

# Molecular Switches As Therapeutic Targets, Drug Development, Drug Delivery Mechanism & Application By Indications Insight 2025

https://marketpublishers.com/r/MEF21424A245EN.html

Date: January 2025 Pages: 150 Price: US\$ 3,300.00 (Single User License) ID: MEF21424A245EN

# **Abstracts**

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Molecular Switches As Therapeutic Targets, Drug Development, Drug Delivery Mechanism & Application By Indications Insight 2025 Research Insights:

Top 20 Drugs Sales Targeting Molecular Switches: 2022 - 2024

Molecular Switches Significance In Regenerative Medicine & Nanomedicine

Molecular Switches Significance In Drug Delivery & Release

Molecular Switches Significance As Therapeutic Targets

Molecular Switches In Cancer Therapeutics: Breast Cancer, Prostate Cancer, Lung Cancer, Colorectal Cancer, Gastric Cancer

Molecular Switches In Neurological Disorder: Parkinson's Disease, Alzheimer's Disease, Multiple Sclerosis

Molecular Switches In Autoimmune & Inflammatory Disorder: Diabetes, Arthritis, Lupus, Psoriasis

Molecular switches are dynamic entities capable of transitioning between distinct states in response to specific environmental or biological triggers. These triggers can include



changes in pH, light exposure, temperature, redox conditions, or the presence of certain ions or biomolecules. The concept of molecular switching has significantly influenced the medical and pharmaceutical domain by providing a foundation for highly controlled diagnostic and therapeutic systems. The ability to precisely regulate biological responses has made molecular switches indispensable in the development of advanced drug delivery systems, real-time diagnostic tools, and personalized therapeutic interventions.

In the pharmaceutical sector, molecular switches have revolutionized drug delivery by enabling precise spatiotemporal control over the release of active pharmaceutical ingredients. One of the most widely explored triggers is pH, as pathological conditions like cancer and inflammation often create acidic microenvironments. pH-sensitive molecular switches are employed in nanoparticle-based drug carriers, which remain stable under normal physiological conditions but disassemble in acidic environments to release their payload. For example, the FPBC@SN nanoparticle system integrates a pH-sensitive molecular switch to target acidic cytoplasm in breast cancer cells. This system releases both sorafenib, which induces ferroptosis, and an IDO inhibitor to enhance tumor immunity. By leveraging such switches, these systems reduce off-target effects and enhance the therapeutic index, addressing key challenges in oncology.



# Contents

#### **1. INTRODUCTION TO MOLECULAR SWITCHES**

- 1.1 Overview
- 1.2 History & Emergence In Medicine

#### 2. MOLECULAR SWITCHES CLINICAL SIGNIFICANCE IN MEDICINE

#### 3. MOLECULAR SWITCHES SIGNIFICANCE IN DRUG DELIVERY & RELEASE

- 3.1 Overview
- 3.2 Ongoing Research & Developments

#### 4. MOLECULAR SWITCHES SIGNIFICANCE AS THERAPEUTIC TARGETS

#### 5. MOLECULAR SWITCHES - BROAD CLASSIFICATION

#### 6. MOLECULAR SWITCHES BY CANCER INDICATION

- 6.1 Breast Cancer
- 6.2 Prostate Cancer
- 6.3 Colorectal cancer
- 6.4 Lung Cancer
- 6.5 Gastric Cancer

#### 7. MOLECULAR SWITCHES BY NEUROLOGICAL DISORDER

- 7.1 Parkinson's Disease
- 7.2 Alzheimer's Disease
- 7.3 Multiple Sclerosis

#### 8. MOLECULAR SWITCHES BY INFECTIOUS DISEASE

- 8.1 Viral Infection
- 8.2 Bacterial Infection

#### 9. MOLECULAR SWITCHES BY AUTOIMMUNE & INFLAMMATORY DISORDER

Molecular Switches As Therapeutic Targets, Drug Development, Drug Delivery Mechanism & Application By Indicati...



- 9.1 Diabetes
- 9.2 Arthritis
- 9.3 Lupus
- 9.4 Psoriasis

# **10. MOLECULAR SWITCHES BY CARDIOVASCULAR DISEASE**

10.1 Myocardial Infarction (Heart Attack)10.2 Others

# 11. MOLECULAR SWITCHES SIGNIFICANCE IN REGENERATIVE MEDICINE

# 12. SALES INSIGHT OF KEY DRUGS TARGETING MOLECULAR SWITCHES

# **13. MOLECULAR SWITCHES IN DRUG FORMULATION**

- 13.1 Smart Drug Formulations & Molecular Switches
- 13.2 Biomaterial Based Drug Delivery Systems
- 13.3 Self Regulating Drug Systems

# **14. CURRENT TRENDS & EMERGING TECHNOLOGIES**

- 14.1 Molecular Switches In Nanomedicine
- 14.2 Innovations In Responsive Drug Systems
- 14.3 Integration With Artificial Intelligence & Machine Learning

# **15. FUTURE PERSPECTIVES & DIRECTIONS**

15.1 Advancements In Molecular Switch Technology
15.2 The Future Of Personalized Medicine With Molecular Switches
15.3 Potential Impact On Drug Discovery & Therapeutics
Figure 1-1: Molecular Switches - Introduction
Figure 1-2: Molecular Switches – Emergence & Evolution
Figure 3-1: Molecular Switches In Drug Delivery & Release
Figure 3-2: Drug Delivery Systems With Molecular Switches
Figure 3-3: Peptide-Based Drug Delivery System
Figure 3-4: Switchable Molecular Tweezers
Figure 3-5: Rotaxane-Based Drug Delivery System



Figure 3-6: Enzyme-Activatable Drug Delivery System

- Figure 3-7: Light-Responsive Drug Delivery Systems
- Figure 3-8: Photo-Responsive Drug Delivery Using Spiropyran

Figure 3-9: Photopharmacological Approach For Neuropathic Pain

Figure 3-10: Insulin Prodrug Activation

Figure 6-1: AR Activation & Its Dual Role In Tumor Growth

Figure 6-2: PRL-3 Activation & AMPI-109's Impact On TNBC

Figure 6-3: Molecular Switch in Prostate Cancer

Figure 7-1: PINK1-Parkin Molecular Switch In Parkinson's Disease

- Figure 8-1: Molecular Switches In Viral infections
- Figure 11 1: Molecular Switches In Regenerative Medicine
- Figure 13-1: Smart Drug Delivery With Molecular Switches
- Figure 13-2: Biomaterial Based Drug Delivery Systems With Molecular Switches
- Figure 13-3: Self-regulating Drug Systems With Molecular Switches
- Figure 14-1: Molecular Switches In Nanomedicine
- Figure 14-2: Molecular switches In Responsive Drug Systems
- Figure 14-3: Integration Of Molecular Switches With Artificial Intelligence & Machine Learning
- Table 1-1: Traditional v/s Molecular Switch Enabled Drug Delivery
- Table 4-1: Examples Of Approved Drugs Targeting Molecular Switches
- Table 5-1: Molecular Switches Broad Classification
- Table 12-1: Top 20 Drugs Targeting Molecular Switches (US\$ Billion), 2022-2024



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