UN Sustainable Development Goals (SDGs) 2030 and Pharmaceuticals

In the year 2015, all the United Nations (UN) member States adopted Sustainable Development Goals (SDGs) 2030. There are 17 goals and the objectives of the SDGs are to bring prosperity, peace for our planet & people (https://sdgs.un.org/goals). As far as pharmaceutical sector is concerned, three of the seventeen goals could be focused.

1. Goal 9 - upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes, with all countries taking action in accordance with their respective capabilities;
2. Goal 12 - environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment;
3. Goal 13 -Climate action: These actions must also go hand in hand with efforts to integrate disaster risk measures, sustainable natural resource management, and human security into national development strategies.

These three goals suggest for development and adoption of environment friendly, green process technologies, reduction of waste generation, recycling of the chemicals, in order to reduce their adverse effects on environment and human health. The pharmaceutical manufacturing involves organic synthesis of active pharmaceutical ingredients. There is a huge scope for adopting green technologies in the pharmaceutical sector and supporting in achieving SDGs. The focus research areas of pharmaceutical and organic chemist are (i) biocatalysis/chemoenzymatic reactions, (ii) recycling of precious metal catalysts, (iii) development of green, photocatalyzed reaction, (iv) reduction, reuse of solvents, (v) use of new green solvents, (v) continuous-flow technology, (vi) atom economy concept, etc. There is also scope for using computer-based selection tools for developing process technologies with improved yield and efficiency. These new process technologies will help in reducing the environment pollution burden.

Circular Economy is a concept which deals with the value of products, materials and resources, which are maintained in the economy for as long as possible, and the generation of waste is minimized. The Pharmaceutical industries are shifting towards circular economy (https://www.efpia.eu/media/ 554663/circular-economy.pdf). European Federation of Pharmaceutical Industries and Association (EFPIA) has published White Paper on Circular Economy. It highlights the action Plan, the roadmap and the European Green Deal for the future approach to a sustainable business model based on circularity.

Many pharmaceutical giant companies like Abbott, Amgen, Johnson & Johnson, Merck and Roche have started utilizing green-chemistry in their pharmaceutical manufacturing and drug discovery processes (https://doi.org/10.1038/534027a). The familiar ranking systems such as Dow Jones Sustainability Indices and the Pacific Sustainability Index provides information about adoption of green chemistry concepts. The efficiency of a process is measured through metrics like E factor, which definesthe kilograms of waste generated per kilogram of product, or process mass intensity (PMI), which measures the total mass of materials per mass of product. The holistic approaches are investing in technologies, defining metrices, raising awareness, and recognizing the achievements.Few companies have ambitious goal like Zero Carbon programme: reduction of greenhouse gas emissions from their global operations by 98% by 2026 (https://www.astrazeneca.com/what-science-can-do/topics/sustainability/Striving-for-sustainable-drug-discovery-using-Green-Chemistry.html).

Indian Pharmaceutical companies have started adopting the sustainable manufacturing process and few of them joined American Chemical Society Green Chemistry Pharma Roundtable Institute. The ministry of Chemicals and Fertilizers, Govt. of India started promoting Green Chemistry concept (https://chemicals.gov.in/green-chemistry). The challengesin adopting green and sustainable chemistry are investment in new technologies, infrastructure, and equipment. As the demand for sustainable manufacturing is rapidly growing, the initial investment will pay the dividend in future. In summary, pharmaceutical researchers have strated developing green, sustainable chemistry and academic laboratories. Few pharmaceuticals are being manufactured with green, sustainable processes. There is enormous scope for development and adoption of sustainable process technologies in pharmaceuticals manufacturing and drug discovery processes, for achieving the SDGs 2030.

Conference cum Workshop on AI-SPARK at NIPER, SAS Nagar

Department of Pharmacoinformatics, NIPER S.A.S. Nagar organized an International Conference cum Workshop on *Artificial Intelligence Solutions for Pharmaceutical Research and Knowledge* (AI-SPARK 2023) that brought together leading researchers, experts, and industry professionals in the field of Artificial Intelligence in drug discovery and development. The conference featured diverse insightful presentations, interactive workshops, and engaging discussions, providing a unique platform for knowledge exchange and networking. The conference was held from October 9-11, 2023, at NIPER, SAS Nagar, Punjab. Hands on AI/ML training with python was held from October 10-11.

Prof. Samir K. Brahmachari, former DG, CSIR inaugurated this workshop. His lecture was on the topic "Healthcare Technologies in the AI Era: Can India Pole-vault with Soft Landing?". Later Dr. Achintaya Das (Syngene International, Bangalore) spoke on AI guided drug discovery. Dr. Gromiha (IIT, Madras) presented his work on ML and AI based method for identifying drug causing mutations. Dr. Deva Priyakumar (IIIT, Hyderabad). Subsequently lectures by Prof. Shandar Ahmad (JNU, New Delhi) on targeting toll-like receptors using data-driven biology, Mr. Deepak Seth (Charles Schawab, USA) on Generative AI, Prof. Andrew Lynn (JNU, New Delhi) on Modeling sequence evaluation, Prof. Neeraj Sharma (IIT, BHU) on AI in prosthetic devise design, Prof. Agarwal (UIET, PU, Chandigarh) on AI based for early stage detection of diseases, Mr. Narayanan (Peptris Technologies, Bengaluru) on AI for finding cure for rare diseases, Dr. Sushant Kamath (Abbott, Mumbai) on artificial intelligence in toxicology, Dr. Kumar deep Chaudhary (IGIB, New Delhi) on AI/ML in data diagnosis, Dr. S.N.H. Bukhari (NIELIT, Srinagar) on AI/ML in antigenic determinant identification, Dr. Avinash Mishra (Growdea Technologies, New Delhi) on Navigating challenges in AIDD, Dr. Tangadpalliwar (Exscientia, UK) on AI in target identification, Dr. Rajesh Singh (Sygnature Disc. UK) on Harnessing AIDD, Mr. Vishwakarma (Evotec, Germany) on AutoEncoder in chemical representation were all impressive.

Faculty members and scientists of NIPER, SAS Nagar also presented their work: Prof. Bharatam spoke on Generative Neural Networks in Drug Discovery, Prof. Garg on AI in Biomarker identification, Prof. Sobhia on AI in SBDD, Dr. Arora on ML in the treatment of RCC, Dr. Anju Sharma on NN in multi-tiered classification of enzymes.

All the participants appreciated the pioneering initiative by NIPER, SAS Nagar. A target participation figure of around 300 was achieved.

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