

# Serum-based protein biomarkers for detection of lung cancer

Review Article

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**Abstract:** Lung cancer is one of the most common cancers in terms of both incidence and mortality. The major reasons for the increasing number of deaths from lung cancer are late detection and lack of effective therapies. To improve our understanding of lung cancer biology, there is urgent need for blood-based, non-invasive molecular tests to assist in its detection in a cost-effective manner at an early stage when curative interventions are still possible. Recent advances in proteomic technology have provided extensive, high throughput analytical tools for identification, characterization and functional studies of proteomes. Changes in protein expression patterns in response to stimuli can serve as indicators or biomarkers of biological and pathological processes as well as physiological and pharmacological responses to drug treatment, thus aiding in early diagnosis and prognosis of disease. However, only a few biomarkers have been approved by the FDA to date for screening and diagnostic purposes. This review provides a brief overview of currently available proteomic techniques, their applications and limitations and the current state of knowledge about important serum biomarkers in lung cancer and their potential value as prognostic and diagnostic tools.

**Keywords:** Lung carcinogenesis • Serum biomarkers • CYFRA 21-1 • Proteomic techniques

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## 1. Introduction

Cancer is one of the leading causes of premature morbidity and mortality. Based on current projections, cancer deaths will continue to rise, with nine million people estimated to die from the disease in 2015, and more than 11 million in 2030. Because cancer disproportionately affects the elderly, the resulting economic burden will become an even greater concern in future as a result of the ageing “baby boomer” population. There has been a significant advancement in the understanding of the mechanisms of carcinogenesis in recent years. However, the improvement in treatment modalities for cancer is lagging behind this advancement [1]. This is due to the fact that the cancer has a complex behaviour with each tumor type consisting of a large number of subtypes. Each subtype has a distinct clinical behaviour and there is a different response to each during the treatment.

The management of various cancers and their cures can become very difficult if the disease is not detected at an early stage. Early detection, on the other hand, is difficult due to the lack of specific biomarkers for diagnosis of the disease at early stages. Over the last decade, major efforts have been aimed at biomarker discovery and their clinical importance, especially after the completion of the Human Genome Project that led to advances in proteomic technologies. The discovery of cancer biomarkers is top priority in this field due to their anticipated critical role in early diagnosis, therapy guidance, and prognosis monitoring of different cancer types. Lung cancer is usually not detected until it has progressed to an advanced stage because the early-stage disease does not typically cause symptoms. Almost 99% of the tumors in lungs are malignant [2]. Lung cancer has become one of the world’s leading causes of preventable deaths, though some decline in rate of its incidence was observed from

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