MEDGENOME

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Internal Quarterly Newsletter

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Liquid Biopsy :
Revolutionising Oncogenomics

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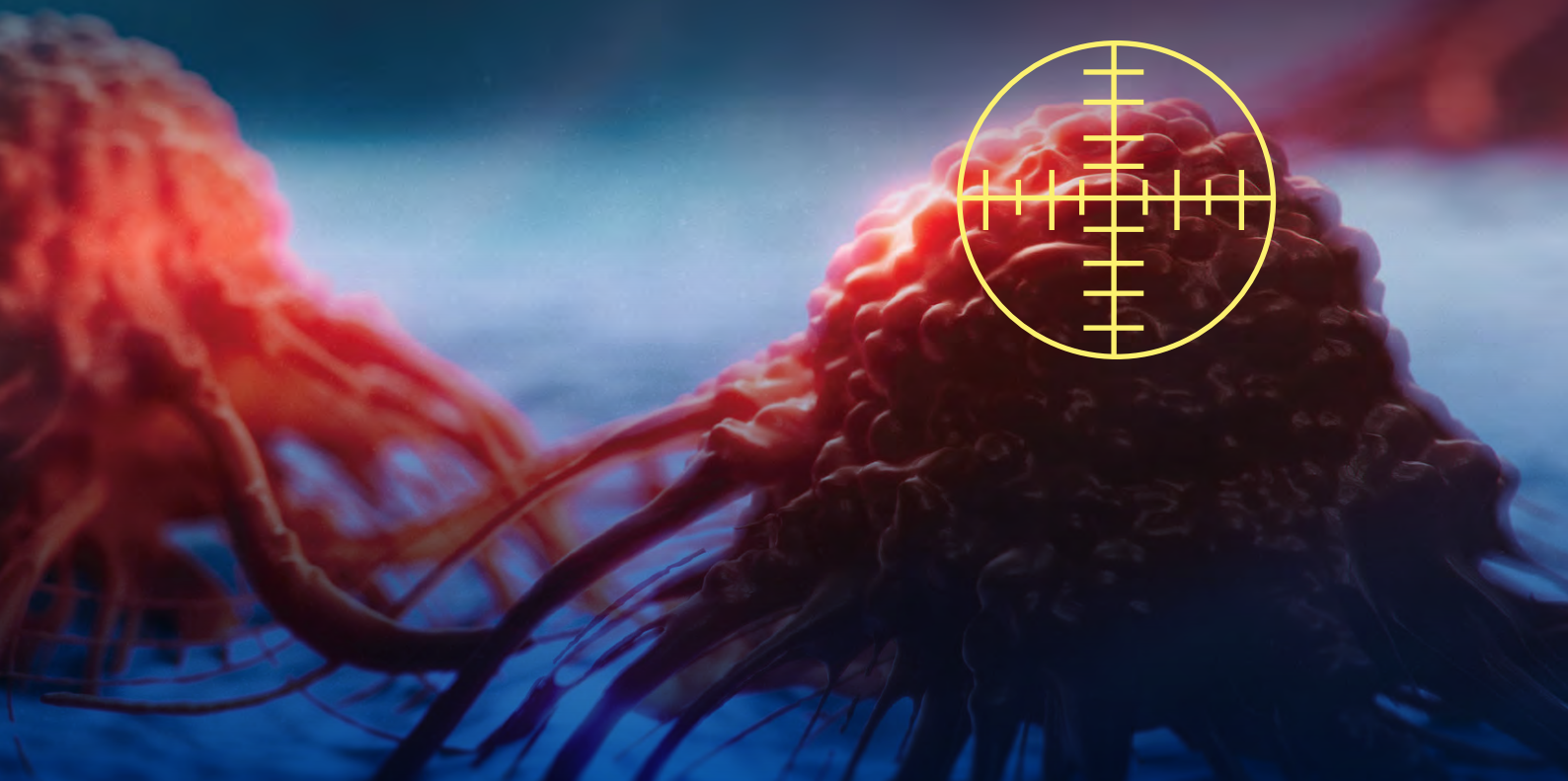
The Patient Will See You Now



WORDS FROM THE **FRONTLINE**

Dr. Priya Kadam,
Director - Reproductive Genomics

Genomics and genetics is an exciting place to be in. I stumbled onto it about two decades ago when, after getting a medical education in Bangalore, I was trying to find variants in tumour samples of retinoblastoma at the Paediatrics laboratory at the National University of Singapore. Setting up PCRs, actually running bubble free slab gels for microsatellite analysis to find loss of heterozygosity was interesting and challenging at the same time. Dwelled into population genetics when we looked at the unique population from Sumatra, Indonesia and later a bit of the role of methylation in breast cancer genetics.

Technically, my foray into laboratory prenatal genetics started when we were looking at isolating fetal cells from maternal blood around 2008 at NUH. We achieved a reasonable amount of success with a couple of patents.

After twelve years in Singapore, and three kids later, my life took a turn when we decided to move back to India. Serendipitously, I happened to meet an old classmate's wife, whose ex-student was in MedGenome. I still remember the trip to Kochi to meet Dr Ram and Sam. They were planning to set up a lab and were exploring setting up non-invasive prenatal testing and that seemed like a perfect fit for me. They said the lab would be situated at Narayana Nethralaya in Bangalore. When I first entered, in Nov 2014, it was not the bustling lab of now but the corridor was dark on either side though some light could be seen at the end of the proverbial tunnel. There were four people sitting there and that's how it started. It has been extremely gratifying to see how far it has grown.

As a pioneer and first mover in its space, MedGenome has provided unique growth opportunities for its employees and this industry in general. The team consisting of Dr Ram, Dr Sakthivel and Dr Venkat has been motivating all the way. I must make a special mention of Dr Venkat, who behind a quiet demeanour is a sharp and capable force who holds it all together with uncompromising attention to quality. As I started work, one of my earliest challenges was probably lack/partial awareness of genetic testing among clinicians and even less awareness amongst end-users or patients. One of my first tasks was to tour the country and start this conversation on prenatal testing through non-invasive methods. I will always be proud of the fact that we were the pioneers in setting up the non-invasive prenatal testing in India. I remember being so excited when the first sample came in. I went in and told Ram and his reaction was - 'only one'?. He He! Ram has been a visionary with unending energy and extremely supportive all along.

One of the most recent challenges that we faced was the NIPT server issue, this January. I want to personally commend and sincerely appreciate the the lab team, Avinash, Rashmi, Aswini, Pushpanjali, Venkatachala Pathy, Sneha and Infant Thomas the reporting team, Angela and Shweta and relevant sales team who have shown extraordinary commitment to overcome this challenge. It was the peak Omicron period but the team worked through it, overcoming several personal challenges.

We have processed nearly forty thousand or more NIPT samples across two different platforms. Apart from challenges that have come in from competitors, it has been a fantastic journey and learning experience. We have had several interesting cases. One particular mention is of a lady with Down syndrome who came in for testing of her pregnancy and fortunately for her, the fetus turned out to be normal. Another case, where a lady's fetus was suspected to have a sex chromosome abnormality which was eventually confirmed. She insisted on NIPT during her next pregnancy, which presented a negligible risk of chromosomal abnormality and went on to have a healthy baby girl. One of the forms of testing where we have been able to make a major impact in the affected families life is through preimplantation genetic testing for aneuploidy and monogenic disorders. We had a case couple of years ago, where the couple had a child with severe abnormality who eventually passed away. The mother was found to be a carrier and eventually through pre-implantation genetic testing, she delivered healthy babies. The clinician was so elated with the outcome that she specially called me late at night to share this happy news.

The backbone of any genetic testing is genetic counselling, its role cannot be understated especially in prenatal scenarios. MedGenome has been fortunate to have a capable team of counsellors, who have been contributing quietly to these efforts. I must make a special mention of my team of counsellors, Angela and Shweta and Dhriti whose scope of work has always been much beyond counselling. Even though it's the patient who should make an informed decision, both pre and post-test counselling is of paramount importance in facilitating the same.

We are only beginning to explore the power of genetics and genomics and there is more to come in terms of how we see genetic testing in our day-to-day life. Non-invasive methods are being explored for various tests and the potential of carrier screening tests is yet to be unleashed. Watch out for more useful and meaningful tests in the prenatal space.

My personal motto has always been to bravely take up opportunities, embrace change and be flexible. Nothing can be pre-decided and pre-set in this dynamic environment. You may have had your bachelor's degree in one field, your Masters in another and you may still be doing something entirely different. Put in your best effort every day. Life is a delicate balance of personal and professional priorities and it is very important to balance both. Don't ask me how, though!

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INDIA

Data- The fuel that powers the genomics engine

February 11, 2022, 11:12 PM IST / Mahesh Pratapneni in Voices, India, TOI

FACEBOOK TWITTER LINKEDIN EMAIL

Mahesh Pratapneni
Mahesh Pratapneni, Co-Founder, MedGenome

Personalisation has now become more of a customer expectation than delight when it comes to products and services but when it comes to healthcare, we are still trying to assimilate the role of genomic data in creating tailor made medicines. The power of genomics lies in getting the right data to the right people to enable them to make the right decisions! To appreciate the role of data in genomics, it is essential to first recognize its varied applications from diagnostics to drug discovery, though the underlying goal remains the same- understanding the biology of a disease.

ThePrint

POLITICS GOVERNANCE ECONOMY DEFENCE INDIA FEATURES OPINION EVENTS

India expands Covid genome sequencing network, 6 pvt labs in Bengaluru, Delhi, Ahmedabad added

New Delhi: Six private laboratories have now been included in India's genomic sequencing consortium — a network of laboratories that have been tracking genetic mutations of the SARS-CoV-2 virus, which causes Covid-19, circulating within the country.

The Indian SARS-CoV-2 Genomic Consortia (INSACOG) was set up in January last year, with initial participation of 10 national research laboratories belonging to the Department of Biotechnology, Indian Council of Medical Research, Council of Scientific and Industrial Research and Ministry of Health and Family Welfare.

EXPRESS HEALTHCARE

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World Cancer Day 2022: Close the Care Gap

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World Cancer Day which is observed every year on February 4, focus on creating awareness, inspire change and reduce the global impact of cancer.

The day also aims to reduce misconceptions surrounding cancer and various stigmas myths associated with it and helps people in getting the right information about it.

The theme of World Cancer Day 2022 is 'Close the Care Gap'. It is all about identifying and recognising global disparities in cancer care, that prevents people from certain economic strata full access to essential healthcare services and facilities. Inequity in cancer care costs lives.

Dr Shivali Ahlawat -Head of National Reference Laboratory, Oncquest Laboratories said, "We have developed cures for everything as a sophisticated civilization, yet the life-threatening problem of cancer persists. The first step in dealing with any problem is to become aware of it. When it comes to a life-threatening disease like cancer, awareness is the first step toward prevention. World Cancer Day is explicitly dedicated to achieving this aim, and its goal is to inculcate in everyone a sense of the seriousness of cancer and encourage its prevention, identification, and treatment."

"This 'World Cancer Day' lets us act responsibly by connecting our hands as a team and raising awareness about this severe disease and the importance of regular health care to prevent it. So, let's make sure that we all do our part to help pave the road for a healthier global environment", she added

DH DECCAN HERALD

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Four Bengaluru labs included in genomics consortium

Sequencing information will be confidential and not shared with any third party, media or the public

Suraksha P, DHNS, Bengaluru, FEB 23 2022, 00:59 IST | UPDATED: FEB 23 2022, 02:16 IST

Representative image. Credit: iStock Photo

The Department of Biotechnology on Tuesday approved the inclusion of six private genomic-sequencing labs in the Indian SARS-CoV-2 Genomics Consortium (INSACOG), a network of labs tasked by the government to sequence Covid samples. Four of the labs are from Bengaluru.

The city labs are Strand Life Sciences, Genotypic Technologies, Medgenome, and Eurofins Genomics India Pvt Ltd, according to an official memorandum from the Ministry of Science and Technology.

However, their inclusion is subject to certain conditions. The sequencing costs are to be met by the private laboratory and charges cannot be levied on patients. The labs will be required to indicate the source of funding in order to undertake sequencing activities.

Sequencing information will be confidential and not shared with any third party, media or the public. The private labs will preserve the RNA samples for a specific period, among other terms and conditions, to ensure the quality of sequencing.

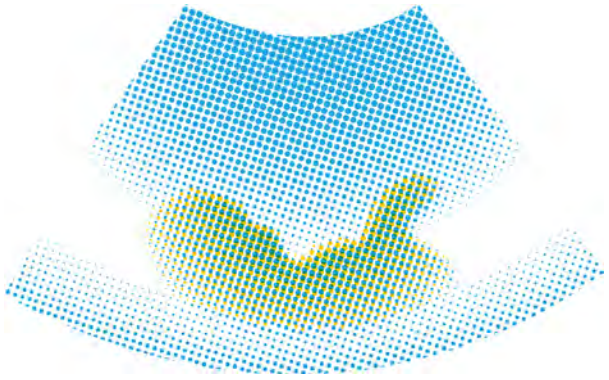
Watch the latest DH Videos here:

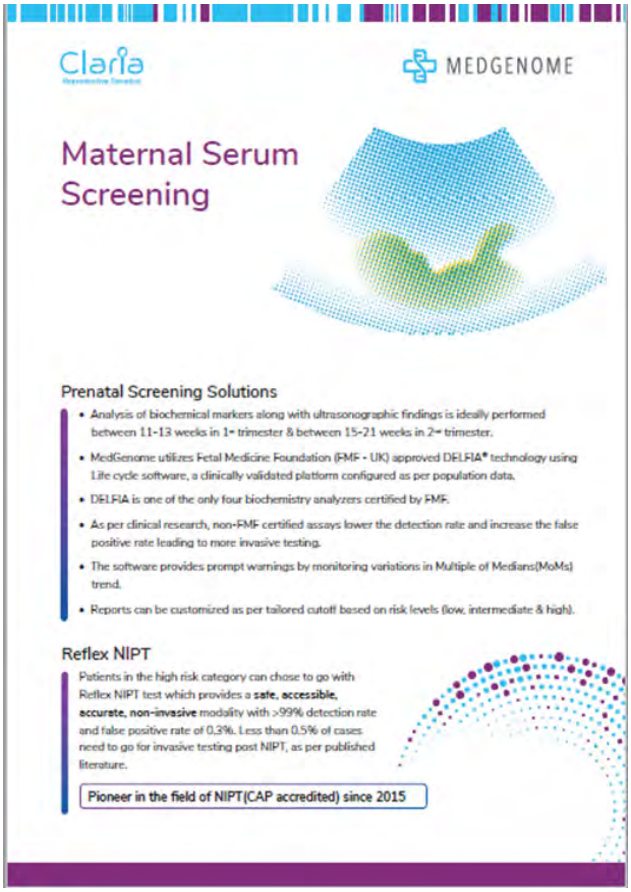
For press articles, please click https://diagnostics.medgenome.com/press/

MedGenome Connect

Claria
Reproductive Genetics

The last quarter has been a very busy one for Claria . We launched our new test- Prenatal maternal serum marker screening to expand our Prenatal testing portfolio. We have been participating in multiple face to face conferences and conducting CMEs, RTMs with our KOLs.





ACTIA
Inherited Genetics

This was the quarter where the team went all out with multiple events planned and executed pan India. The focus of all these events was to bring out the USPs of our offerings and to actively engage the clinicians. We also came out with version 5 of the clinical exome panels.

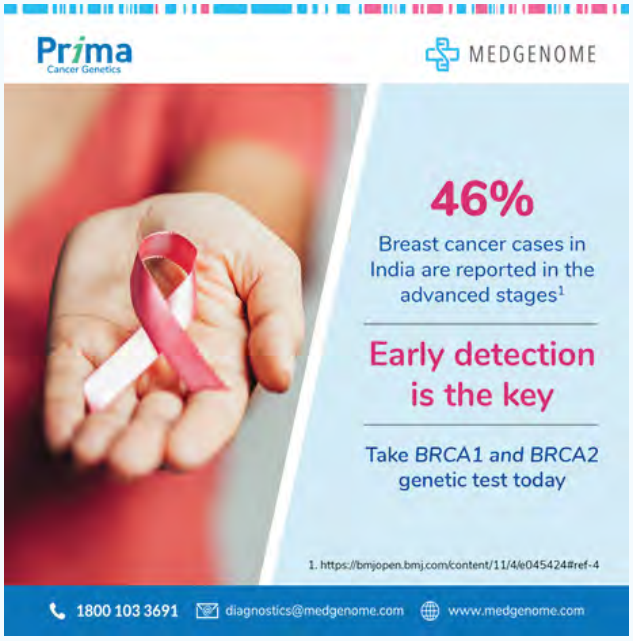
We also executed a social media campaign on Rare Diseases where clinical experts from the field joined hands with MedGenome to create awareness about accurate diagnosis and treatment of such diseases.

MedGenome Connect

Prima Cancer Genetics

The last quarter was a very busy once for Prima, the team engaged clinicians in multiple physical as well as digital activities. In-person meetings have picked up pace like the pre-covid times and we have been part of many face-to-face conferences and panel discussions.

The team is gearing up for the launch of multiple new tests for example :- Liquid biopsy in Ovarian and Prostate Cancer



micra Infectious Disease Genetics

The last quarter has been a very busy one for Micra . We have introduced couple of new tests to our infectious disease segment. March also happens to be the TB awareness month and we executed an awareness campaign with our key physicians like Dr. Camilla Rodrigues & Dr. Pranita Tipre on the theme #InvestToEndTB campaign

What's new

Research Publications

1. *A novel leaky splice variant in centromere protein J (CENPJ)-associated Seckel syndrome.*
   PMID: 35451063

2. *Clinical, genetic profile and disease progression of sarcoglycanopathies in a large cohort from India: high prevalence of SGCB c.544A > C.*
   PMID: 35416532

3. *Evaluation of cytogenetic and molecular markers with MTX-mediated toxicity in pediatric acute lymphoblastic leukemia patients.*
   PMID: 35157101

4. *Whole-exome sequencing and variant spectrum in children with suspected inherited renal tubular disorder: the East India Tubulopathy Gene Study.*
   PMID: 35006361

New Test Launch

Prenatal maternal serum marker screening

From Our US Office

We continue to add information - rich articles to our blog. Some of the recent ones are as follows:

1. Transform your cancer research with the most suitable “omics” strategy
2. Rare Disease Day 2022: A call for better Diagnosis, Treatment, and Equity
3. Spatial Transcriptomics: Beyond gene expression via tissue architecture

Please visit our blog at **https://research.medgenome.com/blog/** to see the archives.
You can share your viewpoints and articles at **mgus-blog@medgenome.com**

Also, MedGenome US conducts regular internal trainings for Commercial and NGS lab members on assays offered. One of them on 'TCR and BCR Sequencing' is available in the link below.

https://youtu.be/4xGgKH8j5Lw

The recordings are archived in LIMS for all the team members to review at any time.

Liquid Biopsy :

Revolutionising Oncogenomics

By: Suruchi A,
Senior Scientist - Oncology

Few years back, a beautiful lady named Emma lived with her family in the city of Kansas, and was found to have a suspicious mass of tissue in her left lung. Her doctor surgically removed a small piece of the tissue for analysis and, after looking at it under the microscope, confirmed that it was cancerous. Now, the question was which treatment would be best suited to her? However, not enough tissue was left for more specific tests that might help answer this question. The only way was to undergo another surgery in order to get more of the cancerous tissue, but she was not happy at the prospect of another surgery and her doctor was worried that the tumour might be located in a sensitive area and better not to disturb.

So what options did she have?

Fortunately, advances in the field of genomics led to the development of a test that was useful for her: the liquid biopsy test. She underwent a non-invasive liquid biopsy genomic test that helped to determine the most effective treatment best matched to her tumor abnormalities.

Simultaneously, a 45-year-old engineer, Liu was undergoing treatment for lung cancer in Luxembourg. After 8 months, he went for a follow up only to learn that he had started progressing again. The response to the current treatment was diminishing. His doctor was not very convinced for surgical biopsy and there were limited options to check for change of therapy regimen. Liu underwent a liquid biopsy genomics test and found that he had developed resistance to the current therapy. The doctor was now well informed for further treatment protocol and disease management.

Rather than undergoing risky and invasive biopsy procedures, Emma and Liu were highly benefitted with non-invasive liquid biopsy genomics tests. Additionally, liquid biopsy tests were repeated at intervals for them in order to monitor treatment response and analyse disease burden.

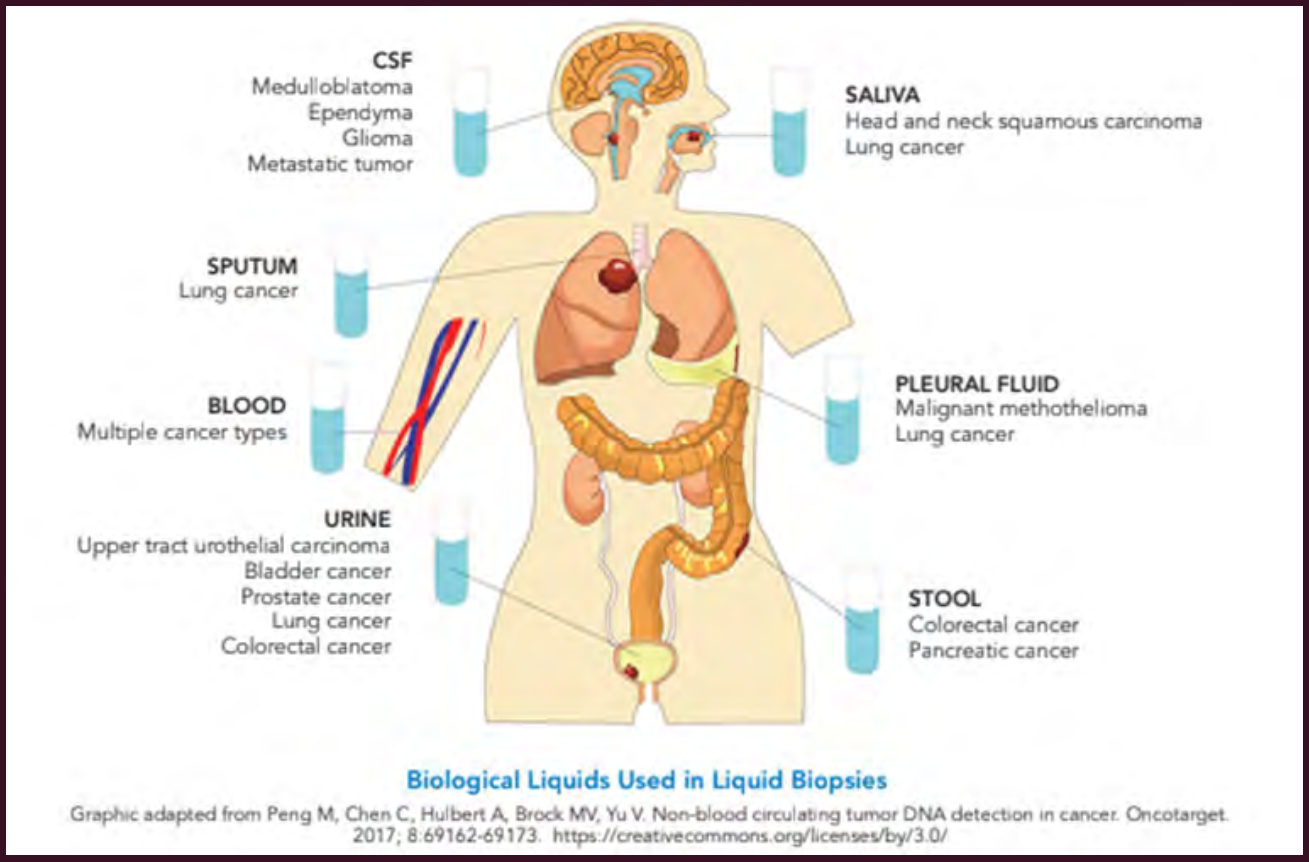
An excellent teacher, Mark, who dedicated his life to education, was enjoying his retired life with his grandchildren in Durban. He got diagnosed with prostate cancer and underwent first line therapy but progressed again with advanced disease metastatic castration resistant prostate cancer. The mets were present in bones and due to the small size of prostate tissue, biopsy test was not an option. His doctors wondered as to how to determine the next best line of treatment until a liquid biopsy genomic test was performed. The test findings helped them to identify cancer biomarkers indicated for approved therapies.

The journey of Emma, Liu and Mark very well highlights the clinical importance of liquid biopsy genomic tests. As an advancement in the field of genomic medicine, it holds potential to impart treatment benefits to the patients with advanced disease.

What is liquid Biopsy?

All of us have undergone a form of liquid biopsy test. Yes, it is just a blood or a urine test that determines the levels of Glucose, Calcium, Vitamins, hormones, etc. A liquid Biopsy is the sampling and biological analysis of body fluids such as blood, urine, saliva, sputum, pleural fluid (liquid in the lungs), and cerebrospinal fluid (the liquid surrounding brain and spinal cord) to determine underlying causes of any disease condition.

But, why do we call these tests liquid biopsies? Pertaining to applications in cancer treatment the term “liquid biopsies” emphasises their similarity to solid tissue biopsies in terms of the information obtained and potential clinical uses. The genomic analysis of biological liquids helps to potentially help identify cancer, develop treatment plans, detect recurrences and monitor disease progression.



Biological Liquids Used in Liquid Biopsies

Graphic adapted from Peng M, Chen C, Hulbert A, Brock MV, Yu V. Non-blood circulating tumor DNA detection in cancer. Oncotarget. 2017; 8:69162-69173. https://creativecommons.org/licenses/by/3.0/

One of the most attractive features of liquid biopsies is that they are much less invasive than solid tissue biopsies. Given the relative ease with which liquid biopsies can be obtained, they can be performed repeatedly over the course of treatment. This allows the treatment team to have a “real time” picture of the cancer, including the mutations it shows at time of biopsy and how the mutations driving the cancer may change over time. This type of monitoring is not as timely with solid tissue biopsies.

Additionally, as alluded to in Emma’s story, tumors are sometimes found in sensitive locations like close to important blood vessels or in the brain or like Mark’s case the tumor may be so tiny that it is difficult for surgeons to obtain the cancerous tissue. In these cases, liquid biopsies provide an attractive alternative.

What do liquid Biopsy detect?

Liquid biopsies don’t actually detect the solid tumor itself, but instead detect some component of bodily fluids that provides information about the tumor. In other words, liquid biopsies detect biomarkers for solid tumors. Biomarkers are biological substances, characteristics, or images that provide an indication of the biological state of an organism. As you can see, the definition of biomarkers is quite broad, with liquid biopsies, we are interested in biomarkers that the tumor releases into the blood or other bodily fluids such as circulating tumor cells, DNA, RNA, and exosomes.

Circulating Tumor Cells

Circulating tumor cells, or CTCs, are cancer cells shed from tumors into the blood, where they may then travel to distant locations in the body and form metastases. Circulating tumor cells in the blood are usually pushed there by tumor growth or mechanical disruption of the tumor during surgery.

Circulating RNA

Several different types of RNA exist in the blood, the messenger RNA, or mRNA has shown some promise as a biomarker, but it degrades rapidly in blood and is therefore difficult to study. miRNAs are abnormal in cancer and are relatively stable, making them good, potential candidates for liquid biopsies.

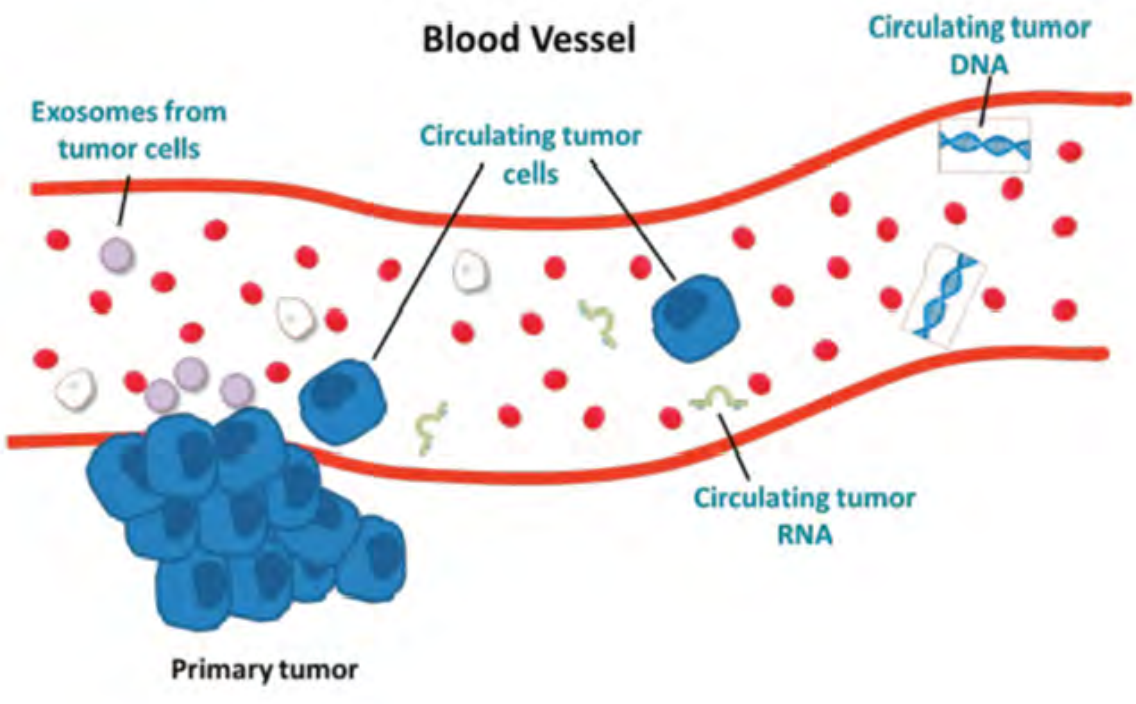
Circulating DNA

Currently, cell-free DNA (cfDNA) is one of the most studied analytes in liquid biopsies. All cells including tumor cells can release circulating free DNA, or cfDNA (circulating tumor DNA, or ctDNA). The total levels of cfDNA tend to be higher in cancer patients than in healthy subjects and seem to increase with stage and metastasis.

Additionally, analysis of tumor-specific genomic alterations (mutations and rearrangements) on cfDNA has proven to be very useful. Importantly, these genetic alterations seem to be highly concordant in blood ctDNA and in corresponding tumor tissues in a variety of cancers, including lung, breast, colorectal, pancreatic, liver, esophageal, gastric, and ovarian cancers. These tests are mainly used as companion diagnostic tests to identify patients who are eligible for targeted treatments.

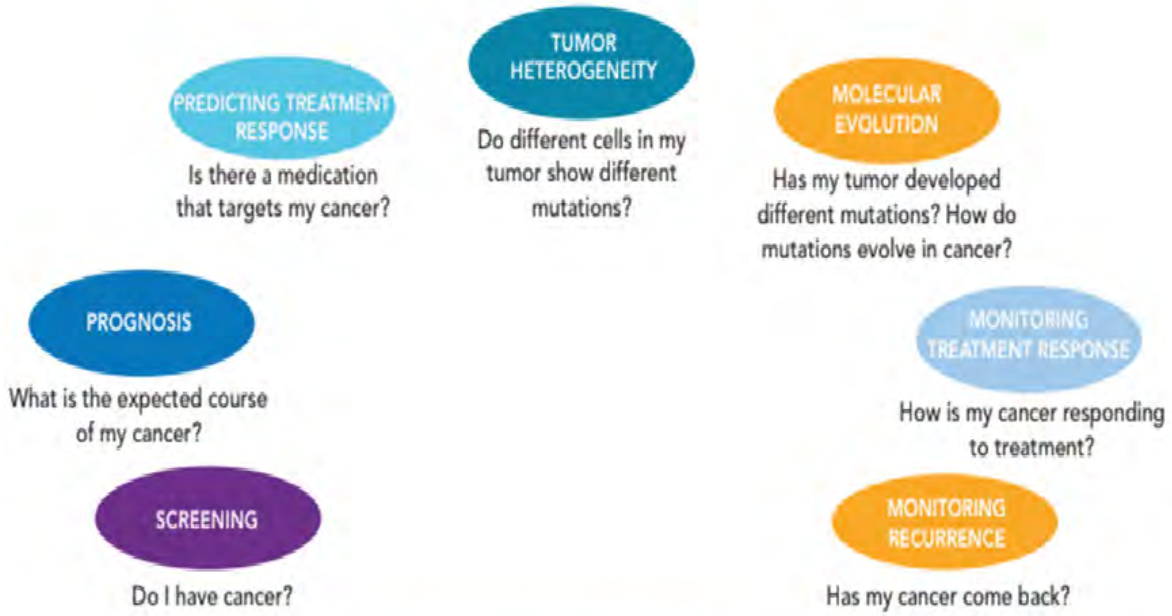
Exosomes

Exosomes are small sacs or vesicles that nearly all cells release into blood and other biological liquids. Exosomes contain DNA, RNA and proteins from inside the cell that are protected from degradation by a membrane surrounding the vesicle. The vesicle acts like a preservation container, keeping the molecules intact, which is clearly an advantage when trying to analyze them. The DNA and RNA found in tumor exosomes may provide genomic information about tumor cells mutations.



How can liquid biopsies be used?

This anecdote illustrates several potential uses of liquid biopsies: screening, diagnosis, predicting treatment response, detecting novel mutations, monitoring treatment response, and monitoring recurrence. Some of these potential uses are likely to develop in coming years as we wait for the techniques to be refined and the proper research to be conducted. Moreover, not all biomarkers in liquid biopsies provide all of this information. Some liquid biopsy tests are now combining different biomarkers to enhance the predictive ability (e.g., circulating tumor cells plus circulating DNA; circulating DNA plus circulating proteins).

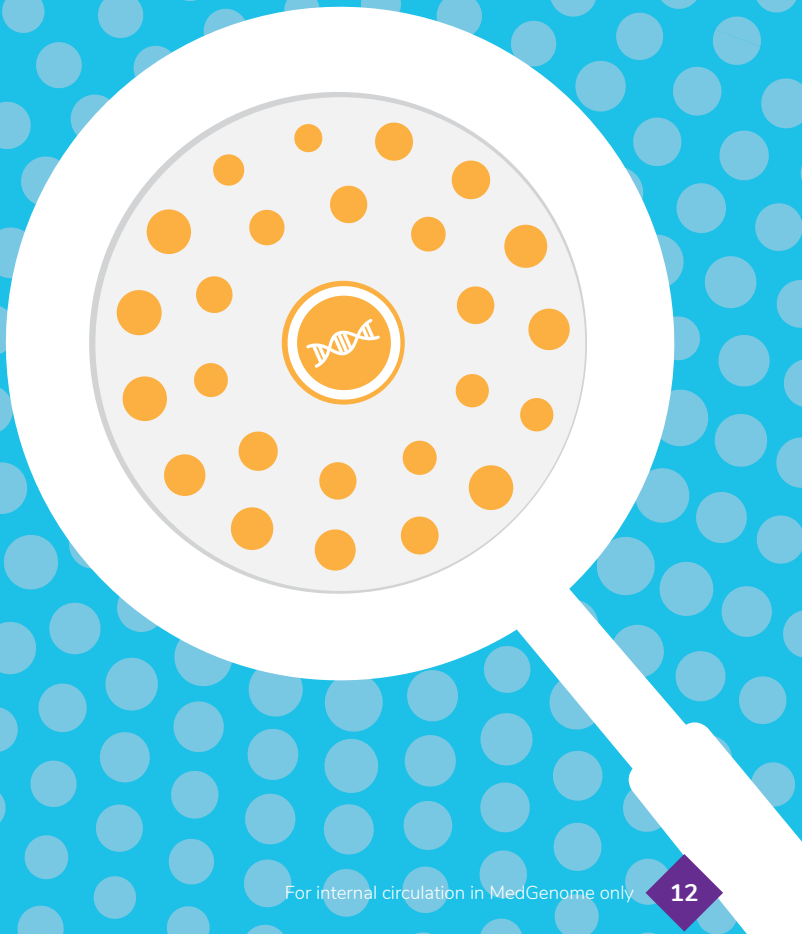


Potential Uses of Liquid Biopsies in Cancer

Screening

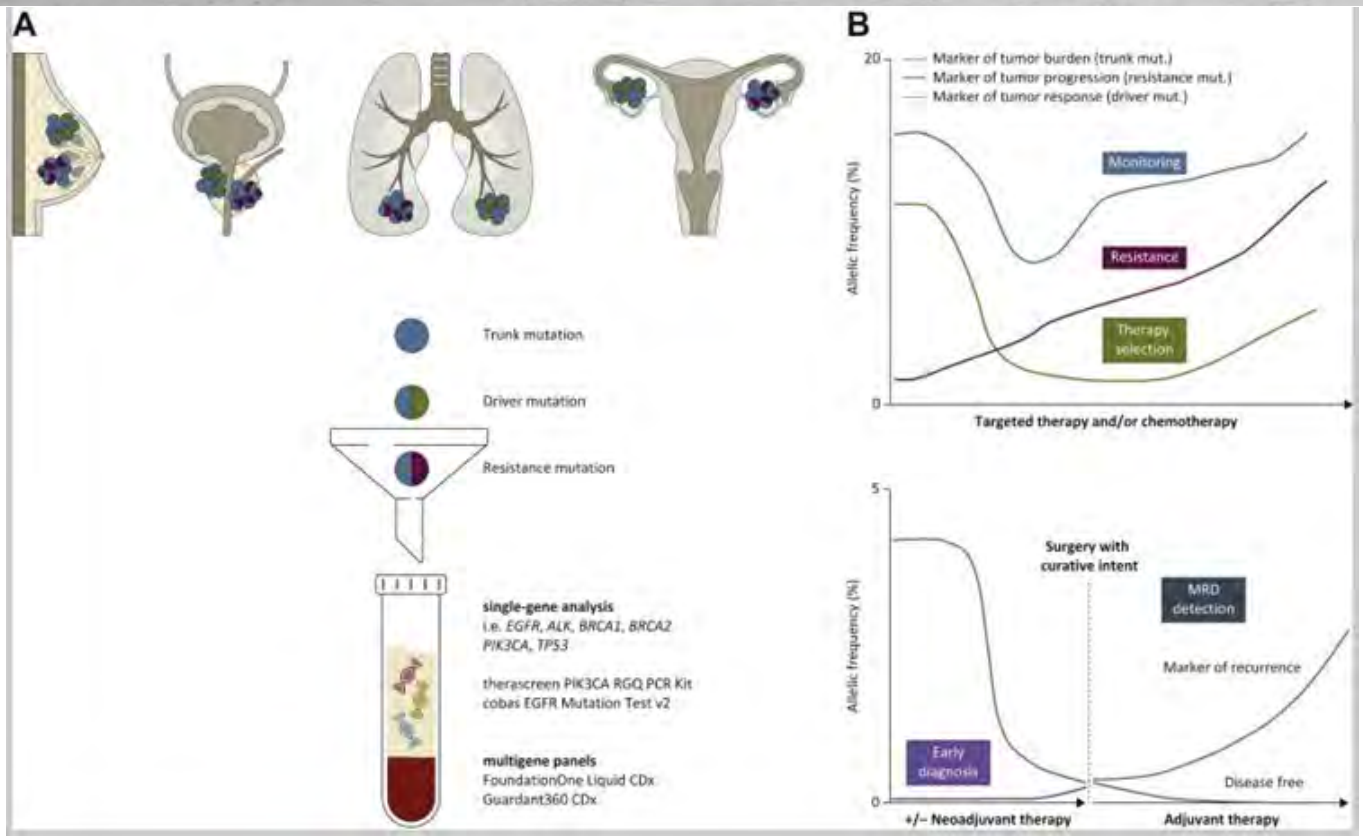
Presence of circulating tumor cells may be useful for cancer screening. For example, one small study of patients with stomach cancer found 97% of 102 people who had two or more CTCs per 7.5 mL were correctly identified as having cancer (https://www.ncbi.nlm.nih.gov/pubmed/28662130. Some cancers are more aggressive than others and knowing numbers of CTCs can help guide treatment.

In addition to circulating tumor cells, circulating tumor DNA has been studied as a biomarker for the prognosis of metastatic triple negative breast cancer. The patients with triple negative breast cancer found to have higher levels of circulating tumor DNA fared significantly worse than the group with lower levels, as demonstrated by shorter survival. (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5815405/).



Predicting Treatment Response

Another useful piece of information that can be gleaned from liquid biopsies is the presence of mutations in the cancer that may render it responsive to drugs targeting those mutations, just like Emma who carried exon 19 deletion mutation in the EGFR gene. Similarly there are many other genes that are altered in different cancer types and can be targeted by FDA approved therapies (Table 1). However, after some years targeted treatments may become unresponsive because of molecular evolution of tumours as explained in the next section. Cancer cells accumulate more mutations over time that imparts drug resistance just like in the case of Liu, T790M mutation in the EGFR gene causes resistance to certain tyrosine kinase inhibitors. Liquid Biopsy tests can detect these mutations and informed treatment decisions can be planned.



Plasma cell-free tumor DNA (ctDNA) clinical utility as a liquid biopsy.

(A) ctDNA can be shed by various tumor types, including breast, lung, prostate, and ovarian cancers. Each lesion can harbor different alterations (trunk mutation, blue, shared by all the clones as it occurs early in the tumorigenesis; driver mutation, green, and resistance mutation, red, which can emerge after treatment). Once in the blood, ctDNA can be assessed to investigate for molecular alterations by two approaches: the single-gene analysis (PCR-based methods such as droplet digital PCR, upper panel), or the multigene panel analysis (next-generation sequencing, lower panel). (B) ctDNA as a biomarker with different dynamics, where the percentage of mutational allelic frequency is quantified throughout all the collected ctDNA timepoints. ctDNA is assessed for three biomarkers: (i) for patients' monitoring during treatment, with a trunk mutation, as a marker of tumor burden, blue line; (ii) for therapy selection, with a driver mutation, as a marker of tumor response to therapy, green line; and (iii) with a resistance mutation, as a marker of tumor progression and resistance to therapy, red line. Lower panel: ctDNA used as a marker of early tumor detection and diagnosis in patients with early stage cancer or in asymptomatic population (purple line).

Liquid biopsy companion diagnostic indications[a]

Test	Tumor type	Genomic alteration detected	Therapy
FoundationOne Liquid CDx	Metastatic NSCLC	*EGFR* Exon 19 deletions and *EGFR* Exon 21 L858R substitution	Osimertinib
			Gefitinib, Erlotinib
		ALK rearrangements	Alectinib
	Metastatic castration-resistant prostate cancer	*BRCA1, BRCA2, ATM* mutations	Rucaparib, Olaparib
	Metastatic ovarian cancer	*BRCA1, BRCA2* alterations	Rucaparib
	Metastatic HR+ HER2− breast cancer	*PIK3CA* mutations C420R, E542K, E545A, E545D [1635G>T only], E545G, E545K, Q546E, Q546R; and H1047L, H1047R, and H1047Y	Alpelisib
Guardant360 CDx	Metastatic NSCLC	*EGFR* exon 19 deletions, L858R, and T790M+	Osimertinib
cobas EGFR Mutation Test v2	Metastatic NSCLC	Plasma (Erlotinib): Exon 19 deletions and *L858R* exon 19 deletions and *L858R* Osimertinib: Exon 19 deletions, L858R and T790M exon 19 deletions, L858R and T790M+ Gefitinib: Exon 19 deletions and L858R exon 19 deletions and L858R	Osimertinib Erlotinib, Osimertinib, Gefitinib
therascreen PIK3CA RGQ PCR Kit	Metastatic HR+/HER2− breast cancer	11 Mutations in the *PIK3CA* gene [exon 7: C420R; exon 9: E542K, E545A, E545D (1635G>T only), E545G, E545K, Q546E, Q546R; and exon 20: H1047L, H1047R, H1047Y]	Alpelisib

Determining Tumor Heterogeneity

Cancer cells divide to produce new, genetically identical cancer cells (i.e., clones). However, cancer cells are notorious for developing additional mutations. Not all cells in the tumor develop the same mutations, though, meaning that not all cells within a tumor are genetically identical. This leads to intra-tumor heterogeneity.

Tumor biopsies may represent mutations from only a part of the tumor and may miss cells on the other side of the tumor that may have different mutations. If the first mutation is used to make a treatment decision, such as selecting a targeted therapy, the treatment may work for a while by preventing cells with the first mutation from growing. Eventually, though, tumor cells with other mutations divide and grow. This is an example of molecular evolution of cancer and it is a major reason for the development of drug resistance.

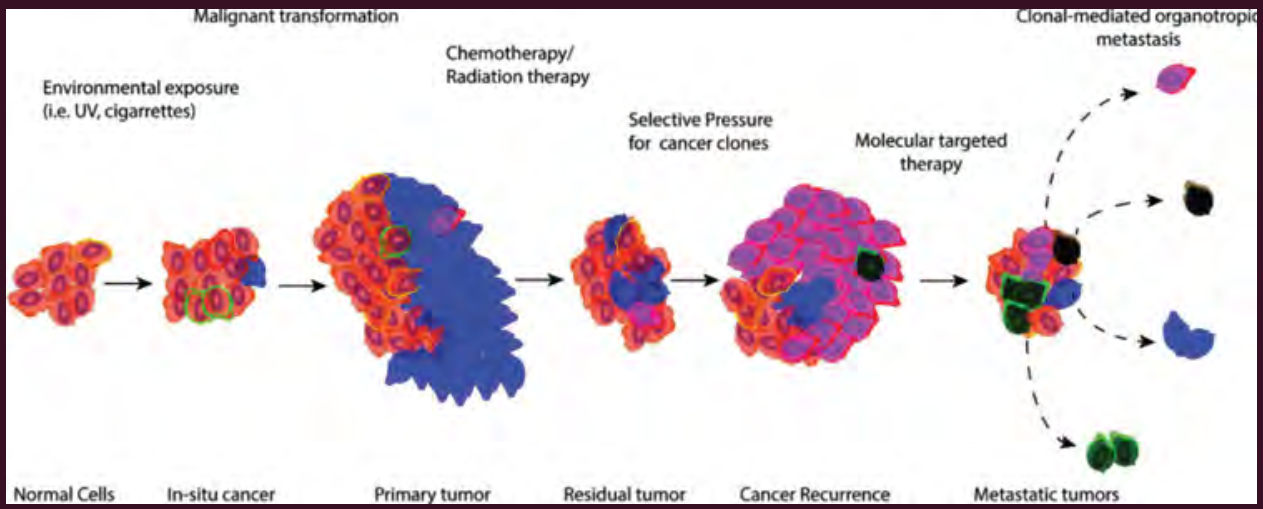


Image Credit: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4913179/

Inter-tumor heterogeneity refers to DNA differences between cells in the primary tumor and secondary tumors that establish and grow at distant sites. This graphic shows tumor heterogeneity and molecular evolution of the cancer. The leftmost clump of orange cells are normal, but develop a mutation shown in blue following exposure to a carcinogen in the environment. Under some circumstances, such as the accumulation of other mutations, the blue, mutated cells multiply generating a primary tumor. A few of the cells in the primary tumor develop different mutations, shown in pink and green. Treatment with chemotherapy or radiation therapy can dramatically reduce the tumor's size, leaving a small residual tumor. Cells with the pink mutation are better able to divide and grow in the post-treatment environment than are the blue cells. Thus, they become an important mutation driving the development of a new tumor. A targeted therapy for the pink cells (called molecular targeted therapy in the graphic) dramatically reduces the size of the tumor by inhibiting its division and growth. After a time, cells with multiple different mutations divide and grow, eventually leading to metastatic disease that may be dominated by different mutations.

Monitoring treatment response and disease recurrence

The longitudinal collection of biofluids allows for the monitoring of the disease, assessment of treatment response, and identification of mechanisms of resistance. For instance, ctDNA analysis has been successfully used to detect resistant mutations in genes such as EGFR, ERBB2, PIK3CA, and RAS, in various cancers including non-small cell lung cancer, colorectal cancer, breast cancer and gastric cancer. As a matter of fact, a decrease in ctDNA after treatment has been associated with lower risk of progression and longer survival, while persistent or increased ctDNA levels have been associated with progression, relapse, and decreased survival.

In addition, ctDNA can be used to detect minimal residual disease (MRD) in cancer patients undergoing surgery with curative intent, with or without prior neoadjuvant treatment. If ctDNA after surgery is still detected, then the patient could be guided to receive adjuvant therapy and monitored for further disease recurrence; if ctDNA after surgery is not detected, then the patient could be considered disease free.

Limitations

The described evidence revealed that liquid biopsies provide a minimally-invasive way of representing the heterogeneous tumor profile at baseline and/or during follow-up, improving patient care without the limitations and risks associated with tissue biopsies. On the other hand, the use of liquid biopsies for screening and early cancer detection remains challenging, mainly because analytes, such as CTCs and ctDNA, are often below optimal levels for analysis, particularly in early-stage patients. In fact, the low specificity of liquid biopsy tests is a concern, given that their use for cancer screening would result in the detection of high numbers of false positives. Ensuring that cfDNA samples are of sufficient quantity and quality is crucial for the success of downstream applications. The low quantities and small fraction of ctDNA in circulation require the use of highly sensitive detection techniques, such as droplet digital Polymerase Chain Reaction (ddPCR), Next Generation Sequencing (NGS) or BEAMing (beads, emulsion, amplification and magnetics). ctDNA profiling is still complex and expensive to apply in clinical routine. Additionally, the isolation of CTCs, which are extremely rare in circulation, is also difficult and costly. Instead, the quantification of total cfDNA could be used as a simple and cheap alternative to predict disease response and outcomes, although its diagnostic value is limited

Despite these challenges, the non-invasive screening and early detection of cancer is still one of the most attractive and awaited applications of liquid biopsies, since it could substantially improve treatment efficacy and patient survival, especially for cancer types lacking screening tools and that are often diagnosed in advanced stages. Hopefully, technological advances and growing interest in this area will develop liquid biopsies as a routine tool for cancer screening and diagnosis in the coming years.

Featured Article

International Women's Day

8th March is International Women's Day which is devoted to celebrating the achievements of women and seeking gender equality.

By: Madhavi,
Principal Genetic Counselor, Level II

When did International Women's Day begin?

On Feb. 28, 1908, roughly 15,000 women (largely garment workers) took to the streets of New York City to demand the rights and respect they were owed. They rallied for shorter work hours, pay equity and even suffrage. Thus, it began as National Women's Day in the United States back in 1909. But by 1910, the momentum had truly gone global.

At the second International Conference of Working Women in Copenhagen, there was a call for an international women's day to give women a greater voice to further their demands for equal rights, which was unanimously approved by the female attendees from 17 countries. The next year, in 1911, more than 1 million women and men in Europe marched and attended International Women's Day rallies or demonstrations. On March 8, 1917, in correlation with these rallies, women in Russia took a stand for Bread and Peace in the midst of war.

In 1975, United Nations chose March 8th as official International Women's Day holiday, to recognize and celebrate the achievements of women from all works of life, without regard to divisions, whether national, ethnic, linguistic, cultural, economic or political.

On the centenary in 2011, sitting US President Barack Obama called for March to be known as Women's History Month. He said: "History shows that when women and girls have access to opportunity, societies are more just, economies are more likely to prosper, and governments are more likely to serve the needs of all their people."

Besides International Women's Day and the International Day for the Elimination of Violence against Women, the UN observes other international days dedicated to raising awareness of different aspects of the struggle for gender equality and women empowerment. On February 6, the International Day of Zero Tolerance to Female Genital Mutilation is observed, February 11 is the International Day of Women and Girls in Science, June 19 is the International Day for the Elimination of Sexual Violence in Conflict, June 23 is International Widows' Day, October 11 is the International Day of the Girl Child and on October 15 the International Day of Rural Women is observed.

Theme of International Women's Day

International Women's Day has a theme each year, and in recent years, those themes speak directly to the importance of pushing forward. The IWD theme for 2016 was Pledge for Parity, for 2017, it was Be Bold for Change, in 2018, the theme was Press for Progress and in 2019 it was Think Equal, Build Smart, Innovate for Change. This year, it's "#BreakTheBias" which aims to create "A world free of bias, stereotypes, and discrimination. A world that is diverse, equitable, and inclusive. A world where difference is valued and celebrated."

This year, UN set the theme as "**Gender equality today for a sustainable tomorrow**", to recognize the contribution of women and girls around the world, who are leading the charge on climate change adaptation, mitigation, and response, to build a more sustainable future for all.

Women are increasingly being recognized as more vulnerable to climate change impacts than men, as they constitute the majority of the world's poor and are more dependent on the natural resources which climate change threatens the most. At the same time, women and girls are effective and powerful leaders and change-makers for climate adaptation and mitigation.

How gender inequality and climate change are interconnected

Climate crisis is not "gender neutral". Social norms and laws have imposed differentiated powers, roles, and responsibilities on women and men in all aspects of life. Girls and women - especially those living in the Global South - bear an unequal responsibility for securing food, water, energy, and other vital resources as well as for caring for the young and elderly - all of which place them at greater risk of experiencing detrimental climate impacts.

- Across the world, women depend more on, yet have less access to, natural resources.
- In many regions, women bear a disproportionate responsibility for securing food, water, and fuel.
- During periods of drought and erratic rainfall, women, as agricultural workers and primary procurers, work harder to secure income and resources for their families.
- It is girls, who often have to leave school to help their mothers manage the increased burden.
- When disasters strike, women are less likely to survive and more likely to be injured due to long standing gender inequalities that have created disparities in information, mobility, decision-making, and access to resources and training.
- Women's and girls' health is endangered by climate change and disasters by limiting access to services and health care, as well as increasing risks related to maternal and child health.

Gender Identity, Gender Equality and Gender Neutrality

At this point, let us also focus on understanding something more basic - Gender, and many terms associated with it.

Gender is one of the many ways an individual defines their identity, and shouldn't be confused with sex, which refers to one's biology.

Gender identity is each person's internal and individual experience of gender. It is a person's sense of being a woman, a man, both, neither, or anywhere along the gender spectrum. Gender expression refers to the ways in which a person chooses to present their gender to the world around them. It is to be noted that a person's gender identity can sometimes inform a person's gender expression, but a person's perceived gender expression need not dictate their gender identity.

DID YOU KNOW

There are 58 Gender Options for Facebook Users

Gender equality is when people of all genders have equal rights, responsibilities, opportunities, and the power to shape their own lives and contribute to the development of society. It is a matter of equitable distribution of power, influence and resources in society. According to the UN, it is a fundamental human right, and is also essential to achieve peaceful societies, with full human potential and sustainable development.

Gender inclusion, is a concept that transcends mere equality. It's the notion that all services, opportunities, and establishments are open to all people.

Gender neutrality is often confused with gender equality. Though both are related to the cause of gender inclusion, they not interchangeable. Gender neutrality can enable gender inclusion in many ways, but it is as a double-edged sword. Gender Neutrality is to say that we are all the same, but in reality, we are not. For example, having a unisex toilet in the main office area is definitely progressive and gender inclusive. But having only unisex toilets across the office building can be considered insensitive and gender blind.

Gender-neutral pronouns are words that don't specify whether the subject of the sentence is female or male. 'They', for instance, is a third-person pronoun that is gender neutral. Other gender-neutral pronouns include 'them', 'this person', 'everyone', 'Ze', or 'Hir'. If you're not sure which pronoun to use, you can also use that person's name.

DID YOU KNOW

There are 78 Gender pronouns

Gender-blindness means ignoring the different roles, responsibilities, capabilities, needs and priorities of people of different genders. It can be harmful, and can further gender inequalities. In a positive sense, Gender-blind is like the idea that any actor can be cast in any role in a theatre, regardless of gender. Hence it can be used in the workplace to encourage women to embrace confidence and independence.

Gender equality:
Our office hires the same number of men and women

Gender neutrality:
Our office hires the best person for the job regardless of gender

Conclusion

The reality is people are treated differently throughout their lives because of many factors including their gender. These are factors we cannot ignore as we try to treat all individuals with respect on the road to gender equality. My view is for all of us have to be Gender aware which is the ability to view society from the perspective of gender roles. We also need to be Gender sensitive which is translating this awareness into action in the design of development policies, programs and budgets. In addition we should be Gender accommodating which means not only being aware of gender differences but also adjusting and adapting to those differences.

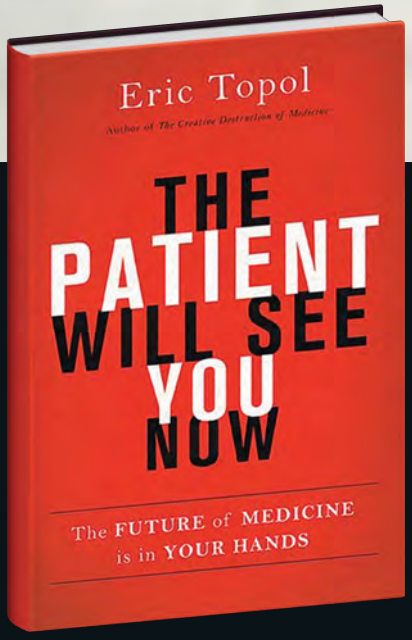
But again, just being aware, sensitive and accommodating is not sufficient. We should strive towards focusing on fairness and justice regarding benefits and needs for people with diverse genders. Hence, the point to be remembered would be - Where Gender equality means equal outcomes for women, men and gender-diverse people, 'Gender equity' is the process to achieve gender equality.

Changes toward Gender Equity within our society will positively impact all genders.

Feminism is concerned with the rights of women while gender equality is concerned with the rights of every individual regardless of their gender. Feminism is all about bringing out equal rights for women while gender equality is about ensuring equal rights for everyone irrespective of their gender.

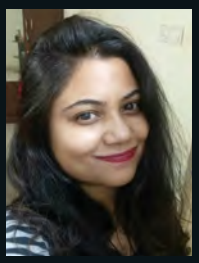
From our Colleagues

Book Review



Book

The Patient Will See You Now



Book review by

Kamalika Das,
Manager, Corporate

Dawn of the smart patients or Doom of the doctors?

Dr. Eric Topol, a cardiologist by profession and revolutionary at heart (and also a Professor of Genomics & Director at Scripps), striked again with his second book, The Patient Will See You Now, where he captured the dawn of patient empowerment and eventual doom or rather, 'upgradation' of rudimentary medical practices.

Dr. Topol had already set the context on 'Smart treatment' in his earlier book, The Creative Destruction of Medicine, where he explained how an individual and genomics would play an important role in data driven research, diagnosis, and even clinical trials. Coupled with various technologies, it would lead to personalised treatment and patient care. In this book, Dr. Topol extended his thoughts to show how patients having complete information and knowledge, would lead to a data driven discussion with the physicians that would be more impactful. He envisions the democratization of medical practices and a union between patients and technology, to create 'Smart Patients'. In true sense, it should be healthcare-of the patient, by the patient and for the patient.

This book broadly encompasses three major areas -

1. Patient Saga **2. Doctor Drama** **3. The Game-changer**

The patient saga

Dr. Topol pressed the right nerves when he explained the effect of medical paternalism on patients. From people having no control on their own test reports or having to blindly (rather forcibly) depend on the practitioner for diagnosis, to taking a full charge of their own health using various technologies or information systems is the highlight of this book.

For patients burdened with forced ignorance, high expenses, unnecessary tests and tests or hospital induced diseases, Dr. Topol's book is like a voice for the voiceless where only a game changing technology can save the day!

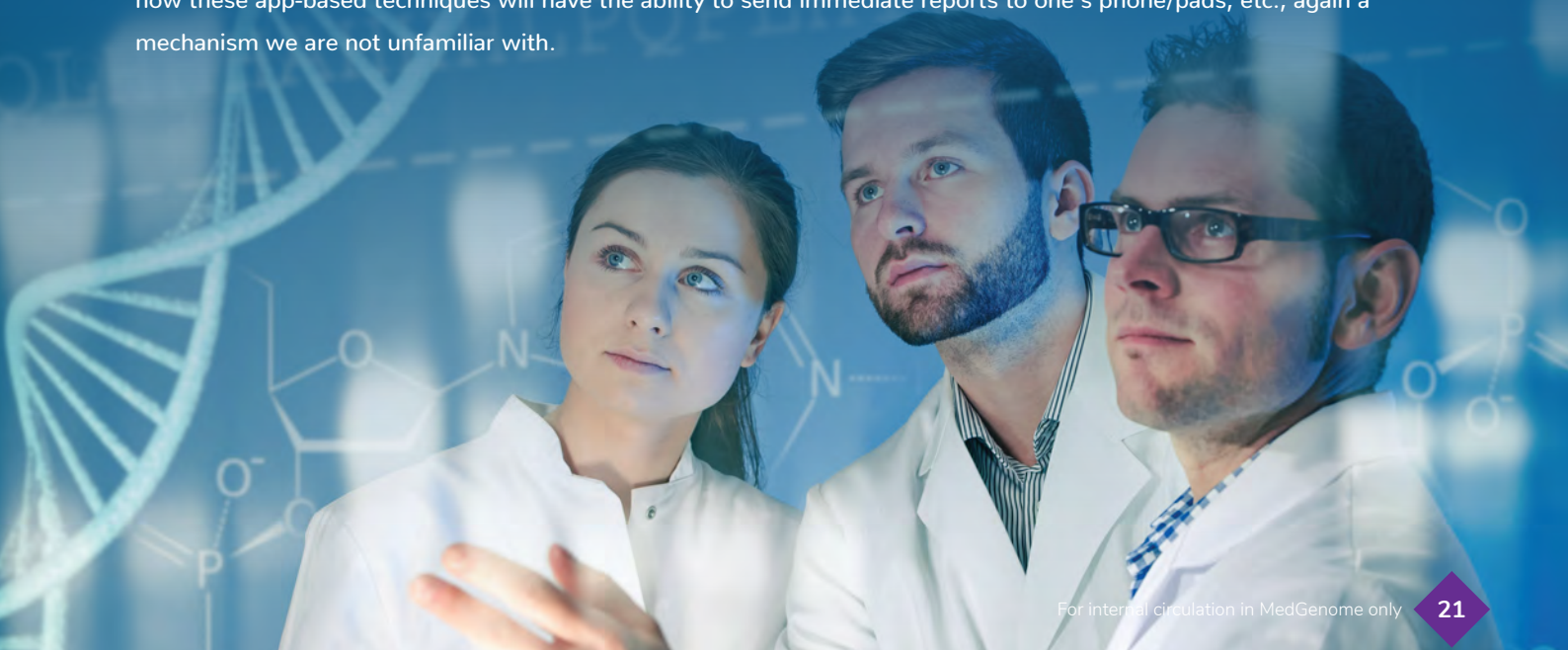
The doctor drama

It is a fact that there is a collective rigidity to change from the traditional medical practices and general unacceptance or reluctance towards technology. We have seen how genomics, even now, has not come into day-to-day practice in medical care. In The Creative Destruction of Medicine, he mentioned how a patient funded a genomic research to find a cure for himself and even the examples he presented in this book about Elena Simon or Kim Goodsell's quest to find the 'fault in her genes', are exceptional examples of the importance of genomics and patient empowerment. Today's clinicians are missing out by not dwelling deeper into it.

Clinicians need to accept that technology and newer methods like genomics, are there to support the physicians and not to create a substitution. By empowering patients, they will not lose their position, as the relationship between patient and a doctor is not about hierarchy but rather it should be symbiotic.

The gamechanger

In today's world full of apps, expecting a pocket friendly (both size and cost wise) technology that can cater to different types of health check-ups including blood, urine or even organ scanning is not actually unrealistic. We have seen many simpler versions of such apps and with better technology, an extensive testing gadget could be a reality. Dr. Topol explains how these app-based techniques will have the ability to send immediate reports to one's phone/pads, etc., again a mechanism we are not unfamiliar with.



To build a robust integrated information system where patient data starting from physiology to genomics to lab reports to mood to post-mortem, (what Dr. Topol referred to as womb to tomb) can be added and accessed by doctors and patients & their families at any point in time will be the practical solution to comprehensive healthcare management. His concepts of turning phones into smart labs or smart doctors, application of human GIS, preventive surgeries (classic Angelina Jolie case) or turning homes into hospitals with all gadgets in place are both futuristic and perhaps achievable targets.

Hence, this book has a thought-provoking take on giving complete control to patients over their own health while the doctors and technology being there to assist, and support, is what the future of patient care should be all about.

However, without global application, this cannot be termed a future of medicine. The cultural and economic aspect of introducing this change needs to be understood. For a country with a huge population and large families, low literacy, or people below poverty line, what are the chances of these applications or technologies to be successful?

Dr. Topol has not explored the limitation of humans themselves to utilise this change as he seemed to have put all people under the same intelligence level or purchase power.

Also, technology tends to go redundant or faulty and requires continuous upgrades, which Dr. Topol has not provisioned in his book, the operational and maintenance factor.

Humans had upgraded from the traditional home-based care and treatments to the sophisticated hospitals and testing labs. But how much these futuristic technologies would push us back into ourselves- 'self-care'. Do we want to do it all by ourselves, or do we want to be taken care of? Would every patient really be open to taking charge in his own hands, it is perhaps only time would tell!

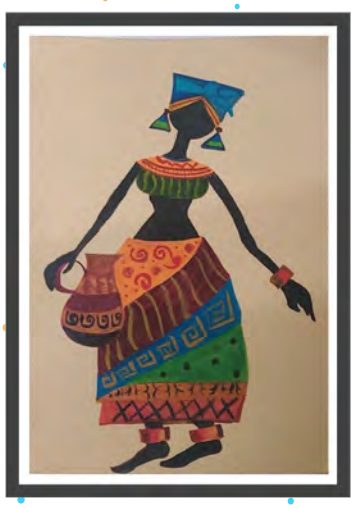
Nevertheless, this book is like a doorway to the concept of prevention before prescriptions and is an eye opener to what the future of medicine could be!

From our Colleagues

Art meets Science

If what is seen and experienced is portrayed in the language of logic, then it is science. If it is communicated through forms whose connections are not accessible to the conscious mind but are recognized intuitively, then it is art. - Albert Einstein

By: Sonakshi Makwana,
Associate Scientist

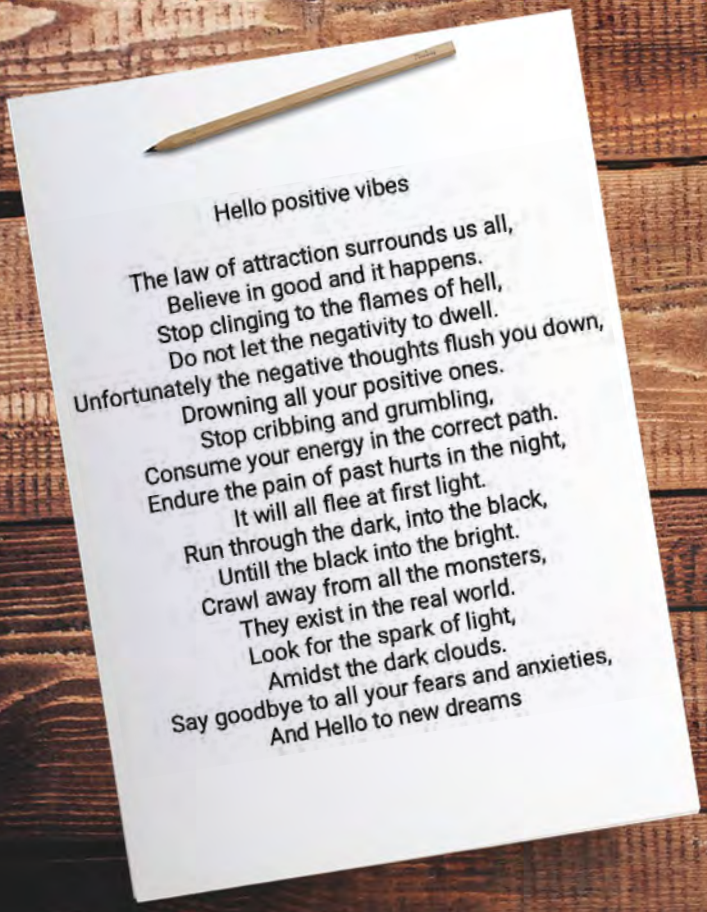


From our Colleagues

Our employee's little Picasso :)

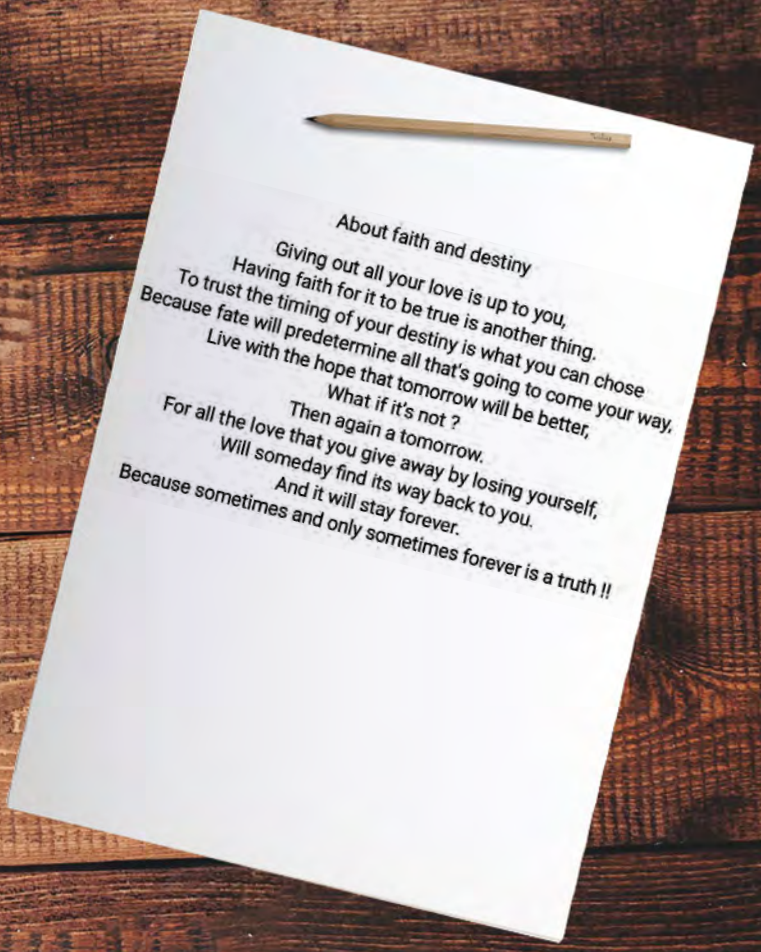
By
Mohammad Aahil Sayed (10 Years)
DNA of Tabassum, Customer Support

From our Colleagues



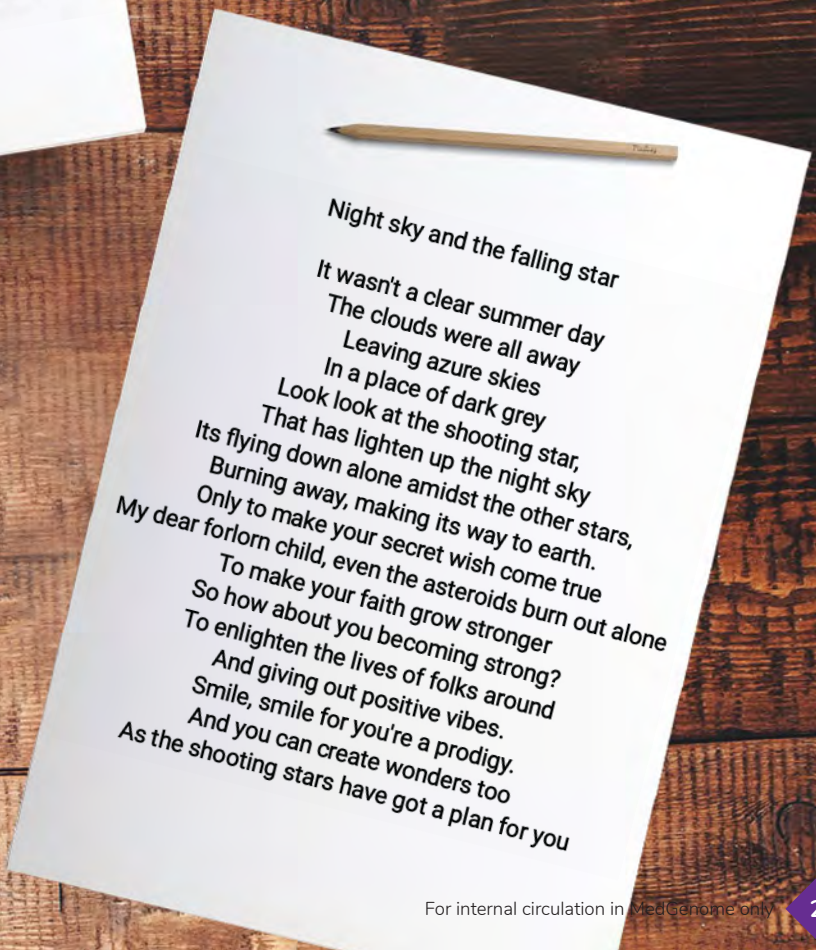
Hello positive vibes

The law of attraction surrounds us all,
Believe in good and it happens.
Stop clinging to the flames of hell,
Do not let the negativity to dwell.
Unfortunately the negative thoughts flush you down,
Drowning all your positive ones.
Stop cribbing and grumbling,
Consume your energy in the correct path.
Endure the pain of past hurts in the night,
It will all flee at first light.
Run through the dark, into the black,
Untill the black into the bright.
Crawl away from all the monsters,
They exist in the real world.
Look for the spark of light,
Amidst the dark clouds.
Say goodbye to all your fears and anxieties,
And Hello to new dreams



About faith and destiny

Giving out all your love is up to you,
Having faith for it to be true is another thing.
To trust the timing of your destiny is what you can chose
Because fate will predetermine all that's going to come your way,
Live with the hope that tomorrow will be better,
What if it's not ?
Then again a tomorrow.
For all the love that you give away by losing yourself,
Will someday find its way back to you.
And it will stay forever.
Because sometimes and only sometimes forever is a truth !!

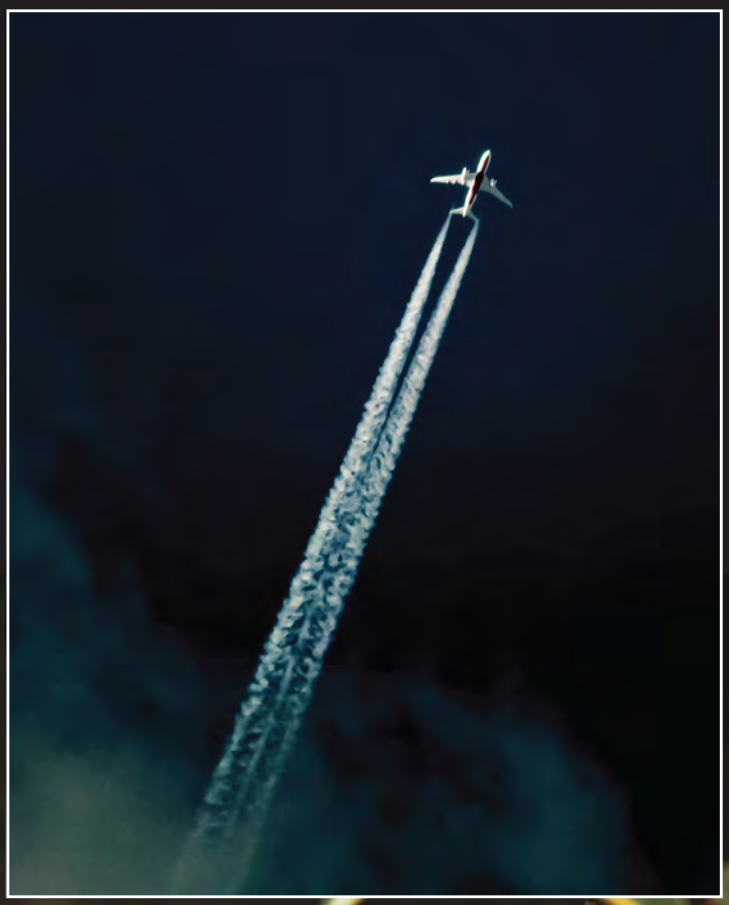


Night sky and the falling star

It wasn't a clear summer day
The clouds were all away
Leaving azure skies
In a place of dark grey
Look look at the shooting star,
That has lighten up the night sky
Its flying down alone amidst the other stars,
Burning away, making its way to earth.
Only to make your secret wish come true
My dear forlorn child, even the asteroids burn out alone
To make your faith grow stronger
So how about you becoming strong?
To enlighten the lives of folks around
And giving out positive vibes.
Smile, smile for you're a prodigy.
And you can create wonders too
As the shooting stars have got a plan for you

By: Sonakshi Makwana,
Associate Scientist

From our Colleagues



By
Writtik Maity
Research Associate Trainee

Employee Connect

WELCOME

Our New-Joiners


Abbagani Samyuktha


Aberame P


Abhishek Chakraborty


Adarsh Kumar Mishra


Aiman


Aishwarya Shishir


Akeen Kour


Alisha Pradhan


Ambreen Asim


Amit Ashok Jadhav


Aparna N


Aruthra B


Yadluri Ashok


Atmadeep Saha


Ayesree Roy


Bhatt Arpan


Chandu Somaji


Gulzar Singh


HariKrishna


Inderjit Prakash


Infant Thomas Susairaj


Jayasankar M J


Jismon Thomas


Karan Patel


Kirtee Jindal


Kumar S


Kunjan Grewal


MN Kavya


Madhusmita Panda


Malini Ayathu Venkata


Md Akram


Mohammad Usama


P Meliteena


Naveen S


Neeba Maria Sebastian


Neha Sudhir


Nibil Paul Varghese


Nidhi


Pankaj Kumar


Partha Pratim Bhuyan


R Partheeban


Nikita Rati


Anjali Rai


Pawan Vishwakarma


Arnav Kumar


P Pooja


Piyush Kumar


Prahlad Balakrishnan


Priyanka Atmaram


Rajadurai C P


Rakshitha V


Rayar E


SatheesKumar


Savita Jayaram


T Senthil Kumar


Sheethal Vijayan


Shruthi HS


Solanki Yogeshkumar


Sonakshi Deepak


Soni Dwivedi


Sowndarya R


Sreesha R Sudhakar


Sudeepth C Anand


Suhaife


Sylvia Janet R


Tahseen Arif


Tanay Kumar Pandey


B Thulasiram


Ujjwal Kumar


Vamshikrishna


Vikram Vilas Ghadge


Vivek Nair

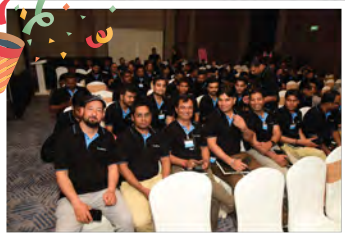
Writtik Maity

Photo Feature

MedGenome organised the **Annual Sales meet 2022 in Goa** at **Hotel Fairfield by Marriott** during 8-10 April, 2022.

The meet was attended by 180+ colleagues from various departments including sales, marketing, HR, operations, procurement, customer support, admin and of course, our senior leadership.

The event witnessed various informative meeting sessions, workshop on sales effectiveness, guest lecture by the voice of Big Boss Mr. Vikram V Singh, fun games and cocktail dinner.



Employee Connect

Question 1: Genetics is the study of all an individual's DNA.

True or false?

Question 2: In healthcare we are interested in the 0.1% variation in our genome because it tells us what?

A. Whether someone will develop a condition
B. Whether someone is more susceptible to a condition
C. Whether someone will react differently to a drug
D. All of these

Question 3: Is cancer a disease of the genome?

Yes or no?

Question 4: Someone is worried their family has an inherited condition. What could be an appropriate first action?

A. Draw a family history
B. Access the family's medical records
C. Meet with the patient's immediate family

Question 5: Antibiotic resistance hasn't got anything to do with genomics.

True or false?

Question 6: Which of these conditions has a genetic cause?

A. Cystic fibrosis
B. Huntington disease
C. Sickle cell anaemia
D. All of the above

Question 7: Results from a genetic test will only have clinical implications for the patient.

True or false?

Question 8: To investigate an individual's genome we need a sample of their DNA, and it must be good quality. Name at least 2 ways in which we can get that DNA.

Previous puzzle Winner

Sonakshi Makwana,
Associate Scientist

Kindly mail your answers by **30th May 2022** *to* **editor@medgenome.com**. *The first two people to answer the quiz correct will be featured in the next edition of our newsletter.*

Answer the Quiz & WIN Voucher

MEDGENOME

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Kochi
Mumbai

US

Foster City

SINGAPORE