

Kingdom of Saudi Arabia
Ministry of High Education
King Saud University
College of Science
Physics and Astronomy Department



CANCER DIAGNOSIS BY SYNCHRONOUS
FLUORESCENCE SPECTRA OF BLOOD AND URINE
COMPONENTS

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ABSTRACT

Cancer is an emotional word, a word associated with disease, death and dying. It is a word which strikes fear into the hearts of ordinary people because, for centuries it has been associated with a mysterious illness with no known cause and no known cure. However, remarkable strides in cancer research and technology in the late 20th century have given way today to an opportunity for exponential progress against the disease.

There are many studies currently being conducted in the area of cancer diagnosis. Researchers are trying to improve current tests to develop new testing techniques for a better understanding of the disease. Diagnostic tests are considered an important research subject because, in some cases, they allow for early detection of the disease. Finding cancer early is beneficial because it often improves a patient's prognosis. During the past several years, there has been a growing interest in optical spectroscopic detection of tumors.

Detection of neoplastic changes by optical spectroscopy techniques such as Raman and fluorescence has been one of the active areas of research in recent times. Several studies have established the potential of these techniques in discriminating oral, cervical, breast and other malignancies. These methods have been described as more objective, less time-

consuming, and in some cases with the advantage of *in vivo* applicability. Thus, by using these methods a painful biopsy can be avoided.

In this line of research we have employed Fluorescence spectra study for detection of cancer. In this dissertation, a study has been done to discriminate the spectral characteristics of cancer-specific fluorophores such as reduced Nicotinamide Adenine Dinucleotide (NADH), collagen, elastin, flavin, tryptophan and porphyrins from blood plasma and the acetone extract of formed elements in blood and also from urine.

In this study we had analyzed more than 50 healthy samples as control and about 75 of cancerous patients blood and urine of different etiology. The test samples were taken before the patients took any treatment or drugs; because drugs may cause confusion of the spectra.

In this study we have been able to show that optical diagnosis especially fluorescence as we have done here can detect cancer from body fluids (blood and urine). The results that others have, obtained, using native fluorescence of tissue could be reproduced almost identically by similar studies on blood alone. And rather than that we had shown the same results using urine native fluorescence.

This dissertation consists of five chapters:

- **CHAPTER 1: BASIC IDEAS ABOUT CANCER.**

This chapter gives basic ideas about cancer, such as: different kinds of cancer, cancer: a genetic disease, causes of cancer, cancer staging, cancer detection and diagnosis.

- **CHAPTER 2: ABSORPTION AND FLUORESCENCE.**

This chapter deals with basic considerations about absorption and emission, such as: absorption spectra, molecular emission, fluorescence, fluorescence type, Quantum efficiency of fluorescence, types of fluorescence.

- **CHAPTER 3: REVIEW OF RELEVANT LITERATURE.**

This chapter deals with the literature review of laser or light-induced fluorescence (LIF), labeled fluorescence, autofluorescence of tissue, autofluorescence of blood components and urine, synchronous luminescence of tissue or body fluid.

- **CHAPTER 4: INSTRUMENTATION.**

This chapter deals with instrumentation of our experiment and with the materials and methods of sample collection and methodology, methods of analyzing samples.

- **CHAPTER 5: RESULTS AND DISCUSSION.**

This chapter deals with results and discussion of the study of fluorescence emission and excitation and synchronous spectra of blood plasma, the acetone extract of formed elements, urine and urine extracts.
