

Essential facts about

Covid-19

**The disease,
the responses and
an uncertain future**

**For South African Learners,
Teachers and
the General Public**



Commissioned by the Academy of Science of South Africa (ASSAf)



The **Academy of Science of South Africa** (ASSAf)

was inaugurated in May 1996. It was formed in response to the need for an Academy of Science consonant with the dawn of democracy in South Africa:

activist in its mission of using science and scholarship for the **benefit of society**, with a mandate encompassing all scholarly disciplines that use an **open-minded** and **evidence-based** approach to build **knowledge**. ASSAf thus adopted in its name the term 'science' in the singular as reflecting a common way of enquiring rather than an aggregation of different disciplines. Its Members are elected on the basis of a combination of two principal criteria, **academic excellence** and **significant contributions to society**.

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GLOSSARY

2019-nCoV Coronavirus disease 2019 (Covid-19) is a contagious disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).

501Y.V2 variant Colloquially known as the 'South African Covid-19 variant' and is a variant of SARS-CoV-2, the virus that causes Covid-19.

ACE2 Angiotensin-converting enzyme 2 (ACE2) is an enzyme attached to the cell membranes of cells located in the lungs, arteries, heart, kidney, and intestines.

Acidification The action or process of making or becoming acidic.

Actuarial data Statistics used to calculate various sorts of risk.

Adaptive immune response The adaptive, or acquired, immunity that occurs after exposure to an antigen either from a pathogen or a vaccination.

Adenovirus Adenoviruses are a group of common viruses that infect the lining of your eyes, airways and lungs, intestines, urinary tract, and nervous system.

Aerosol Suspension of fine solid particles or liquid droplets in air or another gas.

Alternative facts Falsehoods, untruths, delusions.

Antagonists A substance that stops the action or effect of another substance.

Antibiotic medicine (such as penicillin or its derivatives) that inhibits the growth of or destroys microorganisms.

Antibody test Antibody or serology tests look for antibodies in your blood to determine if you had a past infection with, for example, the virus that causes Covid-19.

Antiretroviral Antiretroviral drugs are medications for the treatment of infection by retroviruses, primarily HIV.

Antiviral drugs Class of medication used for treating viral infections.

Asymptomatic When no symptoms of disease are evident.

Attenuated vaccine A vaccine containing partial cellular material as opposed to complete cells.

Atypical Not representative of a type, group, or class; not typical.

Azithromycin Antibiotic medication used for the treatment of a number of bacterial infections.



B.1.1.7 variant Colloquially known as the 'United Kingdom (UK) variant'.

Betacoronavirus One of four genera of coronaviruses.

Bilateral multi-lobular lung Involves lobes in both the right and left lungs.

Biosynthesis Production of complex molecules within living organisms or cells.

Block grant A financial grant from central government, which a local authority can allocate to a wide range of services.

Bond market A marketplace where investors buy debt securities that are brought to the market by either governmental entities or publicly-traded corporations.

Cannula A nasal cannula is a tube used to deliver gas, generally oxygen, through the nostrils or mouth. More generally a cannula can be any tube to provide access to the body, for example to the bloodstream by means of a needle inserted into a vein.

Catchment populations The population of the area served by a facility.

CD4 A large glycoprotein that is found associated with a T cell receptor especially on the surface of helper T cells and that binds to a major histocompatibility complex molecule on the surface of an antigen-presenting cell to facilitate antigen recognition and T cell activation.

Chemotherapy Treatment of disease by introducing chemical substances into the body.

Chloroquine An antimalarial drug.

Chronic infection An infection is chronic when symptoms develop gradually, over weeks or months, and are slow to resolve.

Ciprofloxacin An antibiotic used to treat a number of bacterial infections.

Communicable disease Illness caused by an infectious agent or its toxins that occurs through the direct or indirect transmission of the infectious agent or its products from an infected individual or via an animal, vector or the inanimate environment to a susceptible animal or human host.

Community transmission Describes the situation where an epidemic propagates within a population rather than being brought in by infected people outside the population.

Comorbidities The coexistence of two or more diseases in a person.

Contact tracing Process of identifying all people that a patient has come in contact with.



Contributory social security Benefits financed through contributions.

Control group The standard or norm to which comparisons are made in an experiment. This group is not exposed to the variable under study.

Convalescent plasma Blood plasma that is obtained from an individual who has recovered from an infectious disease and contains antibodies against the infectious agent.

Cytoplasm Thick solution that fills each cell and is enclosed by the cell membrane.

Denialism Practice of denying the existence, truth, or validity of something despite proof or strong evidence that it is real, true, or valid.

DNA gyrase A bacterial enzyme that causes supercoiling of DNA.

DNA intermediate Viral genome replication where the template is single-stranded RNA, and which proceeds via a double stranded DNA intermediate molecule.

DNA replication Biological process of producing two identical replicas of DNA from one original DNA molecule.

DNA Self-replicating material that is present in nearly all living organisms as the main constituent of chromosomes. It is the carrier of genetic information.

Double-stranded RNA Double-stranded RNA viruses are a polyphyletic group of viruses that have double-stranded genomes made of ribonucleic acid.

Dual healthcare system A situation in which a government-provided healthcare system provides care, and a second system of care exists for those who can pay for private care.

Economic bounce-back To return to the usual economic state or activities after having a problem.

Efficacious Successful in producing a desired or intended result.

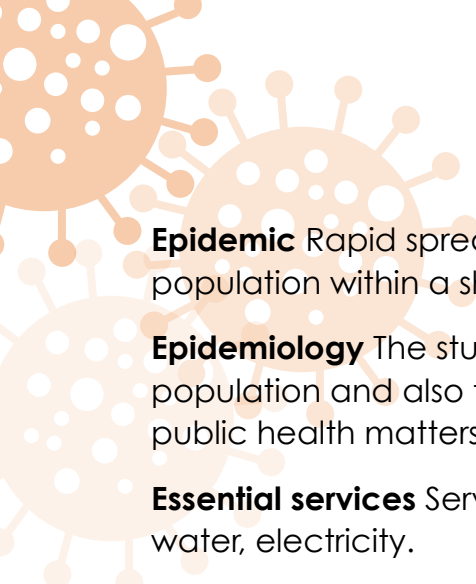
Emergency use authorisation (EUA) Authorisation granted to allow the use of a drug before approval.

Endotracheal tube A small, usually plastic tube inserted into the throat through the mouth or nose to maintain an unobstructed passageway for air to flow into the lungs.

Envelope proteins The CoV envelope (E) protein is a small, integral membrane protein involved in several aspects of the virus' life cycle.

Enzyme Substance produced by a living organism that acts as a catalyst to bring about a specific biochemical reaction.

Epicentre Epicentre is the place where something is most common or intense, or where it originated.



Epidemic Rapid spread of disease to a large number of people in a given population within a short period of time.

Epidemiology The study of the spread and control of infectious diseases in a population and also the prevalence of other diseases, their causes, and other public health matters using statistical methods.

Essential services Services that provide the necessities of life such as healthcare, water, electricity.

Eukaryotic cell Organisms whose cells have a nucleus enclosed within a nuclear envelope.

Experimental group Group of subjects who are exposed to the variable under study. Alongside this group will be the control group against which results are compared.

Exponential growth Growth whose rate becomes ever more rapid in proportion to the growing total number or size.

Fake news False or misleading information presented as news.

Fusion inhibitors Class of antiviral drugs that prevent a virus from entering a cell.

Gastrointestinal Anything related to the digestive system.

Gene A subsequence of the genome, which gets transcribed into RNA. In many cases this RNA, known as messenger RNA (or mRNA) gets translated into a protein whose structure is determined by the sequences of bases of the gene. In other cases, the RNA sequences so transcribed serve functions other than becoming translated into proteins.

Genetic vaccines Approach to immunisation and immunotherapy in which one or more genes that encode proteins of the pathogen are delivered.

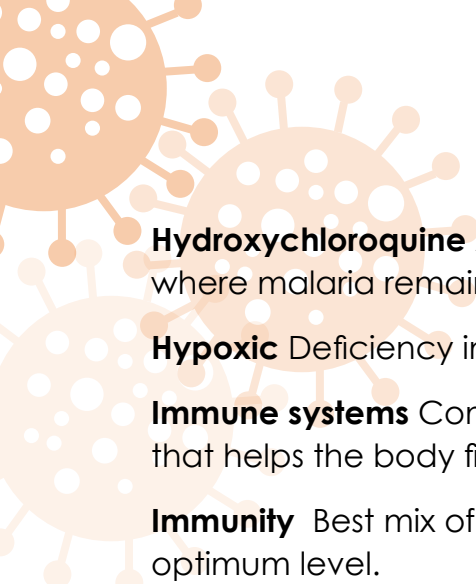
Genome An organism's complete set of DNA.

Geometric sequence Ordered list of numbers in which each term after the first is found by multiplying the previous one by a fixed non-zero number, called the common ratio r .

Herd immunity Describes when a sufficient fraction of a population (but not the entire population) is no longer susceptible to an infectious disease, either through prior exposure and vaccination, so that the number of persons infected decays with time, leading to the end of the epidemic.

Herpesvirus Any of a group of DNA viruses causing herpes and other diseases.

Human papillomavirus Infection that causes warts in various parts of the body, depending on the strain.



Hydroxychloroquine A medication used to prevent and treat malaria in areas where malaria remains sensitive to chloroquine.

Hypoxic Deficiency in the amount of oxygen reaching the tissues.

Immune systems Complex network of cells, tissues, organs, and the substances that helps the body fight infections and other diseases.

Immunity Best mix of cells the immune system needs to function at its optimum level.

Immunology Branch of biology that covers the study of immune systems.

Incubation period Period between exposure to an infection and the appearance of the first symptoms.

Infection peak The number of new cases has begun to level off rather than continuing on a sharp upward trajectory.

Infectious (person) Able to pass a disease from one person to another.

Infectious diseases Infectious diseases are disorders caused by organisms—such as bacteria, viruses, fungi or parasites—which can be transferred from one living being to another in any number of modes.

Inhibitor Substance that reduces the activity of another substance.

Insufflation Act of blowing something into a body cavity.

Internal vesicles Structure within or outside a cell, consisting of liquid or cytoplasm enclosed by a lipid bilayer.

Junk status Non-investment grade (bond).

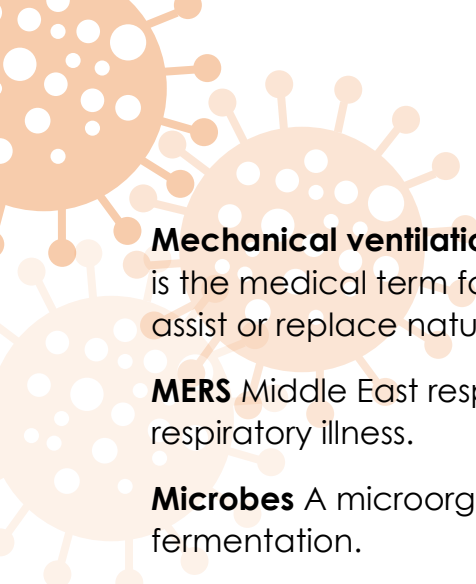
Killed or inactivated vaccine Vaccine consisting of virus particles, bacteria, or other pathogens that have been grown in culture and then killed to destroy disease-producing capacity.

Liquidity How quickly a business can convert its assets into cash.

Live virus vaccines Vaccine made from a virus that has been weakened so it does not cause the disease the virus usually causes.

Lockdown A restriction policy for people or communities to minimise movement, usually due to specific risks to themselves or to others if they can move and interact freely.

Mathematical modelling Description of a system using mathematical concepts and language.



Mechanical ventilation Assisted ventilation, or intermittent mandatory ventilation, is the medical term for artificial ventilation where mechanical means are used to assist or replace natural breathing.

MERS Middle East respiratory syndrome (MERS) is a contagious, sometimes fatal respiratory illness.

Microbes A microorganism, especially a bacterium, causing disease or fermentation.

Micro-organisms A microscopic organism, which may exist in its single-celled form or a colony of cells.

Monoclonal antibodies Antibody made by cloning a unique white blood cell.

Mucosa The moist, inner lining of some organs and body cavities (such as the nose, mouth, lungs, and stomach).

Multisystem inflammatory condition A condition where different body parts can become inflamed, including the heart, lungs, kidneys, brain, skin, eyes, or gastrointestinal organs.

Mutations An alteration in the genetic material (the genome) of a cell of a living organism or of a virus that is more or less permanent and that can be transmitted.

Narcissism A disorder in which a person has an inflated sense of self-importance.

Nascent Just coming into existence and beginning to display signs of future potential.

Nasopharynx Upper part of the throat behind the nose.

Natural selection Process through which populations of living organisms adapt and change.

Nomenclature System of names or terms, or the rules for forming these terms in a particular field of arts or sciences.

Non-communicable disease A disease that is not passed from one person to another, or from an animal to a person, but rather arises spontaneously, such as heart disease or cancer.

Non-nucleoside reverse transcriptase inhibitors (NNRTIs) Small molecule drugs that bind directly to the active site of HIV-1 reverse transcriptase, disrupting its RNA-dependent and DNA-dependent DNA polymerase activities.

Non-pharmaceutical interventions Actions, apart from getting vaccinated and taking medicine, that people and communities can take to help slow the spread of illnesses.



Nucleic acids Long chainlike molecules composed of a series of nearly identical building blocks called nucleotides.

Nucleoside analogues (NRTIs) An anti-retroviral drug using fake building blocks that cause the replication or reverse transcription of the viral genome to fail

Oropharynx Part of the throat that is at the back of the mouth.

Outbreak A sudden onset of something unwelcome, such as war or disease.

P.1 variant Colloquially known as the 'Brazil variant' and is one of the variants of SARS-CoV-2, the virus that causes Covid-19.

Paediatric Relating to dealing with children and their diseases.

Pandemic Epidemic occurring worldwide, or over a very wide area, crossing international boundaries and usually affecting a large number of people.

Pathogens Any organism that can produce disease.

Personal protective equipment (PPE) Protective clothing, helmets, goggles, or other garments or equipment designed to protect the wearer's body from injury or infection.

Phenotypes Refers to the observable physical properties of an organism.

Phylogenetic analyses Uses differences in the genome to map out a family tree of organisms, such as bacteria, viruses, plants, and animals.

Placebo Substance that has no therapeutic effect, used as a control in testing new drugs.

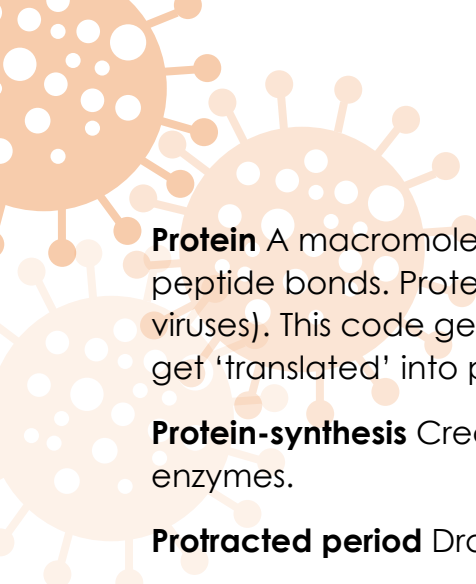
Placebo effect Positive effect on a person's health experienced after taking a placebo. It is triggered by the person's belief in the benefit from the treatment and their expectation of feeling better

Post-attachment inhibitors Class of drugs that bind to the CD4 receptor on a host CD4 cell.

Poxvirus infections Brick or oval-shaped viruses with large double-stranded DNA genomes.

Pre-exposure prophylactics Medications used to prevent the spread of disease in people who have not yet been exposed to a disease-causing agent, usually a virus.

Pre-symptomatic transmission Phase when an individual is infected and may be shedding virus but has not yet developed symptoms.



Protein A macromolecule formed as a chain of amino acids linked through peptide bonds. Proteins are encoded in the DNA (or RNA in the cases of some viruses). This code gets 'transcribed' into messenger RNA molecules, which in turn get 'translated' into proteins in the ribosomes of a cell.

Protein-synthesis Creation of proteins by cells that uses DNA, RNA, and various enzymes.

Protracted period Drawn out or lengthened in time.

Quarantine Restriction on the movement of people, animals and goods which is intended to prevent the spread of disease or pests.

R number Way of rating coronavirus or any disease's ability to spread. R is the number of people that one infected person will pass on a virus to, on average.

R₀ Mathematical term that indicates how contagious an infectious disease is. It is also referred to as the reproduction number.

Recombinant vaccines Products of genetic engineering, where a harmless agent, such as yeast, is programmed to produce antigens of harmful pathogens.

Recovery trial Large-enrolment clinical trial of possible treatments for people in the United Kingdom admitted to hospital with severe Covid-19 infection.

Regulatory proteins Any protein that influences the regions of a DNA molecule that are transcribed by RNA polymerase during the process of transcription.

Respiratory diseases Diseases of the airways and other structures of the lung.

Retroviral integrase Enzyme produced by a retrovirus that integrates—forms covalent links between—it's genetic information into that of the host cell it infects.

Retroviruses Type of virus that inserts a copy of its RNA genome into the DNA of a host cell that it invades, thus changing the genome of that cell.

Reverse transcription Process in cells by which an enzyme makes a copy of DNA from RNA. The enzyme that makes the DNA copy is called reverse transcriptase.

RNA elongation Stage when the RNA strand gets longer, due to the addition of new nucleotides.

RNA replicating Process by which new copies of genome-length RNAs are made.

RNA virus Virus that has RNA (ribonucleic acid) as its genetic material.

RT-PCR Reverse transcription polymerase chain reaction is a laboratory technique combining reverse transcription of RNA into DNA and amplification of specific DNA targets using polymerase chain reaction.



SARS A contagious and sometimes fatal respiratory illness caused by a coronavirus.

SARS-CoV-2 Member of a large family of viruses called coronaviruses. These viruses can infect people and some animals. This virus causes the Covid-19 disease.

Second wave A phenomenon of infections that can develop during a pandemic. The disease infects one group of people first. Infections appear to decrease. And then, infections increase in a different part of the population, resulting in a second wave of infections.

Secondary bond market Also called the aftermarket and follow-on public offering, is the financial market in which previously issued financial instruments such as stock, bonds, options, and futures are bought and sold.

Serological test Blood tests that look for antibodies in blood.

Serotype A distinct variation within a species of bacteria or virus or among immune cells of different individuals.

Shelter-in-place order An official order, issued during an emergency, that directs people to stay in the indoor place or building that they already occupy and not to leave unless absolutely necessary.

Single-stranded RNA virus Virus whose genetic information consists of a single strand of RNA that is the positive (or sense) strand which encodes mRNA (messenger RNA) and protein.

Social distancing A set of non-pharmaceutical interventions or measures intended to prevent the spread of a contagious disease by maintaining a physical distance between people and reducing the number of times people come into close contact with each other.

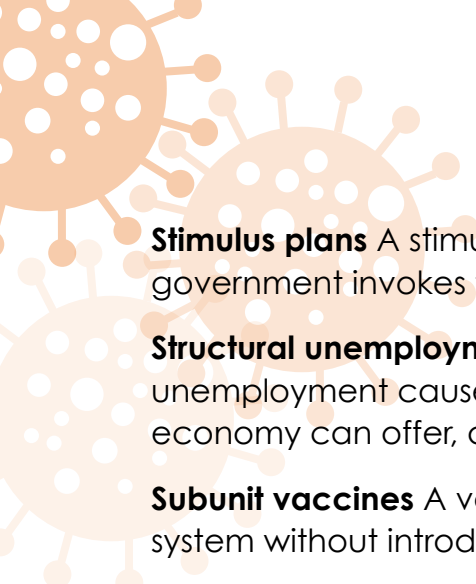
Solidarity trial International clinical trial to help find an effective treatment for Covid-19, launched by the World Health Organization and partners. It is one of the largest international randomised trials for Covid-19 treatments, enrolling almost 12 000 patients in 500 hospital sites in over 30 countries.

Spike protein These spikes protrude from the outside of coronaviruses and help them infect cells.

Sputum Mixture of saliva and mucus coughed up from the respiratory tract, typically as a result of infection or other disease and often examined microscopically to aid medical diagnosis.

State of emergency Situation of national danger or disaster in which a government suspends normal constitutional procedures in order to regain control.

Stigmatisation The action of describing or regarding someone or something as worthy of disgrace or great disapproval.



Stimulus plans A stimulus package is a package of economic measures a government invokes to stimulate a floundering economy.

Structural unemployment Structural unemployment is a form of involuntary unemployment caused by a mismatch between the skills that workers in the economy can offer, and the skills demanded of workers by employers.

Subunit vaccines A vaccine that presents one or more antigens to the immune system without introducing pathogen particles, whole or otherwise.

Super-spreader events Large events, attended by a large number of people, where a greater amount of transmission than would be expected occurs.

Susceptible Likely or liable to be influenced or harmed by a particular thing.

Symbiotic relationship The living together in more or less intimate association or close union of two dissimilar organisms.

Synthetic compounds Substance that is man-made (by synthesis), rather than being produced by nature.

T cell A type of white blood cell. T cells are part of the immune system and develop from stem cells in the bone marrow.

Transmission A passage or transfer, as of a disease from one individual to another.

Vaccine A biological preparation that provides active acquired immunity to a particular infectious disease.

Ventilatory support The patient is on a machine that helps them breathe. A tube is put in through their nose or mouth into the trachea (windpipe). It is attached to a ventilator.

Variant A form or version of something that differs in some respect from other forms of the same thing or from a standard.

Viral evolution Sub-field of evolutionary biology and virology that is specifically concerned with the evolution of viruses.

Viral genome A virus has either DNA or RNA genes and is called a DNA virus or a RNA virus. The genome includes both the genes and the non-coding sequences of the DNA/RNA.

Viral protein Protein generated by a virus.

Viral test Checks specimens from your nose or your mouth to find out if you are currently infected with SARS-CoV-2, the virus that causes Covid.

Virulent A virulent disease or poison is dangerous and spreads or affects people very quickly.



Virus particle A small particle that contains certain proteins from the outer coat of a virus.

Virus-encoded proteins Proteins generated by a virus.

Wet market A marketplace selling fresh meat, fish, produce, and other perishable goods as distinguished from 'dry markets' that sell durable goods such as fabric and electronics.

Zoonotic Caused by germs that spread between animals and people.

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The Parliament of South Africa passed the Academy of Science of South Africa Act (No 67 of 2001), which came into force on 15 May 2002. This made ASSAf the only academy of science in South Africa officially recognised by government and representing the country in the international community of science academies and elsewhere.

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