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## Background

Colorectal cancer is one of the most common cancers worldwide. It accounts for over 9% of all cancer incidences and the third most common cancer worldwide. The five-year survival rate of people with localized stage colorectal cancer is 90% and 13% in patients with distant metastasis. Despite marked improvement in the new therapies, more than 40% of patients who present with stage II or III disease will have a disease recurrence following primary therapy. Thus, the early detection of colorectal cancer can be a key to effectively treating the disease. Early detection process can become more sensitive and specific if we focus on a panel of biomarkers instead of a single biomarker. Heat map visualization of overlapping biomarkers between the indications will enable in understanding the complex biological system and cellular networks in disease development. We confirm that analysis of multiplex biomarkers greatly increases the accuracy of early disease diagnosis and precision of personalized medicine. Heat map signatures in GOBIOM database identify biomarker panels capable of detecting colorectal cancer, but also offer improved insight into the complex network of factors involved in disease development and discover new biomarker patterns across multiple therapeutic indications.

## Objective

The aim of this study was

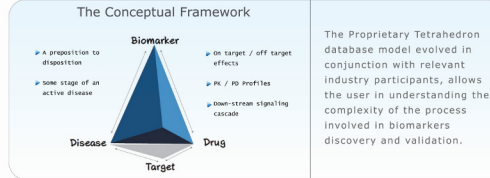
- (a) To analyze the diagnostic biomarkers that are reported for colorectal cancer and explore for the possibility of developing a diagnostic panel that can increase the sensitivity of the disease detection.
- (b) To see if there are any diagnostic markers which are common between colorectal cancer and other indications.

## GOBIOM Database

GOBIOM Biomarker Database is a comprehensive database of validated and putative biomarkers providing insights into relationship between biomarker and disease. The user-friendly interface facilitates analyzing and visualizing the biomarker data, which can aid in better understanding of biological processes involved in specific pathology, identification of new drug targets, development of personalized medicine strategies utilizing companion diagnostics, development/validation of diagnostic assay kits and monitoring the safety of experimental or marketed drugs. GOBIOM in a single platform provides clinical and preclinical information on biochemical, genomic, imaging, metabolite, clinical scoring scales and cellular markers spanning over 18 different therapeutic areas, covering 1832 therapeutic indications with its reported utilities like Diagnosis, Prognosis, Progression of disease, Surrogate, Response to therapy, Pharmacokinetic, Efficacy, Drug resistance and Safety/Toxicity.

Data is manually curated from

- Peer-reviewed journals
- Clinical trials and their results
- Scientific meetings
- Patents
- Regulatory approved documents
- Approved Assays from S10K and PMA database
- Other relevant web resources



Therapeutic Area	# Biomarkers	# Indications
Oncology	8474	950
Diseases of the circulatory system	8020	283
Endocrine, nutritional and metabolic diseases	5715	184
Diseases of the musculoskeletal system & connective tissue	5185	154
Diseases of the nervous system	4702	187
Immunological disorders	4331	115
Infectious and parasitic diseases	3738	133
Infectious and parasitic diseases	2800	118
Diseases of the respiratory system	2523	60
Diseases of the reproductive system	2228	75
Others	2128	1
Diseases of the skin and subcutaneous tissue	1962	61
Injury, poisoning and certain other consequences of external causes	1838	30
Diseases of the circulatory system, respiratory system and certain disorders involving the immune mechanism	1535	60
Diseases of the eye and adnexa	821	57
Organic heart conditions, deformations and chromosomal abnormalities	765	61
Diseases of the ear and related process	208	12
Cardiac conditions originating in the perinatal period	93	8
Total	7942	1832

## Methodology

We extracted diagnostic biomarkers of colorectal cancer and other indications from GOBIOM database by using the new GOBIOM heatmap Analytics feature.

Following steps are carried out in the analysis

### 1. Search Strategy



### 2. Data Analysis and generation of plots



### 3. Generation of the relevant heatmaps



Develop a search strategy to retrieve genomic and biochemical diagnostic biomarkers in colorectal cancer.

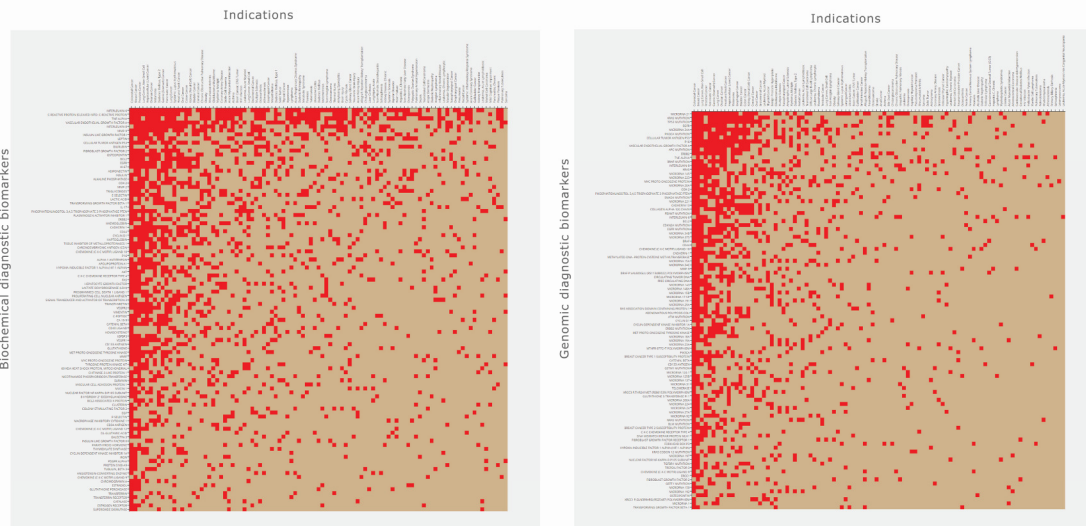
Define the desired parameter for data analysis and visualization; Indication selected in 'X' axis and 'Y' axis value is set to 'Biomarker' by default.

Relevant heat maps can be generated by filtering the desired data by selecting required parameters in 'Applied Filters' table i.e. diagnosis and biochemical/genomic

## Analysis

Biochemical Diagnostic biomarkers that are common between colorectal cancer and other indications

Genomic Diagnostic biomarkers that are common between colorectal cancer and other indications



## Conclusions:

### Biochemical Biomarkers:

1. There is a strong association between Breast cancer and Colorectal cancer as evident by overlap of ~80% of biochemical biomarkers between the two indications
2. Of all the biochemical diagnostic biomarkers reported for colorectal cancer, incidence of inflammatory markers is high suggesting possible implication of chronic inflammation in the etiology of colorectal cancer.

### Genomic Biomarkers:

1. Of all the genomic diagnostic biomarkers reported for colorectal cancer, incidence of microRNA markers is high suggesting a possible role of these markers in disease pathogenesis. Development of a microRNA panel can help in early detection of colorectal cancer and may provide improved risk stratification of patients.
2. The integrated analysis of KRAS, TP53, PIK3CA, BRAF mutations along with epigenetics markers can give additional insight regarding the regulation of colorectal cancer associated genes and their underlying mechanisms that contribute to colorectal carcinogenesis.
3. Understanding the panel of gene biomarkers can help in defining the patient's prognosis and choosing the best available treatment.

Further focused studies should help us in identifying more robust panels for both screening and differential diagnosis of colorectal cancer thus decreasing unnecessary invasive procedures, and potentially avoiding unnecessary health care costs.

Focused biomarker databases like GOBIOM can be a very useful resource to perform such large scale studies and identify the hidden patterns in the published literature.

## About GOBIOM:

### Content

- Biomarker Nature - Biochemical, Genomic, Scoring scale, Physiological, Cellular, and Imaging
- Therapeutic Area - 18 therapeutic areas across ~1800 indications
- Utilities of the biomarker - Diagnosis, Prognosis, Disease progression, Surrogate, Efficacy, Drug response, Drug resistance and Safety
- FDA/EMA approval data for biomarkers - Approval authority, Qualification purpose, and supporting documentation
- Analytical Qualification - Accuracy, Sensitivity, Specificity, Positive predictive value and Negative predictive value
- Approved diagnostics and companion diagnostics Information- Assay methodology, Associated drug, Approval authority, Sample specificity and Assay vendor details
- Drugs/Intervention details - Drug/Intervention, Drug dose, Route of administration, Intervention duration, End point, and Toxicity information
- Biomarker associated endpoints - Statistical test, Statistical significance, Odds/Hazards or other ratio, sample size and Confidence interval values
- Clinical and Preclinical qualification - Experimental details, Marker analysis, Marker modification, Specimen details and experimental methodology
- Study Population details - Population description, Sample size, Ethnicity, Age, and Gender

## Salient Features

- Easy integration with client proprietary data
- Multiple export options and instant report generation for data analysis
- Controlled vocabulary for easy interpretation
- Identify biomarkers impacting your research/business
- Competitive intelligence analysis
- Make informed decisions using dashboard and heat map analytics
- Insights into drug repositioning
- Insights into clinical trial landscape

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