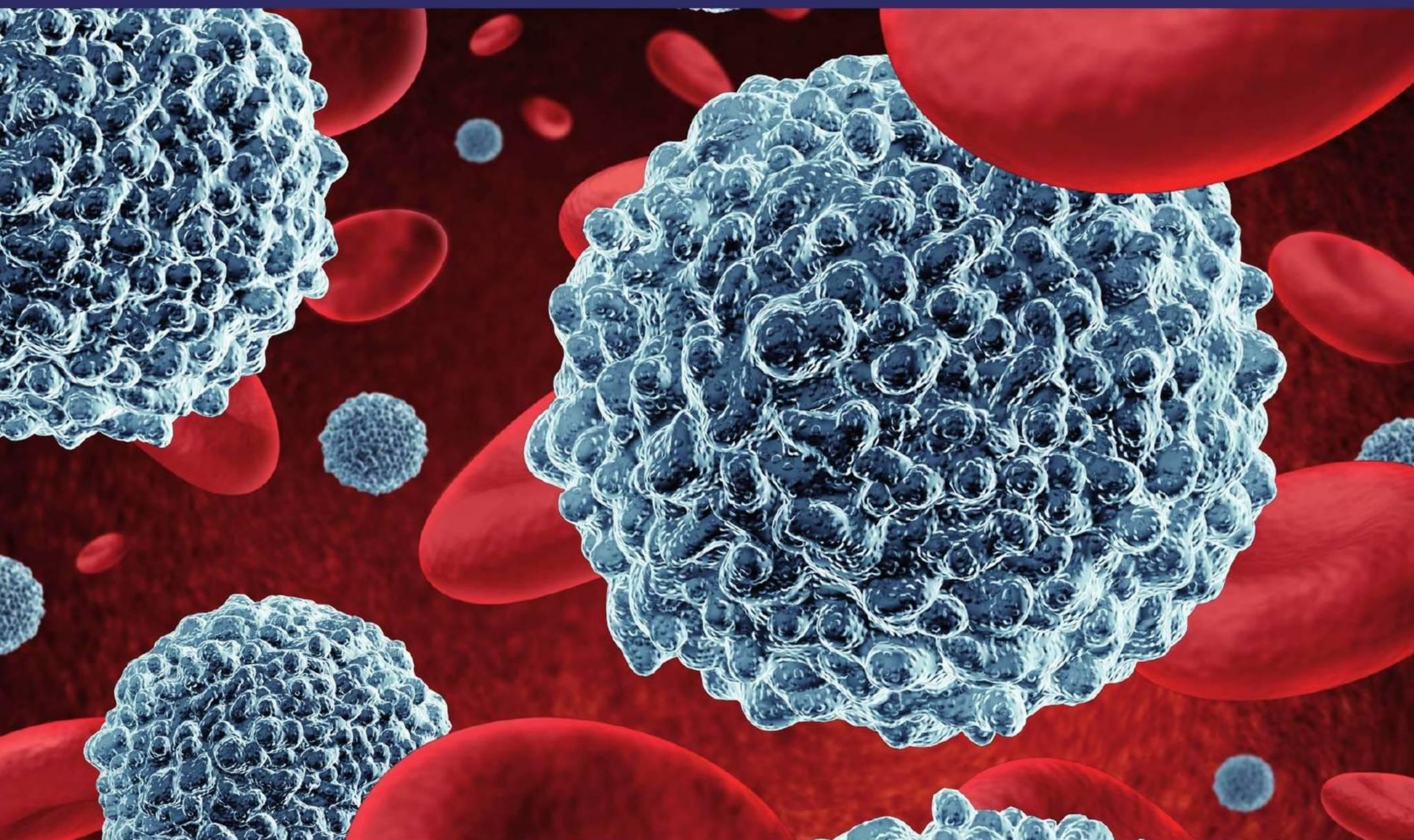
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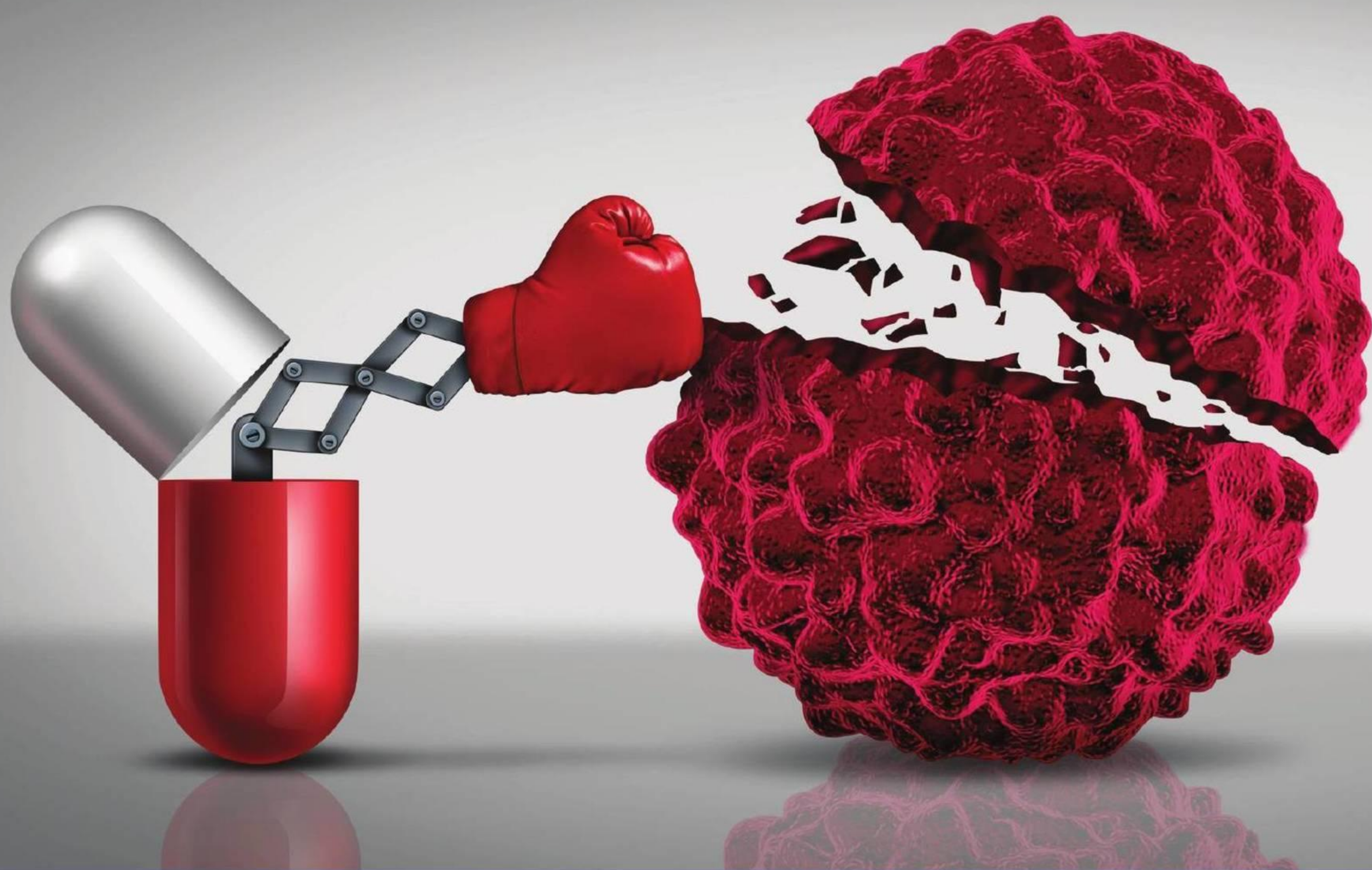
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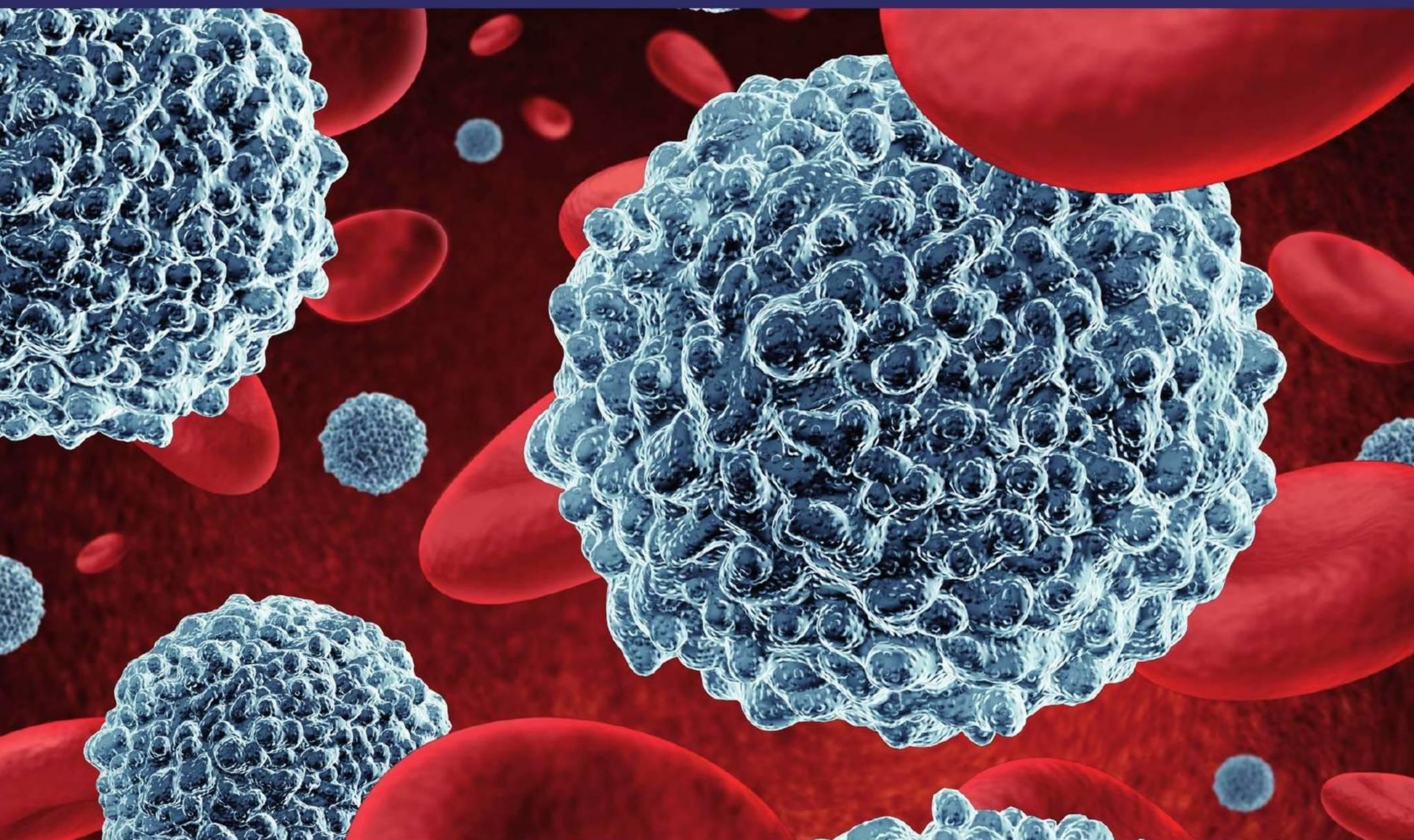
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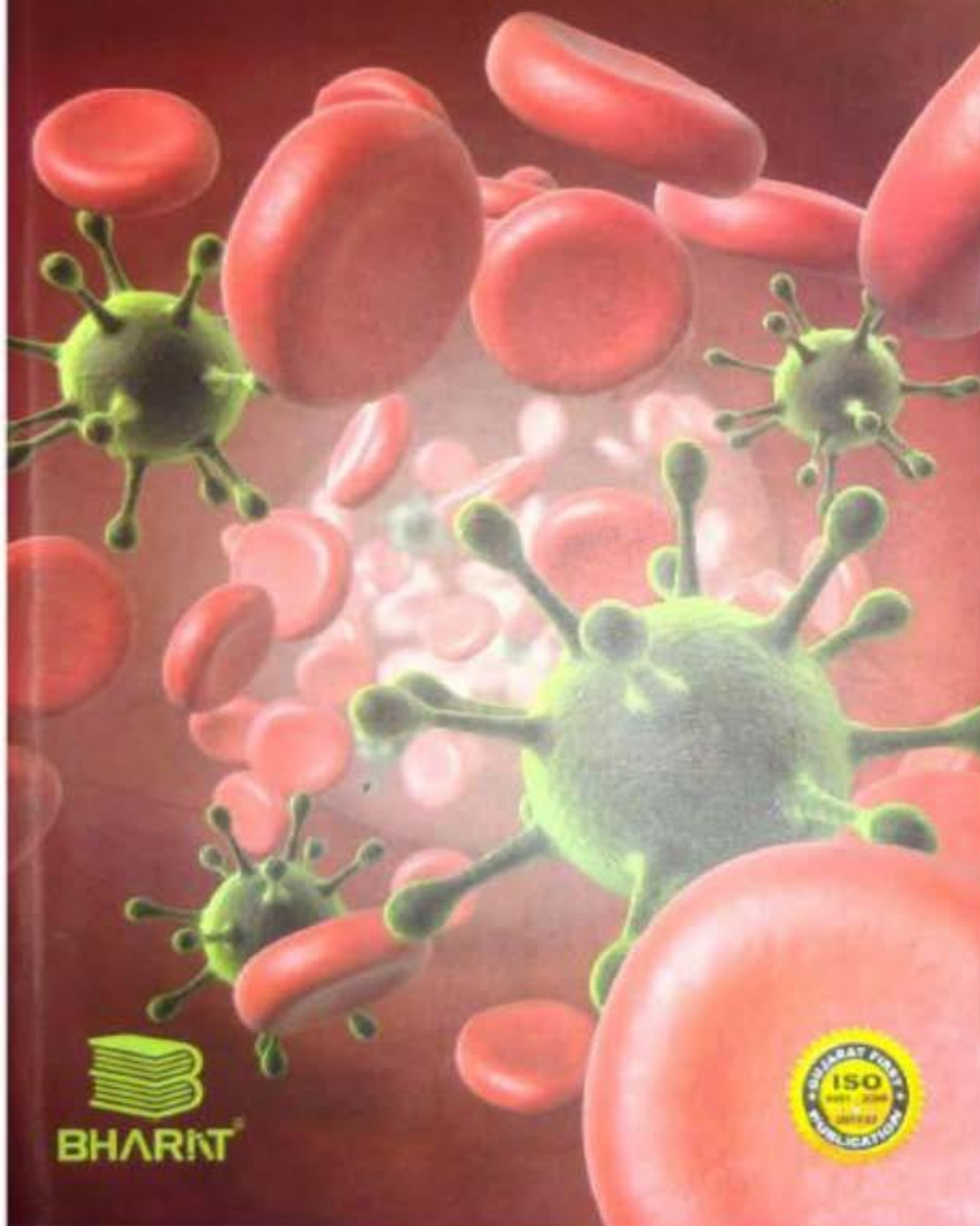
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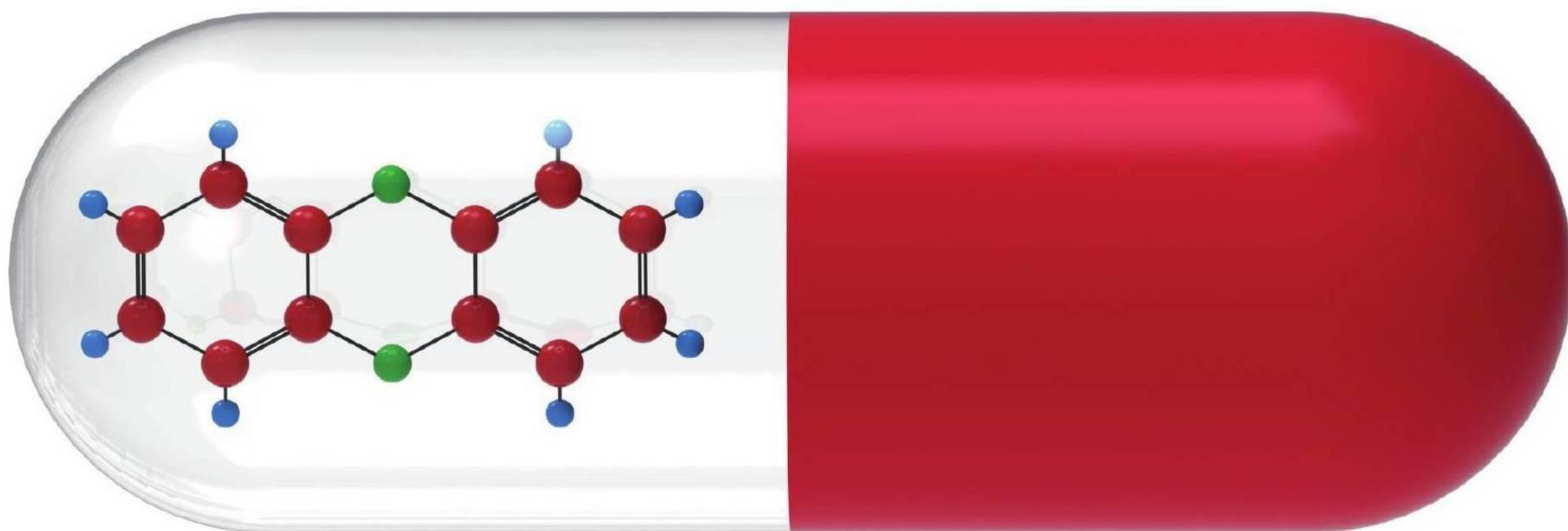
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Chemistry of some Quinolone and Quinoline Derivatives

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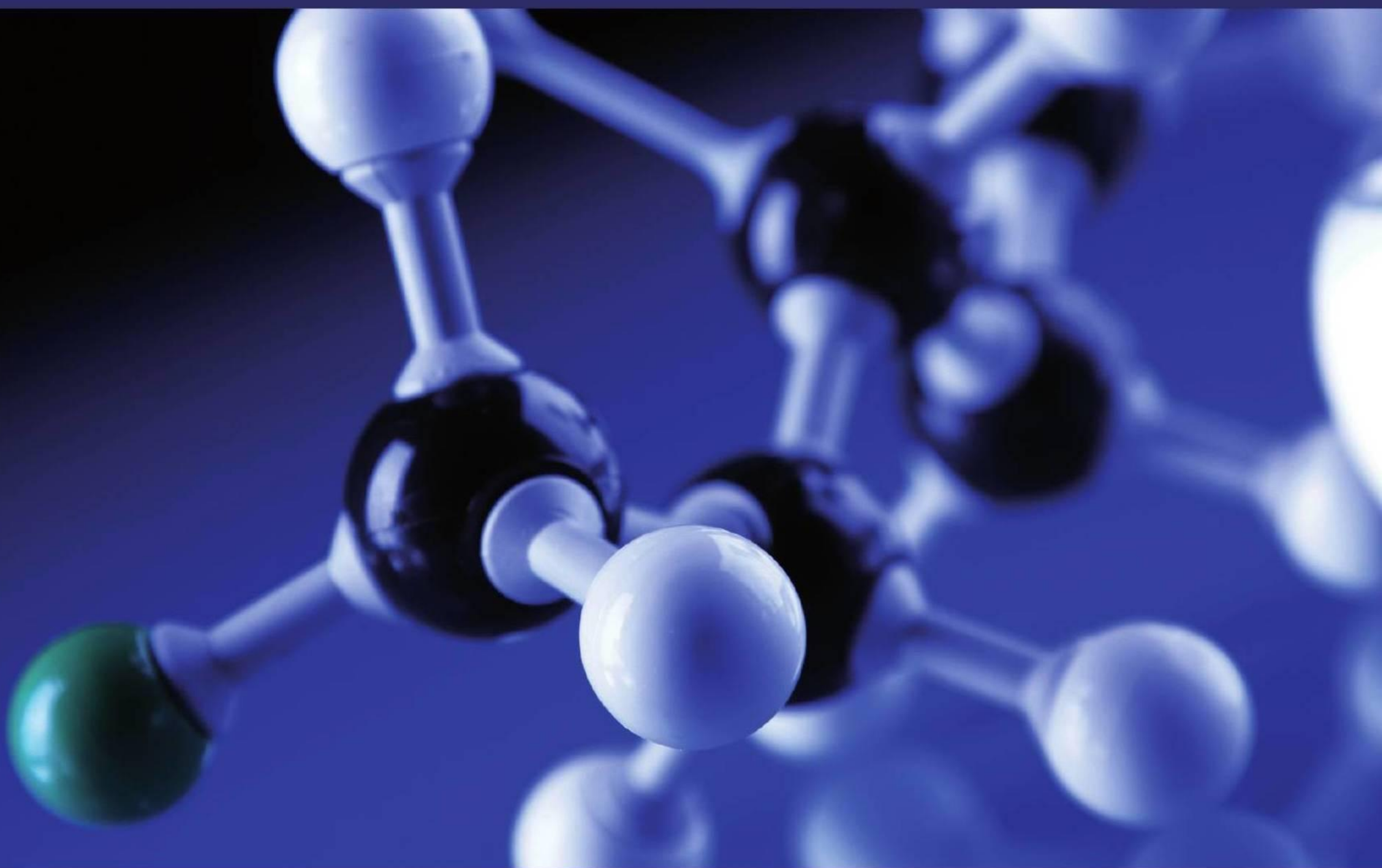
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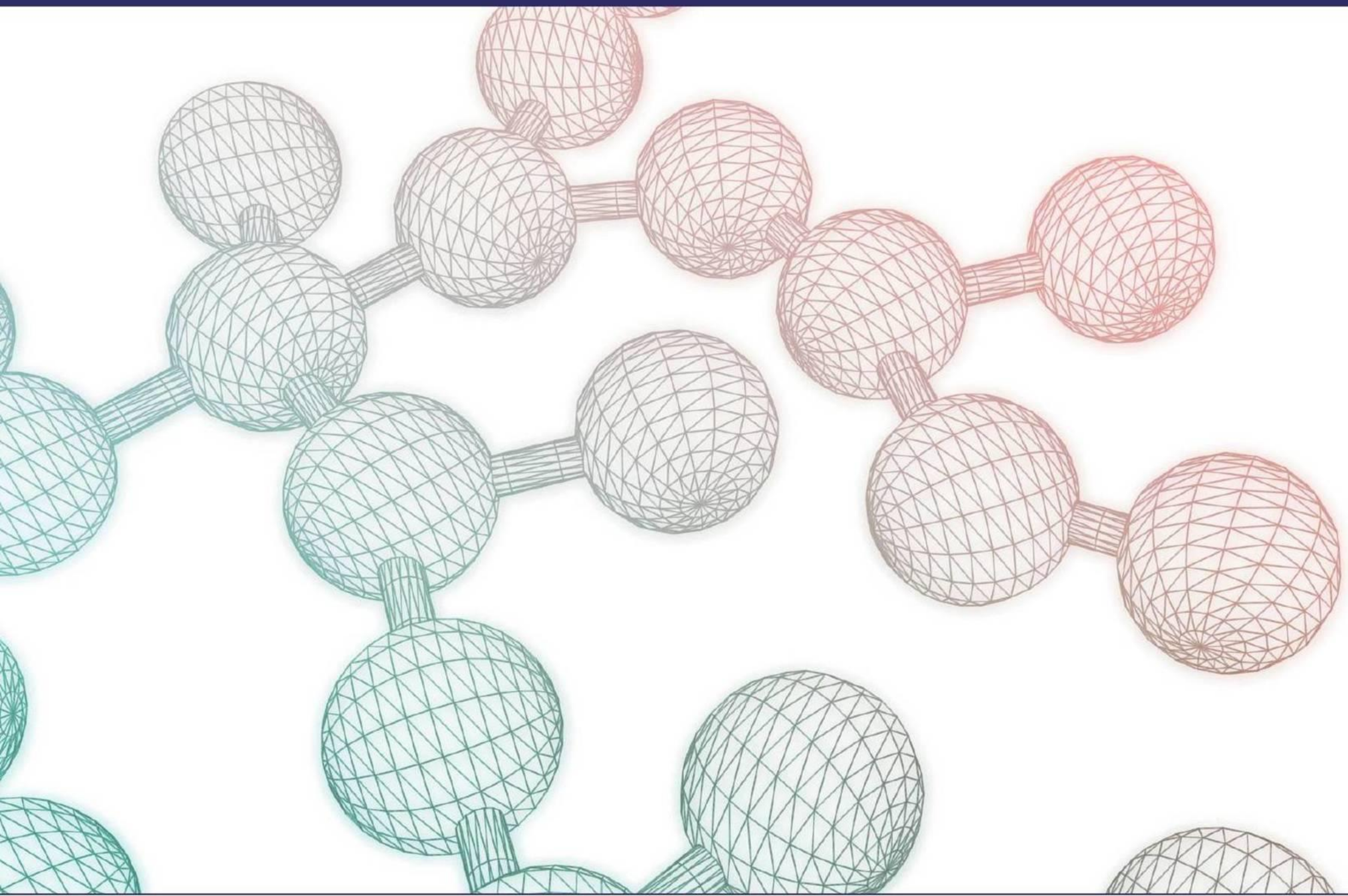
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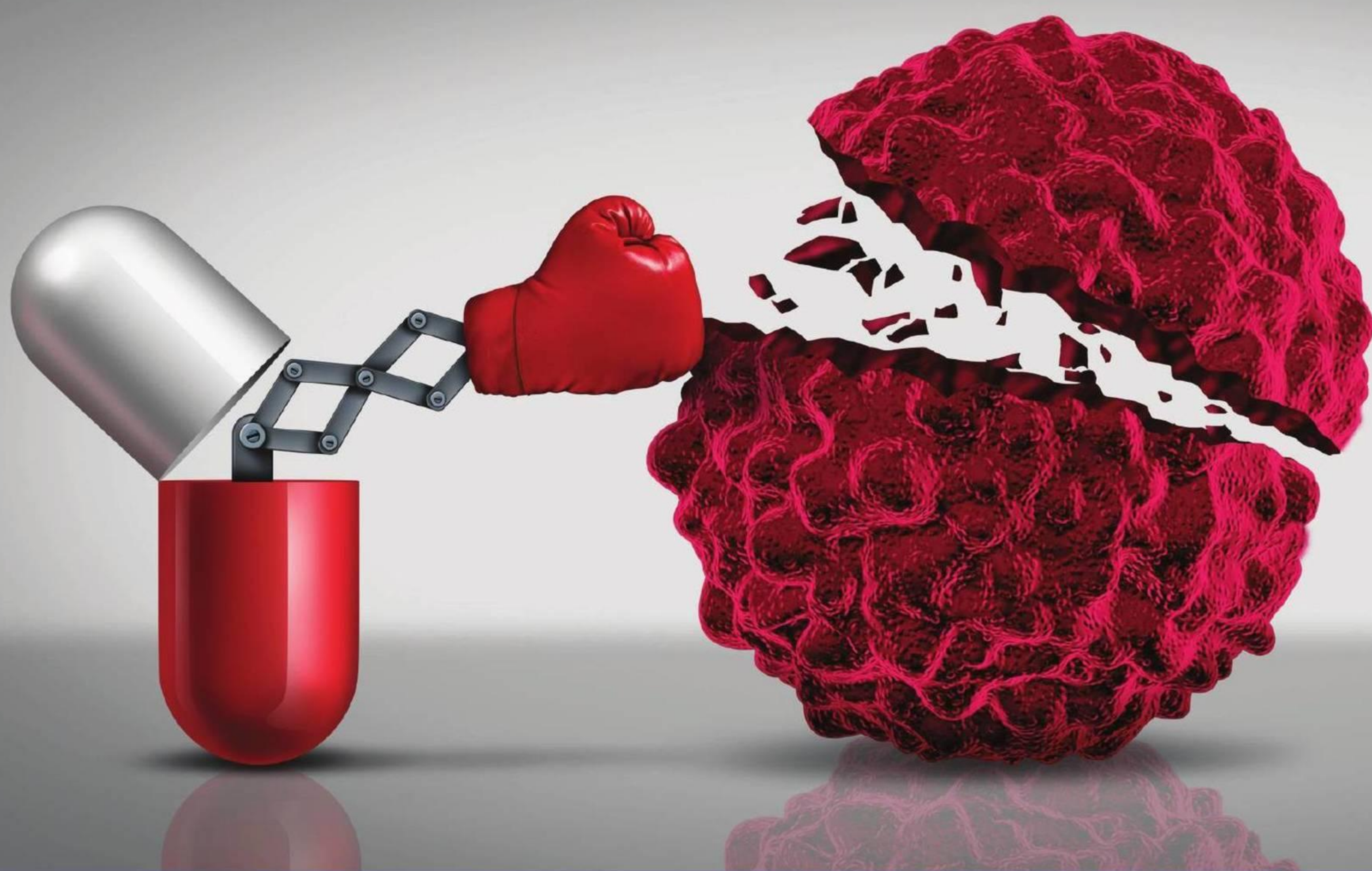
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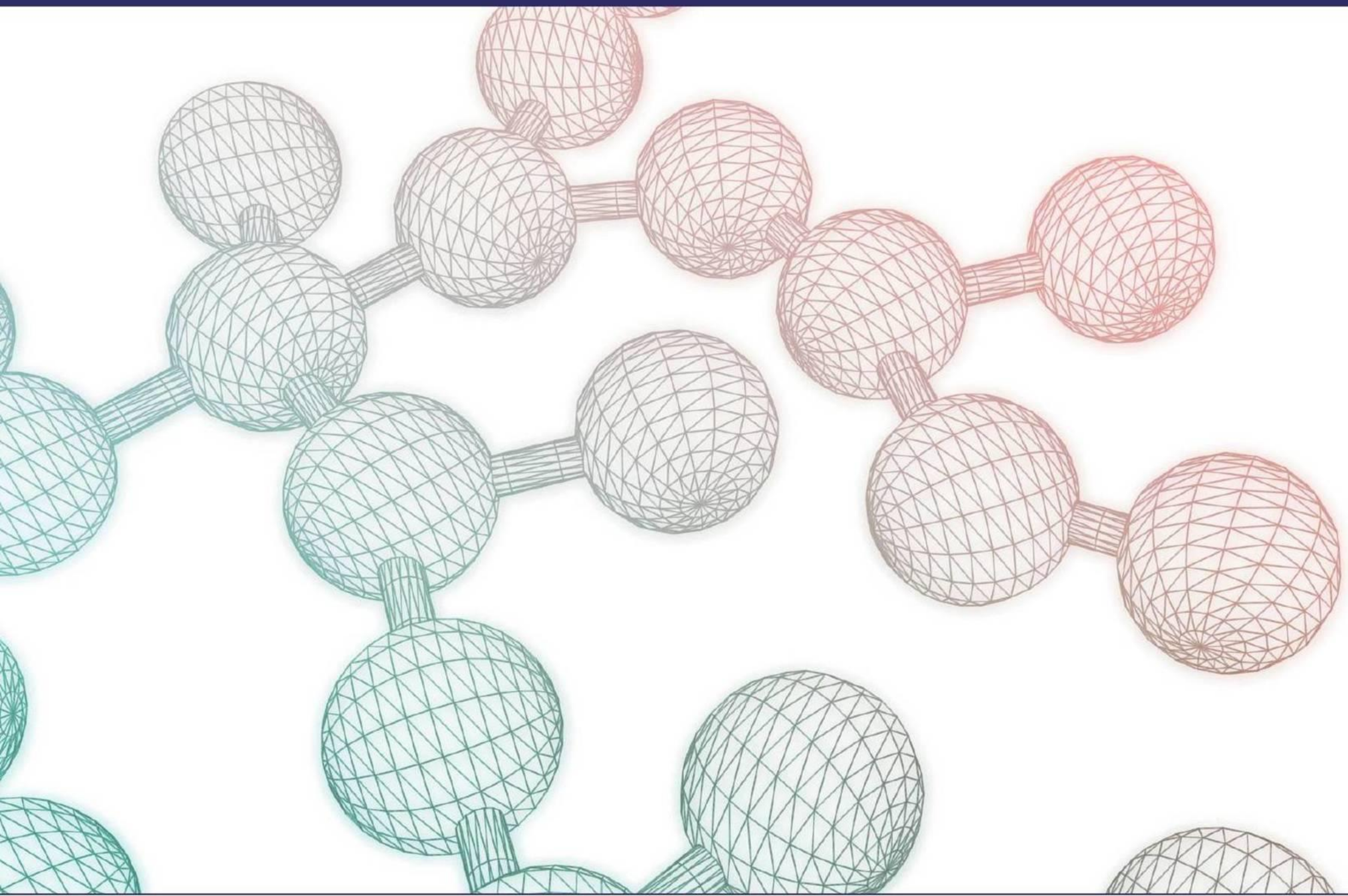
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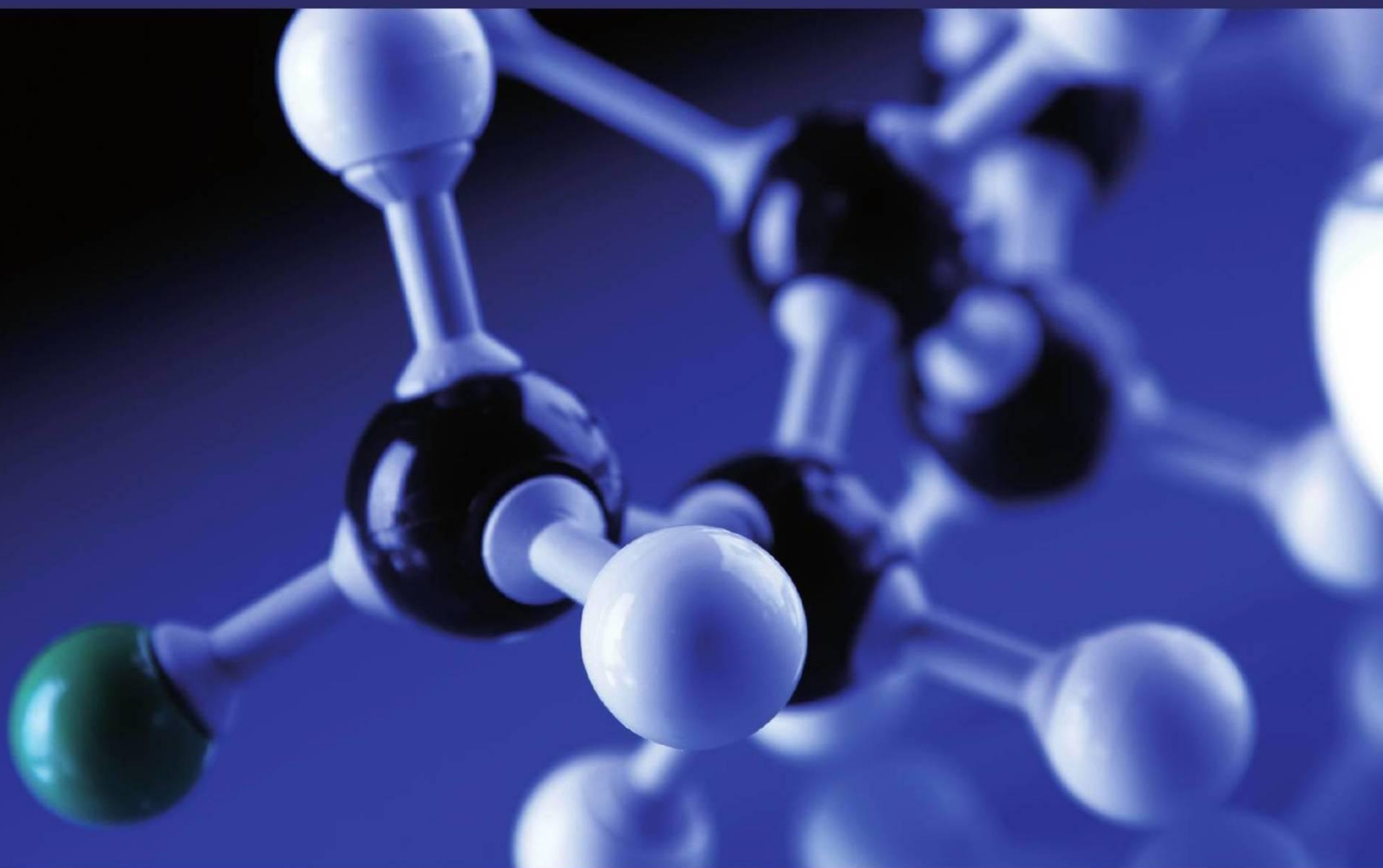
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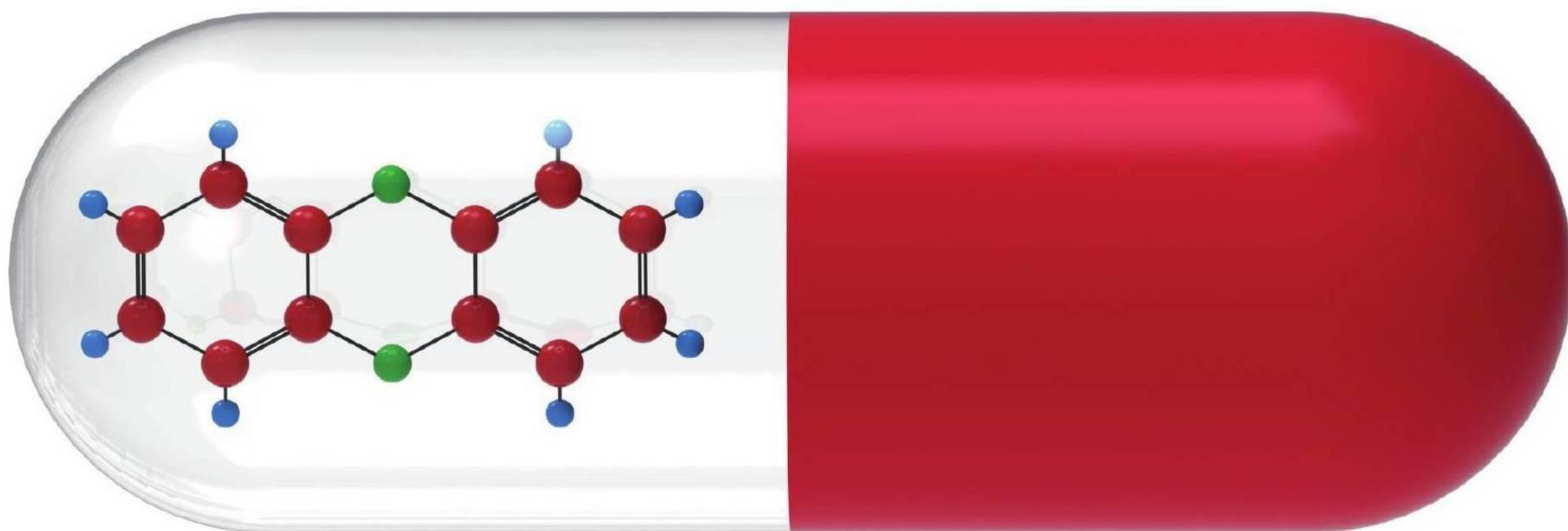
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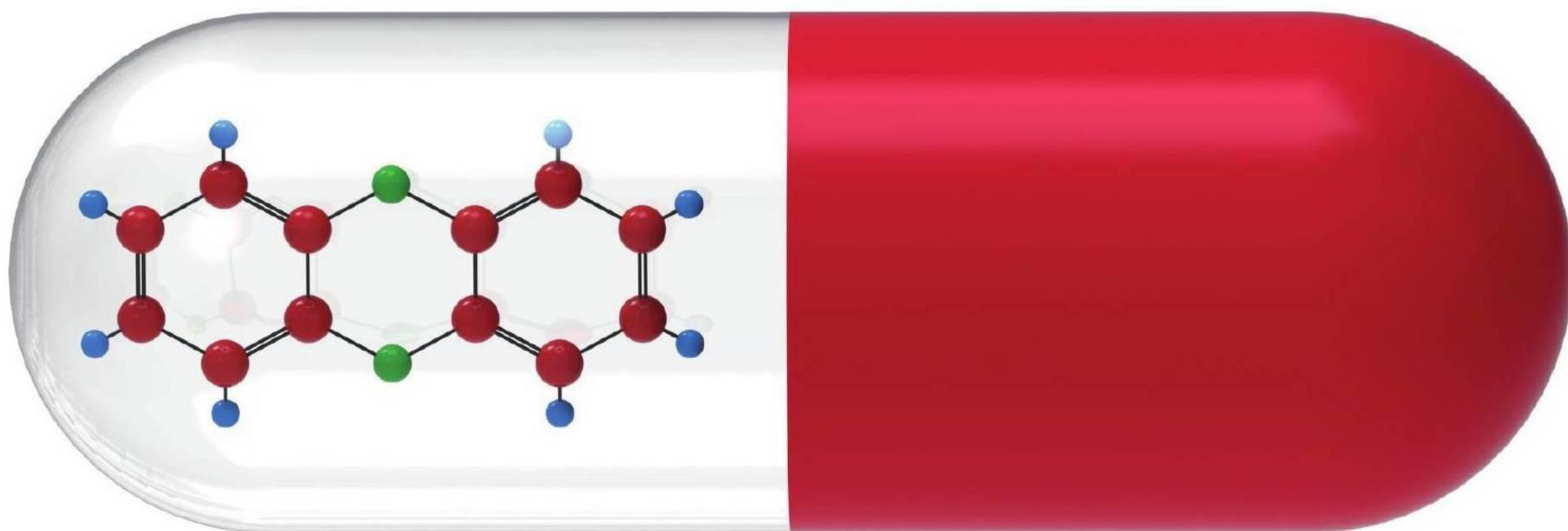
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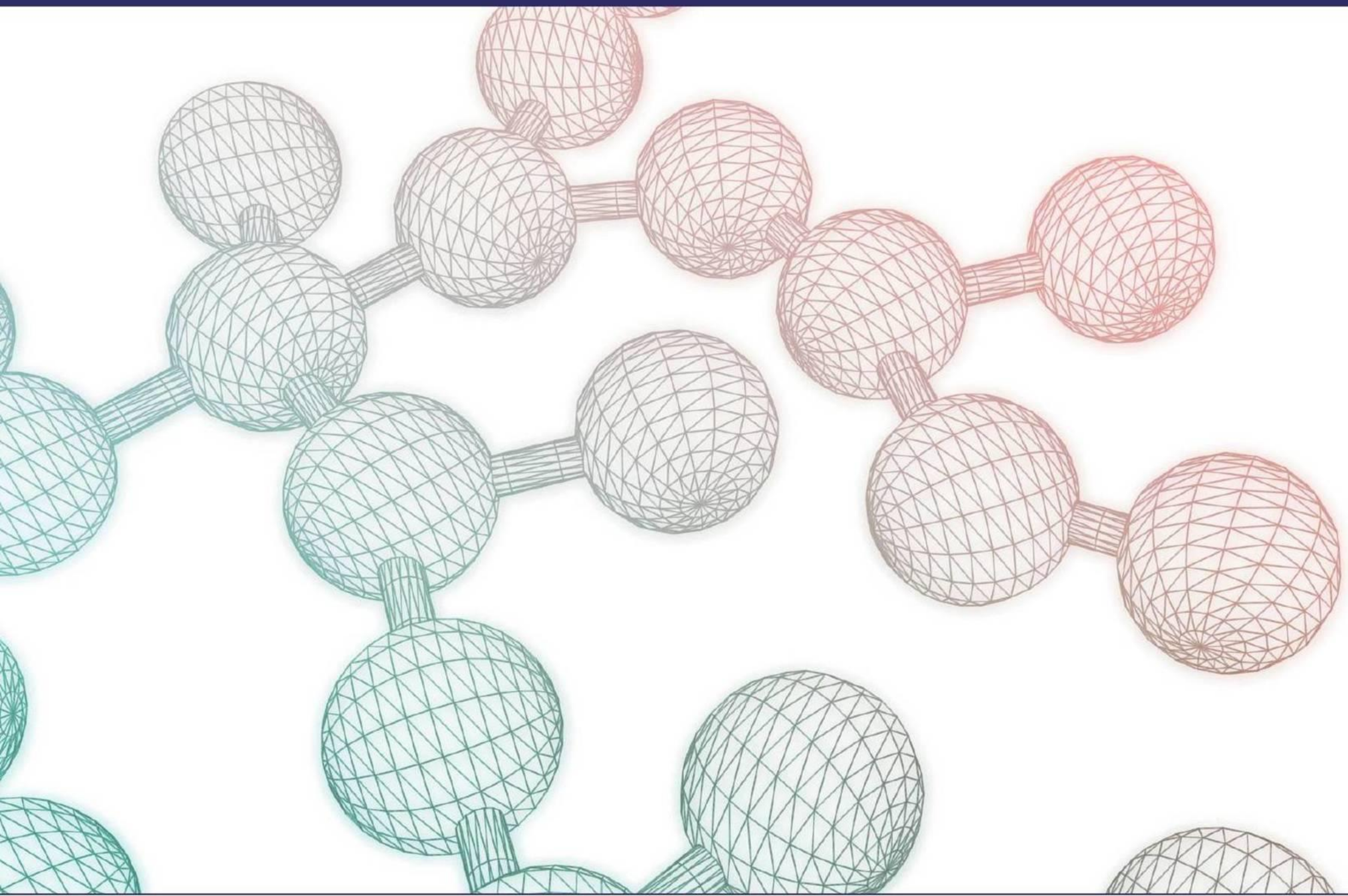
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Preface

The New Edition of College Mathematics-I (B.Sc. Sem-I) is out come of sincere and combined efforts of the authors. This book is designed to fulfill the requirements of B.Sc. First Semester students, as per new syllabus and new paper style effective from June-2019 prescribed by the Saurashtra University. The author has tried to present the subject matter in an easy understandable way without sacrificing the essential details.

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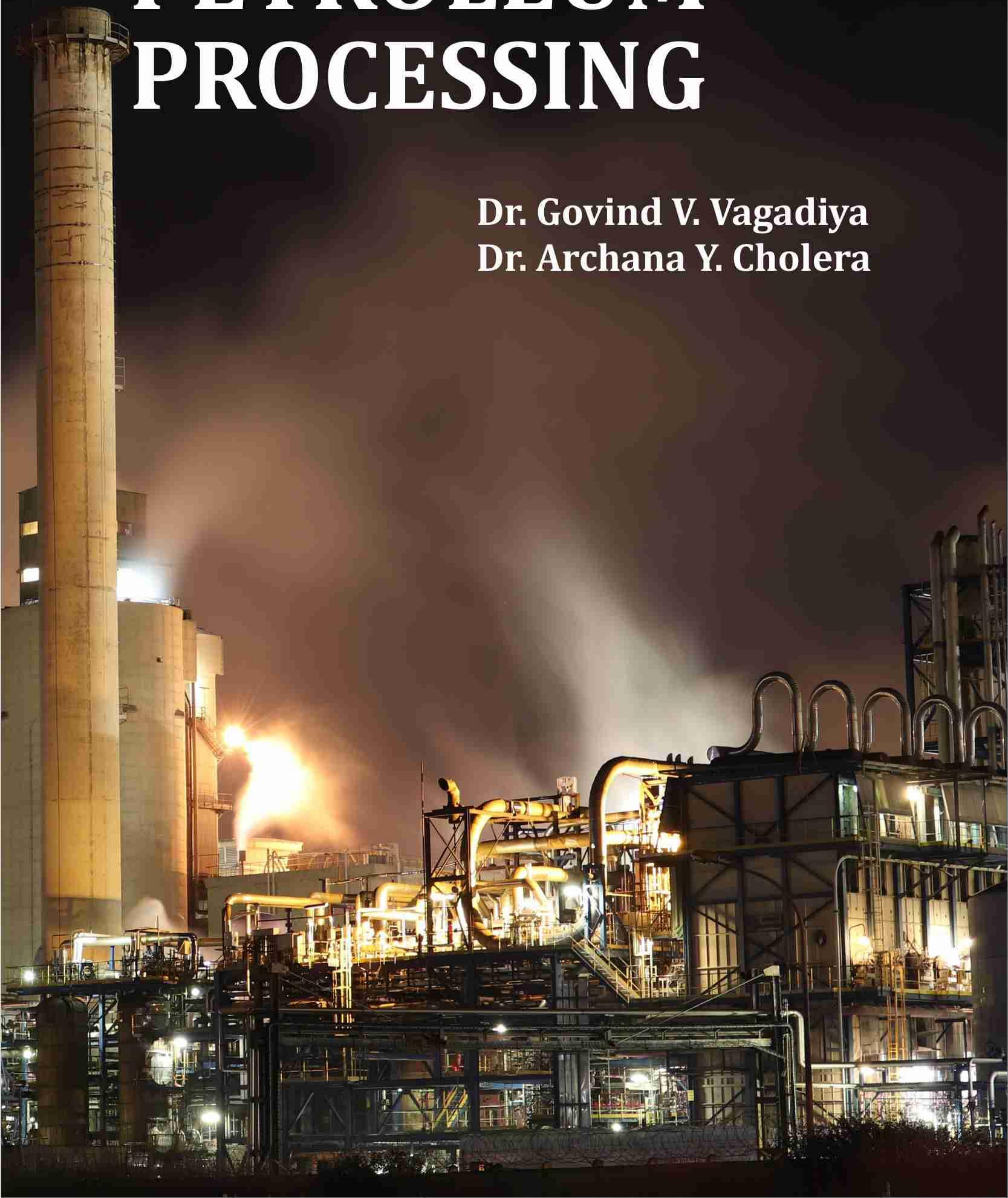
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Effect of spermine and putrescine on germination and growth of *Vigna radiate* (L.) R. Wilczek seeds

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ABSTRACT

Polyamines are polycationic hydrocarbons that are found in all plant parts that regulates growth and development. In current study, seeds treated with polyamines, spermine and Putrescine were studied to evaluate the growth and development in terms of various physiological and biochemical parameters. For this study, seeds were soaked in different strengths of Spermine and Putrescine (0.01mM, 0.1mM and 1mM) for 48 hours and distilled water was used as control. After sprouting, seeds were transferred into half strength M.S. medium and evaluated at every 48 hours for 10 days. Highest seed germination (95%) was obtained in control after 24 hours and it was observed that germination was less in higher concentrations of polyamines. Out of all treatments, 0.01mM concentration showed maximum concentration compared to 0.1mM and 1mM polyamine concentration. First leaves were observed in Putrescine and Spermine treated seeds after 24 hours whereas, first leaves in distilled water treated seeds were observed after 30 hours. Statistical analysis using One Way ANOVA and Dunn's Post hoc analysis were performed to check the relationship between protein concentration, shoot length, chlorophyll a and b content. It was observed that there is a significant relationship between total protein content and chlorophyll a and b content and also between shoot length and chlorophyll a and b content. However, no significant relationship was observed between shoot length and protein concentration. An attempt has been made to characterize protein profile using SDS-PAGE, however no distinct band was found in treated seeds compared to control.

Keywords: Polyamines, Spermine, Putrescine, *Vigna radiate*, Growth and Development

Growth promoting impact of biosynthesised silver nanoparticles (AgNPs) on *Gossypium hirsutum* and *Vigna radiata*

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ABSTRACT

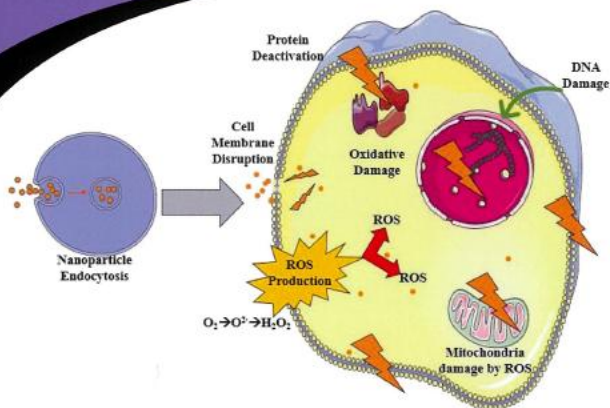
To check the impact of biosynthetic agglomerate form of AgNPs on plant growth, synthesised AgNPs was characterized by using UV- Visible spectroscopy. Antifungal assay was performed by poisoned food method and plant growth was evaluated by using shoot length (cm), Leaves (no./plant), shoot dry wt./plant (g), % seed germination and photosynthetic properties. AgNPs exhibit absorption spectra at 420 nm and showed antifungal activity against *A. niger* and *F. oxysporium*. Significant positive effect was found over *Gossypium hirsutum*. The biosynthesised AgNPs exert significant antifungal activity against *F. oxysporium*. AgNPs show positive effect over shoot length (cm), Leaves (no. /plant), shoot dry wt./plant (g), % seed germination and photosynthetic properties of both plants. The produced AgNPs was in agglomerate form and low in concentration, so they were safe for plant and environment.

Key words: Green synthesis of silver nanoparticles, Antifungal activity, plant growth promotion activity.

1. INTRODUCTION

Silver was an ancient element used in the treatment of infections^[1] The first use of silver as medicine was reported in 5000 B.C. by Caraka. The use of silver was traced back in 18th century after its use in ulcer treatment [2]. This silver showed its inhibitory action as in ionic or nanoparticle form. The silver exhibit its activity by 3 possible mechanisms as making a puncture in cell membrane, by generating reactive oxygen species and by disturbing DNA replication cycle. [3] Because of its antimicrobial property the silver was widely used in agriculture and medical sector to inhibit the growth of harmful microorganisms. In the last decade the 5000 new applications of silver containing material was investigated and most of them were nanoparticles based. [4] The production of silver nanoparticles was mainly carried

INTERFACES BETWEEN NANOMATERIALS AND MICROBES



Editors

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Sunil Kumar Khare

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Application of Microbial Technology for Waste Removal

Bavi Banjan Kumar, Chitra Bhattacharya & Nutan Prakash Vishwakarma

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Abstract

The continuous rise of waste in the environment becomes a global burden as it decreases the natural balance of waste recycle. It has further accelerated due to quality and amount of waste added in the environment in the last century. Increasing human population, introduction of xenobiotic compounds, overexploitation of natural resources and alarming increased waste generation rate are major threats to environmental safety. Several waste management practices have been implemented to decrease the harmful impacts of waste. Microorganisms are inhabitants of nature that play a major role in biodegradation, bioremediation, nutrient cycling and detoxification to maintain a sustainable environment. Microbial technology utilizes a wide range of selective microorganisms in specific condition for removal of waste from the environment. The utilization of microbes is only limited to culture-dependent method, and the majority of undiscovered microbes has also been explored using culture-independent techniques. Technological advancement has increased the exploration of microbial diversity for their utilization in solid and liquid waste management. Traditional and advanced techniques such as composting, anaerobic digestion and bioremediation techniques have been implemented in solid waste management. Waste from wastewater has been successfully removed using fixed-film processes, activated sludge, biosorption technology and microbial electrochemical technology. Notorious chemicals such as synthetic dyes and oil spillage have been also removed from wastewater using microbial technology. Microbial technology has been magnificently implemented around the world for removal of waste from the environment. This chapter represents traditional and advanced microbial technology in both solid and liquid waste treatments.

Keywords

Microbes Microbial technology Waste disposal Aerobic processes

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References

- Abadulla E, Tzanov T, Costa S, Robra KH, Cavaco-Paulo A, Gubitz GM (2000) Decolorization and detoxification of textile dyes with a laccase from *Trametes hirsuta*. *Appl Environ Microbiol* 66(8):3357–3362
- Abdulsalam S, Omale AB (2009) Comparison of biostimulation and bioaugmentation techniques for the remediation of used motor oil contaminated soil. *Brazilian Arch Biol Technol* 52(3):747–754
- Aguilera A, Souza-Egipsy V, Gómez F, Amils R (2007) Development and structure of eukaryotic biofilms in an extreme acidic environment, Rio Tinto (SW, Spain). *Microb Ecol* 53(2):294–305
- Aislabie J, Saul DJ, Foght JM (2006) Bioremediation of hydrocarbon-contaminated polar soils. *Extremophiles* 10(3):171–179
- Akpor OB, Adefani-Akande TA, Adeniyi BI (2013) The effect of temperature on nutrient removal from wastewater by selected fungal species. *Int J Curr Microbiol* 2(9):328–340
- Albrecht R, Périssol C, Ruaudel F, Le Petit J, Terron G (2010) Functional changes in culturable microbial communities during a co-composting process: carbon source utilization and co-metabolism. *Waste Manage* 30(5):764–770.
<https://doi.org/10.1016/j.wasman.2009.12.008>
- Amani T, Nosrati M, Sreerishnan TR (2010) Anaerobic digestion from the viewpoint of microbiological, chemical, and operational aspects - a review. *Environ Rev* 18(1):255–278
- Amaral AL, Da Motta M, Pons MN, Vivier H, Roche N, Mota M et al (2004) Survey of Protozoa and Metazoa populations in wastewater treatment plants by image analysis and discriminant analysis. *Environmetrics* 15(4):381–390

Arezoo D, Mohammed Maikudi U, Kang Tzin L, Rita Devi V, Nasser S, Pravin V et al (2017) Microbial aspects in wastewater treatment – a technical review. *Environ Pollut Prot* 2(2):75–84

Arous F, Jaouani A, Mechichi T (2019) Oleaginous microorganisms for simultaneous biodiesel production and wastewater treatment: a review. In: *Microbial wastewater treatment*. Elsevier, Amsterdam, pp 153–174. <https://doi.org/10.1016/B978-0-12-816809-7.00008-7>

Arumugam K, Renganathan S, Renganathan K, Sharma NK, Babalola OO (2017) Enhancing the post consumer waste management through vermicomposting along with bioinoculum. *Int J Eng Trends Technol* 44(4):179–182

Aulenta F, Catervi A, Majone M, Panero S, Reale P, Rossetti S (2007) Electron transfer from a solid-state electrode assisted by methyl viologen sustains efficient microbial reductive dechlorination of TCE. *Environ Sci Technol* 41(7):2554–2559

Ayilara MS, Olanrewaju OS, Babalola OO, Odeyemi O (2020) Waste management through composting: challenges and potentials. *Sustainability* 12(11):1–23

Azócar L, Ciudad G, Heipieper HJ, Navia R (2010) Biotechnological processes for biodiesel production using alternative oils. *Appl Microbiol Biotechnol* 88(3):621–636

Beffa T (2002) The composting biotechnology: a microbial aerobic solid substrate fermentation complex process. *HappyswissCom* [Internet], pp 1–37. http://www.happyswiss.com/compag/pdf/THECOMPOSTING_BIOTECHNOLOGY_COMPLETE.pdf

Brunner PH, Rechberger H (2015) Waste to energy - key element for sustainable waste management. *Waste Manag* 37(April 2018):3–12

Cai T, Park SY, Li Y (2013) Nutrient recovery from wastewater streams by microalgae: status and prospects. *Renew Sustain Energy Rev* 19:360–369. <https://doi.org/10.1016/j.rser.2012.11.030>

Cayllahua JEB, Torem ML (2010) Biosorption of aluminum ions onto *Rhodococcus opacus* from wastewaters. *Chem Eng J* 161(1):1–8. <http://www.sciencedirect.com/science/article/pii/S1385894710002445>

Chen KF, Kao CM, Chen TY, Weng CH, Tsai CT (2006) Intrinsic bioremediation of MTBE-contaminated groundwater at a petroleum-hydrocarbon spill site. *Environ Geol* 50(3):439–445

Conesa JA, Martín-Gullón I, Font R, Jauhainen J (2004) Complete study of the pyrolysis and gasification of scrap tires in a pilot plant reactor. *Environ Sci Technol* 38(11):3189–3194

Cripps C, Bumpus JA, Aust SD (1990) Biodegradation of azo and heterocyclic dyes by *Phanerochaete chrysosporium*. *Appl Environ Microbiol* 56(4):1114–1118

D'Annibale A, Rosetto F, Leonardi V, Federici F, Petruccioli M (2006) Role of autochthonous filamentous fungi in bioremediation of a soil historically contaminated with aromatic hydrocarbons. *Appl Environ Microbiol* 72(1):28–36

Delille D, Duval A, Pelletier E (2008) Highly efficient pilot biopiles for on-site fertilization treatment of diesel oil-contaminated sub-Antarctic soil. *Cold Reg Sci Technol* 54(1):7–18

Demirbas A (2011) Waste management, waste resource facilities and waste conversion processes. *Energy Convers Manag* [Internet] 52(2):1280–1287.

<https://doi.org/10.1016/j.enconman.2010.09.025>

Dias RL, Ruberto L, Calabró A, Lo BA, Del Panno MT, Mac Cormack WP (2015) Hydrocarbon removal and bacterial community structure in on-site biostimulated biopile systems designed for bioremediation of diesel-contaminated Antarctic soil. *Polar Biol* 38(5):677–687

Diaz LF, Savage GM (2007) Chapter 4 factors that affect the process. *Waste Manage Ser* 8:49–65

Dijkema GPJ, Reuter MA, Verhoef EV (2000) A new paradigm for waste management. *Waste Manag* 20(8):633–638

Fdez-Güelfo LA, Álvarez-Gallego C, Sales Márquez D, Romero García LI (2011) Dry-thermophilic anaerobic digestion of simulated organic fraction of municipal solid waste: process modeling. *Bioresour Technol* 102(2):606–611

Fernandes L, Lucas MS, Maldonado MI, Oller I, Sampaio A (2014) Treatment of pulp mill wastewater by *Cryptococcus podzolicus* and solar photo-Fenton: a case study. *Chem Eng J* 245:158–165. <https://doi.org/10.1016/j.cej.2014.02.043>

Finstein MS, Miller FC, Strom PF (1983) Composting ecosystem management for waste treatment. *Rev Med Suisse Romande* 103(6):347–353

Flemming H-C, Wingender J (2001) Relevance of microbial extracellular polymeric substances (EPSs) - Part II: technical aspects. *Water Sci Technol* 43(6):9–16. <https://doi.org/10.2166/wst.2001.0328>

Gandolla M, Aragno M (1992) The importance of microbiology in waste management. *Experientia* 48:362–366

Garg A, Tothill IE (2009) A review of solid waste composting process-the UK perspective. *J Dyn Soil Dyn Plant* 3(1):57–63.
http://www.ecochem.com/t_compost_faq2.html

Ghiani G, Lagarà D, Manni E, Musmanno R, Vigo D (2014) Operations research in solid waste management: A survey of strategic and tactical issues. *Comput Oper Res [Internet]* 44:22–32. <https://doi.org/10.1016/j.cor.2013.10.006>

Gonewala SS, Jardosh H (2018) Organic waste in composting: a brief review. *Int J Curr Eng Technol* 8(01):36–38

Goswami S, Syiem MB, Pakshirajan K (2015) Cadmium removal by *Anabaena doliolum* Ind1 isolated from a coal mining area in Meghalaya, India: associated structural and physiological alterations. *Environ Eng Res* 20(1):41–50

Guo X, Gu J, Gao H, Qin Q, Chen Z, Shao L et al (2012) Effects of Cu on metabolisms and enzyme activities of microbial communities in the process of composting. *Bioresour Technol* 108:140–148. <https://doi.org/10.1016/j.biortech.2011.12.087>

Gupta J, Tyagi B, Rathour R (2019) *Microbial diversity in ecosystem sustainability and biotechnological applications*. Springer, New York

Hachicha S, Sellami F, Cegarra J, Hachicha R, Drira N, Medhioub K et al (2009) Biological activity during co-composting of sludge issued from the OMW evaporation ponds with poultry manure-Physico-chemical characterization of the processed organic matter. *J Hazard Mater* 162(1):402–409

Hoeppe RE, Hinchee RE, Arthur MF (1991) Bioventing soils contaminated with petroleum hydrocarbons. *J Ind Microbiol* 8(3):141–146

Holst O, Stenberg B, Christiansson M (1998) Biotechnological possibilities for waste tyre-rubber treatment. *Biodegradation* 9(3–4):301–310

Huang B, Feng H, Ding Y, Zheng X, Wang M, Li N et al (2013) Microbial metabolism and activity in terms of nitrate removal in bioelectrochemical systems. *Electrochim Acta* 113:29–36

Iidi A, Md Nor MH, Abdul Wahab MF, Ibrahim Z (2015) Photosynthetic bacteria: an eco-friendly and cheap tool for bioremediation. *Rev Environ Sci Biotechnol* 14(2):271–285

Jiunn-Jyi L, Yu-You L, Noike T (1997) Influences of pH and moisture content on the methane production in high-solids sludge digestion. *Water Res* 31(6):1518–1524

Johnston J, LaPara T, Behrens S (2019) Composition and dynamics of the activated sludge microbiome during seasonal nitrification failure. *Sci Rep* 9(1):1–15

Kanekar P, Sarnaik S (1991) An activated sludge process to reduce the pollution load of a dye-industry waste. *Environ Pollut* 70(1):27–33

Kaouther Zaafouri AA (2014) Feasibility of a bioremediation process using biostimulation with inorganic nutrient NPK for hydrocarbon contaminated soil in Tunisia. *J Bioremediat Biodegrad* 5(4):224

Karanasios KA, Vasiliadou IA, Pavlou S, Vayenas DV (2010) Hydrogenotrophic denitrification of potable water: a review. *J Hazard Mater* 180(1–3):20–37. <https://doi.org/10.1016/j.jhazmat.2010.04.090>

Kaushik P, Malik A (2009) Fungal dye decolourization: recent advances and future potential. *Environ Int* 35(1):127–141. <http://www.sciencedirect.com/science/article/pii/S0160412008001037>

Khalid A, Arshad M, Anjum M, Mahmood T, Dawson L (2011) The anaerobic digestion of solid organic waste. *Waste Manage* 31(8):1737–1744. <https://doi.org/10.1016/j.wasman.2011.03.021>

Kumar S, Smith SR, Fowler G, Velis C, Kumar SJ, Arya S et al (2017) Challenges and opportunities associated with waste management in India. *R Soc Open Sci* 4(3):160764

Kumari D, Li M, Pan X, Xin-Yi Q (2014) Effect of bacterial treatment on Cr(VI) remediation from soil and subsequent plantation of *Pisum sativum*. *Ecol Eng* 73:404–408. <http://www.sciencedirect.com/science/article/pii/S09255857414005047>

Kutsanedzie F (2015) Maturity and safety of compost processed in HV and TW composting systems. *Int J Sci Technol Soc* 3(4):232

Larsen MB, Schultz L, Glarborg P, Skaarup-Jensen L, Dam-Johansen K, Frandsen F et al (2006) Devolatilization characteristics of large particles of tyre rubber under combustion conditions. *Fuel* 85(10–11):1335–1345

Lee MD, Swindoll CM (1993) Bioventing for in situ remediation. *Hydrobiol Sci J* 38(4):273–282

Leow CW, Van Fan Y, Chua LS, Muhamad II, Klemes JJ, Lee CT (2018) A review on application of microorganisms for organic waste management. *Chem Eng Trans* 63:85–90

Liu J, Wu Y, Wu C, Muylaert K, Vyverman W, Yu HQ et al (2017) Advanced nutrient removal from surface water by a consortium of attached microalgae and bacteria: a review. *Bioresour Technol* 241:1127–1137. <https://doi.org/10.1016/j.biortech.2017.06.054>

Louhasakul Y, Cheirsilp B, Prasertsan P (2016) Valorization of palm oil mill effluent into lipid and cell-bound lipase by marine yeast *Yarrowia lipolytica* and their application in

Ma X, Wang Y, Feng S, Wang S (2015) Comparison of four flocculants for removing algae in Dianchi Lake. *Environ Earth Sci* 74(5):3795–3804

Martins J, Peixe L, Vasconcelos V (2010) Cyanobacteria and bacteria co-occurrence in a wastewater treatment plant: absence of allelopathic effects. *Water Sci Technol* 62(8):1954–1962

Mary KV (2011) Bioremediation - an overview. *J Ind Pollut Control* 27(2):161–168

Mata-Alvarez J (2002) The biomethanization of the organic fraction of municipal solid waste. *Water* 21(October):59–61

McKinney RE (1957) Activity of microorganisms in organic waste disposal. II. Aerobic processes. *Appl Microbiol* 5(3):167–174

Miller RM, Bartha R (1989) Evidence from liposome encapsulation for transport-limited microbial metabolism of solid alkanes. *Appl Environ Microbiol* 55(2):269–274

Mishra A, Kumar S, Bhatnagar A (2019) Potential of fungal laccase in decolorization of synthetic dyes. In: *Microbial wastewater treatment*. Elsevier, Amsterdam, pp 127–151. <https://doi.org/10.1016/B978-0-12-816809-7.00007-5>

Mrozik A, Piotrowska-Seget Z (2010) Bioaugmentation as a strategy for cleaning up of soils contaminated with aromatic compounds. *Microbiol Res* 165(5):363–375. <https://doi.org/10.1016/j.micres.2009.08.001>

Muniraj IK, Xiao L, Hu Z, Zhan X, Shi J (2013) Microbial lipid production from potato processing wastewater using oleaginous filamentous fungi *Aspergillus oryzae*. *Water Res* 47(10):3477–3483. <https://doi.org/10.1016/j.watres.2013.03.046>

Ogawa T, Yatome C (1990) Biodegradation of azo dyes in multistage rotating biological contactor immobilized by assimilating bacteria. *Bull Environ Contam Toxicol* 44(4):561–566

Omokhagbor Adams G, Tawari Fufeyin P, Eruke Okoro S, Ehinomen I (2020) Bioremediation, biostimulation and Bioaugmentation: a review. *Int J Environ Bioremediat Biodegrad* 3(1):28–39

Pailard D, Dubois V, Thiebaut R, Nathier F, Hoogland E, Caumette P et al (2005) Occurrence of *Listeria* spp. in effluents of French urban wastewater treatment plants. *Appl Environ Microbiol* 71(11):7562–7566

Panswad T, Luangdilok W (2000) Decolorization of reactive dyes with different molecular structures under different environmental conditions. *Water Res* 34(17):4177–4184

Perez-García O, Escalante FME, de-Bashan LE, Bashan Y (2011) Heterotrophic cultures of microalgae: metabolism and potential products. *Water Res* 45(1):11–36

Petric I, Avdihodžić E, Ibrić N (2015) Numerical simulation of composting process for mixture of organic fraction of municipal solid waste and poultry manure. *Ecol Eng* 75:242–249

Pous N, Puig S, Balaguer MD, Colprim J (2017) Effect of hydraulic retention time and substrate availability in denitrifying bioelectrochemical systems. *Environ Sci Water Res Technol* 3(5):922–929

Rabaey K, Van De Sompel K, Maignien L, Boon N, Aelteman P, Clauwaert P et al (2006) Microbial fuel cells for sulfide removal. *Environ Sci Technol* 40(17):5218–5224

Rani N, Sangwan P, Joshi M, Sagar A, Bala K (2019) Microbes: a key player in industrial wastewater treatment. In: *Microbial wastewater treatment*. Elsevier, Amsterdam, pp 83–102. <https://doi.org/10.1016/B978-0-12-816809-7.00005-1>

Rastogi M, Nandal M, Khosla B (2020) Microbes as vital additives for solid waste composting. *Heliyon* 6(2):e03343. <https://doi.org/10.1016/j.heliyon.2020.e03343>

Rathour R, Gupta J, Kumar M, Hiloidhari M, Mehrotra AK, Thakur IS (2017) Metagenomic sequencing of microbial communities from brackish water of Pangong lake of the Northwest Indian Himalayas. *Genome Announc* 5(40):40–41

Ravikumar S, Baylon MG, Park SJ, Choi J (2017) Engineered microbial biosensors based on bacterial two-component systems as synthetic biotechnology platforms in bioremediation and biorefinery. *Microb Cell Factories* 16(1):1–10

Raza S, Ahmad J (2016) Composting process: a review. *Int J Biol Res* 4(2):102

Rogayan JD V, Tomboc EHF, Paje AV, Lim KLP, Ararro JAR, Ocampo JG, et al. *Vermiculture and vermicomposting* 2010;6(October 2010):1–23

Sani RK, Banerjee UC (1999) Decolorization of triphenylmethane dyes and textile and dye-stuff effluent by *Kurthia* sp. *Enzym Microb Technol* 24(7):433–437

Sanscartier D, Zeeb B, Koch I, Reimer K (2009) Bioremediation of diesel-contaminated soil by heated and humidified biopile system in cold climates. *Cold Reg Sci Technol* 55(1):167–173. <https://doi.org/10.1016/j.coldregions.2008.07.004>

Schliephake K, Lonergan GT (1996) Laccase variation during dye decolonisation in a 200 L packed-bed bioreactor. *Biotechnol Lett* 18(8):881–886

Schröder U, Harnisch F, Angenent LT (2015) Microbial electrochemistry and technology: terminology and classification. *Energy Environ Sci* 8(2):513–519

Shalaby EA (2011) Prospects of effective microorganisms technology in wastes treatment in Egypt. *Asian Pac J Trop Biomed* 1(3):243–248

Sharholy M, Ahmad K, Mahmood G, Trivedi RC (2008) Municipal solid waste management in Indian cities - a review. *Waste Manag* 28(2):459–467

Sheng Y, Chen F, Sheng G, Fu J (2012) Water quality remediation in a heavily polluted tidal river in Guangzhou, South China. *Aquat Ecosyst Health Manag* 15(2):219–226

Silva-Bedoya LM, Sánchez-Pinzón MS, Cadavid-Restrepo GE, Moreno-Herrera CX (2016) Bacterial community analysis of an industrial wastewater treatment plant in Colombia with screening for lipid-degrading microorganisms. *Microbiol Res* 192:313–325. <https://doi.org/10.1016/j.micres.2016.08.006>

Singh SPTG (2014) Application of bioremediation on solid waste management: a review. *J Bioremediation Biodegrad* 5(6):248

Stevenson K, Stallwood B, Hart AG (2008) Tire rubber recycling and bioremediation: a review. *Biorem J* 12(1):1–11

Tyagi M, da Fonseca MMR, de Carvalho CCCR (2011) Bioaugmentation and biostimulation strategies to improve the effectiveness of bioremediation processes. *Biodegradation* 22(2):231–241

Wang Y, Zhang W, Zhao Y, Peng H, Shi Y (2016) Modelling water quality and quantity with the influence of inter-basin water diversion projects and cascade reservoirs in the middle-lower Hanjiang River. *J Hydrol [Internet]* 541:1348–1362. <https://doi.org/10.1016/j.jhydrol.2016.08.039>

Ward AJ, Hobbs PJ, Holliman PJ, Jones DL (2008) Optimisation of the anaerobic digestion of agricultural resources. *Bioresour Technol* 99(17):7928–7940

Waszkielisz KM, Wronowski R, Chlebuz W, Białobrzewski I, Dach J, Piłarski K et al (2013) The effect of temperature, composition and phase of the composting process on the thermal conductivity of the substrate. *Ecol Eng* 61:354–357. <https://doi.org/10.1016/j.ecoleng.2013.09.024>

Wei Y, Li J, Shi D, Liu G, Zhao Y, Shimaoka T (2017) Environmental challenges impeding the composting of biodegradable municipal solid waste: a critical review. *Resour Conserv Recycling* 122:51–65. <https://doi.org/10.1016/j.resconrec.2017.01.024>

Whelan MJ, Coulon F, Hince G, Rayner J, McWatters R, Spedding T et al (2015) Fate and transport of petroleum hydrocarbons in engineered biopiles in polar regions. *Chemosphere* 131:232–240. <https://doi.org/10.1016/j.chemosphere.2014.10.088>

Wu X, Xie YB (2012) The field application of microbial technology used in bioremediation of urban polluted river. *Adv Mater Res* 518–523:2906–2911

Xu L, Yu H, Yu J, Luo H, Li Z (2017) Study on ecological remediation method of purification of rural polluted slow-flow water. 2017;3(Bep):275–282

Yang Y, Wang L, Xiang F, Zhao L, Qiao Z (2020) Activated sludge microbial community and treatment performance of wastewater treatment plants in industrial and municipal zones. *Int J Environ Res Public Health* 17(2):436

Young L, Yu J (1997) Ligninase-catalysed decolorization of synthetic dyes. *Water Res* 31(5):1187–1193

Zabaniotou AA, Stavropoulos G (2003) Pyrolysis of used automobile tires and residual char utilization. *J Anal Appl Pyrolysis* 70(2):711–722

Zhang L, Sun X (2016) Influence of bulking agents on physical, chemical, and microbiological properties during the two-stage composting of green waste. *Waste Manage* 48:115–126. <https://doi.org/10.1016/j.wasman.2015.11.032>

Zhou W, Wang W, Li Y, Zhang Y (2013) Lipid production by *Rhodosporidium toruloides* Y2 in bioethanol wastewater and evaluation of biomass energetic yield. *Bioresour Technol* 127:435–440. <https://doi.org/10.1016/j.biortech.2012.09.067>

Zissi U, Lyberatos G (1996) Azo-dye biodegradation under anoxic conditions. *Water Sci Technol* 34(5–6):495–500. [https://doi.org/10.1016/0273-1223\(96\)00684-1](https://doi.org/10.1016/0273-1223(96)00684-1)

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**LIGNEOUS PLANTS OF
JAMBUDIA VIDI**

Authors:
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A h m e d a b a d



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Desertibacillus †

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Bacilli
Bacillales
Bacillaceae

Hitarth B. Bhatt, Azmatunnisa Begum, Sasikala Chintalapati, Venkata Ramana Chintalapati, Satya P. Singh

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Abstract

De.ser.ti.ba.cil'lus. L. neut. n. *desertum*, desert; L. masc. n. *Bacillus*, a bacterial genus; N.L. masc. n. *Desertibacillus*, a Bacillus-like organism isolated from desert.

Firmicutes / Bacilli / Bacillales / Bacillaceae / *Desertibacillus*

The genus *Desertibacillus* belongs to the family Bacillaceae. Cells are aerobic, Gram-stain-positive, endospore forming, nonmotile, and rod shaped. Colonies are cream colored, round, and smooth. The growth occurs in the range of 5–20% (w/v) NaCl, optimally at 7.5%. The range of temperature and pH for the growth are 20–55°C and 7–10.5, respectively, the optima being 37°C and pH 9, respectively. The polar lipids consist of diphosphatidylglycerol, phosphatidylglycerol, and six other unknown lipids. The major fatty acids are anteiso-C_{15:0}, anteiso-C_{17:0}, C_{16:0}, and iso-C_{15:0}. The predominant menaquinone is MK-7. The peptidoglycan contains meso-diaminopimelic acid (meso-DAP) as the diagnostic diamino acid.

DNA G + C content (mol%): 48.7 (genomic).

Type species: ***Desertibacillus haloalkaliphilus*** Bhatt et al. 2017^{VP}.

References

Bhatt HB & Singh SP (2016) Phylogenetic and phenogram based diversity of haloalkaliphilic bacteria from the saline desert. In *Microbial Biotechnology: Technological Challenges and Developmental Trends*. Apple Academic Press; pp 373–386.

Bhatt HB, Begum MA, Chintalapati S, Chintalapati VR, & Singh SP (2017) *Desertibacillus haloalkaliphilus* gen. nov., sp. nov., isolated from a saline desert. *Int J Syst Evol Microbiol* 67: 4435–4442.

Bhatt HB, Gohel SD, & Singh SP (2018) Phylogeny, novel bacterial lineage and enzymatic potential of haloalkaliphilic bacteria from the saline coastal desert of Little Rann of Kutch, Gujarat, India. *3 Biotech* 8: 1–12.

Hirota K, Aino K, & Yumoto I (2016) *Fermentibacillus polygami* gen. nov., sp. nov., an alkaliphile that reduces indigo dye. *Int J Syst Evol Microbiol* 66: 2247–2253.

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