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# UNDERSTANDING THE RELATIONSHIP BETWEEN CERULOPLASMIN LEVELS AND INFLAMMATORY RESPONSES: A CLINICAL INSIGHT

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**ABSTRACT**

Ceruloplasmin is a plasma protein with important functions in copper metabolism and antioxidant defence of the body. Studies show that the concentration of ceruloplasmin can change in response to various physiological and pathological conditions. This article presents the results of a study on the effect of a pronounced inflammatory response on the level of ceruloplasmin and the significance of this protein in clinical practice.

**KEYWORDS**

ceruloplasmin, inflammatory reaction, erythrocyte sedimentation rate, C-reactive protein, aceruloplasminemia, biochemical spectrophotometry.

## Introduction

Ceruloplasmin is a glycoprotein mainly synthesised in the liver and plays a key role in copper metabolism in the body [4; P. 26–45]. It functions as a transporter for copper, making it important in the context of metabolism and antioxidant defence [3; P. 117–124, 8; P. 88–98]. In addition, ceruloplasmin has enzymatic activity, promoting iron oxidation and preventing the formation of free radicals, confirming its role in the body's defence mechanisms [7; P. 3299–3310].

Recent studies suggest that ceruloplasmin levels may be altered in response to inflammatory processes. Inflammation is a complex, multifaceted process that is activated in response to injury or infection, and involves activation of the immune system and release of various mediators [1; P. S65–86]. At this time, the body undergoes changes in the synthesis of various proteins, including acute-phase proteins such as ceruloplasmin [5; P. 386–391]. An increase in its concentration can serve as an indicator of acute inflammation or chronic diseases.

It is known that the level of ceruloplasmin and its relationship with inflammatory markers such as C-reactive protein (CRP) and erythrocyte sedimentation rate (ESR) can vary significantly depending on the patient's health status [6; P. 242–253]. This holds promise for the use of ceruloplasmin as a potential marker of inflammation and copper metabolic status [2; P. 23–35].

The aim of our study was to elucidate how a marked inflammatory response affects blood levels of ceruloplasmin. We investigated the correlation between the increase in COE and CRP and changes in plasma ceruloplasmin concentration in patients with different clinical conditions, and identified the most accurate method for its determination, especially in patients with suspected aceruloplasminemia.

**Methods**

The study conducted involved patients with a variety of clinical conditions characterised by a marked inflammatory response. Patients were selected on the basis of the presence of acute or chronic disease, thus providing a diversity of samples for analysis. All participants provided informed consent to participate in the study, which emphasised the ethical standards of our work.

A biochemical spectrophotometric method was used to determine ceruloplasmin concentration, which provides high accuracy and reliability. This analytical study is based on the measurement of light absorption in solution, which allows quantification of protein levels in samples. Prior to the assay, blood plasma samples were pretreated and diluted in appropriate solutions to initiate the reaction.

The degree of inflammation in the participants was assessed using several standard laboratory tests. The main indicators of inflammation were erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP) levels. CRP is a simple and accessible assay that reflects the level of inflammatory activity in the body: the higher the value, the more severe the inflammation. CRP, on the other hand, is an acute-phase protein whose level increases significantly in inflammatory processes, which allows it to be used as a marker of inflammatory activation.

To achieve more accurate results, multiple determinations of the above parameters were performed at different time intervals and under different conditions, which allowed a better understanding of the dynamics of changes and their relationship with ceruloplasmin levels.

**Results**

The analysis of the collected data showed that there was a clear relationship between ceruloplasmin levels and inflammation indices measured through COE and CRP. With an increase in erythrocyte sedimentation rate (ESR), which is a marker of inflammatory activity, there was a trend of 20% to 35% increase in ceruloplasmin concentration. This result confirms that under conditions of active inflammation, ceruloplasmin is probably synthesised in greater amounts to provide protective functions to the body.

Similar patterns were found for the level of C-reactive protein (CRP): when it increased, the concentration of ceruloplasmin also increased, on average by 15-25%. This indicates that ceruloplasmin may serve as an indicator of inflammatory processes, supporting the role of acute-phase protein in maintaining homeostasis and adaptation of the organism to stressful situations.

These data emphasise the importance of ceruloplasmin not only as a transport protein for copper, but also as a marker of inflammatory diseases. This approach opens new horizons in clinical practice, allowing the use of ceruloplasmin to monitor the condition of patients with a marked inflammatory

response, which may significantly influence the strategy of treatment and diagnosis of diseases associated with copper metabolism disorders and inflammatory processes.

**Discussion**

The results of this study show that ceruloplasmin levels change in proportion to the severity of the inflammatory response. This is important for clinical practice because it may help physicians to more accurately assess the condition of patients with suspected aceruloplasminemia, especially during remission.

The following conclusions can be drawn on the basis of the obtained data:

1. A marked inflammatory response leads to a significant increase in ceruloplasmin concentration, which may be useful for treatment and diagnosis.
2. The most accurate determination of ceruloplasmin concentration should be performed by biochemical spectrophotometry, which will provide more reliable results, especially in patients with suspected aceruloplasminemia during remission.

These recommendations may help to optimise diagnostic approaches and improve management strategies in patients with copper metabolism disorders. In the future, more research is needed to clarify the role of ceruloplasmin as a marker of inflammation and its importance in clinical practice.

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