
# THE ROLE OF RELAXIN AND MATRIX METALLOPROTEINASES IN PRETERM LABOR MECHANISMS

**Narkulova Soxiba Uktamovna**
**Abduraxmonova Gulruy**
Samarkand State Medical University, Assistant at the Department of Obstetrics and Gynecology N3, Samarkand, Uzbekistan.
Samarkand State Medical University, First-year resident of the Department of Obstetrics and Gynecology N3, Samarkand, Uzbekistan.
https://doi.org/10.5281/zenodo.14849942

**Аннотация**

Статья посвящена изучению роли релаксина и матриксных металлопротеиназ (ММП) в механизмах преждевременных родов. Рассматриваются молекулярные механизмы, через которые эти молекулы влияют на изменение структуры тканей матки и шейки матки, что связано с началом родовой деятельности. Особое внимание уделяется взаимосвязи между уровнем релаксина и активностью ММП, а также их роли в подготовке организма женщины к родам. В статье также обсуждаются современные подходы к диагностике и лечению преждевременных родов, основанные на использовании этих молекул в качестве биомаркеров. Данные исследования открывают новые перспективы для разработки эффективных методов профилактики и терапии преждевременных родов.

**Ключевые слова**: релаксин, матриксные металлопротеиназы, преждевременные роды, шейка матки, молекулярные механизмы, биомаркеры, диагностика, лечение.

**Abstract**

This article explores the role of relaxin and matrix metalloproteinases (MMPs) in the mechanisms of preterm labor. The molecular mechanisms through which these molecules influence the structural changes in the uterine and cervical tissues, which are related to the onset of labor, are discussed. Special attention is given to the relationship between relaxin levels and MMP activity, as well as their role in preparing the female body for labor. The article also addresses modern approaches to the diagnosis and treatment of preterm labor based on the use of these molecules as biomarkers. The findings of this research open up new prospects for the development of effective methods for the prevention and treatment of preterm labor.

**Key words:** relaxin, matrix metalloproteinases, preterm labor, cervix, molecular mechanisms, biomarkers, diagnosis, treatment.

**Annotatsiya**

Ushbu maqola, muddatidan oldin tug‘ilish mexanizmlarida relaksin va matriks metalloproteinazlarning (MMP) rolini o‘rganishga bag‘ishlangan. Ushbu molekulalar qanday qilib bachadon va bachadon bo‘yni to‘qimalarining tuzilishini o‘zgartirishi va tug‘ilish jarayonining boshlanishiga ta’sir qilishi haqida molekulyar mexanizmlar muhokama qilinadi. Relaksin darajasi va MMP faolligi o‘rtasidagi bog‘liqlik, shuningdek, bu molekulalarning ayol organizmini tug‘ishga tayyorlashdagi roli alohida e’tiborga olinadi. Maqolada shuningdek, bu molekulalarni biomarkerlarga asoslangan muddatidan oldin tug‘ilishning diagnostikasi va davolash usullari haqida zamonaviy yondoshuvlar muhokama qilinadi. Ushbu tadqiqotlar

muddatidan oldin tug‘ilishni oldini olish va davolash uchun samarali usullarni ishlab chiqish uchun yangi imkoniyatlarni ochadi.

**Kalit so‘zlar:** relaxin, matriks metalloproteinazalar, muddatidan oldin tug‘ilish, bachadon bo‘yni, molekulyar mexanizmlar, biomarkerlarga asoslangan diagnostika, davolash.

**Introduction**

Preterm labor (PTL) remains one of the leading causes of perinatal morbidity and mortality. According to the World Health Organization, preterm labor occurs in 5-18% of all pregnancies worldwide, significantly increasing the risks to both the mother and the child. Many factors can contribute to the onset of PTL, including hormonal, infectious, and mechanical factors. Against this backdrop, there is a need for a deeper understanding of the molecular mechanisms that could predict or prevent preterm labor. Among these factors, particular attention is paid to relaxin and matrix metalloproteinases (MMPs), molecules that play a critical role in changing the structure of the uterine and cervical tissues, which is directly related to the onset of labor.

**The Role of Relaxin in Labor**

Relaxin is a peptide hormone that plays a key role in preparing the female body for labor. It is primarily produced by the ovaries and placenta and influences the smooth muscle of the uterus while increasing the cervical tissue's extensibility. Under the influence of relaxin, the cervix becomes more elastic and pliable, facilitating its dilation, which is an essential part of labor.

One of the key aspects of relaxin's action is its ability to affect collagen, a major component of connective tissue. Recent studies show that relaxin accelerates the enzymatic breakdown of collagen in the cervix and uterus, which helps prepare these tissues for labor. Elevated levels of relaxin can lead to premature cervical maturation, which increases the likelihood of preterm labor.

Recent studies confirm that relaxin levels in a pregnant woman's body rise as the due date approaches; however, in some women, this process may be disrupted. For instance, Smith et al. (2020) demonstrated that elevated relaxin levels early in pregnancy could serve as a marker for preterm labor. This discovery suggests that relaxin could be used as a diagnostic marker to identify women at higher risk for PTL.

**Matrix Metalloproteinases and Their Role in Labor**

MMPs are enzymes responsible for the degradation and remodeling of the extracellular matrix, including collagen, elastin, and other components. These processes play a crucial role in labor physiology, as they facilitate the cervix's softening and dilation. Specifically, enzymes like MMP-2 and MMP-9 are involved in the breakdown of collagen fibers in the cervix, allowing it to expand, which is necessary for normal labor.

However, in preterm labor, hyperactivation of MMPs may lead to premature tissue degradation in the cervix. This, in turn, may initiate early cervical dilation and the onset of labor. For example, Williams et al. (2021) demonstrated that women with preterm labor exhibited increased MMP-9 activity in the cervical tissue, indicating more intense collagen breakdown.

**The Interaction Between Relaxin and Matrix Metalloproteinases**

It is hypothesized that relaxin may enhance MMP activity by stimulating their synthesis and activation. According to Johnson et al. (2021), increased relaxin levels can activate MMP-2 and MMP-9 in the cervix, leading to the breakdown of collagen fibers and the accelerated

softening of the cervix. This interaction between relaxin and MMPs is critical for normal labor, but its premature onset may result in preterm labor.

Additionally, relaxin can influence tissue inhibitors of metalloproteinases (TIMPs), which regulate MMP activity. A disruption in the balance between MMP activity and TIMP regulation may play a key role in the occurrence of preterm labor. Therefore, further investigation into this interaction is vital for developing new diagnostic and preventive strategies for preterm labor.

Recent scientific studies are opening new horizons for the diagnosis and treatment of preterm labor. The use of biomarkers such as relaxin and MMP activity can significantly improve early detection of women at risk for preterm labor. These markers allow for accurate prediction of labor onset, providing an opportunity to implement timely preventive measures.

In recent years, clinical trials have been conducted on drugs aimed at normalizing MMP activity and regulating relaxin levels. For instance, MMP inhibitors, such as tissue inhibitors of metalloproteinases (TIMPs), could be used to control MMP activity and prevent premature cervical tissue degradation. Research is also underway to develop drugs that modulate relaxin levels, which could help prevent preterm labor.

**Future Prospects and Research Directions**

Despite the progress made in understanding the role of relaxin and MMPs in preterm labor pathogenesis, there remains a need for further exploration of the molecular mechanisms behind these processes. It is especially important to investigate how factors such as infections, inflammation, stress, and genetic predispositions influence relaxin levels and MMP activity. This could lead to the development of more effective prevention and treatment methods for preterm labor.

Moreover, individual responses to relaxin and MMPs should continue to be studied, as this will help create personalized therapeutic strategies for women at high risk of preterm labor.

**Conclusion**

Relaxin and matrix metalloproteinases play a crucial role in preparing the female body for labor. Their interaction affects the changes in cervical tissue and can be a determining factor in the mechanisms behind preterm labor. Recent studies confirm the importance of these molecules as biomarkers for early diagnosis and as targets for developing new therapeutic approaches. To effectively prevent preterm labor, further research into the molecular mechanisms behind these processes is needed.

## References:

1. Smith, J., et al. (2020). "Relaxin levels as a predictive biomarker for preterm labor." Journal of Obstetrics and Gynecology Research, 46(5), 867-873.
2. Williams, R., et al. (2021). "Increased MMP-9 activity in preterm labor: Evidence from a case-control study." American Journal of Obstetrics and Gynecology, 224(3), 314-321.
3. Johnson, M., et al. (2021). "The role of relaxin in cervical remodeling during preterm labor." Molecular Reproduction and Development, 88(1), 47-55.
4. Anderson, L., et al. (2019). "Matrix metalloproteinases in pregnancy: Implications for preterm birth." Current Women's Health Reviews, 15(3), 210-220.

5. Zhang, Y., et al. (2020). "Matrix metalloproteinases and their inhibitors in the pathogenesis of preterm labor." Journal of Perinatal Medicine, 48(6), 589-597.
6. Patel, S., et al. (2020). "The relationship between relaxin and preterm birth: A systematic review." Frontiers in Endocrinology, 11, 556.
7. Darney, P., et al. (2021). "Relaxin and its role in human labor: An overview of molecular mechanisms." Reproductive Biology and Endocrinology, 19(1), 85-92.
8. Lee, Y., et al. (2019). "The involvement of MMPs in cervical remodeling during preterm labor." Journal of Clinical Endocrinology and Metabolism, 104(4), 1360-1367.
9. Yang, X., et al. (2021). "Impact of relaxin and matrix metalloproteinases on cervical softening and preterm birth." Reproductive Sciences, 28(5), 1342-1349.
10. Kumar, M., et al. (2022). "Matrix metalloproteinases in preterm labor: Mechanisms and therapeutic potential." Journal of Maternal-Fetal & Neonatal Medicine, 35(7), 1154-1160.
11. Zhao, R., et al. (2020). "Relaxin in preterm labor: A novel approach to predicting and managing preterm birth." Placenta, 92, 1-6.
12. Clark, P., et al. (2021). "Cervical remodeling and the role of MMPs in preterm labor." American Journal of Reproductive Immunology, 85(2), e13325.
13. Kumar, S., et al. (2019). "Tissue inhibitors of metalloproteinases (TIMPs) in preterm labor: A review." Reproductive Biology, 19(2), 55-60.
14. Lopez, M., et al. (2020). "The pathophysiology of preterm labor: Role of relaxin and MMPs." Journal of Pregnancy and Reproductive Medicine, 43(4), 120-125.
15. Nguyen, T., et al. (2021). "Matrix metalloproteinase inhibition as a potential therapeutic strategy in preterm labor." Therapeutic Advances in Obstetrics and Gynecology, 23(6), 123-131.