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Review Article

Biomedicine Potentials in Lighting up Deep Layers of Psychiatric Disorders Medication

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Abstract

Background: Biomedicine has increasingly become a crucial tool in unraveling the complex biological mechanisms underlying psychiatric disorders, offering new pathways for developing targeted pharmacological therapies. This review aims to provide a comprehensive overview of how recent advancements in various biomedical fields contribute to understanding and treating psychiatric conditions.

Methods: This review focuses on examining cutting-edge techniques in neuroimaging, genetics, transcriptomics, proteomics, and epigenetics, all of which have significantly advanced our comprehension of the pathophysiology of psychiatric disorders.

Results: Genetic studies, coupled with transcriptomic and proteomic analyses, offer deeper insights into the molecular underpinnings of conditions such as schizophrenia, depression, and bipolar disorder. Epigenetic research also reveals how environmental factors can influence gene expression and contribute to the onset and progression of psychiatric diseases. These advancements have led to the identification of novel therapeutic targets, opening the door for more precise and individualized treatment alternatives. By leveraging these multi-omic approaches, clinicians are now better equipped to design personalized treatment regimens, improving the efficacy and minimizing the side effects of psychiatric medications.

Conclusion: In general, the integration of state-of-the-art omics technologies is revolutionizing the way we understand psychiatric disorders, offering transformative insights that pave the way for more effective, personalized treatment strategies.

Keywords: Biomedicine, Psychiatric disorders, Drug

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Introduction

Biomedicine is known as a branch of medical sciences through which biological and physiological principles are applied in clinical practices. Indeed, biomedicine generally states that all the causes of diseases and the mechanisms of action for different treatment methods are based on biological processes.[1] More precisely, biomedicine is the study of the human body at the tissue, cellular, and biochemical levels, in addition to investigating the interactions between human tissues with each other and with cells, as well as their biochemical interactions with drugs, external stimuli, and other organisms and microorganisms.[2] In brief, medicine mainly examines diseases and the methods of their treatment, while biomedicine explores the biological basics of the human body and the processes involved in diseases and employs the findings in prevention, drug design, and treatments.[3] When it comes to psychiatric disorders, biomedicine plays a crucial role in the development and use of medications. Psychiatric disorders are complex conditions that involve disturbances in mood, cognition, behavior, and overall mental well-being.[4] Biomedicine contributes to the understanding of these disorders by investigating the underlying biological factors that contribute to their development, including studying the genetic, neurochemical, and neurobiological aspects of psychiatric disorders.[5] In the context of medication, biomedicine has been instrumental in the development of psychotropic drugs, which are medications that target the brain and affect mood, thoughts, and behavior. These drugs are designed to correct imbalances or dysfunctions in the brain's neurotransmitter systems, which are known to play a role in psychiatric disorders.[6] One example of a class of medications used in psychiatric disorders is

antidepressants. Biomedicine has contributed to the development of selective serotonin reuptake inhibitors (SSRIs), which are commonly prescribed for the treatment of depression and anxiety disorders. SSRIs work by increasing the availability of serotonin, a neurotransmitter associated with mood regulation, in the brain.[7]

Antipsychotics are another class of medications utilized in the treatment of psychiatric disorders. Biomedicine has played a part in the development of both first-generation (typical) and second-generation (atypical) antipsychotics.[8] These medications primarily target dopamine receptors in the brain and are used to manage symptoms of conditions such as schizophrenia and bipolar disorder.[9]

Furthermore, biomedicine has played a crucial role in advancing our understanding of the underlying neurobiology of psychiatric disorders. This has led to the identification of new drug targets and the development of novel medications.[10] Researchers have been investigating the role of glutamate, a major excitatory neurotransmitter, in conditions such as major depressive disorder (MDS) and obsessive-compulsive disorder, leading to the development of drugs that modulate the glutamate system.[11,12]

Biomedical psychiatry is built on the comprehensible body of theories, research, and clinical data and constantly benefits from major scientific advances in neurophysiology, pharmacology, molecular biology, and genetics. It is currently well approved that basic biological mechanisms are a vital part of the biological studies of psychiatric disorders.[13] They offer molecular tips that can later be considered biomarkers or molecular targets for the development of novel drugs. Identifying the genes, pathways, and types of cells associated with these diseases will significantly help treat or design medications with fewer side effects.[14]

In this regard, this study will provide an overview of several biomedical psychiatry approaches that hold the potential to yield groundbreaking psychiatric drugs.

Next-Generation Sequencing

DNA sequencing is the method of defining the order of nucleotides in DNA (nucleic acid sequence). After sequencing, the sequences of healthy and mutated DNAs are compared and characterized, which can be applied to direct patient treatment. The first steps of DNA sequencing were taken in 1970 through a location-specific primer extension strategy. So far, several new methods have been developed for DNA sequencing, all called the "next-generation" or "second-generation" sequencing (NGS) methods. NGS technology is well known to be highly scalable, making the simultaneous sequencing of the entire genome possible.[15]

NGS technology has provided promising alternatives for researchers to look for new comprehensions into health, medications, and personalized medicine.[16] NGS has emerged as a powerful tool in psychiatric medication development. At present, NGS is involved in the global determination of genes that influence brain activity.[17] It provides new insights into the genetics of underlying psychiatric disorders, owing to the number and variety of variants that it can uncover. The applications of NGS extend from unraveling the genetic architecture of psychiatric disorders to facilitating personalized treatment approaches and identifying novel drug targets.[18] Integrating NGS technologies into psychiatric research and clinical practice has the potential to revolutionize the field, leading to improved therapeutic strategies and better outcomes for individuals with psychiatric disorders.[19]

NGS has enabled large-scale genomic studies, such as genome-wide association studies and whole-exome sequencing, providing valuable insights into the genetic basis of psychiatric disorders.[20] Whole-exome sequencing, as one of the NGS methods, analyzes the coding regions of thousands of genes at once. Thereafter, it is capable of decrypting most complex psychiatric traits. It is noteworthy that accuracy and caution in data interpretation are essential for the clinical application of NGS. These studies have identified novel risk variants, rare mutations, and gene pathways associated with specific disorders, offering potential targets for drug development.[21]

Moreover, NGS facilitates pharmacogenomics research by identifying genetic variants that influence drug response and metabolism. Pharmacogenomics studies utilizing NGS have revealed genetic predictors of antidepressant efficacy, antipsychotic side effects, and treatment resistance. This information can guide clinicians in selecting appropriate medications and dosages tailored to an individual's genetic profile, ultimately improving treatment outcomes.[22]

NGS-based transcriptomics and epigenetics studies have shed light on gene expression patterns and regulatory mechanisms underlying psychiatric disorders. Potential drug targets and pathways have been identified by comparing gene expression profiles of affected individuals and healthy controls. NGS also aids in understanding the impact of genetic variants on gene regulation, providing insights into disease mechanisms and potential therapeutic interventions.[23]

Microarray Applications in Psychiatry

Microarrays are used for the simultaneous detection of expression levels of thousands of genes. DNA microarrays consist of microscope slides that are printed collections of tiny DNA spots in defined positions, whereas each spot contains a known DNA sequence or gene.[23] Although currently NGS provides an appreciated source of information on single-nucleotide variants, microarray-based comparative genomic hybridization techniques, in conjunction with cytogenetic techniques, remain the most honored devices for the detection of structural variants. It is well proven that structural variants are risk factors for several psychiatric disorders, including schizophrenia, autism spectrum disorder (ASD), substance use disorder,

intellectual disability, attention deficit hyperactivity disorder, and developmental delay.[24] For instance, microdeletions in chromosome 22q11 are significantly frequent among schizophrenia patients.[25]

Furthermore, focusing on networks of genes or microRNAs, rather than addressing the single effects of genes, may provide a promising stand for the causes of complex psychiatric conditions. Now, the nobility of analyzing gene networks to reveal the molecular basis of mental conditions is well documented.[26] Although single-gene signals provide some valuable information, they primarily lose detailed points and possible interconnections.[27] In contrast, network analysis is more revealing by focusing on complex sets of genes, transcriptional regulatory networks, protein-protein interactions, metabolic networks, gene regulatory networks, and the interactions between these networks, which can open an avenue to novel drug development.[28,29] Hence, many researchers have been deeply interested in establishing a "network psychiatry" by linking genomics, epigenetics, transcriptomics, and proteomics to identify all genetic contributors to a condition at all levels, from a single cell to the entire brain.[30,31] It is worth mentioning that the prevalence of alternative splicing is higher in the brain than in other organs; therefore, transcriptional data analysis as a feature of the network approach serves as a promising tool in favor of psychiatric disorders. Moreover, analyzing co-expressed genes and their associations with mental disorders may yield innovative and unforeseen roads for diagnosis and treatment, as well as personalized medicine.

Biomedicine approaches can also illuminate how gene expression regulators, along with chemical or epigenetic changes, can alter gene expression and how these regulatory factors change during brain development in different regions.[32] Although several studies have been conducted in this area, they do not provide a conclusive answer to how genetic changes play a role in mental diseases. Owing to the focus on the biological function of the nervous system, biomedical psychiatry is of particular importance in the development of novel drug-based therapies for mental disorders.[33] Consequently, targeted drugs can be designed to have fewer drawbacks and overcome treatment-resistant issues.

Molecular Targets in Biomedical Psychiatry

To date, extensive studies have been performed on molecular mechanisms, animal models, biological markers, advanced methods of diagnosis and treatment, and drug production, as well as genetic and epigenetic effects in the field of psychiatry.[34] Novel achievements that have led to the introduction of molecular target tools for psychiatric disorders will be briefly overviewed in this study.

Biomedical psychiatry investigations changed the basic concept of neurotransmitters and presented more than a hundred discrete molecules as neurotransmitters/neuropeptides. D-serine is an amino acid found in the brain known as an atypical neurotransmitter due to its origin.[35] Many studies have shown that it has exclusive neurotransmitter characteristics as well as promising impacts on psychiatric disorders. D-serine has already emerged as the main subject of several studies on mental disorders, especially schizophrenia.[36] It has also provided hints to the development of new antipsychotic approaches.

The same can be stated for other so-called atypical neurotransmitters such as nitric oxide, monoxide, and hydrogen sulfide. Recent studies have introduced nitric oxide as a pathogenic factor in psychiatric disorders and the target of several investigations.[37] Moreover, biological studies in psychiatry have presented several corticosteroid receptors as targets for the management of psychiatric disorders.[38] Among them, the mechanisms of action of the mineralocorticoid and glucocorticoid receptors, as well as targeting them in mental disorders, are required to be addressed in future studies.

It is well documented that the *disrupted-in-Schizophrenia 1* gene is a risk factor for psychiatric disorders, and it is involved in several conditions from schizophrenia to major depression.[39] Disrupted-in-Schizophrenia 1 is a hub protein of neuro-signaling.[40] Therefore, more thorough studies on its function and its protein-protein interactions seem to be necessary for managing psychiatric disorders and designing novel drugs.

In a study, researchers demonstrated that intranasal oxytocin administration improved social cognition in individuals with schizophrenia, reducing the social withdrawal often associated with the condition. Similarly, trials involving oxytocin for children with ASD have shown improvements in social behaviors and communication skills, suggesting the potential for enhancing social functioning in these populations. Despite these encouraging results, oxytocin-based treatments remain in the experimental stage, with ongoing trials to determine the optimal dosing, safety, and long-term effects.[41]

A more recent development in the treatment of schizophrenia has been the introduction of aripiprazole, an atypical antipsychotic that functions as a partial agonist at the D2 receptor.[42] Aripiprazole's unique mechanism, acting as an agonist and an antagonist depending on the local concentration of dopamine, helps alleviate the symptoms of schizophrenia while minimizing some of the side effects observed with traditional antipsychotics. Aripiprazole has become an important tool in the management of schizophrenia, especially when patients do not respond to first-generation antipsychotics. Ongoing research is also exploring novel D2 receptor modulators that can better target specific dopaminergic pathways involved in schizophrenia without affecting others to improve both efficacy and side-effect profiles.[43]

A randomized clinical trial revealed that a single dose of psilocybin, combined with psychotherapy, led to significant reductions in depressive symptoms in patients with major depression. The trial's results were

so promising that the US Food and Drug Administration granted breakthrough therapy status to psilocybin for treatment-resistant depression, accelerating its development.[44] Additionally, research in the treatment of post-traumatic stress disorder has shown that psilocybin can help patients confront traumatic memories in a therapeutic context, offering new hope for those with chronic trauma-related disorders.[45] Psilocybin's success has spurred further exploration of other psychedelic substances, such as lysergic acid diethylamide and dimethyltryptamine, as potential treatments for various psychiatric disorders, with ongoing studies into their mechanisms of action and safety profiles.

It is noteworthy that one of the most well-known examples of molecular targeting in psychiatric drug development is the use of SSRIs in the treatment of depression. Depression has long been associated with the dysregulation of serotonin, a neurotransmitter that plays a key role in mood regulation, sleep, and appetite.[46] SSRIs, such as fluoxetine and sertraline, work by specifically targeting the serotonin transporter, which is responsible for reabsorbing serotonin from the synaptic cleft after its release.[47] By inhibiting the reuptake of serotonin, SSRIs increase the levels of this neurotransmitter in the brain, helping to restore normal mood function. This class of drugs has become one of the most widely prescribed treatments for depression due to their efficacy and relatively favorable side-effect profiles compared to older antidepressants such as tricyclics. The development of SSRIs was a major step forward in psychiatric treatment, as it was based on a clear molecular understanding of how serotonin imbalance contributes to depression.[48] However, ongoing research continues to refine these treatments, focusing on optimizing their effects while reducing side effects such as sexual dysfunction and weight gain.

Targeted Drug Delivery Systems

Targeted drug delivery systems (TDDSs) have gained significant attention as innovative approaches to enhance the efficacy and safety of medications for psychiatric disorders.[49] Researchers are exploring innovative drug delivery systems that specifically target brain regions or neural circuits implicated in psychiatric disorders. Examples include nanoparticle (NP)-based drug carriers, implantable devices, and transcranial magnetic stimulation (TMS), which can modulate brain activity and potentially alleviate symptoms.[50] TMS is a non-invasive technique that uses magnetic fields to stimulate specific brain regions.[51] In addition to its therapeutic effects, TMS can also serve as a targeted drug delivery method.[52] Using magnetic NPs or liposomes loaded with drugs, TMS can facilitate the targeted release of medications to specific brain areas.[53] This approach has the potential to enhance drug delivery efficiency while minimizing systemic exposure.

NP-based drug carriers, such as liposomes, polymeric NPs, and dendrimers, have shown potential in delivering psychiatric medications. These carriers can encapsulate drugs, protect them from degradation, and facilitate their targeted delivery to specific brain regions.[54] Surface modifications of NPs with ligands or antibodies can enhance their specificity for targeted cells or receptors, improving drug efficacy.[55]

Implantable devices, such as drug-eluting implants or microchips, provide sustained and localized drug release.[56] These devices can be implanted directly in the brain or in proximity to the target regions, allowing for controlled and long-term drug delivery. Implantable devices offer advantages such as bypassing the blood-brain barrier (BBB), reducing systemic side effects, and improving patient compliance.[49]

Despite the promising applications of TDDS in psychiatric disorder medications, several challenges need to be addressed, including optimizing the design and formulation of drug carriers, ensuring their safety and biocompatibility, enhancing brain targeting efficiency, and improving drug release kinetics. Additionally, the development of personalized TDDS approaches based on individual patient characteristics may enhance treatment outcomes while minimizing adverse effects.[54]

Mechanistic Targets for Psychiatric Disorder Medications

In recent years, a better knowledge of the mechanism of action of various mental disorders has provided new insights into the prevention and treatment of such disorders. The molecular pathomechanism of neuropsychiatric conditions serves as a guiding tool for novel therapeutics. Among several mechanisms involved in mental conditions, oxidative stress (OS) and inflammation were more prominent.[57]

Oxidative Stress and Psychiatric Disorders

An imbalance between the production of reactive species and the antioxidant defense system causes OS.[58] Excessive free radicals induce OS and cause several degenerative syndromes in the central nervous system as well as mental disorders.[59]

It is widely accepted that OS plays key roles in the development of MDD,[60] attention deficit,[61] ASD,[62] mental retardation,[63] hyperactivity,[64] dementia,[65] schizophrenia, delusional disorders,[66] alcohol-related disorders, nicotine dependence, anxiety, and eating and sleep disorders.[67] Thereafter, targeting OS and antioxidant therapy may provide promising improvements in the above-mentioned disorders. Some studies have suggested that combining antioxidants and anxiolytics or antidepressants may provide promising innovative therapeutic options.[67] However, the proposed therapeutics require extensive investigation of proteomics, genomics, transcriptomics, pharmacological, and toxicological aspects. Several mechanisms contribute to OS in psychiatric disorders, including mitochondrial dysfunction, inflammation,

neurotransmitter imbalances, and impaired antioxidant systems.[68] The dysregulation of these pathways can lead to the production of reactive oxygen species and subsequent oxidative damage to lipids, proteins, and DNA, disrupting normal neuronal function.[69] Moreover, OS may establish a therapeutic target for overcoming treatment-resistant disorders.

Understanding the underlying mechanisms and therapeutic implications of OS opens new avenues for medication design in psychiatric disorders.[70] In addition, targeting OS pathways, either through antioxidant supplementation or modulation of related enzymes and signaling pathways, holds promise for the development of novel treatments. However, further research is needed to validate the efficacy and safety of these approaches and identify optimal therapeutic strategies for specific psychiatric disorders.

Antioxidant compounds, such as vitamins C and E, glutathione, and coenzyme Q10, have shown promise in preclinical and clinical studies for reducing OS and alleviating symptoms in psychiatric disorders.[71] Additionally, modulating OS-related enzymes and signaling pathways, such as Nrf2-ARE and the glutathione system, may offer therapeutic benefits.[72]

Immune System Contribution to Psychiatric Diseases

The correlation between the immune system and psychiatric disorders has been well studied and well documented[73] (Table 1). However, the exact mechanism of so-called connections is unknown currently. In addition to the major roles of the immune system in psychiatric disorders, brain-resident immune system involvement in mental disorders and behaviors has been presented.[74] Schizophrenia is one of the main examples of immune system functionality impact in psychiatric diseases.[75] One of the immune genes (complement C4 protein) in the major histocompatibility complex class 1 (MHC1) locus is correlated with the schizophrenia risk. Extra genetic correlations between the MHC1 locus and schizophrenia are considered a worthy goal for future research.[76]

The possible functions of the immune system in psychiatric disorders are further discussed in ASD.[82] However, there are fewer documents on the role of the immune system in ASD compared to schizophrenia. Some clinical data suggest that changes in immune function, such as attenuated transforming growth factor-β1 and elevated interleukin (IL)-1β levels in peripheral blood, are observed in autism.[83] Moreover, it is worth to mention that increased CD4/CD8 T cell and serum levels of IL-6 accounted for immunological biomarkers of MDD.[84] Likewise, increased levels of IL-6, IL-1β, and tumor necrosis factor-α have shown a correlation with post-traumatic stress disorder.[85]

Various studies have indicated that the brain possesses a different homeostatic immune element, which is more powerful. The immune environment of the brain is more complex. For instance, the brain hosts immune cells (neuroglia) that stimulate and engulf synapses and actively affect neurotransmission processes.[86] Brain parenchyma produces and regulates immune modulators such as tumor necrosis factor, transforming growth factor-β, and IL-33, which affect microglia, neurons, astrocytes, and oligodendrocytes.[87] Additionally, myeloid and lymphoid lineages and mast cells populate meninges that may influence the function of the brain.[88] Microglia have a key role in synapse numbers decreased in schizophrenia and human MDD. In addition, microglia are considered candidate elements for incongruous pruning in psychiatric diseases; however, this issue is not well-documented, and their mechanism of action is not fully understood.[89] On the other hand, some data have revealed the impacts of interferon-gamma (IFN-γ) on hippocampal plasticity and cognition.[90] It has been suggested that IFN-γ controls a function by acting exactly on inhibitory interneurons or presumably by performing developmental roles.[91] Further studies on the impact of IFN-γ on psychiatric disorders may uncover mysterious connections between viral infections and psychiatric diseases. In brief, cognition, memory, neurogenesis, behavior physiology, and pathology are highly regulated by various cytokines and tissue-resident elements. Determining the countless roles of cytokines in brain development and pathology is one of the main fields of research.

All the above-mentioned examples demonstrate that brain–immune interactions have imperative contributions to psychiatric diseases, and their molecular mechanisms require more specific focus and investigation. In other words, the neuroimmunology of psychiatric diseases and

Table 1. Contribution of the Immune System to Various Diseases

Psychiatric Disease	Immune System Contribution	Key Findings/Mechanisms
Depression[57]	Increased pro-inflammatory cytokines	Elevated levels of IL-6 and TNF-α; neuroinflammation linked to mood disorders.
Schizophrenia[77]	Dysregulation of immune response	Association with autoimmune markers; increased cytokine levels observed.
Bipolar disorder[78]	Fluctuations in inflammatory markers	Changes in IL-1β and IL-6 during manic and depressive episodes.
Anxiety disorders[79]	Altered immune response	Increased levels of CRP and cytokines; stress-induced inflammation may exacerbate symptoms.
Autism spectrum disorder[80]	Immune dysregulation and neuroinflammation	Maternal immune activation linked to increased risk; altered cytokine profiles in affected individuals.
Post-traumatic stress disorder[81]	Inflammatory response to trauma	Higher levels of pro-inflammatory cytokines; potential impact on brain function and stress response.

Note. IL: Interleukin; TNF: Tumor necrosis factor; CRP: C-reactive protein.

its relation to basic immunology provide an appealing area for future drug development.

Personalized Medicine in Psychiatry

In addition to developing medications, biomedicine also contributes to the field of personalized medicine in psychiatry.[92] By studying an individual's genetic and biological markers, researchers aim to identify specific factors that may influence an individual's response to certain medications. This field, known as pharmacogenomics, has the potential to optimize the selection and dosing of medications for psychiatric disorders, improving treatment outcomes while minimizing adverse effects.[93] Biomedicine utilizes pharmacogenomic approaches to identify genetic variations that can influence an individual's response to psychiatric medications.[94] By analyzing a patient's genetic profile, researchers can identify specific genetic markers that predict how an individual may metabolize or respond to certain drugs.[95] This information helps clinicians make more informed decisions about medication selection, dosing, and potential risk of adverse effects. It is well established that certain genetic variations in drug-metabolizing enzymes may impact the efficacy and tolerability of antidepressants or antipsychotics.[96]

Biomedicine takes an integrative approach by combining multiple data sources, including genomic data, clinical assessments, imaging findings, and other relevant information, to develop comprehensive profiles of individual patients.[97] This holistic approach allows clinicians to create personalized treatment plans that consider a patient's unique biological, genetic, and clinical characteristics.[98] It also enables the identification of subgroups within psychiatric disorders that may have distinct biological features, leading to more targeted interventions. By integrating these approaches, biomedicine aims to move away from a one-size-fits-all approach in psychiatry and toward personalized treatment strategies. The goal is to optimize treatment outcomes, minimize adverse effects, and improve patient care by tailoring interventions to the specific needs of each individual.

Limitations and Future Implications

Developing psychiatric drugs using biomedical approaches presents several challenges for researchers. Psychiatric disorders are highly complex and heterogeneous, implying that they can manifest differently in various individuals.[99] This variability makes it challenging to identify consistent biomarkers or drug targets that are applicable across a broad range of patients. Researchers must consider the diversity within psychiatric populations when developing new drugs. Despite significant progress, the underlying mechanisms of many psychiatric disorders are not fully understood yet. This knowledge gap makes it difficult to identify precise targets for drug development. Researchers need a comprehensive understanding of the molecular, genetic, and neural circuitry aspects of psychiatric disorders to develop effective drugs. The BBB is a protective barrier that restricts the passage of substances from the bloodstream into the brain.[100] It poses a significant challenge in drug development for psychiatric disorders, as many potential drugs may not effectively cross this barrier. Researchers need to develop drug delivery methods or design drugs with properties that can bypass or penetrate the BBB to reach the target sites in the brain. Nonetheless, conducting clinical trials for psychiatric drugs presents unique challenges.[101] Heterogeneity in patient populations, placebo response, and the subjective nature of psychiatric symptoms make it difficult to design robust and reproducible trials. Researchers must carefully consider trial design, outcome measures, and statistical analysis to ensure reliable results. Psychiatric drugs can have significant side effects, ranging from mild to severe. Balancing efficacy with safety is a critical challenge for researchers. Understanding the potential risks and developing drugs with improved safety profiles are priorities to minimize adverse effects and improve patient outcomes.

Conclusion and Final Remarks

We emphasize the view that biomedicine can unravel the details of mental diseases and bring imperative changes in psychiatric practice. While going forward from the basic science to the translation, new challenges will come to light. The complexities of psychological illness pose a particular challenge to the translation of knowledge in terms of integrating disease manifestations, behavior, neural circuits, and molecular pathways to form a complete theory with significant clinical implications. On the other hand, predictive test results for psychiatric diseases meet some ethical issues, such as dignity, discrimination, traumatization, and social stigma. Conclusively, despite the aforementioned challenges, it is well approved that biomedicine integration with psychiatry will highly expose novel areas of focus for future basic and translational studies.

Overall, biomedicine plays a vital role in psychiatric disorder medication by deepening our understanding of the underlying biology, developing new drugs, and advancing personalized treatment approaches. Through ongoing research and collaboration between biomedical scientists, clinicians, and other healthcare professionals, we continue to make strides in improving the lives of individuals affected by psychiatric disorders.

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