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ASSOCIATION OF CANCER EDUCATION AND RESEARCH
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VISION

Cancer Control among community through education and research.

MISSION

- **To disseminate cancer awareness through organised seminar, workshops and conferences.**
- **To encourage cancer based research among the students and research scholars.**

USING TEARS TO DETECT CANCER

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The thin layer of tears covering the ocular surface are a complex body fluid containing thousands of molecules of varied form and function of several origins. The ocular proteome can be used to diagnose various diseases, including cancer. Among biological fluids like blood and urine, tear fluid is perhaps one of the most understated in terms of clinical value.

The tears are a complex fluid comprised of secretions from a number of sources including the lacrimal gland, goblet cells, cornea, and vascular sources. The tear film provides an optically smooth surface for focusing light onto the retina as well as lubrication, prevention of dehydration of the mucosal surface, protection against pathogens, and nutrition for the underlying corneal and conjunctiva epithelial cells. The tears contain thousands of molecules including proteins/peptides, lipids, electrolytes, and small molecule metabolites secreted from the main and accessory lacrimal glands, meibomian glands, goblet cells, and ocular surface epithelial cells. This review discusses the advantages of analyzing tears for biomarkers and its significance in detecting breast cancer.

Tears are usually collected noninvasively using Schirmer's strips, other absorbent materials, or fire-polished microcapillary tubes. However care must be taken not to activate the corneal nerves and induce reflex tears as there is a dramatic difference in the tear protein profile between the two, with reflex tending to be more dilute than basal tears. Analysis of biomarkers in tears is more advantageous as compared to detecting cancer biomarkers in blood, where biomarkers are more diluted. Based on the current knowledge, the tear proteome is clearly different from plasma proteome with about 500–600 plasma proteins being seen in tears.

This is striking as there are more than 8000 proteins in the plasma proteome. Due to the overlap between the tear proteome and plasma proteome, there may be opportunities to observe systemic responses in the tears. Several such examples thus far include breast cancer, type 2 diabetes, Alzheimer's disease, and rheumatoid arthritis. Some systemic diseases may affect the eye so that we can use 'tears' as a 'window' to assess systemic as well as ocular disease.

According to a microarray test, many low molecular weight proteins showed a higher intensity in tears when compared to blood. This effect could be attributed to larger molecular weight proteins overshadowing smaller ones in plasma or due to the preprocessing leading to damage of the proteins.

DETECTION OF BREAST CANCER

There has been an increasing interest in finding markers of disease in non-traditional biological fluids. Ease of collection, high protein concentration, and lower complexity of the tear fluid compared to blood make tears an ideal diagnostic fluid. The tear samples are collected using Schirmer strips.

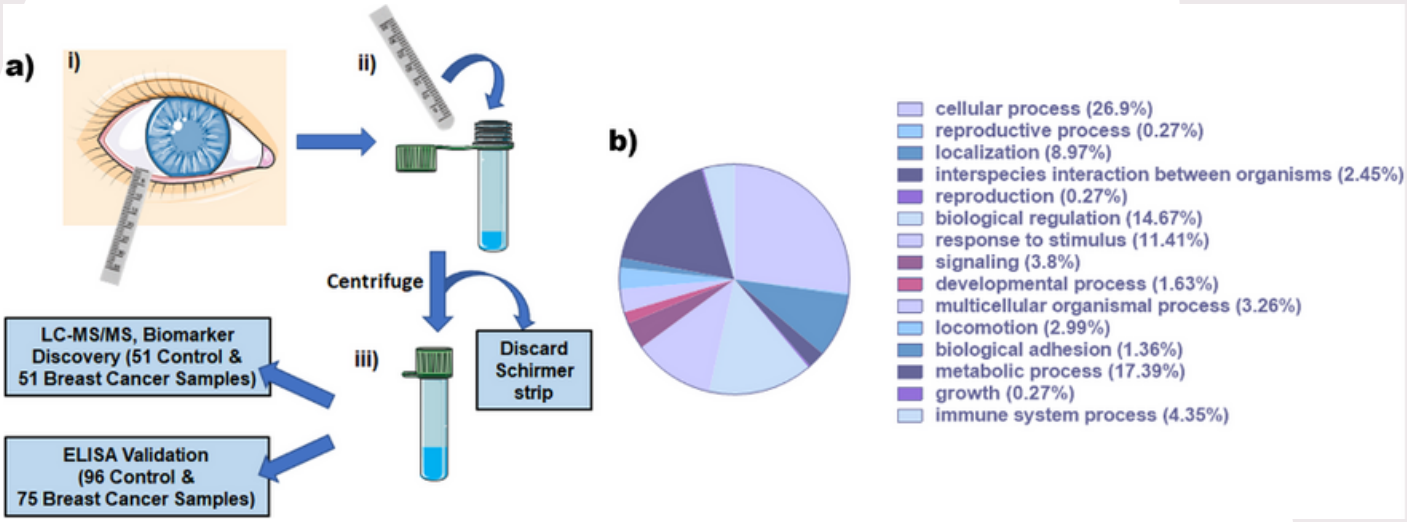

Fig 1. a) Schematic of Tear Collection using Schirmer strip

i) Schirmer strip is placed in the lower conjunctival fornix;
ii) Wetted strips are placed in screw-top tube prefilled with 225µL of 1XPBS and centrifuged to collect the tears;
iii) Schirmer Strips are discarded to collect tears and stored in -80°C before being analyzed by LC-MS/MS and validated by ELISA.

b) Functional classification of 301 mapped proteins in tear samples using PANTHER classification system.

The tear samples were studied using LC-MS/MS and ELISA. In a study, three proteins (S100A8, S100A9, and LG3BP) were selected for validation by performing ELISA based on previously reported association with breast cancer. The Concentrations of S100A8 and S100A9 were found to be elevated in breast cancer.

CONCLUSION

The field of tear-based diagnostics is rapidly expanding beyond ocular diseases. The non-invasive accessibility of tears, ease of collection, minimal to no preprocessing techniques, and reduced processing times make tears as a suitable alternative over blood for diagnostics. While the number of individual tear samples in the current studies is large for the field of tear-based proteomics, it is quite small in the field of breast cancer as well as biomarker validation. Significantly larger studies would need to be conducted in order to reach a sound conclusion on the ability of tear proteins to distinguish between control and disease state samples.

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TURMERIC & CURCUMIN: AN ALTERNATIVE TO CHEMOTHERAPY?

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According to research, the average Indian diet provides around 2,000 to 2,500 mg of turmeric, which is around 60 to 100 mg of curcumin a day. turmeric in its powdered form from the supermarket, but the spice itself comes from the turmeric plant, which is also known as Indian saffron. With its pungent, bitter taste, turmeric is a core ingredient in Indian curries, but it can now also be found in teas, powders, capsules and in many more imaginative products.

In Ayurvedic practices, turmeric root has been used medicinally to treat a range of disorders of the skin, upper respiratory tract, the joints and digestive system, and internal and external inflammation. But why was turmeric this widely used. There's always a reason behind why our ancestors used this wonder spice in numerous ways, more than how were using it now. Turmeric is a plant that has a very long history of medicinal use, dating back nearly 4000 years. In Southeast Asia, turmeric is used not only as a principal spice but also as a component in religious ceremonies.Because of its brilliant yellow color, turmeric is also known as "Indian saffron." Modern medicine has begun to recognize its importance, as indicated by the over 3000 publications dealing with turmeric that came out within the last 25 years. More than 100 components have been isolated from turmeric. Here, we're going to speak about curcumin, which according to research, helps in the management of oxidative and inflammatory conditions, metabolic syndrome, arthritis, anxiety, and hyperlipidemia. It also helps in the management of exercise-induced inflammation and muscle soreness, thus enhancing recovery and subsequent performance in active people.

Extensive research over the past two decades suggests that curcuminoids, the active ingredient in turmeric (C. longa), interfere with multiple cell signaling pathways, providing support for the potential role of curcumin in modulating cancer development and progression.Despite the tangible advances in cancer therapy, the reported incidence of the disease and the mortality have not declined in the past 30 years. Understanding the molecular alterations that contribute to cancer development and progression is a key factor in cancer prevention and treatment several anticancer compounds with different modes of action have been extracted from plant sources, such as Taxus brevifolia, Catharanthus roseus, Betula alba, Cephalotaxus species, Erythroxylum previllei, Curcuma longa, and many others. Among them, curcumin is the most important component of the rhizomes of Curcuma longa L. (turmeric) Which brings us to the topic of how curcumin can be used as an anticarcinogenic drug. To what can curcumin be used to to eliminate cancer instead of chemotherapy, a standardized cancer treatment? To know about that we first need an analysis of the compound. Curcumin is a bright yellow chemical produced by plants of the Curcuma longa species. It is the principal curcuminoid of turmeric (Curcuma longa), a member of the ginger family, Zingiberaceae. It is sold as a herbal supplement, cosmetics ingredient, food flavoring, and food coloring.

The discovery of curcumin dates to around two centuries ago when Vogel and Pelletier reported the isolation of “yellow coloring-matter” from the rhizomes of Curcuma longa (turmeric) and named it curcumin. Later, this substance was found to be a mixture of resin and turmeric oil. It was extracted from turmeric plant in a pure crystalline form for the first time in 1870. Curcumin and its derivatives have received immense attention in the past two decades due to their biofunctional properties such as anti-tumor, antioxidant, and anti-inflammatory activities . These properties are attributed to the key elements in the curcumin structure. Due to the strong relationship between inflammation and cancer, the anti-inflammatory effects of curcumin would well result in its anti-tumor effects. It was reported that curcumin has prevented the development of several types of cancer by reducing the production of mediators of the inflammatory process. One of the possible mechanisms for suppressing tumor proliferation is the chemical inhibitor effect of curcumin. As a result, topical use of curcumin considerably inhibits inflammation.

The other mechanism of the anti-cancer effects of curcumin, is due to its interference in the cell cycle, and reduction in CDK expression. CDKs are actually serine / threonine kinases that control cell cycle progression. Furthermore, curcumin inhibits the STAT3 phosphorylation, which is responsible for signalling carcinogenic pathways. According to the studies, curcumin has reduced side effects, including skin complications. Depending on the different doses of curcumin prescribed for the patients suffering from cancer, their survival rate was increased and their symptoms of chemotherapy were reduced. A 2009 study, found that curcumin can kill many types of cancer cells in multiple ways. Because more than one method is possible, cancer cells are less likely to become curcumin-resistant. Curcumin targets only cancer cells, leaving healthy cells unaffected. This is an important step in potential treatment because chemotherapy drugs kill both healthy cells and cancer cells. Research has also looked at turmeric, which contains curcumin, as a way of preventing cancer. According to the Memorial Sloan Kettering Cancer Center, rats exposed to cancer-causing substances and then treated with turmeric didn’t develop stomach, colon, or skin cancers. According to the published studies, the use of curcumin during radiation therapy for breast cancer patients improved treatment outcomes for these patients, such as preventing skin symptoms, reducing pain and suffering of patients, improving their quality of life during treatment, and reducing delays or unwanted stops during the course of radiation therapy. Similarly, curcumin has showed numerous beneficial effects with regard to different kinds of cancer with its unique mechanism.

But can curcumin alone be sufficient to cure cancer?

One potential downside that several studies have highlighted is that curcumin isn’t absorbed easily by the body. Researchers are working to identify ways to resolve this problem. Though turmeric is being studied as a cancer fighter, recent experiments have shown that the spice may interfere with how some chemotherapy drugs work. The spice can interfere with certain medications, such as blood thinners and blood sugar-lowering drugs. Additionally, it may impact the effectiveness of chemotherapies. Some people who take turmeric have reported stomach pain or an allergic reaction. Even though numerous research shows how it may be a cancer-fighter, more studies need to be done to confirm turmeric’s role in cancer prevention and treatment. In conclusion even though curcumin shows promise as an alternative treatment for cancer.

Research is ongoing to determine how curcumin works to fight cancer, and the best way to use it as a treatment. Until a verdict is reached. We can use turmeric in a variety of ways like how we always have because it is still a wonder spice that has a powerhouse of health. Nothing will change that. But it is important to make sure to consult a doctor before attempting to treat cancer or any other medical condition with curcumin, since research is still ongoing.

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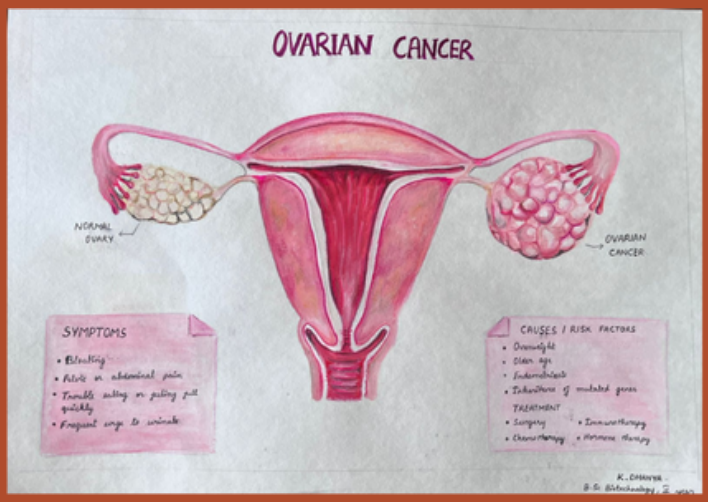

K. Dhanya
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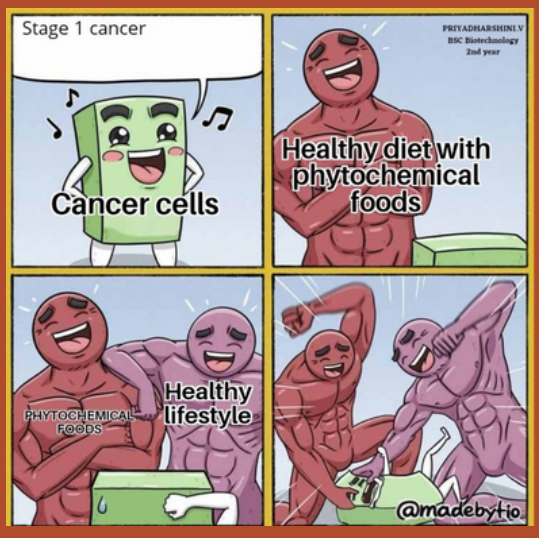

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