

The development of novel biomarkers for the diagnosis and prognosis of colorectal cancer

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Abstract

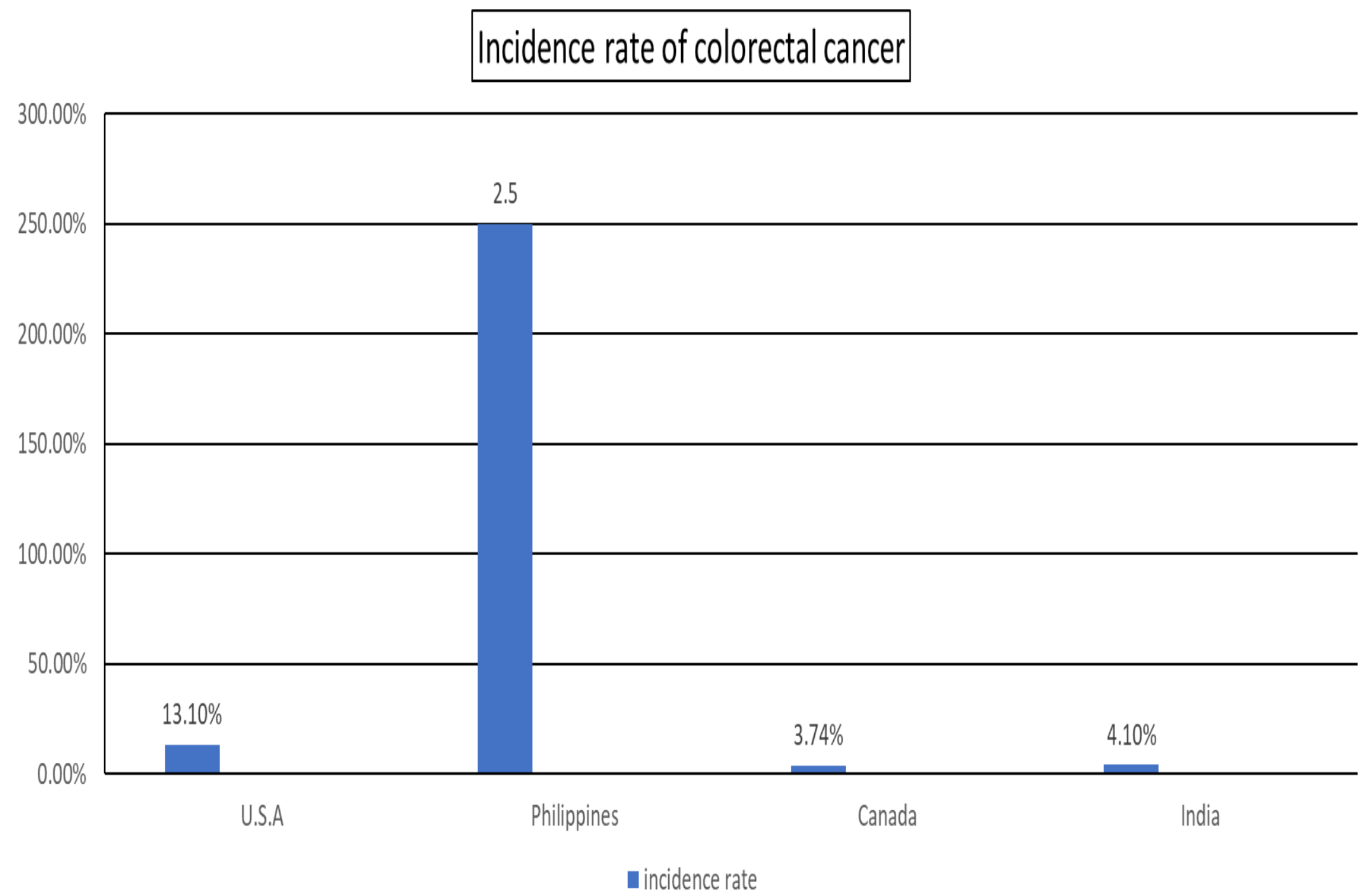
Colorectal cancer (CRC) is the third most commonly detected cancer and the fourth cause of mortality globally. It is anticipated to rise by 60% of the 2.2 million new cases and 1.1 million deaths by 2030.The cancer originates in the digestive tract’s lower end i.e. the colon and rectum which begin as a non-cancerous polyp and turns out to be a tumor (sarcoma) in the later stages. It is generally resulted as a consequence of lifestyle and environmental factors which includes obesity and physical inactivity. The major aspects responsible are dysfunction of signaling mechanisms, alternation in methylation of various pathways leading to characteristic symptoms such as rectal bleeding, abdominal discomfort, etc. The intent of this study is to investigate the biomarkers used for diagnosis of colorectal cancer. There are many methods to diagnose the disease, one of such diagnostic measures are biomarkers. They are sequences of DNA which are associated with the pre-disposition of a disease for instance exosomes, long non-coding RNA, methylated vimentin, etc. are some of the novel biomarkers used in the detection of colorectal cancer. The exosomes are double membranous vesicles structurally sound in lipids are present in body fluids like blood, saliva and urine plays a major role in initiation and progression of the tumor. MicroRNAs are endogenous non-coding sequences that obstruct the expression of target genes. The carcinoembryonic antigen (CEA) is a highly suggested prognostic marker because the level of CEA increases with the increase in CRC. Recently, it has been discovered that the fusion of exosomes and CEA enhances the accuracy of diagnosis.

Key words: colorectal cancer, biomarkers, exosomes, microRNA, carcinoembryonic antigen.

Introduction

Colorectal cancer is defined as the carcinoma that is caused in the lower end of the alimentary canal which comes under adenocarcinoma. The first sign would be change in bowel habits i.e. diarrhea or constipation and other symptoms include weakness, rectal bleeding and pain in the lower abdomen. Sedentary lifestyle, low fiber diet and heredity are some of the factors responsible for colorectal cancer. The genes that give rise to this cancer are Ras, EGFR and TGF-beta1. The best methods to treat a colorectal cancer are polypectomy, laparoscopic surgeries and endoscopic mucosal resection. Globally it is estimated that 1.9 million people are affected and the mortality rate is 0.9 million people. In the Unites States, the rate of prevalence of the disease has increased rapidly among youngsters as 13.1 per 100,000 when compared to adults but they have no history of tumor phenotype and germline mutations. The occurrence of CRC in the Philippines is 38.1% because it is a developing country due to financial crisis these diseases are left undiagnosed. The annual percentage of CRC in Canada in both men and women is 3.47% and 4.45% respectively. In India, the annual incidence rate of cancer in men and women are 4.1 and 3.9 per 100,000 respectively. South India especially Tamil Nadu shows a 0.5% incidence rate of the total Indian population.

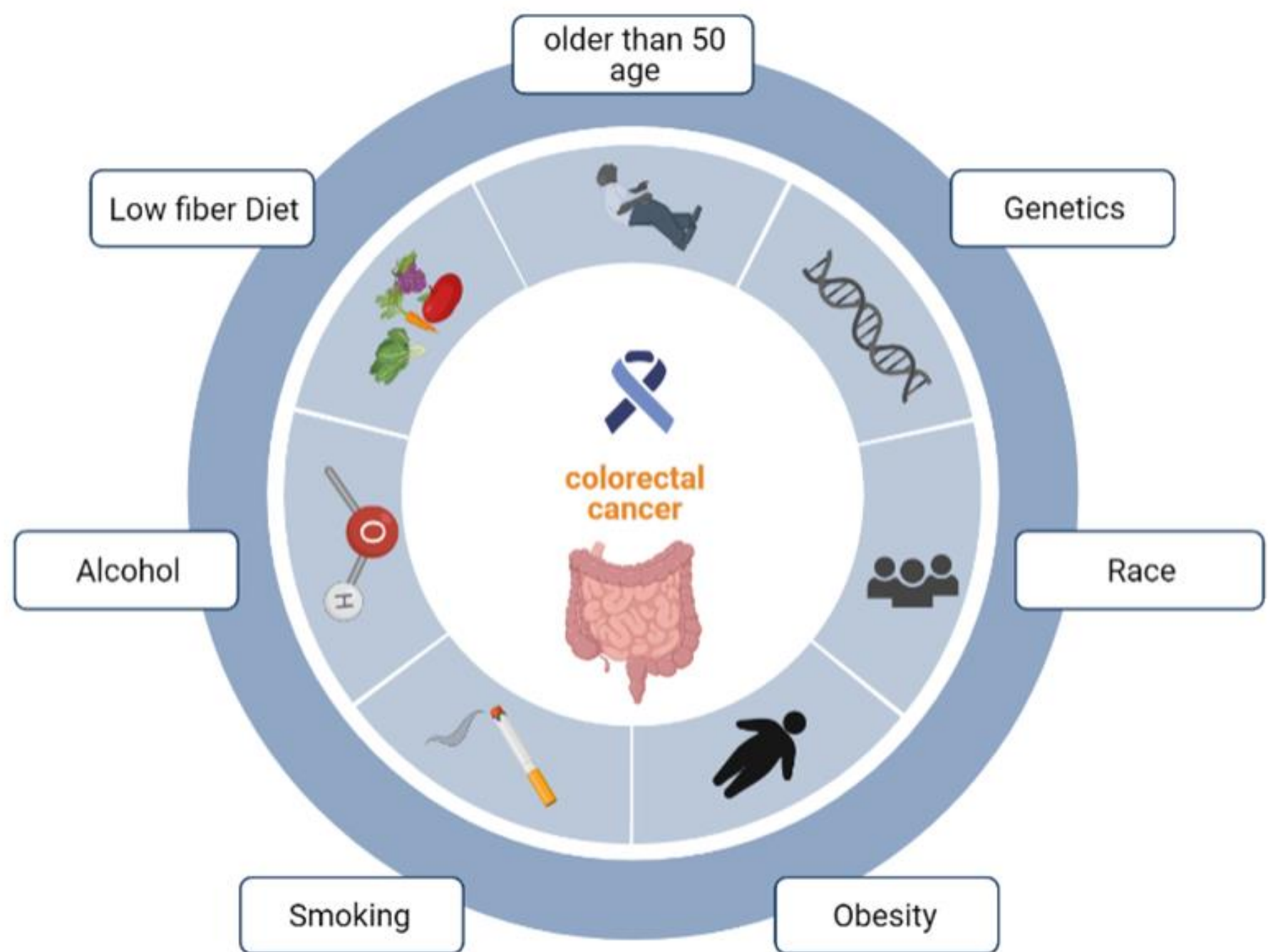
Incidence



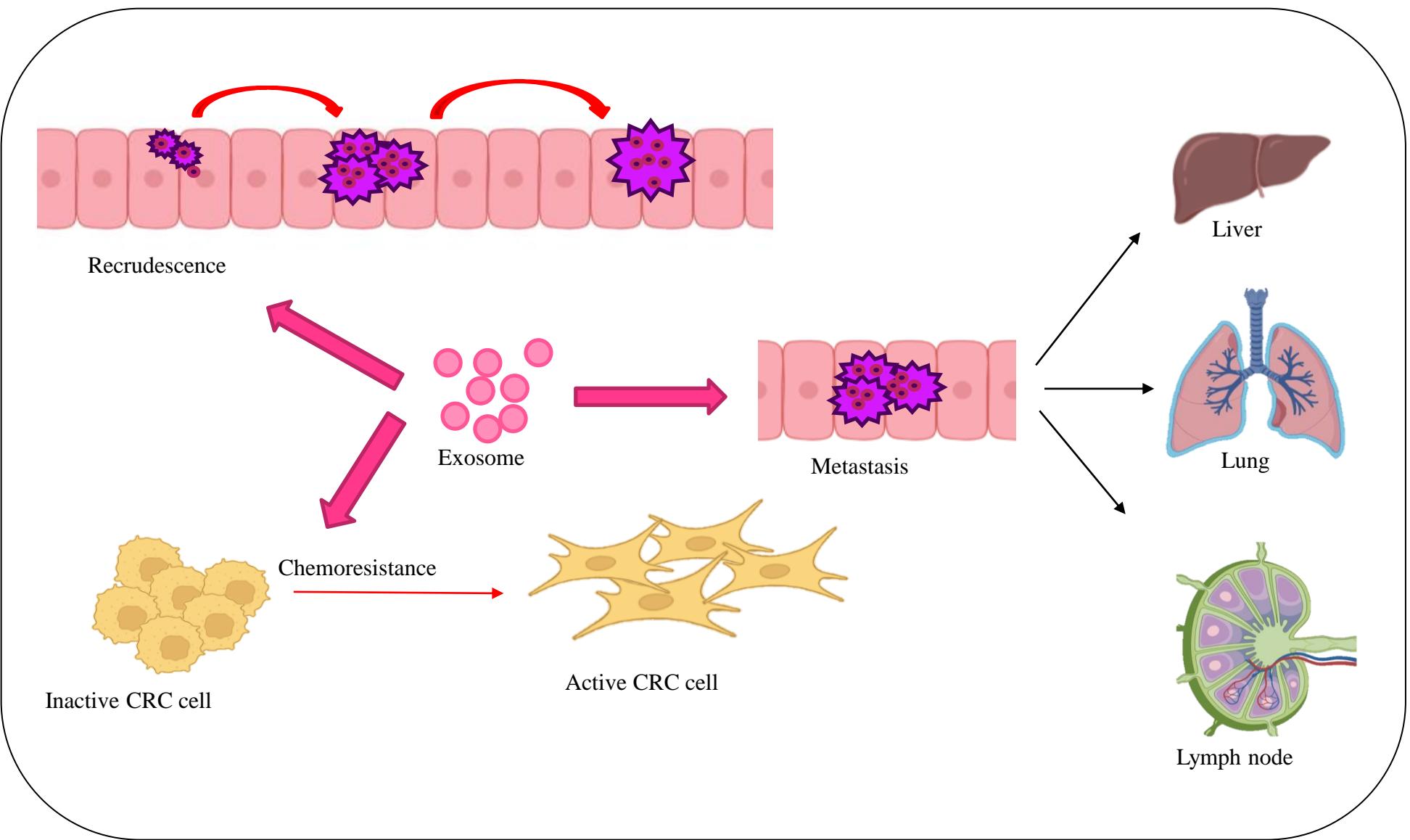
Biomarkers and its function

Biomarker	Symbol	Function
Exosomes (or) extracellular vesicle	EVs	They acts as mediators which carry molecules like proteins and nucleic acids
Micro RNA	miRNA	It helps in post-transcriptional gene expression and mRNA destabilization
Carcinoembryonic antigen	CEA	It acts as an intercellular adhesion molecule
Methylated vimentin	mVim	It is a sarcoma prognostic marker used to determine mesenchyme

Risk factors



Mechanism of CRC



Conclusion

The study investigates some of the novel non-invasive prognostic markers which can significantly predict life-threatening diseases like colorectal cancer, neurodegenerative and cardiovascular disorders.

The most recent articles suggest that the combination of carcinoembryonic antigen and exosomes intensifies the accuracy of diagnosis.

References

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