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THE NEUROBIOCHEMICAL MODEL OF HAPPINESS: THE ROLE OF THE INTERACTION OF OXYTOCIN, SEROTONIN, AND DOPAMINE IN PSYCHO-EMOTIONAL STABILITY

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ABSTRACT:

This article analyzes the contemporary neurobiochemical foundations of happiness and psycho-emotional stability. Based on a review of the literature, the roles of oxytocin, serotonin, and dopamine in the central nervous system, as well as their interactions, are examined. Dopamine is considered an initiating factor that activates motivation and reward mechanisms; serotonin is viewed as a central regulator ensuring emotional balance and stress resilience; and oxytocin is described as a neurohormonal factor that strengthens social bonding and the sense of safety. The study substantiates that the balanced activity of these mediators is a fundamental condition for psycho-emotional stability. The proposed integrative neurobiochemical model allows happiness to be interpreted not as the effect of an isolated hormone, but as a complex systemic process. The findings provide a theoretical basis for the development of scientific approaches aimed at maintaining mental

health, improving stress adaptation, and preventing affective disorders.

Introduction

Over the past decades, the concept of assessing human health not only through somatic condition but also through psycho-emotional stability and subjective well-being has become a global scientific paradigm. According to the World Health Organization, conditions associated with depression, anxiety disorders, and chronic stress are considered among the most pressing medical and social challenges of the 21st century. These processes directly affect quality of life, work productivity, and social adaptation. Therefore, an in-depth investigation of the molecular and neurobiological mechanisms underlying psycho-emotional states represents one of the key objectives of modern medicine and biochemistry [1].

Although psycho-emotional stability and the concept of “happiness” were long regarded as subjective and philosophical categories, they are now explained through clearly defined neurobiochemical mechanisms. In the central nervous system, the balance of neurotransmitters and neurohormones plays a decisive role in emotional regulation, motivation, stress adaptation, and the formation of social behavior. In particular, oxytocin, serotonin, and dopamine are recognized as the principal neurochemical regulators of psycho-emotional states due to their biological activity [2].

Dopamine is one of the main mediators of the brain’s reward system and is involved in motivation, goal-directed behavior, and the formation of pleasure. Serotonin plays a crucial role in emotional stability, impulse control, and mood regulation. Oxytocin enhances social bonding, trust, empathy, and the sense of safety, while attenuating the physiological stress response. Although the individual effects of these three mediators have been well studied, their integrated and interactive mechanisms of action have not yet been sufficiently analyzed in a systematic manner [3].

Recent studies indicate that psycho-emotional stability is determined not by the level of a single mediator, but by the dynamic balance between dopamine, serotonin, and oxytocin. Disruption of this balance may lead to depressive states, anxiety syndromes, affective disorders, and reduced social adaptation. Consequently, it is scientifically justified to

consider the concept of "happiness" not as the result of an isolated hormonal or neurotransmitter factor, but as a complex neurobiochemical system.

The present study aims to scientifically elucidate a neurobiochemical model of happiness based on the interactions of oxytocin, serotonin, and dopamine within the central nervous system, to analyze the integrative role of these mediators in the formation of psycho-emotional stability, and to explain the pathogenesis of pathological conditions associated with disturbances in their balance. The findings are expected to have significant theoretical and practical implications for the development of new scientific approaches aimed at maintaining mental health, enhancing stress resilience, and preventing psycho-emotional disorders.

Literature Review

1.1. Contemporary Scientific Interpretation of the Concepts of Happiness and Psycho-Emotional Stability

In 21st-century science, the concept of "happiness" has moved beyond the framework of a purely philosophical and subjective category and is now regarded as a complex systemic process reflecting neurobiological and psycho-emotional states. Contemporary research in neuroscience and biochemistry demonstrates that human subjective well-being is closely associated not only with external social factors but also with molecular and neurochemical processes occurring within the central nervous system. Therefore, the study of happiness in an integrated context with psycho-emotional stability, stress adaptation, and emotional regulation is considered scientifically relevant [4].

Psycho-emotional stability refers to the organism's capacity to respond adequately to internal and external stressors. This condition is determined by the ability to regulate emotions, maintain cognitive stability, and adapt to the social environment. In scientific literature, psycho-emotional stability is often associated with the concept of "subjective well-being," which is characterized by the predominance of positive emotions, life satisfaction, and a low level of negative affective states. Recent studies indicate that the balance of neurotransmitters plays a decisive role in the formation of these conditions.

From a neurobiological perspective, happiness and psycho-emotional stability are supported by the functioning of specific brain structures and neurochemical systems. Functional integration between the limbic system, the prefrontal cortex, and the hypothalamus plays a crucial role in emotional regulation. Neurotransmitters and neurohormones active within these structures occupy a central position in shaping emotional

responses, physiological adaptation to stress, and the regulation of motivational processes [5].

Scientific sources emphasize that the state of happiness cannot be explained by a single biological factor. Rather, it represents a multicomponent system that emerges from the coordinated interaction of various neurobiochemical mechanisms. Dopamine, serotonin, and oxytocin are identified as the primary regulators of this system. Although each of these mediators has distinct functional significance, psycho-emotional stability is ensured specifically through their balanced activity.

Thus, according to contemporary scientific approaches, the concept of happiness extends beyond subjective feeling and manifests as the outcome of complex neurobiochemical processes occurring within the central nervous system. This conceptual framework necessitates the study of happiness within an integrative model based on the interactions of oxytocin, serotonin, and dopamine and provides a scientific foundation for an in-depth analysis of the molecular mechanisms underlying psycho-emotional stability [6].

1.2. Dopamine: Neurobiochemical Foundations of the Reward System and Motivational Behavior

Dopamine is one of the most important catecholamine neurotransmitters of the central nervous system and plays a leading role in the regulation of motivation, reward perception, goal-directed behavior, and learning processes. Although dopamine is often interpreted in the scientific literature as a “reward hormone,” contemporary neurobiological approaches demonstrate that its function is considerably more complex and multifaceted. Dopamine not only generates pleasurable sensations but also serves as a signaling mechanism for expected outcomes, motivational drive, and the activation of behavior.

From a neuroanatomical perspective, the principal pathways of the dopaminergic system are the mesolimbic and mesocortical pathways. The mesolimbic pathway primarily facilitates the formation of reward and pleasure through connections between the ventral tegmental area and limbic structures. The mesocortical pathway influences prefrontal cortex activity and participates in decision-making, planning, and the regulation of social behavior. Balanced functioning of these systems is essential for healthy motivation and psycho-emotional activity.

Dopaminergic signaling determines the dynamic nature of psycho-emotional states. Short-term dopamine release enhances feelings of joy, interest, and activity, whereas chronic dysregulation may lead to emotional instability. Scientific studies indicate that

increased dopamine activity can produce short-term experiences of “rapid happiness” but does not ensure long-term emotional stability. Conversely, excessive stimulation of the dopaminergic system may result in motivational exhaustion, apathy, and even the development of depressive states [7].

A key issue discussed in contemporary literature is the relationship between the dopaminergic system and addiction-related and compulsive behaviors. Artificial stimuli, including digital technologies, social media platforms, and rapid reward mechanisms, continuously stimulate dopamine release, leading to dysregulation of natural motivational systems. As a result, short-term gratification becomes dominant, while deep and sustained psycho-emotional well-being fails to develop.

From this perspective, interpreting dopamine as the sole biochemical basis of happiness is scientifically unfounded. Although dopamine acts as an initiating factor that activates psycho-emotional states, its effects cannot ensure stable happiness unless integrated with serotonin and oxytocin signaling. Therefore, the dopaminergic system should be regarded as an important but insufficient component in the formation of psycho-emotional stability and must be evaluated within the framework of an integrative neurobiochemical model [8].

1.3. Serotonin: The Central Regulator of Emotional Stability and Mood Balance

Serotonin (5-hydroxytryptamine) is one of the most widely distributed monoamine neurotransmitters in the central nervous system and plays a crucial role in emotional stability, mood regulation, and stress adaptation. Contemporary neurobiological research increasingly views serotonin not merely as a “mood-enhancing hormone,” but as a key neurochemical regulator responsible for maintaining psycho-emotional balance. Its physiological effects are mediated through a complex receptor system and multilevel signaling mechanisms.

Serotonin is primarily synthesized in the raphe nuclei and projects to essential brain structures such as the cerebral cortex, limbic system, and hypothalamus. This anatomical distribution underlies serotonin’s role in emotional regulation, cognitive functioning, and the coordination of autonomic responses. Scientific literature indicates that serotonin stabilizes functional connectivity between the prefrontal cortex and the limbic system, thereby reducing emotional impulsivity and ensuring the appropriateness of affective responses.

Serotonergic signaling differs fundamentally from the dopaminergic system in maintaining long-term emotional stability. While dopamine enhances short-term

motivational activity, serotonin functions as a regulatory “inhibitory” mechanism that maintains emotional equilibrium. Adequate serotonin levels reduce anxiety, limit the intensification of negative affective states, and enhance psychological resilience to stressors [9].

Scientific studies demonstrate that serotonergic imbalance plays a significant role in the pathogenesis of psycho-emotional disorders. Serotonin deficiency has been consistently associated with depression, anxiety syndromes, impulsive behavior, and aggression. At the same time, excessive serotonergic activity may lead to emotional blunting, apathy, and reduced motivation. These findings indicate that maintaining serotonin within an optimal physiological range is essential for psycho-emotional stability.

The interaction between the serotonin and dopamine systems is critically important in shaping psycho-emotional states. Serotonin modulates dopaminergic signaling by limiting reward-related impulsive reactions and stabilizing behavior. Consequently, serotonin is regarded as the principal regulator that integrates dopamine-induced short-term “happiness signals” into sustained emotional balance [10].

In summary, serotonin represents a central neurobiochemical factor ensuring psycho-emotional stability and plays a vital role in the sustained and continuous manifestation of happiness. Its balanced interaction with dopamine and oxytocin provides a necessary scientific foundation for the formation of psycho-emotional well-being as an integrative system.

1.4. Oxytocin: Neurohormonal Mechanisms of Social Bonding and Stress Resilience

Oxytocin is a neurohormone synthesized in the hypothalamus and released via the pituitary gland, playing a key role in regulating social behavior, emotional bonding, and physiological responses to stress. Although oxytocin was initially studied primarily in relation to childbirth and lactation, recent neurobiological research has demonstrated that its functional significance within the central nervous system is considerably broader. Today, oxytocin is recognized as one of the principal neurohormonal regulators of psycho-emotional stability.

Within the central nervous system, oxytocin directly influences the activity of the limbic system, amygdala, hippocampus, and prefrontal cortex. These brain structures are involved in emotional processing, the formation of a sense of safety, and responses to social stimuli. Through its action in these regions, oxytocin reduces anxiety levels, enhances trust and social closeness, and attenuates physiological responses to stress. Scientific literature

explains the anti-stress effects of oxytocin through its modulation of the hypothalamic–pituitary–adrenal (HPA) axis. By reducing cortisol secretion, oxytocin limits stress-related autonomic and emotional reactions.

This mechanism improves the organism's adaptation to prolonged stress and plays an important role in preventing the development of psycho-emotional instability. A distinctive feature of oxytocin is that it reinforces happiness and well-being not merely at the level of individual emotional experience, but within a social context. Social support, close interpersonal relationships, and empathic interactions enhance oxytocin release, thereby strengthening psycho-emotional stability. For this reason, oxytocin is often described as a "social safety hormone" [11].

Contemporary research indicates that oxytocin imbalance is associated with feelings of loneliness, social isolation, anxiety states, and depressive symptoms. Reduced oxytocin signaling may diminish stress resilience and disrupt the functioning of dopamine and serotonin systems, further confirming the integrative nature of oxytocin's interaction with other neurotransmitters.

Thus, oxytocin serves as a central neurohormonal factor that enhances social bonding and stress resilience, playing a critical role in maintaining psycho-emotional stability. Its coordinated interaction with dopamine and serotonin forms the neurobiochemical basis necessary for the manifestation of happiness not only at the individual level, but also within a stable social framework.

1.5. An Integrative Neurobiochemical Model of Oxytocin, Serotonin, and Dopamine Interactions

Recent scientific studies indicate that explaining psycho-emotional stability and subjective well-being solely through the activity of individual neurotransmitters is insufficient. According to contemporary neurobiological concepts, the state of "happiness" is considered an integrative neurobiochemical condition arising from the coordinated and dynamic activity of dopamine, serotonin, and oxytocin systems. This approach allows happiness to be interpreted not as a short-term emotional response, but as a stable functional state established within the central nervous system [12].

Within this integrative model, dopamine functions as the initiating signal that activates motivational activity and goal-directed behavior. It drives exploration, reward-oriented actions, and positive expectations. However, dopaminergic signaling is transient and variable, and by itself cannot ensure psycho-emotional stability. Therefore, the

dopaminergic system is regarded as a “trigger” of happiness, but not a stabilizing component.

Serotonin plays a stabilizing and balancing role within this system. It modulates impulsive and rapid emotional responses generated by dopamine and ensures long-term mood equilibrium. Adequate serotonergic signaling enables individuals to demonstrate resilience to stressors, prevents the deepening of negative affective states, and maintains appropriate emotional responses. Accordingly, serotonin emerges as the primary “supporting pillar” of psycho-emotional stability within the integrative model [13].

Oxytocin constitutes the social and stress-adaptive component of the system. It reinforces the effects of dopamine and serotonin within a social context, enhancing the sense of safety, trust, and social closeness. At the same time, oxytocin attenuates stress-response mechanisms, reduces cortisol levels, and prevents psycho-emotional instability. Within the integrative model, oxytocin is considered a factor that elevates the state of happiness from individual emotional experience to socially stable well-being.

Disruption of the balance among these three neurobiochemical systems can lead to various pathological forms of psycho-emotional dysfunction. Dopaminergic dominance promotes short-term gratification and susceptibility to addictive behaviors, serotonin deficiency leads to emotional instability and depressive states, and reduced oxytocin signaling manifests as social isolation, anxiety, and decreased stress resilience. Thus, psycho-emotional stability is not determined by the dominance of any single system, but by the optimal coordinated activity of all three [14, 15].

In conclusion, the integrative neurobiochemical model based on the interactions of oxytocin, serotonin, and dopamine represents a contemporary scientific approach to explaining happiness and psycho-emotional stability. This model provides a theoretical foundation for developing novel preventive and therapeutic strategies aimed at maintaining mental health, enhancing stress resilience, and preventing affective disorders.

Discussion

In recent years, the number of studies investigating the effects of oxytocin, serotonin, and dopamine on psycho-emotional states has increased; however, their scientific interpretations often remain fragmented. Some authors primarily associate happiness and subjective well-being with the dopaminergic reward system. According to this approach, enhanced motivation and pleasure are regarded as the main biological markers of happiness. However, such views have been criticized for equating short-term emotional activity with stable

psycho-emotional states. Contemporary clinical observations indicate that dopaminergic dominance does not promote long-term well-being but rather increases susceptibility to motivational fatigue and addictive tendencies.

Another group of researchers considers serotonin as the principal neurobiochemical basis of psycho-emotional stability. This perspective is widely applied in clinical practice, particularly in antidepressant therapy. Numerous experimental and clinical studies have confirmed that serotonin deficiency is associated with depressive and anxious states. Nevertheless, an approach focused solely on serotonin cannot fully explain the state of happiness, as it bypasses the complex mechanisms of motivation, social bonding, and stress adaptation.

Research on oxytocin emphasizes the interpretation of happiness and well-being primarily within a social context. These studies highlight the role of social support, empathy, and perceived safety in promoting psycho-emotional stability. However, some authors over-idealize oxytocin, portraying it as a universal “happiness hormone.” In reality, the effectiveness of oxytocin signaling varies depending on an individual’s psychological characteristics and social environment.

Comparing these divergent approaches demonstrates that explaining happiness and psycho-emotional stability solely through individual neurotransmitters is scientifically insufficient. Only an integrative model that accounts for the interactions among dopamine, serotonin, and oxytocin can more fully capture the complex nature of psycho-emotional states. Such a model unifies disparate research findings into a coherent system, resolves existing contradictions, and elevates the concept of happiness from a short-term emotional response to a stable neurobiological state.

Conclusion and Future Directions

The literature analysis indicates that happiness and psycho-emotional stability are determined by complex neurobiochemical processes occurring within the central nervous system. Although dopamine, serotonin, and oxytocin individually perform important biological functions, stable subjective well-being does not emerge without their optimal and balanced interaction. Dopamine acts as the initiating factor that triggers motivational activity and reward perception, serotonin serves as the principal regulator maintaining emotional balance, and oxytocin provides a neurohormonal component ensuring social safety and stress resilience.

Unlike simplified approaches that attempt to explain happiness through a single hormone or neurotransmitter, this integrative neurobiochemical model allows psycho-emotional states to be evaluated as systematic processes. This perspective contributes to a deeper understanding of the pathogenesis of affective disorders, stress-related syndromes, and conditions associated with impaired social adaptation. Future research should investigate individual differences in dopamine, serotonin, and oxytocin interactions, their associations with genetic and epigenetic factors, and how these systems are modulated by social environmental influences. Furthermore, applying this integrative model can guide the development of novel preventive and therapeutic strategies aimed at enhancing psycho-emotional stability, offering important scientific and practical implications for mental health preservation.

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