CircRNAs: Is it a potential bridge between COPD and gynecological diseases?

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Abstarct: *Circular RNAs (circRNAs), as non-coding RNAs unique to eukaryotes, have a certain influence on the development of various diseases. This article investigates the possible relationship between CircRNA and chronic obstructive pulmonary disease (COPD) and gynecological diseases. Through the summary of existing epidemiological studies, case-control studies, and related studies, we found that CircRNA is expected to become a bridge between the two systems due to its unique structure and function. Although the specific mechanism still needs further exploration, this review opens up a new path for studying cross-system diseases. It is expected that more studies in the future will uncover the detailed mechanism of circRNAs in coordinating the relationship between COPD and gynecological diseases.*

BACKGROUND

CircRNA, as a highly abundant non-coding RNA in cells, plays a key role in regulating the enrichment of miRNA and protein expression. It has better stability, subcellular localization specificity, tissue specificity, and disease specificity than linear RNA molecules[1]. It plays a role in predicting disease occurrence and promoting drug development in the occurrence and development of COPD and gynecological diseases[2].

Chronic obstructive pulmonary disease (COPD) is a common chronic respiratory disease worldwide, characterized by persistent airflow limitation and respiratory symptoms. Its pathogenesis is complicated, and there is no clear conclusion[3]. The current consensus is that chronic inflammation of the airway, lung parenchyma, and pulmonary vessels caused by inflammatory cells such as neutrophils leads to the characteristic changes of COPD[4]. Gynecological diseases cover many women 's health problems, such as cervical cancer, polycystic ovary syndrome, breast cancer, etc., and their pathogenesis is complex and diverse. At present, studies have revealed the correlation between COPD and these gynecological diseases.

MATERIALS AND METHODS

There is a certain correlation between COPD and gynecological diseases

The term comorbidity is often used to describe a condition in which a primary disease coexists with an existing condition during its course[3]. A study of COPD-specific comorbidities revealed a significant association between the risk of death in COPD patients and lung cancer and pulmonary fibrosis[5].

In addition, a cross-sectional case-control study revealed that there is also a close correlation between the incidence of COPD and cardiovascular disease, metabolic disease, and musculoskeletal disease[6]. However, there are relatively few academic studies on its association with gynecological diseases. Epidemiological investigations have shown that there is a close correlation between hypomenorrhea, postmenopausal complications, and one of the symptoms of premature ovarian failure hirsutism, and COPD[7].

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In addition, a prospective cohort study further explored the relationship between COPD and female reproductive health and found that women with more than 3 births, late menarche, and women with polycystic ovary syndrome (PCOS) or ovarian cysts had an increased risk of hospitalization/death due to COPD after simple hysterectomy or bilateral oophorectomy[8]. In addition, the case-control study of Megan and other scholars analyzed the demographic characteristics of recurrent urinary tract infection (UTI) and COPD in the elderly. The results showed that women with recurrent urinary tract infections had a higher risk of suffering from the above diseases[9], which further confirmed that there is a link between COPD and gynecological diseases, but the specific association mechanism still needs to be further explored.

CircRNA will become an important bridge between the two

CircRNA forms a circular structure through head and tail splicing, thus maintaining a relatively stable abundance, structure, and conserved expression sequence in blood and diseased tissues and organs[16].In addition, given that the CircRNA family can indirectly regulate the expression of downstream genes by interacting with RNA or proteins, or directly translating proteins as templates, its key role in disease development has been gradually revealed in recent years[16]. For example, Liu et al summarized the differentially expressed CircRNA profiles in lung tissues of COPD lesions in recent years based on the experimental results of others, and how these CircRNAs affect the progression of lesions through what mechanism. In addition, the differential expression of CircRNA in gynecological-related diseases has also been widely studied and verified, such as polycystic ovary syndrome[18], breast cancer [19], cervical cancer [20], and other pathological tissues, the expression of some CircRNA also showed a stable difference.

Based on the previously discussed potential association between COPD and gynecological diseases, the specific biological characteristics of CircRNA, and its possible multiple molecular biological mechanisms, we speculate that CircRNA may serve as a bridge between the two diseases.

Similarly, TAS2R was originally regarded as a G protein receptor for human perception of bitterness [10] and later found that it not only exists in the mouth and throat but also is widely distributed in the intestine, brain, and upper and lower respiratory tract[11]. Studies have confirmed that TAS2R not only participates in the airway remodeling process in COPD lesions through anti-mitosis[12], but also differentially expresses in breast cancer cells and ovarian cancer cells, and regulates tumor migration habits[13]. These results suggest that there may be an association between gynecological tumors and COPD, and this association may be related to the TAS2R family. This hypothesis has been further verified in the experiment that saffron relieves women 's dysmenorrhea, regulates the fluctuation of hormone levels, improve female sexual dysfunction[14], and reduces the expression level of serum inflammatory markers in chronic obstructive pulmonary disease (COPD), thereby alleviating the symptoms of COPD[15]. Based on the above experimental results, we firmly believe that circRNA has the potential to become a bridge between the two diseases, but there are still research gaps. The future research direction can obtain the common region in the expression profile by sequencing the circRNA expression profile of the two diseased tissues, and provide new ideas for further exploring the relevant mechanisms and managing the clinical complications of COPD / gynecological diseases in the future.

CircRNA is a promising candidate for clinical transformation

From the perspective of clinical transformation, CircRNA has a wide range of applications, giving a revolutionary possibility to the medical field. The importance of CircRNA as a potential bridge between COPD and gynecological diseases has been deeply discussed in the previous article. This bridge not only provides a new perspective to understand the correlation between the two diseases but also greatly broadens the application path of circRNA in the field of clinical transformation.

The CircRNA family has shown great potential in the field of vaccine development due to its unique biological characteristics such as low

immunogenicity, high stability, and long half-life. Compared with other linear RNA vaccines, CircRNA vaccines have the advantages of fewer adverse reactions, more lasting immune responses, and simple transportation conditions. Therefore, the CircRNA vaccine is expected to become a new treatment strategy for tumors, infectious diseases, autoimmune diseases, and other diseases. In addition, given the stable expression of CircRNA, tissue specificity, and detectability in liquid biopsy samples, it can also be used as a biomarker to assist in disease diagnosis. So far, many circRNAs have been identified as potential diagnostic and prognostic biomarkers, which provide a basis for clinical diagnosis and prognosis evaluation [18,22,23]. In recent years, the research on the synthesis, purification, and delivery of CircRNA is also in full swing. CircRNA synthesized in vitro has been proven to be stable in eukaryotes and can be translated[24]. We look forward to more studies in the future to reveal the specific mechanism of CircRNA in gynecological diseases and COPD, and to promote its clinical application and development.

CONCLUSION

Based on the above analysis, we conclude that circRNAs play a key regulatory role in both COPD and gynecological diseases, and may establish a potential association between these two diseases. Although the two diseases belong to different systems, molecular biology studies have revealed that the immune system of patients with COPD may be affected, thereby increasing the risk of infection, including gynecological infectious diseases. [25] CircRNAs can regulate inflammation-related signaling pathways, affect lung inflammation, and accelerate the development of COPD [26]; in the field of gynecological diseases, the specific differential expression of some circRNAs is closely related to the pathological process of the disease [27]. By analyzing the expression profiles of circRNAs in the two lesions, it is possible to find some common expression pattern changes, which may change the disease process by affecting the expression of downstream target genes[26].

Before applying CircRNA to clinical practice, it is important to understand its regulatory mechanism,including specific binding sites, mode of action, and changes in disease status. At present, although some achievements have been made in the study of CircRNA in COPD and gynecological diseases, the research from the cross perspective is still insufficient. In the future, circRNAs are expected to become new targets for the diagnosis and treatment of two diseases. Strengthening interdisciplinary cooperation and clinical application integration will provide the possibility to promote the clinical transformation of circRNAs, achieve breakthroughs in diagnosis and treatment, and bring new treatment hopes to patients.

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