

# Pharmacology Must Evolve Beyond Drug Discovery to Improve Global Health

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## DESCRIPTION

Pharmacology has traditionally been recognized as the science that examines how drugs interact with living systems. While these responsibilities remain essential, I believe pharmacology should no longer be viewed solely as a laboratory based science supporting drug development. Instead, it must embrace a broader role that connects scientific discovery with patient centered care, public health, digital technologies and global healthcare equity. accordingly. The problem often lies not in the medicines themselves but in their appropriate use. Patients frequently receive multiple medications simultaneously, experience drug interactions, or discontinue therapy because of adverse effects or inadequate understanding of treatment plans. These issues highlight an important reality: Discovering effective medicines is only the beginning. Pharmacology should place greater emphasis on ensuring that medicines are prescribed, monitored and used in ways that maximize patient benefit while minimizing harm. Pharmacologists possess detailed knowledge of drug mechanisms, metabolism and therapeutic responses, yet their expertise is sometimes underutilized within healthcare systems. Greater collaboration between pharmacologists, physicians, pharmacists, nurses and other healthcare professionals could improve medication selection, reduce preventable adverse drug reactions and promote more individualized treatment strategies. Such interdisciplinary cooperation should become a routine component of healthcare rather than an occasional consultation.

Another area deserving increased attention is pharmacogenomics. Individuals often respond differently to the same medication because of inherited genetic variations affecting drug metabolism, transport and receptor sensitivity. While pharmacogenomic testing is becoming increasingly accessible, its integration into routine healthcare remains inconsistent. I believe pharmacology should actively support the translation of genetic discoveries into practical clinical tools that assist healthcare providers in selecting safer and more effective treatments. Personalized prescribing has the potential to improve therapeutic success while reducing unnecessary healthcare costs associated with ineffective therapy and medication related complications. The rapid expansion of biological medicines also

requires pharmacology to broaden its scientific perspective. Traditional pharmacological principles were largely developed around small synthetic molecules. However, modern therapeutics increasingly include monoclonal antibodies, therapeutic proteins, gene based interventions and cell therapies that exhibit distinct pharmacological characteristics. Understanding the behavior of these advanced therapies requires new experimental models, updated educational frameworks and innovative regulatory approaches. Pharmacology should continue adapting its scientific methods to remain relevant within this changing therapeutic landscape.

Artificial intelligence is another development that deserves careful consideration. Machine learning algorithms are now capable of predicting drug interactions, identifying adverse event patterns, optimizing dosage recommendations and supporting clinical decision making. Although these technologies provide valuable analytical capabilities, I believe they should complement rather than replace scientific judgment. Pharmacology has always depended on careful interpretation of experimental evidence and clinical observation. Artificial intelligence should therefore be viewed as a decision support tool that enhances human expertise instead of functioning as an independent authority. Medication safety remains one of the strongest arguments for expanding the influence of pharmacology. Adverse drug reactions continue to contribute significantly to hospital admissions, prolonged treatment and healthcare expenditure worldwide. Many of these events are preventable through improved prescribing practices, patient education and continuous monitoring. Pharmacologists should participate more actively in pharmacovigilance programs, helping healthcare systems detect emerging safety concerns and implement evidence-based interventions before widespread harm occurs. Preventing medication related complications is as valuable as developing new therapeutic agents. Another issue that deserves greater discussion is the unequal global availability of essential medicines. Scientific advances have produced remarkable therapeutic innovations, yet many patients continue to lack reliable access to affordable treatment. Pharmacology should contribute not only to drug innovation but also to discussions surrounding medicine accessibility, rational prescribing and sustainable pharmaceutical policies.

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**Received:** 03-Oct-2025, Manuscript No. EOED-25-43915; **Editor assigned:** 06-Oct-2025, PreQC No. EOED-25-43915 (PQ); **Reviewed:** 20-Oct-2025, QC No. EOED-25-43915; **Revised:** 27-Oct-2025, Manuscript No. EOED-25-43915 (R); **Published:** 03-Nov-2025, DOI: 10.35841/2329-6631.25.14.258

**Citation:** Carter L (2025). Pharmacology Must Evolve Beyond Drug Discovery to Improve Global Health. J Develop Drugs. 14:258.

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