Biotechnological Advancements in Vaccine Development for Emerging Infectious Diseases: A Focus on COVID-19

Ritambhara1, Susmita Shukla1\*

1Applied Plant Biotechnology Research Lab, Centre for Plant and Environment Biotechnology Amity Institute of Biotechnology, Amity University, Noida (U.P), India

Taramla Raman2

2Dpt. Of Genetics and Plant Breeding, College of Agriculture, Eroisemba, nCAU, Imphal, India

ABSTRACT

In today’s world, we have recognized what action or circumstances may cause transmission of various infection. Consider who could be in danger, choose how likely it is that somebody could be infected. Corona virus is majorly more serious in individuals of 60+ years or people with ailments like lung or coronary diseases, diabetes or conditions that influence their immune system. The infection spreads for the most part through air when individuals are close to one another leaving a contaminated individual as they inhale, sneeze, whistle, or talk and enters someone else through their mouth, nose, or eyes and polluted surfaces. Current advanced techniques to detect many diseases such as MRI, EEG, MEG, PET, and CT scan non-invasively look at the sick individual and research the hidden neural frameworks, bringing about incredible methodologies for identification of infection. One of the latest technologies is “Nanoshells” which are miniscule dots covered with gold. The thickness of each layer in a nanoshell might be controlled toward planning dabs that retain explicit frequencies of light. Because of their size, nanoshells can be infused securely inside a model and specially amass at malignancy sore locales through a disease explicit marvel called improved saturation and maintenance. Recent advances in science, innovation, and fruitful clinical applications along with the improvement of new techniques can lead to fast, bedside identification and conclusion of disease. There is a genuine clinical requirement for such new indicative devices as obtaining the correct finding is a critical part of medical services. It gives a clarification of a patient's medical condition and illuminates ensuing medical care choices. The demonstrative cycle is an intricate, cooperative action that includes clinical thinking and data collection to decide a patient's medical issue. As indicated by Improving Diagnosis in Health Care, analytic mistakes - erroneous or deferred analysis keep on hurting several unsatisfied patients. All things considered, most people will at any rate come across one indicative blunder during their life, in some cases with annihilating outcomes. Analytic blunders may hurt patients by forestalling or postponing suitable treatment, giving superfluous or unsafe treatment, or bringing about mental or monetary repercussions. The panel reasoned that improving the analytic interaction is not just conceivable, but addresses an ethical, expert, and general wellbeing. This modern technology will one day help save the entire human race as it is doing today.

Keywords— Covid, Nanotechnology, Diseases, Detection, Cure

# INTRODUCTION

Planning for what's to come, is to deliver a dream of future frameworks for the discovery, recognizable proof and observation of irresistible sicknesses, and to evaluate how they may change our capacities in dealing with the future danger. Sicknesses in people, animals and plants are thought to have similarity. The early location and treatment assist in diminishing the spread of disease and lessen the hazard of intricacies additionally saving a lot of money. Significant issues include: access, proprietorship and secrecy of medical care and other individual information; guideline of hand-held demonstrative gadgets, including access by the general population, suggestions for medical care experts, garbage removal and guidelines for quality and approval; evaluation for infection at transport hubs like ports and air terminals and its information classification and their related data. Misusing exogenous turns of events: a large part of the innovation on which the future disease management frameworks will be based is now being produced for purposes disconnected to the administration of irresistible illnesses. The issue is the means by which best to advance access, and how to not abuse it. For instance, it would be very useful for the motivations behind overseeing irresistible illnesses, to advance better admittance to information from sources presently irrelevant to illness – such as distant checking and cell phone following information. This issue here is how to advance better access, while ensuring individual and security interests. Expanding the public profits: getting the best option worth from future disease management frameworks will require thought of zones, for example, advancing interoperability, open access of disease management frameworks; elevating better admittance to scholarly property; expanding the advantages from the developing business interests of mass electronic producers; how to animate diagnostics for illnesses that are probably not going to hold any importance with industry, like SARS, and illnesses of the developing world; and the need to coordinate future disease management frameworks viably inside more extensive frameworks models for infectious disease prevention. Commitment with people in general: the public should gauge the advantages of the future disease management frameworks against their conceivable social 'costs' (for example expanded observing of the populace and expanded utilization of individual information). Regardless, it will be essential to guarantee public commitment with the plan of many the expected future disease management frameworks if they are to be successfully conveyed.

In barely a century, information in the fields of microbiology and parasitology, immunology, hereditary qualities, general wellbeing, and medication has expanded dramatically. In mix with monetary turns of events, this has brought about numerous positive changes in human wellbeing: decrease in newborn child mortality, improved future, the close to annihilation of certain irresistible infections and the compelling treatment of others. Even more, as of late, significant advances in new fields and advances, counting genomics, proteomics, high throughput screening, advanced mechanics, imaging, and geological data frameworks have changed medication revelation and the observation, anticipation, treatment, and control of new and arising irresistible sicknesses [1–3]. Nonetheless, getting the correct instruments to the individuals who need them more than anything is not simple. Even though administration organizations and examination establishments, private associations, public–private organizations and local area-based associations have all attempted to lessen the weight of irresistible infections, some difficulties continue. Lifesaving developments, including straightforward yet viable intercessions, stay out of the reach of many. Numerous irresistible infections are still under-investigated and ineffectively comprehended, what is more, the advancements to address them are of restricted business interest. To diminish the weight of irresistible illness, more noteworthy worldwide value, we need new degrees of worldwide responsibility and new models of cooperation among partners to achieve inventive arrangements and to make an interpretation of these arrangements into compelling programs in settings where the necessities are most prominent. The test is more than the quest for mechanical wonders and "enchantment shots". It is tied in with encouraging a "culture of development". Development is tied in with invigorating the inquiry for novel revelations; the advancement of apparatuses for wellbeing mediations; understanding the particular social settings in which mediations will be conveyed; solid commitment with networks to guarantee the best and practical execution and take-up [4]. Advancement is not just about doing things any other way but getting things done in a more practical, powerful, protected, and even-handed way. In this part, we adopt a frameworks-based strategy to advancement. We start by examining step by step instructions to establish a climate of advancement in low and center pay nations at that point analyses how to encourage inventive coordinated efforts, item advancement for irresistible sicknesses, the social developments fundamental for the take-up and conveyance of wellbeing mediations, and how to fabricate limit in exploration and preparing in these nations. Wellbeing development frameworks recognize the inter relationship between instruction, research, improvement (R&D), fabricate, homegrown and send out business sectors, scholarly property, and administrative strategies [5]. These various parts should be connected so that generally public and local frameworks work productively and quickly to react to the country’s needs. Exploration plays a focal part in a development framework, from the commencement of thoughts to better approaches for interpretation, strategy plan and guideline [6-7]. For big time salary nations, wellbeing advancement frameworks incorporate entertainers from various areas and controls. Customarily, preparing, and essential examination are financed by the public area through colleges and government research organizations. Translational exploration and item improvement like model creations or limited scope creation is directed by drug or then again different organizations or, contingent upon the public framework, government establishments. In low-paying nations, be that as it may, the wellbeing development framework is frequently simple and divided.

|  |  |  |
| --- | --- | --- |
| **Diseases** | **Out-break year** | **Deaths (in Millions)** |
| Antonine plague | 165-180 | 5 |
| Plague of Justinian | 541-542 | 30-50 |
| Japanese smallpox epidemic | 735-737 | 1 |
| Black death (bubonic plague) | 1347-1351 | 200 |
| Small pox | 1520 | 56 |
| 17th century great plagues | 1600 | 3 |
| 18th century great plagues | 1700 | 0.6 |
| Cholera 6 | 1817-1923 | 1 |
| The third plague | 1855 | 12 |
| Yellow fever | Late 1800 | 0.2 |
| Spanish flu | 1918-1919 | 40-50 |
| Russian flu | 1889-1890 | 1 |
| Asian flu | 1957-1958 | 1.1 |
| Hong Kong flu | 1968-1970 | 1 |
| HIV/AIDS | 1981-present | 25-35 |
| SARS | 2002-2003 | 0.7 |
| Swine flu | 2009-2010 | 0.2 |
| Ebola | 2014-2016 | 0.01 |
| MERS | 2012-present | 0.85 |
| Covid-19 | 2019-present | 3.4 |

Table 1: Represents the deadly pandemic diseases in the past and present

As the Covid pandemic (Covid-19) advances, mechanical applications and drives are duplicating, trying to stop the spread of the flu, treat patients and ease the heat off exhausted medical care laborers, while additionally growing new, viable antibodies. At the point when everybody needs better data, including pandemic infection modelers, state specialists, worldwide associations and individuals in isolation or keeping up friendly separating, computerized data and observation advances have been released in an exceptional way to gather information and solid proof to help general wellbeing dynamic. Man-made computers are being conveyed to help track the infection and uphold prohibitive measures; while researchers are quickly applying quality altering, manufactured science, and nanotechnologies in a bid to get ready and test future immunizations, medicines and diagnostics. Blockchain applications can follow virus, oversee protection instalments, and maintain clinical stock chains. Moreover, 3D printing and open-source advances appear to be fit for supporting the exertion of governments and clinics all throughout the planet to meet the expanding need for clinical equipment (for example facemasks, ventilators and breathing channels) and advance the stock of the vital clinical hardware. Simultaneously, telehealth advances offer a practical way to moderate the spread of the infection and to keep up emergency clinic limit by working as a potential channel, keeping those with moderate side effects at home and steering more extreme cases to emergency clinics. Introducing a non-comprehensive outline of the innovations presently used, featuring their fundamental highlights and importance in the battle against the Covid pandemic, zeroing in transit to screen and contain the quick spread of the disease, and to guarantee that general wellbeing organizations keep up their ability to meet the always expanding needs brought about by this pandemic. The examination additionally represents the primary lawful and administrative difficulties and the key socio-moral predicaments that these advancements' complex applications present when utilized in a general wellbeing crisis setting like the current one.

An output of the mechanical skyline with regards to Covid-19 permits some starter comments in regards to the conditions of innovative commitment in the battle against this once-in-a-century pandemic. To start with, dissimilar to past general wellbeing emergencies, this one is by all accounts changing residents from objects of reconnaissance and epidemiological investigation into subjects of information age through self-following, information sharing and advanced information streams. Also, albeit many of these advancements have not been applied in a health-related crisis setting previously, their escalated use on a worldwide scale triggers inquiries regarding the impacts on common freedoms of assembling mass reconnaissance apparatuses just as worries about state specialists keeping up with increased degrees of observation, even after the pandemic closures. With regards to the current pandemic, various information assortment and area following innovative applications have been dispatched based on crisis laws that include the transitory suspension of basic rights and authorization of clinical gadgets and immunizations through optimized strategies. Albeit the focal point of this investigation is on innovative applications, introducing answers for squeezing pandemic-related issues, this piece of examination does not intend to support thoughts of techno-solutionism. At the end of the day, innovative applications by their own doing cannot address complex cultural difficulties, for example, those related with the current pandemic. Maybe, this current work's fundamental discoveries show that innovation cannot swap or compensate for other public approach gauges, however, it has an inexorably basic task to carry out in crisis reactions. Coronavirus, as the principal pandemic of the century, addresses a magnificent chance for strategy creators and controllers to ponder the lawful credibility, moral sufficiency, and viability of sending arising innovations under time tension. Finding some kind of harmony will be urgent for keeping up the public's trust in proof based general wellbeing mediations.

Figure 1: Shows the death percentage during some pandemic over the years

The effect of microorganisms on human wellbeing today is fundamental, notwithstanding the huge advancement in infectious prevention and comprehension. In developing nations, irresistible infections like flu, pneumonia and tuberculosis were the significant reason of deaths in the mid-1900s. Presently, heart-related disease and stroke are the ruling reasons for death in these nations, though the danger of kicking the bucket from an irresistible sickness in less developing nations is yet equivalent to the circumstance in these nations 100 years prior. The danger from various microorganisms has changed during the mankind's set of experiences as we people have changed way of life, exhibiting the close connection between microorganisms and their hosts. While a few illnesses and their causing specialists are more or then again less annihilated, other "new" microbes are arising. These microbes incorporate creatures not detached or recognized previously, yet additionally microbes changing hosts and, in this manner, influencing human wellbeing. Expanded information has additionally brought about incorporation of recently viewed non-destructive creatures into the human microbes [8]. The expanded understanding into microorganism relationship has additionally uncovered an expanded hazard of creating neoplasia with disease of certain infections [9-10] and that disease with one microbe can bring about an inclination toward other contaminations [11]. Human allelic variety can likewise be related with expanded powerlessness or obstruction towards various microbes [12-14]. The new development of numerous medication safe, types of microbes beforehand handily treated with anti-toxins has brought about a circumstance looking like the time before anti-microbials were accessible, by certain individuals named the "post-anti-infection time" [15]. Clinical microbiology as a science began to exist towards the end of the nineteenth century. The fundamental was Pasteur's work to refute the hypothesis of "unconstrained age" and his presentation of disinfection systems and aseptic strategies [17]. The presence of infectious diseases had been suspected for a long time and Koch affirmed that microorganisms were the reason for irresistible diseases by his work on the germ hypothesis of infection [16]. As per his notable hypothesis, which was an endeavor to normalize the verification of causation in irresistible infection, the organism should be explicitly connected with the sickness. The organic entity ought to be available for each situation of the sickness and not in different infections or in sound people. The microorganism should be over and again filled in unadulterated culture outside the body and have the option to initiate the illness all over again when immunized into powerless creatures. The unadulterated culture and clonality ideas, where specific media are utilized together with seclusion of single settlements on strong media, were fundamental for examination of microorganisms and diagnostics of irresistible infections during very nearly a century. The presentation of DNA sequencing [18-19] and nucleic corrosive enhancement-based strategies [20-21] during the 1970's and 80's permitted a grouping-based ID of organisms just as likely discoveries of new microorganisms from a heterogeneous populace, without earlier development. This replacement of a natural enhancement for an enzymatic intensification has been named the "PCR as- petri-dish representation" [23]. Because of this advancement, new rules for microorganism ID and for proof of infection causation have been proposed [22].

Accordingly, it might be drivers of fundamental aggravation or impact safe homeostasis. The investigation of the part of viral contaminations and history of infection movement is ineffectively perceived. In any event, for very much described infections, there is little data on the further association with human wellbeing [24]. Unanswered inquiries incorporate whether the circumstance or explicit succession of viral diseases affects insusceptible capacity and in general wellbeing, or whether the by and large number of viral contaminations or chose specialists related to certain people with more noteworthy dismalness or vulnerability to certain ongoing sicknesses. Resolving these perplexing inquiries has been troublesome as of not long ago, on the grounds that there were just a predetermined number of indicative tests accessible to report the presence of a select viral specialist. Most examines for identifying a viral disease depend on examination of either popular nucleic acids or antiviral antibodies. Nucleic corrosive innovations recognizing explicit viral RNA or DNA is the most delicate methodology, especially during beginning phases of viral disease. A top to bottom conversation of a few as of now well-known NAT approaches including PCR, moving circle enhancement, circle intervened isothermal intensification and DNA sequencing can be found in late audits [25-27]. Measuring host antibodies, normally as IgG reactions against infections, is another corresponding approach utilized for viral conclusion or as proof of recorded disease. These immunoassays are commonly performed by ELISA, yet different methods including western smudging and Luminex are additionally utilized at present [28]. Although existing NAT and immunizer-based methodologies are utilized broadly, a significant number of these tests require generous time and complex research facilities for investigation, dissect a limited number of target infections, or potentially produce moderately low-resolution data.

Currently, we need the capability to carry out computerized advances that can be utilized at different phases of the COVID-19 episode, including information driven illness observation, screening, emergency, finding, and checking. Techniques that might diminish the openness of medical services suppliers to the infection are likewise talked about. In December of 2019, emergency clinics started to report instances of unidentified disease among patients with a past filled with openness to the Huanan fish market in Wuhan, Hubei, China. Scientists quickly disconnected a novel Covid (SARS-CoV-2, additionally alluded to as COVID-19) from affirmed contaminated pneumonia patients [29]. Drawing in extraordinary consideration broadly and around the world, affirmed instances of Coronavirus surpassed those of extreme intense respiratory condition (SARS) and Middle East respiratory condition (MERS). Starting at 13 April 2020, affirmed instances of COVID-19 had surpassed 1,800,000 cases and 117,000 fatalities. The World Health Organization (WHO) has as of late, pronounced COVID-19 as both a pandemic and crisis of worldwide concern. During the episode of Ebola and extreme intense respiratory disorder (SARS), computerized wellbeing shown its potential in identifying and battling worldwide pandemics [30-32]. DH is characterized as innovation that, "associates and engages individuals and populaces to oversee wellbeing and health, expanded by open and strong supplier groups working inside adaptable, coordinated, interoperable, also, carefully empowered consideration conditions that deliberately influence advanced instruments and administrations to change care conveyance" [33]. As of late, a critical number of DH efforts have arisen due to the phenomenal worldwide strain of COVID-19 on medical care frameworks. Techniques that might lessen the openness of medical care suppliers to the infection will likewise be talked about. The audit means to manage further improvement in DH to improve irresistible infectious prevention. Advanced Health gives a chance to utilize continuous information to improve the counteraction and control of the quickly changing nature of scourges. Late SARS, H1N1, and Ebola flare-ups over numerous exercises about the utilization of DH for general wellbeing crises. These learnings can be moved to new effective innovations to upgrade our reaction against the COVID-19 pandemic. DH has the potential to fortify our readiness for the following pandemic. We need to have these instruments bolted furthermore, stacked for our next battle against irresistible sickness.

Biosensors are estimation gadgets that can detect a few biomolecules, and are generally utilized for the discovery of pertinent clinical microorganisms like microscopic organisms and infections, showing exceptional results. As a result of the inert existing danger of confronting another pandemic like the one we are living through because of COVID-19, analysts are continually anticipating growing new innovations for analysis and treatment of contaminations brought about by different microscopic organisms and infections. Nanotechnology has improved biosensors' plan and execution through the advancement of materials and nanoparticles that improve their affinity, selectivity, and efficacy in identifying these microbes, for example, utilizing nanoparticles, graphene quantum dabs, and electro spun nanofibers. Thus, this work intends to introduce a complete survey that uncovered how biosensors work in terms of bacterial and viral location, and the nanotechnological highlights that are adding to accomplishing a quicker yet still efficient COVID-19 determination at the mark of-care. Biosensor's idea was right off the bat tended to by Clark and Lyons around 1962 when they created an oxidase compound cathode for glucose identification [34]. From that point forward, nanotechnological advancement has advanced biosensors development and specialization for different purposes [35]. Presently, nanotechnology is at the cutting edge of science, and its mix with bio-sensor applications includes different fields like medication, science, natural, drug conveyance, and food handling [36-40]. Be that as it may, the discovery of microorganisms has gotten perhaps the most important goals for these gadgets since bacterial and viral disease right now address a significant string for human wellbeing [41-42]. Infection and microscopic organisms’ discovery normally include the utilization of a few atomic procedures such as the converse record polymerase chain response (RT-PCR), which stays the best quality level for microbe identification [43]. The traditional location techniques for these microbes normally require detachment, refined and biochemical tests [44]. Moreover, serological tests like the Enzyme-Linked Immunosorbent Assay (ELISA) are utilized for the identification of antibodies and immunoglobulin required for distinguishing proof purposes [45]. Notwithstanding, a portion of these strategies set aside a long effort to acquire results and are generally arduous. In this manner, new methodologies dependent on nanotechnological propels have arisen as reasonable and simpler choices for recognizing microbes in quicker and efficient ways [44-46]. On one hand, nanoparticles (NPs) have shown extraordinary properties against different microbes used to foster novel gadgets and advancements that add to this general wellbeing issue [47-48].

Biosensors can be characterized as an estimation framework for analyte discovery that consolidates a natural segment with a physicochemical identifier [49]. The analyte discovery relies upon the biosensor plan and reason. Some generally utilized gadgets, for example, cell phones can be utilized as a biosensor with the consideration of straightforward adornments as distributed by Soni et al., where they fostered a non-intrusive cell phone-based biosensor for urea utilizing salivation as test [50-51]. This permits quick and minimal expense fundamental identification [52]. Normally, biosensors distinguish biomolecules, for example, nucleic acids, proteins, and cells that are related with illnesses. This is conceivable considering their three significant parts: The naturally touchy component, the locator component, and the examiner gadget [53]. Proteins, microorganisms, organelles, antibodies, and nucleic acids are utilized to recognize the biomolecules [54]. Furthermore, analysts should distinguish the necessities to acquire a useful gadget as indicated by the planned use. Consequently, multidisciplinary examines are central to choose the appropriate material, transducing gadget and natural component required prior to amassing the biosensor [55]. At a clinical level, biosensors are applied for distinguishing illness related biomolecules [53]. These gadgets can screen the biochemical markers of a sickness in body liquids, like spit, blood, or in the urine sample [56-57].

**Corona: a pandemic**

Covids have a place with the Corona viridae family in the Nidovirales with crown-like spikes on the external surface of the infection; accordingly, it was named Covid. Covids are minute in size (65-125 nm in measurement), contain a solitary abandoned RNA as nucleic material, with a size going from 26 to 32 kilobases (kb) long [58]. A few Covid strain can taint people, like the internationally endemic human Covid HCoV-229E, HCoV-NL63, HCoV-HKU1, and HCoVOC43 that will in general cause gentle respiratory infection, and the zoonotic Middle East respiratory disorder Covid (MERS-CoV) and serious intense respiratory condition Covid (SARS-CoV) that have a higher case casualty rate [59]. At first probably named 2019 novel Covid (2019-nCoV), the infection has presently been named SARS-CoV-2 by the International Committee of Taxonomy of Viruses (ICTV) [62]. This infection can cause the sickness named Covid infection 2019 (COVID-19) [62]. The SARS-CoV-2 has a place with the equivalent Covid bunch (Betacoronavirus) as SARS and MERS infections that caused two of the more extreme scourges lately. As with SARS and MERS, this new Covid, 2019-nCoV, is accepted to be of zoonotic beginning, yet may likewise be sent through the respiratory parcel, by direct contact, and potentially Diary of Immunology Research through patient’s excreta which may contain the living infection [63].

Since the development of the 2019 novel Covid (2019- nCoV) disease in Wuhan, China, it has quickly spread across China and numerous different nations [64]. The episode of COVID-19 has influenced in excess of 3,000,000 patients in 187 nations, regions, or domains with a death rate of 4.2% and has become a significant worldwide concern [65]. Considering the proof of a quickly expanding occurrence of contaminations and the chance of transmission by asymptomatic transporters [66-67], SARS-CoV-2 can be sent viably among people and displays high potential for a pandemic [68-70]. Until this point, the sickness has spread around the world, become a genuine irresistible sickness influencing overall human wellbeing [71]. Without explicit remedial medications or immunizations for 2019 novel Covid sickness (COVID-19), it is fundamental to distinguish the infections at a beginning phase and promptly confine the contaminated individual from the sound populace. In this paper, we endeavor to survey and record the current information identified with Covid Disease 2019 (COVID-19) including ethology, the study of disease transmission, clinical attributes, and measures of treatment of COVID-19, with an extraordinary spotlight on contamination control and anticipation.

**Disease transmission of COVID-19**

In December 2019, Wuhan City, Province of China, became the focal point of an episode of novel infectious Covid sickness (COVID-19) of obscure ethology [68-72]. Endeavors are in progress to better see more about contagiousness, seriousness, and different highlights related with Coronavirus [73]. Before long, an auxiliary wellspring of disease was discovered to be human-to-human transmission of the COVID-19 infection [74]. Later considers showed that individuals matured ≥ 60 years and the populace with helpless safe capacity like diabetes, cardiovascular illness, persistent respiratory infection, malignancy, renal, and hepatic brokenness are at higher danger for serious COVID-19 than youngsters who may be less inclined to get tainted or on the other hand, assuming this is the case, may show milder indications or even asymptomatic carriers [75]. The developing worldwide count remembers spikes for Korea, Iran, Italy, Spain, France, and Germany. The infection is additionally proceeding to spread to African nations including Algeria, South Africa, Senegal, Burkina Faso, Cameroon, Nigeria, and Côte d'Ivoire. Notwithstanding the affirmed case, Moroccan's wellbeing service says that Morocco has more than 4500 affirmed instances of the Covid. Beginning and Transmission of COVID-19. The SARS-CoV-2 was discovered to be a positive-abandoned RNA infection having a place with the family Betacoronavirus with a crown because of the presence of spike glycoproteins on the envelope [64]. Other than SARS-CoV-2, there are six sorts as people with Covid have been recognized HCoV-229E, HCoV-OC43, SARS-CoV, HCoV-NL63, HCoV-HKU1, and MERS-CoV [76]. Researchers are attempting to discover the creature host of this novel Covid in order to destroy the spread, yet up until now, nobody is sure. Most sources concur that the conceivable host of the 2019-nCoV is bats, pangolins, or then again fish [60-61,77]. The job needing to be done is to track down the moderator that is liable for infecting Covid to the people. It is imperative to decide the wellspring of the infection, to help the revelation of the zoonotic transmission designs [77]. SARS-CoV-2 presents a high contagiousness and pathogenicity [79]. It very well may be sent from human to human by beads and contact [79]. A few reports have recommended that suggestive individuals are the most successive wellspring of COVID-19 spread. It principally spreads between individuals through respiratory beads by hacking or sniffling from a tainted individual [78]. Also, there are ideas that people who stay asymptomatic could send the infection. Further, considers are expected to explain and comprehend the instruments of transmission, the hatching period, and the span of infectivity of this infection.

Figure 2: The various health practices in the time of covid that are mandatory to follow to beat corona

**Clinical Characteristics of COVID-19**

In patients with Coronavirus infection 2019 (COVID-19), the most normal clinical side effects are fever, brevity of breath and other breathing challenges apart from other vague side effects, including cerebral pain, dyspnoea, weariness, and muscle torment [80-81]. Additionally, a few patients additionally report stomach related side effects like loose bowels and spewing [79-81]. Coronavirus was like SARS and MERS in a few clinical indications (80). 18.7% of patients had no fever at affirmation, recommending that the shortfall of fever proved unable to preclude the chance of COVID-19 [80]. Even though patients at first have fever with or without respiratory manifestations, different levels of lung anomalies foster later in all patients, also, these can be seen on CT-scan [68,82]. Even though loose bowels are available in around 20-25% of patients tainted with MERS-Cov or SARS-Cov, intestinal manifestations have seldom been accounted for in patients with COVID-19 [83]. Patients get chest CT filters that give dependable information on the unique X-beam design. Run of the mill gentle COVID-19 pneumonia starts basically with little, subpleural, one-sided, or respective off-white glass opacities in the lower flaps, which at that point form into an insane clearing design and resulting union. After over about fourteen days, the sores are slowly assimilated with leftover pearly glass opacities and subpleural parenchymal groups in the patients who have recuperated from COVID-19 pneumonia [84]. At confirmation, the greater part of patients had lymphopenia and platelet irregularities, neutrophils, aspartate aminotransferase (AST), aspartate aminotransferase (AST), lactate dehydrogenase (LDH), and provocative biomarkers. As per the after effects of the CT or X-beam, the patients had respective pneumonia and pleural emission that happened in 10.3% of the patients. Contrasted with patients all in all, recalcitrant patients had a more significant level of neutrophils, AST, LDH.

**Nanotechnology applications in disease diagnosis**

Innovation for noticing and controlling particles and atoms in the scope of 0.1–100 nm is called nanotechnology. As a hot subject, it has a vital impact for the rise and advancement of innovation and has been recorded as one of the vital advances all throughout the planet in the 21st century. The possibility of nanotechnology was presented in 1959 by Feynman, an American physicist. In 1989, xenon particles were utilized by the International Business Machines Corporation (IBM) to shape the organization brand name "IBM" utilizing examining burrowing microscopy. Also, the creation of a single particle at a nuclear level was right off the bat illustrated. In 1990, the principal International Conference on Nanotechnology, held in Baltimore, denoted the authority birth of nanotechnology. Contrasted and the naturally visible world, nanomaterials have numerous interesting physical and substance properties, for example, size impact, surface and interface impact, little size impact, and plainly visible quantum burrowing impact. At that point, numerous one-of-a-kind properties and abnormal wonders of nanomaterials are shown like the higher surface region, much more surface dynamic place, higher surface response movement, more grounded adsorption limit, and the higher synergist limit [85-87]. Additionally, there are numerous different qualities for example, lower dissolving point, higher explicit warmer limit, higher extension of engrossing coefficient, higher response movement, higher diffusivity, higher sturdiness, and more grounded and abnormal attraction [88,89]. Nanotechnology gave another approach to biomedical research advancement. The crossing point of nanotechnology and medication is named nanomedicine, in which life data at the degree of a solitary particle is gotten by utilizing nanotechnology. Following illness anticipation, finding and treatment is done in the field of nano-biomedicine. Following the ligand brightened into nanoconjugates, development of intracellular or intercellular designs can be contemplated. At that point, the genuine conduct and pathogenesis of cells is furtherly talked about to offer a solid help for the early analysis and treatment of different infections [90]. At present, nanomedicine is principally centered around the accompanying applications:

Combined with the properties of nanomaterials, nanomedical materials with great biocompatibility were produced for application in tissue designing and regenerative medication [91]. Compared with the traditional natural color particles, quantum specks (QDs) have great fluorescence properties in semiconductor nanomaterials in which there is a wide scope of excitation frequencies and a restricted scope of outflow frequencies. Hence, the outflow top is limited and balanced, the cover is little, the fluorescence yield is high, and the security is acceptable. As the ideal fluorescent test with long fluorescent lifetime, it very well may be applied for exact conclusion and constant checking of illnesses [92]. Based on attractive nanomaterials, novel imaging and investigation strategies can be created to improve the current level of neurotic tissue observing and furthermore, create another kind of continuous atomic imaging innovation [93]. In view of nanotechnology, the multifunctional drug conveyance framework with focus on capacity can be created in which drug conveyance and focusing on control can be accomplished to improve the adequacy of the medication and grow the extension of existing medication medicines. The cytotoxicity impacts of conventional drug atoms can likewise be viably decreased [90]. The mix of nanotechnology and clinical innovation can adequately grow the restorative reach, improve the treatment level, and enormously advance the advancement of medication.



Figure 3: showing the model of tiny robot (nanobot) which can be used in future in the field of health and medicines

Ongoing identification of individual infections would incredibly affect our capacity to analyses and give early intercession to a wide scope of illnesses. Albeit customarily unimaginable, it has as of late been accounted for that solitary infection particles could be identified with high selectivity, utilizing nanowire field-impact semiconductors to gauge discrete conductance changes normal for restricting and unbinding on nanowire clusters adjusted with viral antibodies [93]. The exhibits recognized and separated flu, infections, paramyxoviruses, and adenoviruses put together both with respect to the receptors used to tie them and the length of restricting of every infection to its receptor. Assuming this methodology can be effectively scaled for clinical use, it very well may be feasible to utilize nanowire gadgets for the synchronous recognition of various unmistakable infections down to the level of the individual particle [91].

Indeed, even today different sickness like diabetes, malignant growth, Parkinson’s illness, Alzheimer’s disease, cardiovascular infections and numerous scleroses just as various types of genuine incendiary or irresistible sicknesses (for example HIV) comprise a high number of genuine and complex ailments which are representing a significant issue for humanity. Nano-medication is the use of nanotechnology which works in the field of wellbeing and medication. Nano-medication utilizes nano materials, and nano electronic biosensors. Later, nano medication will profit atomic nanotechnology [94]. The clinical space of nano science application has many projected advantages and is conceivably important for every human race. With the assistance of nano medication early location and anticipation, improved determination, legitimate treatment, and follow-up of sicknesses is possible [95]. Certain nano scale particles are utilized as labels and names, organic can be performed rapidly, the testing has gotten more touchy and more adaptable. Quality sequencing has gotten more proficient with the creation of nano gadgets like gold nano particles, which when labelled with short sections of DNA can be utilized for recognition of hereditary grouping, as an example. With the assistance of nanotechnology, infected tissue can be duplicated or fixed. These supposed falsely invigorated cells are utilized in tissue designing, which may alter the transplantation of organs or counterfeit implants [96].

Nano gadgets can be utilized in foundational microorganism research in following and imaging them. It has its applications for fundamental science just as translational medication. Foundational microorganisms can be tweaked by blending of nano transporters with natural particles. Nano gadgets can be utilized for intracellular access and furthermore, for astute conveyance and detecting of biomolecules [96]. These innovations have an incredible effect in undifferentiated organism microenvironment and tissue designing contemplates and have an incredible potential for biomedical applications. In nanotechnology, nano particles are utilized for site explicit medication conveyance. In this method, the required medication portion is utilized and results are brought down altogether as the dynamic specialist is saved in the dreary locale as it were. This exceptionally specific methodology can diminish expenses and torment to the patients. Accordingly, assortment of nano particles like dendrimers, and nano permeable materials discover their applications. Micelles got from block co-polymers, are utilized for drug embodiment. They transport little medication atoms to the ideal area. Also, nano electromechanical frameworks are used for the dynamic arrival of medications. Iron nano particles or gold shells are discovering significant application in the disease treatment. A focused-on medication lessens the medication utilization and treatment costs, making the treatment of patients cost effective [96]. Nano medications utilized for drug conveyance are comprised of nano scale particles or atoms which can improve drug bioavailability. For expanding bioavailability both at explicit places in the body and throughout some stretch of time, atomic focusing on is finished by nano designed gadgets, for example, nano robots [98]. The particles are targeted [95] and conveying of medications is finished with cell exactness. In vivo imaging is another region where Nano apparatuses and devises are being produced for in vivo imaging. Utilizing nano molecule pictures, for example, in ultrasound and MRI, nano particles are utilized as differentiation. A third medication conveyance approach referenced here utilizes nano shells or dielectric-metal (gold-covered silica) nanospheres. One energizing space of expected use for nano shells is the conveyance of chemotherapeutics to tumors. These nano designed materials are being produced for successfully treating sicknesses and infections, for example, cancer [96]. With the progression of nanotechnology, self-collected biocompatible nano gadgets can be made which will identify the carcinogenic cells and naturally assess the illness, fix, and plan treatment reports [94]. The pharmacological and restorative properties of medications can be improved by legitimate planning of medication conveyance frameworks, by utilization of lipid and polymer based nano particles [99]. The strength of medication conveyance frameworks is their capacity to change the pharmacokinetics and bio-appropriation of the medication. Nano particles are intended to keep away from the body's safeguard components can be utilized to improve drug conveyance. New, complex medication conveyance instruments are being created, which can get drugs through cell layers and into cell cytoplasm, consequently expanding proficiency. Set off reaction is one path for drug atoms to be utilized even more proficiently. Medications that are set in the body can enact just on accepting a specific sign. A medication with helpless solvency will be supplanted by a medication conveyance framework, having improved solubility [94]. Nano particles were found valuable in conveying the myelin antigens, which instigate safe resistance in a mouse model with backsliding various sclerosis. In this method, biodegradable polystyrene miniature particles covered with the myelin sheath peptides will reset the mouse’s invulnerable framework and consequently forestall the repeat of sickness and decrease the manifestations as the defensive myelin sheath structures covering on the nerve filaments of the focal sensory system. This technique for treatment can possibly be utilized in treatment of different other immune system diseases [100,101].

Because of the minute size of nano particles, they can be of incredible use in oncology, especially in imaging. Nano particles such as quantum spots, with quantum control properties like size-tenable light emanation, can be utilized related to attractive reverberation imaging, to create extraordinary pictures of tumor destinations. When contrasted with natural colors, nano particles are a lot more splendid and need one light hotspot for excitation [94]. Thus, the utilization of fluorescent quantum spots could deliver a higher differentiation picture and at a lower cost than natural colors utilized as difference media. Be that as it may, quantum specks are typically made of very poisonous components. Nano particles have a unique property of high surface region to volume proportion, which permits different practical gatherings to get joined to a nano molecule and hence tie to certain tumor cells. Besides, the 10 to 100 nm little size of nanoparticles, permits them to specially gather at tumor locales as tumors come up short on a viable lymphatic waste framework. Multifunctional nano particles can be fabricated that would recognize, picture, and afterward treat a tumor in future malignant growth treatment [102]. Kanzius RF treatment appends tiny nano particles to disease cells and afterward "cooks" tumors inside the body with radio waves that heat just the nanoparticles and the adjoining (harmful) cells. Nano materials have expanded surface region and nano scale impacts, consequently utilized as a promising apparatus for the headway of medication and quality conveyance, biomedical imaging and symptomatic biosensors, insightful, discovery and helpful purposes and strategies, for example, focusing on malignant growth, drug conveyance, improving cell-material communications, frameworks for tissue designing, and quality conveyance frameworks, and give imaginative freedoms in the battle against serious diseases [95]. There has been an immense advancement on understanding the capacity of natural constructions and their cooperation and coordination with several, [96] non-living frameworks, however there are yet open issues to be replied, essentially identified with biocompatibility of the materials and gadgets which are brought into the body. Nano materials have extraordinary physicochemical and organic properties when contrasted with their bigger partners. The properties of nano materials [97] can incredibly impact their associations with bio atoms and cells, because of their size, shape, synthetic piece, surface design, charge, dissolvability, and agglomeration. For instance, nano particles can be utilized to create remarkable pictures of tumor destinations; single-walled carbon nanotubes, have been utilized as high-effectiveness conveyance carriers for biomolecules into cells. The utilization of nanomedicine can give substantially more advances across the different fields like medication, correspondences, genomics, and mechanical technology etc. [95] on a superficial level, scaling down gives practical and more quickly working mechanical, synthetic and natural parts. More subtle, however is the way that nanometer-sized items are heavily influenced by powers very not quite the same as full scale objects. These extraordinary practices are what make nanomedicine conceivable, and by expanding our comprehension of these cycles, new ways to deal with improving the nature of human existence will be created. Be that as it may, this will require some investment. In the following not many years, numerous uses of nanotechnology will get typical inside clinical practice. Since these headways will be steady and will be at first gotten from continuous wet science [94] rather than downsized machining and registering, they may amusingly some of the time be too little to be in any way taken note. There is a splendid future to nano innovation, by its converging with different advancements and the resulting development of mind boggling and inventive half breed advances. Science based advances are entwined with nanotechnology-nanotechnology is now used to control hereditary material, and nano materials are now being fabricated utilizing organic segments. The capacity of nanotechnology to design matter at the littlest scale is changing regions, for example, data innovation psychological science and biotechnology and is prompting new and interlinking these and different fields. [96] By further exploration in nanotechnology, it very well may be helpful for each part of human existence. Medication, regenerative medication, undifferentiated cell exploration and drugs are among the main areas that will be adjusted by nanotechnology innovations [94]. Many nanoparticles and nanodevices are relied upon to be utilized, with a huge positive effect on human wellbeing. The vision is to improve wellbeing by upgrading the adequacy and security of nano systems and nanodevices. Moreover, early finding, inserts with improved properties, malignancy treatment and least obtrusive medicines for coronary illness, diabetes and different infections are anticipated [95]. In the coming years, nanotechnology will assume a critical part in the medication of tomorrow giving progressive freedoms to early disease discovery, indicative and restorative systems to improving wellbeing and upgrading human actual capacities, and empowering exact and viable treatment custom fitted to patient.

**Conclusion:**

As the Covid cases are rising day by day from wave 1 to 2 and so on, we need a permanent solution for this disease and all the other diseases like this. An average human age is decreasing because of these diseases no matter how advanced the medical sciences go. Only a single disease causes a pandemic and shows us that the development is still needed in the medical field. Currently, many countries are working to find the origin of this disease, which is an important step forward so that no other pandemic disease like this ever originate. In this chapter, we summarize about covid and some modern diseases which can harm humans, animals, and plants and how we can fight it by characterizing, identification, modelling, vaccines, and nanotechnology which are all a very big part of biotechnology. Some technologies are yet to come in market but we think the preparation towards cure must be ready; it is important because although covid is dangerous for its mortality rate, it is less as compared to many deadly viruses and other diseases. However, it is just matter of time that another disease or pathogen come in play which may have high mortality and highly communicable, which may be even more life threatening than what we have encountered so far. So, preparation of a tough test in advance is not in vain, otherwise people need to rush and leave everything behind like how we have waited for development of an effective vaccine to save us. Nanotechnology is an answer to many problems, as not only these tiny particles (robots) can help us fight the disease but also can help us monitor our body functions and any change in our body which they can give us as updates on our mobile devices soon. Biotechnology covers an expansive range of logical applications that are applied in numerous areas counting wellbeing and farming. It includes the use of living beings, or its parts to convey imaginative strategies for creation and make new items, for example, new immunization creation (through illness analysis) to keep away from infection assault; hereditarily adjusted plants (to foster obstruction against different nuisances); microscopic organisms being able to tidy up oil slicks and so on. Every one of these highlights are identified with biotechnology that is appropriate to human medical care. All in all, biotechnology identified with human medical care has an enormous sway on the need of patients and their families as it not just spins around prescriptions but furthermore, diagnostics that are delivered utilizing a biotechnological measure. In addition, it includes quality and cell treatments, recombinant DNA items, tissue designed items and controlling climate contamination. Today, the greater parts of creative drugs either created utilizing biotechnology or through analytic items, are made promptly accessible to the general public by applying current biotechnology in their turn of events as well as extension measures. Biotechnology plays a very important role in counter measure of any disease from the diagnosis to making its vaccines available on every step; and we need this type of technology soon enough to fight other harmful diseases.

##### REFERENCES

1. King DA et al. Epidemiology. Infectious diseases: preparing for the future. Science. 313(5792):1392–1393. 2006.
2. Diggle PJ et al. Spatial modelling and the prediction of Loa loa risk: decision making under uncertainty. Annals of Tropical Medicine and Parasitology. 101(6):499–509. 2007.
3. Thomson MC et al. Potential of environmental models to predict meningitis epidemics in Africa. Tropical Medicine and International Health. 11(6):781–788. 2006.
4. Mahoney RT, Morel CM. A global health innovations system (GHIS). Innovation Strategy Today. 2(1):1–12. 2006.
5. Morel C et al. Health innovation in developing countries to address diseases of the poor. Innovation Strategy Today. 1(1):1–15. 2005.
6. Matlin S, Samuels G. The global health research and innovation system (GHRIS). Lancet. 374(9702):1662–1663. 2009.
7. Gardner C, Acharya T, Yach D. Technological and social innovation: a unifying new paradigm for global health. Health Affairs. 26(4):1052–1061. 2007.
8. Labenz J and Borsch G. Evidence for the essential role of Helicobacter pylori in gastric ulcer disease. Gut 35:19-22. 1994.
9. Brechot C. Hepatitis C virus 1b, cirrhosis, and hepatocellular carcinoma. Hepatology 25:772-774. 1997.
10. Zur Hausen H. Human papillomaviruses and their possible role in squamous cell carcinomas. Curr Top Microbiol Immunol 78:1-30. 1977.
11. Chang Y, Cesarman E, Pessin MS, Lee F, Culpepper J, Knowles DM and Moore PS. Identification of herpesvirus-like DNA sequences in AIDS-associated Kaposi's sarcoma. Science 266:1865-1869. 1994.
12. Hill AV, Elvin J, Willis AC, Aidoo M, Allsopp CE, Gotch FM, Gao XM, Takiguchi M, Greenwood BM, Townsend AR and et al. Molecular analysis of the association of HLA-B53 and resistance to severe malaria. Nature 360:434-439. 1992.
13. Apple RJ, Becker TM, Wheeler CM and Erlich HA. Comparison of human leukocyte antigen DRDQ disease associations found with cervical dysplasia and invasive cervical carcinoma. J Natl Cancer Inst 87:427-436. 1995.
14. Michael NL. Host genetic influences on HIV-1 pathogenesis. Curr Opin Immunol 11:466-474. 1999.
15. Beardsley T. Paradise lost? Microbes mount a comeback as drug resistance spreads. Sci Am 267:18-20. 1992.
16. Koch R, in Clark, D. H. (Ed.), Source book of medical history, Dover Publications, Inc., New York. p.392-406. 1942.
17. Manchester KL. Louis Pasteur (1822-1895) chance and the prepared mind. Trends Biotechnol 13:511-515. 1995.
18. Maxam AM and Gilbert W. A new method for sequencing DNA. Proc Natl Acad Sci U S A 74:560-564. 1977.
19. Sanger F, Nicklen S and Coulson AR. DNA sequencing with chain-terminating inhibitors. Proc Natl Acad Sci U S A 74:5463-5467. 1977.
20. Saiki RK, Scharf S, Faloona F, Mullis KB, Horn GT, Erlich HA and Arnheim N. Enzymatic amplification of beta-globin genomic sequences and restriction site analysis for diagnosis of sickle cell anemia. Science 230:1350-1354. 1985.
21. Mullis KB and Faloona FA. Specific synthesis of DNA in vitro via a polymerase-catalyzed chain reaction. Methods Enzymol 155:335-350. 1987.
22. Fredericks DN and Relman DA. Sequence-based identification of microbial pathogens: a reconsideration of Koch's postulates. Clin Microbiol Rev 9:18-33. 1996.
23. Persing DH, in D H Persing, T F Smith., F C Tenover and T J White (Ed.), Diagnostic Molecular Microbiology: Principles and Applications, ASM Press, Washington, D.C. p. 51-87. 1993.
24. Readhead B, Haure-Mirande JV, Funk CC et al. Multiscale analysis of independent Alzheimer’s cohorts finds disruption of molecular, genetic, and clinical networks by human herpesvirus. Neuron. 99(1), 64–87. 2018.
25. Houldcroft CJ, Beale MA, Breuer J. Clinical and biological insights from viral genome sequencing. Nat. Rev. Microbiol. 15(3), 183–192. 2017.
26. Chang CC, Chen CC, Wei SC et al. Diagnostic devices for isothermal nucleic acid amplification. Sensors (Basel) 12(6), 8319–8337. 2012.
27. Gullett JC, Nolte FS. Quantitative nucleic acid amplification methods for viral infections. Clin. Chem. 61(1), 72–78. 2015.
28. Burbelo PD, Ching KH, Bush ER, Han BL, Iadarola MJ. Antibody-profiling technologies for studying humoral responses to infectious agents. Expert. Rev. Vaccines 9(6), 567–578. 2010.
29. Zhu, N.; Zhang, D.;Wang,W.; Li, X.; Yang, B.; Song, J.; Zhao, X.; Huang, B.; Shi,W.; Lu, R.; et al. A Novel Coronavirus from Patients with Pneumonia in China, 2019. N. Engl. J. Med. 382, 727–733. 2020.
30. Bempong, N.E.; De Castañeda, R.R.; Schütte, S.; Bolon, I.; Keiser, O.; Escher, G.; Flahault. A. Precision Global Health—The case of Ebola: A scoping review. J. Glob. Health, 9. 2019.
31. Tom-Aba, D.; Nguku, P.; Arinze, C.; Krause, G. Assessing the Concepts and Designs of 58 Mobile Apps for the Management of the 2014-2015 West Africa Ebola Outbreak: Systematic Review. JMIR Public Health Surveill. 4, e68. 2018.
32. Eysenbach. G. SARS and Population Health Technology. J. Med. Internet Res., 5, e14. 2003.
33. HIMSS Defines Digital Health for the Global Healthcare Industry. Healthcare Information and Management Systems Society. 2020.
34. Clark, L.C.; Lyons, C. Electrode Systems for Continuous Monitoring in Cardiovascular Surgery. Ann. N. Y. Acad. Sci.102, 29–45. 1962.
35. Solaimuthu, A.; Vijayan, A.N.; Murali, P.; Korrapati, P.S. Nano-biosensors and their relevance in tissue engineering. Curr. Opin. Biomed. Eng. 13, 84–93. 2020.
36. Metkar, S.K.; Girigoswami, K. Diagnostic biosensors in medicine—A review. Biocatal. Agric. Biotechnol. 17, 271–283. 2019.
37. Lakshmipriya, T.; Gopinath, S.C.B. An Introduction to Biosensors and Biomolecules. In Nanobiosensors for Biomolecular Targeting; Gopinath, S.C.B., Lakshmipriya, T., Eds.; Elsevier: Amsterdam, The Netherlands, pp. 1–21. 2019.
38. Scholten, K.; Meng, E. A review of implantable biosensors for closed-loop glucose control and other drug delivery applications. Int. J. Pharm. 544, 319–334. 2018.
39. Yazdi, M.K.; Zarrintaj, P.; Bagheri, B.; Kim, Y.C.; Ganjali, M.R.; Saeb, M.R. Nanotechnology-based biosensors in drug delivery. In Nanoengineered Biomaterials for Advanced Drug Delivery; Mozafari, M., Ed.; Series in Biomaterials; Woodhead Publishing: Cambridge, MA, USA, pp. 767–779. 2020.
40. Griesche, C.; Baeumner, A.J. Biosensors to support sustainable agriculture and food safety. TrAC Trends Anal. Chem.128, 115906. 2020.
41. Pandey, A.; Gurbuz, Y.; Ozguz, V.; Niazi, J.H.; Qureshi, A. Graphene-interfaced electrical biosensor for label-free and sensitive detection of foodborne pathogenic E. coli O157:H7. Biosens. Bioelectron. 91, 225–231. 2017.
42. Cesewski, E.; Johnson, B.N. Electrochemical biosensors for pathogen detection. Biosens. Bioelectron.159, 112214. 2020.
43. Guliy, O.I.; Zaitsev, B.D.; Larionova, O.S.; Borodina, I.A. Virus Detection Methods and Biosensor Technologies. Biophysics 64, 890–897. 2019.
44. Farooq, U.; Yang, Q.; Ullah, M.W.; Wang, S. Bacterial biosensing: Recent advances in phage-based bioassays and biosensors. Biosens. Bioelectron. 118, 204–216. 2018.
45. Cheng, M.S.; Ho, J.S.; Tan, C.H.; Wong, J.P.S.; Ng, L.C.; Toh, C.-S. Development of an electrochemical membrane-based nanobiosensor for ultrasensitive detection of dengue virus. Anal. Chim. Acta 725, 74–80. 2012.
46. Sharma, A.; Sharma, N.; Kumari, A.; Lee, H.-J.; Kim, T.; Tripathi, K.M. Nano-carbon based sensors for bacterial detection and discrimination in clinical diagnosis: A junction between material science and biology. Appl. Mater. Today 18, 100467. 2020.
47. Rai, M.; Gade, A.; Gaikwad, S.; Marcato, P.D.; Durán, N. Biomedical applications of nanobiosensors: The state-of-the-art. J. Braz. Chem. Soc. 23, 14–24. 2012.
48. Zhao, V.X.T.; Wong, T.I.; Zheng, X.T.; Tan, Y.N.; Zhou, X. Colorimetric biosensors for point-of-care virus detections. Mater. Sci. Energy Technol. 3, 237–249. 2020.
49. Chao, J.; Zhu, D.; Zhang, Y.; Wang, L.; Fan, C. DNA nanotechnology-enabled biosensors. Biosens. Bioelectron. 76, 68–79. 2016.
50. Soni, A.; Surana, R.K.; Jha, S.K. Smartphone based optical biosensor for the detection of urea in saliva. Sens. Actuators B Chem. 269, 346–353. 2018.
51. Zhang, H.; Xue, L.; Huang, F.; Wang, S.; Wang, L.; Liu, N.; Lin, J. A capillary biosensor for rapid detection of Salmonella using Fe-nanocluster amplification and smart phone imaging. Biosens. Bioelectron. 127, 142–149. 2019.
52. Roda, A.; Michelini, E.; Zangheri, M.; Di Fusco, M.; Calabria, D.; Simoni, P. Smartphone-based biosensors: A critical review and perspectives. TrAC Trends Anal. Chem. 79, 317–325. 2016.
53. Choi, C. Integrated nanobiosensor technology for biomedical application. Nanobiosens. Dis. Diagn. 1, 1–4. 2012.
54. Srinivasan, B.; Tung, S. Development and Applications of Portable Biosensors. J. Lab. Autom. 20, 365–389. 2015.
55. Mehrotra, P. Biosensors and their applications—A review. J. Oral Biol. Craniofacial Res. 6, 153–159. 2016.
56. Krejcova, L.; Michalek, P.; Rodrigo, M.M.; Heger, Z.; Krizkova, S.; Vaculovicova, M.; Hynek, D.; Adam, V.; Kizek, R. Nanoscale virus biosensors: State of the art. Nanobiosens. Dis. Diagn. 4, 47–66. 2015.
57. Malon, R.S.P.; Sadir, S.; Balakrishnan, M.; Córcoles, E.P. Saliva-Based Biosensors: Noninvasive Monitoring Tool for Clinical Diagnostics. BioMed Res. 962903. 2014.
58. M. A. Shereen, S. Khan, A. Kazmi, N. Bashir, and R. Siddique. “COVID-19 infection: origin, transmission, and characteristics of human coronaviruses,” Journal of Advanced Research, vol. 24, pp. 91–98. 2020.
59. World Health Organization, Laboratory testing for coronavirus disease (COVID-19) in suspected human cases, World Health Organization. 2019.
60. H. Lu, C. W. Stratton, and Y. W. Tang. “Outbreak of pneumonia of unknown etiology in Wuhan China: the mystery and the miracle,” Journal of Medical Virology, vol. 92, no. 4, pp. 401- 402. 2020.
61. I. I. Bogoch, A. Watts, A. Thomas-Bachli, C. Huber, M. U. G. Kraemer, and K. Khan. “Pneumonia of unknown aetiology in Wuhan, China: potential for international spread via commercial air travel,” Journal of Travel Medicine, vol. 27, no. 2. 2020.
62. A. E. Gorbalenya, S. C. Baker, R. S. Baric et al. “severe acute respiratory syndrome-related coronavirus: The species and its viruses – a statement of the Coronavirus Study Group,” BioRxiv. 2020.
63. H.-W. Zhang, J. Yu, H. J. Xu et al. “Corona virus international public health emergencies: implications for radiology management,” Academic Radiology, vol. 27, no. 4, pp. 463–467. 2020.
64. C. C. Lai, T.-P. Shih, W. C. Ko, H. J. Tang, and P.-R. Hsueh. “Severe acute respiratory syndrome coronavirus 2 (SARSCoV-2) and coronavirus disease-2019 (COVID-19): The epidemic and the challenges,” International Journal of Antimicrobial Agents, vol. 55, no. 3, article 105924. 2020.
65. World Health Organization, “Coronavirus disease 2019 (COVID-19): Situation Report 61,”. 2020.
66. C. Biscayart, P. Angeleri, S. Lloveras, T. . S. S. Chaves, P. Schlagenhauf, and A. J. Rodríguez-Morales. “The next big threat to global health? 2019 novel coronavirus (2019-nCoV): what advice can we give to travellers? – Interim recommendations January 2020, from the Latin-American society for travel medicine (SLAMVI),” Travel Medicine and Infectious Disease, vol. 33, article 101567. 2020.
67. S. Zhao, Q. Lin, J. Ran et al. “Preliminary estimation of the basic reproduction number of novel coronavirus (2019-nCoV) in China, from 2019 to 2020: a data-driven analysis in the early phase of the outbreak,” International Journal of Infectious Diseases, vol. 92, pp. 214–217. 2020.
68. C. Huang, Y. Wang, X. Li et al. “Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China,” The Lancet, vol. 395, no. 10223, pp. 497–506. 2020.
69. W. G. Carlos, C. S. Dela Cruz, B. Cao, S. Pasnick, and S. Jamil. “Novel Wuhan (2019-nCoV) coronavirus,” American Journal of Respiratory and Critical Care Medicine, vol. 201, no. 4, pp. P7–P8. 2020.
70. G. Chowell, F. Abdirizak, S. Lee et al. “Transmission characteristics of MERS and SARS in the healthcare setting: a comparative study,” BMC Medicine, vol. 13, no. 1, p. 210. 2015.
71. C. Li, Y. Yang, and L. Ren. “Genetic evolution analysis of 2019 novel coronavirus and coronavirus from other species,” Infection, Genetics and Evolution, vol. 82, p. 104285. 2020.
72. F. Wu, S. Zhao, B. Yu et al. “A new coronavirus associated with human respiratory disease in China,” Nature, vol. 579, no. 7798, pp. 265–269. 2020.
73. S. P. Adhikari, S. Meng, Y. J. Wu et al. “Epidemiology, causes, clinical manifestation and diagnosis, prevention and control of coronavirus disease (COVID-19) during the early outbreak period: a scoping review,” Infectious Diseases of Poverty, vol. 9, no. 1, p. 29. 2020.
74. H. Nishiura, S.-M. Jung, N. M. Linton et al. “The extent of transmission of novel coronavirus in Wuhan, China, 2020,” Journal of Clinical Medicine, vol. 9, no. 2, p. 330. 2020.
75. T. P. Velavan and C. G. Meyer. “The COVID-19 epidemic,” Tropical Medicine & International Health, vol. 25, no. 3, pp. 278–280. 2020.
76. F. A. Rabi, M. S. al Zoubi, G. A. Kasasbeh, D. M. Salameh, and A. D. al-Nasser. “SARS-CoV-2 and coronavirus disease 2019: what we know so far,” Pathogens, vol. 9, no. 3, p. 231. 2020.
77. Y.-H. Jin, L. Cai, Z.-S. Cheng et al. “A rapid advice guideline for the diagnosis and treatment of 2019 novel coronavirus (2019-nCoV) infected pneumonia (standard version),” Military Medical Research, vol. 7, no. 1, p. 4. 2020.
78. H. A. Rothan and S. N. Byrareddy. “The epidemiology and pathogenesis of coronavirus disease (COVID-19) outbreak,” Journal of Autoimmunity, vol. 109, article 102433. 2020.
79. Y. Han and H. Yang. “The transmission and diagnosis of 2019 novel coronavirus infection disease (COVID-19): a Chinese perspective,” Journal of Medical Virology, vol. 92, no. 6, pp. 639–644. 2020.
80. P. Mo, Y. Xing, Y. Xiao et al. “Clinical characteristics of refractory COVID-19 pneumonia in Wuhan, China,” Clinical Infectious Diseases. 2020.
81. W. Wang, J. Tang, and F. Wei. “Updated understanding of the outbreak of 2019 novel coronavirus (2019-nCoV) in Wuhan, China,” Journal of Medical Virology, vol. 92, no. 4, pp. 441– 447. 2020.
82. D. Wang, B. Hu, C. Hu et al. “Clinical characteristics of 138 hospitalized patients with 2019 novel coronavirus–infected pneumonia in Wuhan, China,” JAMA, vol. 323, no. 11, pp. 1061–1069. 2020.
83. A. R. Sahin, A. Erdogan, P. M. Agaoglu et al. “2019 novel coronavirus (COVID-19) outbreak: a review of the current literature,” Eurasian Journal of Medicine and Oncology, vol. 4, no. 1, pp. 1–7. 2020.
84. F. Pan, T. Ye, P. Sun et al. “Time course of lung changes on chest CT during recovery from 2019 novel coronavirus (COVID-19) pneumonia,” Radiology, no. article 200370. 2020.
85. Fissell WH. What is nanotechnology? Adv. Chronic Kidney Dis. 20, 452–453. 2013.
86. Rasheed PA, Sandhyarani N. Carbon nanostructures as immobilization platform for DNA: a review on current progress in electrochemical DNA sensors. Biosens. Bioelectron. 97, 226–237. 2017.
87. Qiu H, Min YZ, Rodgers Z, Zhang LZ, Wang AZ. Nanomedicine approaches to improve cancer immunotherapy. Wiley Interdiscip. Rev. Nanomed. Nanobiotechnol. 9, e1456. 2017.
88. Manickam V, Velusamy RK, Lochana R, Amiti, Rajendran B, Tamizhselvi R. Applications and genotoxicity of nanomaterials in the food industry. Environ. Chem. Lett. 15, 399–412. 2017.
89. Damborska D, Bertok T, Dosekova E, Holazova A, Lorencova L, Kasak P, Tkac J. Nanomaterial-based biosensors for detection of prostate specific antigen. Microchim. Acta 184, 3049–3067. 2017.
90. Akhtar MJ, Ahamed M, Alhadlaq HA, Alrokayan SA, Kumar S. Targeted anticancer therapy: over-expressed receptors and nanotechnology. Clin. Chim. Acta 436, 78–92. 2014.
91. Mura S, Nicolas J, Couvreur P. Stimuli-responsive nanocarriers for drug delivery. Nat. Mater. 12, 991–1003. 2013.
92. Peng L, He M, Chen B, Wu Q, Zhang Z, Pang D, Zhu Y, Hu B. Cellular uptake, elimination and toxicity of CdSe/ZnS quantum dots in HepG2 cells. Biomaterials 34, 9545–9558. 2013.
93. Su XY, Liu PD, Wu H, Gu N. Enhancement of radiosensitization by metal-based nanoparticles in cancer radiation therapy. Cancer Biol. Med. 11, 86–91. 2014.
94. Nanotechnology and its Applications in Medicine Anna Pratima Nikalje\* Department of Pharmaceutical chemistry, Y.B. Chavan College of Pharmacy, Dr. Rafiq Zakaria Campus, Rauza Bagh, Aurangabad- 431001, Maharashtra, India.
95. Nanotechnology in Medicine: The Medicine of Tomorrow and Nanomedicine Logothetidis S Aristotle University of Thessaloniki, Physics Department Lab for Thin Films - Nanosystems & Nanometrology, GR-54124 Thessaloniki, Greece.
96. Nanomedicine – prospective therapeutic and diagnostic applications Dwaine F Emerich LCT BioPharma, 766 Laten Knight Rd,Cranston, RI 02921, USA.
97. Biomedical Applications of Nanotechnology by ineke malsch. Abraham SA Researchers Develop Bucky balls to Fight Allergy. Virginia Commonwealth University Communications and Public Relations. 2010.
98. lanza GM, Trousil RL, WALLACE KD et al.: In vitro characterization of a novel, tissue-targeted ultrasonic contrast system with acoustic microscopy. J. Acoust. Soc. Am. 104: 3665-3672. 1998.
99. Laurance J Scientists develop nanoparticle method to help tackle major diseases. The Independent. 2012.
100. Miller Stephen, Getts D, Martin A, McCarthy D, Terry R, et al. Micro particles bearing encephalitogenic peptides induce T-cell tolerance and ameliorate experimental autoimmune encephalomyelitis. Nature Biotechnology. 30: 1217-1224. 2012.
101. Nie S, Xing Y, Kim GJ, Simons JW Nanotechnology applications in cancer. Annu Rev Biomed Eng. 9: 257-288. 2007.
102. Zheng G, Patolsky F, Cui Y, Wang WU, Lieber CM Multiplexed electrical detection of cancer markers with nanowire sensor arrays. Nat Biotechnology. 23: 1294-1301. 2005.