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Biotechnology is boon in field of life science and analysis field. it's a technology in field of biology with several new rising technology moreover doing best in medical, research, particularly life saving boon for individual. it's not a replacement discipline, however it's advancing by step wise step and it making additional and additional applications in our regular lives: from medical, pharmaceutical development, to food production and therefore the treatment of polluting waste. mortal even a lay man will explore this exciting field below and take a look at to see however way it would come in the longer term. Its giving an honest opportunities in entrepreneurship development conjointly.

Corona viruses was first found in city 'China ' in Dec 2019 [1]. Further, it became a pandemic among the total world. On Feb 2020, World Health Organisation (WHO) proclaimed a political candidate name for Coronavirus unfold malady as COVID-19 [2]. It primarily affects the respiratory system in humans, because the look of symptoms depends on the time period, and additionally depends on the patient’s age, immune system. [3].Biotechnology in pandemic covid -19 is that the solely field that reinforces up all round the world in treating from starting designation to treatment and saving life.

Working with human cells and cistron mechanisms, biotechnologists improve their understanding of infective agent mechanisms by finding out their biology and transcribing this info into information and tools to go looking for a immunogen. These biotech vaccines could trigger a direct immune reaction in symptomatic patients, instead of ancient vaccines, that square measure preventive in nature.  Now a days biotechnology has become one amongst the weapon with the fight against the COVID-19 world pandemic. Since it helps to identify the virus' ordination and activate the body's defence works against infectious agents. Biotechnology brings solutions for the various strains of corona virus assaultive body and the way to urge disembarrass removed from them.

**Different Aspects:**

Modern biotechnology provides breakthrough merchandise and technologies by utilizing biological systems and living organisms or elements of them. Biotechnology worked in varied aspects of pandemic nineteen from identification of virus to diagnose, treatment, recovery altogether. Biotechnology has helped develop over one,1200 diagnostic tests in clinical use nowadays. With solely a blood sample or mouth swab, several of those tests square measure ready to diagnose conditions quicker and with bigger accuracy than ever before. The quicker a condition is diagnosed, the faster a patient will begin treatment. Several of those diagnostic tools square measure currently transportable, permitting physicians to conduct tests, interpret results and confirm treatment on-site. These tools have had a profound result on access to health care in developing countries, wherever the health care infrastructure is usually undeveloped. Antibiotics, genetic testing, ordination mapping, and artificial tissue growth square measure among the foremost well-known merchandise during this field [4]. Here during this chapter together with varied essential, helpful aspects, method Biotechnology that square measure progressing to use during this pandemic era.

# CRISPR-Based Assays:

# Clustered frequently Interspaced Short word Repeats (CRISPR) represents a family of macromolecule sequences found in being organisms, like bacterium. These sequences are often recognized and cut by a group of microorganism enzymes, known as CRISPR-associated enzymes, exemplified by Cas9, Cas12, and Cas13. sure enzymes within the Cas12 and Cas13 families are often programmed to focus on and cut infective agent ribonucleic acid. This technology work like best pictured within the fig.1.,as the virus invade microorganism unharness there nucleic material that get integrated with microorganism order and turn out CRSPR ribonucleic acid . This CRISPR direct the molecules machinery to destroy infective agent order. So this technology isshowed postive leads to pandemic condition.



Fig:1:Process of CRISPR based assay

# Enzyme-Linked Immunosorbent Assay (ELISA):

# ELISA is a micro well, plate-based assay technique used for detecting and quantifying substances such as peptides, proteins, antibodies, and hormones. The test can be qualitative or quantitative, and time consumed typically 1–5 h. In figure .2, various steps are described about the ELISA worked.

In pandemic 19, it was a very important tool for the diagnosis of corona different stains.



# Fig-2: various steps of ELISA assay

# Lateral Flow Immunoassay:

# This check is often a qualitative (positive or negative) activity assay that's little, portable, and used at the point-of-care. The check could be a style of speedy diagnostic assay (RDT) because the result is obtained in 10–30 min. In fluid samples measure applied to a substrate material that enables the sample to flow past a band of immobilized infective agent substance. Basically, it's a straightforward to use diagnostic device wont to ensure the presence or absence of a target analyte, like pathogens or biomarkers in humans or animals, or contaminants in water provides, foodstuffs, or animal feeds. The foremost normally best-known style of lateral flow speedy check strip is that the bioassay. For instance, COVID-19 speedy protein tests that notice immunoglobulin antibodies that concentrate on the SARS-CoV-2 spike macromolecule, use blood with a buffer.

# Sandwich assays – A positive check is represented by the presence of a colored line at the check line position. Competitive assays – A positive check is portrayed by the absence of a colored line at the check line position. These types of kits were terribly useful in pandemic corona to self notice the virus and create isolate themselves encompassing and acquire quick correct treatment before pandemic severe effects.

Fig:3: Lateral Flow Immunoassay showing positive result

# Microarray:

# Biotech diagnostic tools use genetic data to assist doctors' sight and diagnose conditions quicker and with larger ease and accuracy. Doctors will currently tailor malady interference associated treatment to individual patient's exploitation an individual’s genetic data. Biotechnology has helped develop over one, 1200 diagnostic tests in clinical use nowadays.



Fig-4 : Steps involved in cDNA based Micrroarray

**Droplet digital PCR:**

The drop digital enzyme chain reaction (ddPCR), could be a modification of PCR ways. The principle of ddPCR is to divide a standard PCR reaction mixture into smaller reaction system either by diluting to microwell plates, capillaries, or oil emulsion. [5] Droplet Digital PCR (ddPCR) could be a technique for playing digital PCR that's supported water-oil emulsion drop technology. A sample is fractionated into twenty droplets, and PCR amplification of the model molecules happens in every individual drop. Drop Digital PCR addresses these shortcomings by massively partitioning the sample within the fluid introduce one step. The creation of tens of thousands of droplets implies that one sample will generate tens of thousands of knowledge points instead of one result, transportation the facility of applied math analysis inherent in digital PCR into usage.

## RT-PCR diagnosis :

In addition to prevention methods like hygiene, social distance, isolation of infected individuals, and travel restriction, rigorous community infection testing is essential to track and remove the transmission of the disease as well as educating public policies . Nations that have implemented large research strategies at an early stage like South Korea, Vietnam, and New Zealand have done better restriction for spread of the disease. Tests should ideally be simple to sample and evaluate, precise, reliable, and inexpensive. Often, point-of-care tests based on antibodies match this definition. However, rapidly emerging epidemics due to novel viruses do not allow antibody-based tests to evolve in a timely manner . Because of the simple adaptability to the nucleotide sequence of the target, viral load tests based on real-time, quantitative RT-PCR are thus an ideal test .

PCR method was discovered in 1986 and since then the method is serving medical sectors. In the future, as potential molecular diagnostic methods, PCR will play a significant role. Lots of PCR methods are already used in various research and medical fields, but as we know currently under this pandemic situation RT-PCR has turned out to be a boon in healthcare sectors. Lots of kits have been manufactured throughout the world with some or little variation, thus making it more sensitive, specific and less time consuming.

### Nucleic Acid Testing:

Nucleic acid tests using isothermal amplification are currently in development for SARS-CoV-2 detection. Isothermal amplification techniques are conducted at a single temperature and do not need specialized laboratory equipment to provide similar analytical sensitivities to PCR. [7]. These techniques include recombinase polymerase amplification, helicase-dependent amplification, and loop-mediated isothermal amplification (LAMP). Several academic laboratories have developed and clinically tested reverse transcription LAMP (RT-LAMP) tests for SARS-CoV-2. [8].

#### Designing a Nucleic Acid Test for SARS-CoV-2

Nucleic acid testing is the primary method of diagnosing COVID-19[9]. The design process generally involves two main steps:

(1) sequence alignment and primer design

(2) assay optimization and testing.

Corman *et al*. aligned and analyzed a number of SARS-related viral genome sequences to design a set of primers and probes. [10]

# RNAi Therapy:

A promising approach to develop a lot of specific anti-viral medical aid may well be supported endogenous RNA interference (RNAi) mechanism whose physiological goal is to control macromolecule synthesis events. RNAi has been adopted for medical aid by silencing desired genes supported blockage and degradation of corresponding mRNAs. RNAi will be enforced with artificial short busy RNAs  or in place production of short pin RNAs (shRNAs) through usually inclusion DNA (pDNA)-based expression vectors. Whereas the latter depends on nuclear targeting for economical expression, siRNAs will be delivered to protoplasm house to interact the RNA-induced silencing advanced directly with nominal process by host cells. Silencing a large vary of targets with RNAi square measure being effectively enforced at can, so a broad medical aid platform may well be pictured during this pursuit. The exciting potentialities with RNAi was recently (2018) confirmed with the FDA-approval of the primary siRNA primarily based drug (Patisiran by Alnylam) to treat the nerve injury caused by the rare illness hereditary transthyretin-mediated illness (hATTR) in adults.[11]  
Developing RNAi primarily based medication for SARS-CoV-2 are going to be a lengthier method than the re-purposed, already approved medication however it's doubtless to supply a lot of specific therapies. Past makes an attempt to manage SARS-CoV infections exploitation RNAi could guide the efforts within the current pandemic.

### Protein Testing:

Viral macromolecule antigens and antibodies that square measure created in response to a SARS-CoV-2 infection is used for identification COVID-19. Changes in infective agent load over the course of the infection might build infective agent proteins troublesome to sight. as an example, Lung et al. showed high secretion infective agent masses within the initial week when onset of symptoms, that step by step declined with time. [12]

**Viral Sequencing:**

The happening investigation should additionally confirm clusters of patients and also the pathway of the dissemination of the motive agent to prevent the infectious agent dissemination. Until now, Sanger sequencing methodology is employed to get partial sequence of infectious agent ordination necessary to spot clusters of cases. However, several technical limitations, particularly the tiny quantity of infectious agent ordination within the biological samples, create this approach not terribly effective for the management of the happening. High-throughput sequencing (HTS) technologies offer the chance to quickly get the complete sequence of infectious agent genomes. Notably whole-genome sequencing (WGS) of viruses may be a powerful tool for the event of novel treatments and vaccines, for learning virus evolution and genetic association to diseases or for trailing outbreaks. Recently, HTS has been wont to investigate infectious agent outbreaks in health-care industry [13].

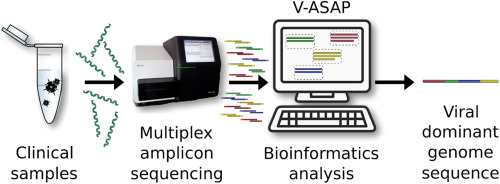


Fig-5: Viral Sequencing steps (source: [Garvey et al., 2017](https://www.sciencedirect.com/science/article/pii/S0042682219300728#bib6))

**Summary:**

Biotechnology is boon in field of medical science that proved in pandemic 19 .Diagnosis is very important process in health care industries, as fast as diagnosis as fast treatment provides relief to patient. Different variants of corona virus occurred in world that brought number of deaths, in that emergency fast diagnosis by various techniques like Protein Testing, RNAi Therapy, Droplet digital PCR various number of tools provided by biotechnology.

Biotechnology shows there future prospects in various field lke agriculture, waste management, food production etc. In pandemic from diagnosis to treatment even in precautionary equipment plays a vital role.

Biotechnology in all over world lead in diagnosis as well in treatment of covid. The biotechnology and covid protection shield itself represent importance of biotechnology in pandemic era.

**References:**

**1.Recent biotechnological tools for diagnosis of corona virus disease: A review**

[**Bikash C. Behera**](https://aiche.onlinelibrary.wiley.com/action/doSearch?ContribAuthorRaw=Behera%2C+Bikash+C)**,[Rashmi R. Mishra](https://aiche.onlinelibrary.wiley.com/action/doSearch?ContribAuthorRaw=Mishra%2C+Rashmi+R),**[**Hrudayanath Thatoi**](https://aiche.onlinelibrary.wiley.com/action/doSearch?ContribAuthorRaw=Thatoi%2C+Hrudayanath)

**09 September 2020 <https://doi.org/10.1002/btpr.3078>**

**2.Lu R, Zhao X, Li J, et al. Genomi characterisation and epidemiology of 2019 novel coronavirus: implications for virus origins and receptor binding. *Lancet*. 2020;395:565-574.**

**3.Development of RT-PCR Based Diagnosis of SARS-CoV-2 ,Rutuja Sunil Patankar and Vasudeo Pandharinath Zambare Submitted: February 4th, 2021Reviewed: February 25th, 2021Published: March 16th, 2021,DOI: 10.5772/intechopen.96823**

**4.Pham PV. *Medical biotechnology: techniques and applications. Omics Technologies and Bio-Engineering*. Elsevier; 2018. p. 449–69.**

**5.Rougemont M, Saanen MV, Sahli R, Hinrikson HP, Bille J, Jaton K. Detection of four plasmodium species in blood from humans by 18s rrna gene subunit-based and species-specific real-time PCR assays. *J Clin Microbiol*. 2004;42:5636-5643.**

**6.Kageyama, T.; Kojima, S.; Shinohara, M.; Uchida, K.; Fukushi, S.; Hoshino, F. B.; Takeda, N.; Katayama, K. Broadly Reactive and Highly Sensitive Assay for Norwalk-like Viruses Based on Real-Time Quantitative Reverse Transcription-PCR. J. Clin. Microbiol. 2003, 41 (4), 1548– 1557, DOI: 10.1128/JCM.41.4.1548-1557.2003**

**7. Craw, P.; Balachandran, W. Isothermal Nucleic Acid Amplification Technologies for Point-of-Care Diagnostics: A Critical Review. *Lab Chip* 2012, *12*, 2469,  DOI: 10.1039/c2lc40100b**

**8..Lamb, L. E.; Bartolone, S. N.; Ward, E.; Chancellor, M. B. Rapid Detection of Novel Coronavirus (COVID-19) by Reverse Transcription-Loop-Mediated Isothermal Amplification. *medRxiv*, February 24, 2020. DOI: 10.1101/2020.02.19.20025155 (accessed on March 20, 2020).**

**9. *CDC 2019-Novel Coronavirus (2019-nCoV) Real-Time RT-PCR Diagnostic Panel*; Division of Viral Diseases, U.S. Centers for Disease Control and Prevention: Atlanta, GA, 2020.**

**10. Corman V.; Bleicker T.; Brünink S.; Zambon M.. *Diagnostic Detection of Wuhan Coronavirus 2019 by Real-Time RT-PCR*; World Health Organization: Geneva, 2020.**

## 11. REVIEW article Front. Bioeng. Biotechnol., 30 July 2020 | <https://doi.org/10.3389/fbioe.2020.00916> Prospects for RNAi Therapy of COVID-19

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**12. K. K.-W.; Tsang, O. T.-Y.; Leung, W.-S.; Tam, A. R.; Wu, T.-C.; Lung, D. C.; Yip, C. C.-Y.; Cai, J.-P.; Chan, J. M.-C.; Chik, T. S.-H.Temporal Profiles of Viral Load in Posterior Oropharyngeal Saliva Samples and Serum Antibody Responses during Infection by SARS-CoV-2: An Observational Cohort Study. *Lancet Infect. Dis.* 2020,  DOI: 10.1016/S1473-3099(20)30196-1**

**13.** **[Garvey et al., 2017](https://www.sciencedirect.com/science/article/pii/S0042682219300728" \l "bib6);****[Houlihan et al., 2018](https://www.sciencedirect.com/science/article/pii/S0042682219300728" \l "bib8);****[Vaughan et al., 2014](https://www.sciencedirect.com/science/article/pii/S0042682219300728" \l "bib17)**