

How do vaccines work?

STAR HEALTH DESK

Germes are all around us, both in our environment and in our bodies. When a person is susceptible and they encounter a harmful organism, it can lead to disease and death.

The body has many ways of defending itself against pathogens (disease-causing organisms). Skin, mucus, and cilia (microscopic hairs that move debris away from the lungs) all work as physical barriers to prevent pathogens from entering the body in the first place. When a pathogen does infect the body, our body's defences, called the immune system, are triggered and the pathogen is attacked and destroyed or overcome.

The body's natural response

A pathogen is a bacterium, virus, parasite or fungus that can cause disease within the body. Each pathogen is made up of several subparts, usually unique to that specific pathogen and the disease it causes. The subpart of a pathogen that causes the formation of antibodies is called an antigen.

The antibodies produced in response to the pathogen's antigen are an important part of the immune system. You can consider antibodies as the



soldiers in your body's defense system. Each antibody, or soldier, in our system is trained to recognise one specific antigen. We have thousands of different antibodies in our bodies. When the human body is exposed to an antigen for the first time, it takes time for the immune system to respond and produce antibodies specific to that antigen. In the meantime, the person is susceptible to becoming ill. Once the antigen-specific

antibodies are produced, they work with the rest of the immune system to destroy the pathogen and stop the disease. Antibodies to one pathogen generally do not protect against another pathogen except when two pathogens are very similar to each other, like cousins. Once the body produces antibodies in its primary response to an antigen, it also creates antibody-producing memory cells, which remain alive even after the pathogen is

defeated by the antibodies. If the body is exposed to the same pathogen more than once, the antibody response is much faster and more effective than the first time around because the memory cells are at the ready to pump out antibodies against that antigen. This means that if the person is exposed to the dangerous pathogen in the future, their immune system will be able to respond immediately, protecting against disease.

How vaccines help

Vaccines contain weakened or inactive parts of a particular organism (antigen) that triggers an immune response within the body. Newer vaccines contain the blueprint for producing antigens rather than the antigen itself. Regardless of whether the vaccine is made up of the antigen itself or the blueprint so that the body will produce the antigen, this weakened version will not cause the disease in the person receiving the vaccine, but it will prompt their immune system to respond much as it would have on its first reaction to the actual pathogen.

Some vaccines require multiple doses, given weeks or months apart. This is sometimes needed to allow for the production of long-lived antibodies and development of memory cells. In this way, the body is trained to fight the specific disease-causing organism, building up memory of the pathogen to rapidly fight it if and when exposed in the future.

Vaccinating not only protects yourself, but also protects those in the community who are unable to be vaccinated. If you are able to, get vaccinated.

Source: World Health Organisation

UPDATE



Convalescent plasma not effective for COVID-19 treatment

A randomised, controlled phase 2 trial involving 464 patients failed to show an effect on progression from moderate to severe disease or mortality.

In the absence of other effective therapies, convalescent plasma — first tested against diphtheria and tetanus in the late 19th century — has been tested for COVID-19. Observational reports and small studies have had variable results so far. Now, researchers have published the first randomised open-label trial of convalescent plasma for treatment of moderate COVID-19 (PaO₂/FiO₂ between 200 and 300 mm Hg or respiratory rate) 24/min and oxygen saturation ≤93% on room air) involving 464 adults in 39 tertiary care hospitals across India. All patients received antiviral agents, antibiotics, and immunomodulators or corticosteroids. In addition, 235 were assigned to two doses of 200-mL convalescent plasma, one at randomisation and one 24 hours thereafter. The plasma was donated by 262 individuals (94% with mild disease) a median of 41 days after reverse transcription–polymerase chain reaction confirmation of COVID-19. Of the donors, 64% had neutralising antibody titers) 1:20 (median titer, 1:40).

Since most participants had neutralising antibodies at enrollment, plasma administration may have come too late in the course of COVID-19, but even in the small subgroup given plasma within 3 days of symptom onset, no effect was seen. Besides, the antibody concentration in the convalescent plasma used in this trial and volume given may have been too low. Still, these results discourage the use of unscreened convalescent plasma for COVID-19, despite its approval in several countries.

HEALTH bulletin



During COVID-19 first wave, the proportion of caesarean section deliveries halved

New research from north-west England published in Anaesthesia (a journal of the Association of Anaesthetists) shows that during the first wave of COVID-19, the proportion of caesarean section deliveries carried out under general anaesthesia approximately halved, from 7.7% to 3.7%. This lower rate of general anaesthesia (also 3.7%) was also found among the small number of women having caesarean sections who had tested positive for COVID-19.

"At the onset of the global pandemic of COVID-19 (SARS-CoV-2), guidelines recommended using regional anaesthesia for caesarean section in preference to general anaesthesia, to reduce the risk of SARS-CoV-2 infection in healthcare workers," say the authors, who include Dr Kailash Bhatia, Saint Mary's Hospital, Dr Malachy Columb, Wythenshawe Hospital, UK, and colleagues.

Overall, the authors conclude that the general anaesthesia rate for women having caesarean sections declined significantly during the peak of the COVID-19. Anaesthetic decision-making recommendations from anaesthetic guidelines and presence of an on-site anaesthetic consultant in the delivery suite could be among the key factors that potentially influenced this decline.

Medical physics in radiotherapy for cancer treatment

PROF DR KAZI MANZUR KADER

The first known reference to cancer or cancer-like diseases in man was documented almost 5,000 years ago. Cancerous disease has been documented in all animal species that have been thoroughly studied. The terms cancer, neoplasm, tumour and malignancy are usually used interchangeably. The aetiology of malignancy is multifactorial ranging from diet, lifestyle, genetics, radiation, chemicals etc. The basic modalities of cancer treatment are surgery, radiotherapy and chemotherapy. Since the real answer to a simple and successful cancer treatment still eludes us, the treatment modalities continue to evolve.

Extensive surgeries are on the decline and the era of conservation surgery has begun. Chemotherapy has established its role as a major modality, but its true efficacy is seen only in certain types of cancers. Radiotherapy, on the other hand, found a definite place for itself in the management of almost all cancer, for almost all ages of the disease; and can be combined effectively with the other modalities. Therefore it would not be wrong to state that, radiotherapy remains the key treatment in the management of cancer.

Cancer is one of the leading causes of death globally and radiotherapy is currently essential in the management of cancer patients either alone or in combination with surgery or chemotherapy or both for cure and palliation. Approximately 60% of all cancer patients received radiotherapy each year as definitive, palliative or adjuvant to surgery or chemotherapy. Radiotherapy aims

to deliver the precisely measured dose of radiation for defined tumour volume with minimum damage to surrounding healthy tissues. This results in radiation of tumours, high quality of life, prevention of symptoms including pain, restoring luminal patency with minimum morbidity.

Medical physics is the application of physics concepts, theories and methods to medicine or healthcare. In radiation therapy, medical physicists work with physicians, optimise treatment plans, and conduct quality control and verification of the actual medical application working in concert with physicians, clinical radiological technologists, and radiotherapy quality control specialists.

They also contribute to maintaining and improving the quality, safety and cost-effectiveness of healthcare services through patient-oriented activities requiring

expert action, involvement or advice regarding the specification, selection, acceptance testing, commissioning, quality assurance/control and optimised clinical use of medical devices and regarding patient risks and protection from associated physical agents (e.g., x-rays, electromagnetic fields, laser light, radionuclides) including the prevention of unintended or accidental exposures.

They confirm the accuracy of the position and doses administered to the patient body, ensuring that they are within the clinically required range and that the treatment is performed as prescribed by the physicians. The medical physicists also engage in medical physics research and development related to radiation therapy.

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Causes and misconceptions of miscarriage

DR MUHAMMAD TOREQUL ISLAM

Miscarriage is a common consequence of pregnancy. In most cases, 12-15% of miscarriages occur within 20 weeks of conception. However, determining the total miscarriage rate in one country is very challenging because it is higher when the pregnancies are medically recognised. Moreover, there is an unclear conception among people about the difference between miscarriage and stillbirth. The

miscarriage rate is also affected by the competing risk of induced abortion.

The causes of most miscarriages are a complex interplay between parental age, genetic, hormonal, immunological, and environmental factors. Maternal age is the strongest known risk factor. The risk of miscarriage is slightly elevated in the youngest mothers and then rises sharply in older mothers.

A survey of 421,201 pregnant

women in Norway between 2009-13 suggests that the risk of miscarriage is lower in women aged 25-29 (10%), then rose rapidly after age 30, reaching 53% in women aged 45 and over. Genetic factors, including parental chromosomal rearrangements and abnormal embryonic genotypes or karyotypes, could underlie more than half of recurrent miscarriages. Miscarriage may adversely affect future pregnancy outcomes and complications.

About 75% of miscarriages happen during the first trimester of pregnancy; infection around the baby and its mother's health condition affect greatly in this stage. In this trimester, miscarriages are often caused by problems with the chromosomes of the foetus. The mother's placenta supplies blood to her baby's body; any problem in this organ may lead to miscarriage. Moreover, obesity, smoking, drinking alcohol, certain drugs (e.g., misoprostol, retinoids, methotrexate, ibuprofen) and caffeine at high dose (200 mg/kg/day), also increase the risk of miscarriage among pregnant women.

Several long-term (chronic) health conditions also increase the risk of miscarriage in the second trimester, including diabetes (if left uncontrolled or poorly-controlled), severe hypertension, lupus, kidney disease, thyroid gland's under or overactivity, anti-phospholipid syndrome, problems and abnormalities in the womb (e.g., fibroids and shape abnormality), weakened cervix or cervical incompetence, and polycystic ovary syndrome (also causes infertility).

Many infections may increase the risk of miscarriage,

such as rubella (German measles), cytomegalovirus, bacterial vaginosis, human immunodeficiency viruses, chlamydia, gonorrhoea, syphilis, malaria, etc. The severe acute respiratory distress syndrome coronavirus 2 (SARS-CoV-2) induced placental infection also has been reported for newborns with foetal distress and stillbirth after the maternal contraction of the virus during the third trimester.

However, there are lots of misconceptions about miscarriage, including the emotional state of the woman, having a shock or fright, exercise, lifting or straining, working, having sex, travelling by air and eating spicy food during pregnancy; as these are not the risk factors in miscarriage (if no one crosses the limit).

Many women having a miscarriage for the first time may have another. But most miscarriages are a one-off event. About 0.01% of women experience recurrent miscarriages and many of them go on to have a successful pregnancy.

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Stay safe from COVID-19 this winter

As temperatures fall, people are spending more time indoors. That heightens the risk of the coronavirus spreading, but there are some simple steps you can take to help protect yourself and everyone around you.

Avoid crowds and keep some distance: Avoid the 3 C's – closed, crowded and close contact. This gets harder as the seasons change and more activities move indoors. The risks of contracting COVID-19 increase in inadequately ventilated spaces where people spend long periods together in close proximity.

Wear a face mask: Face masks can reduce the virus's spread by stopping droplets people breathe out and filtering some of what they breathe in. They are especially important in crowded and poorly ventilated areas.

Avoid touching your eyes, nose and mouth: Your hands touch many surfaces and can pick up viruses. Once contaminated, hands can then transfer the virus to your eyes, nose or mouth. From there, the virus can infect you.

Wash your hands: Simply washing your hands can reduce the spread of viruses. Regularly and thoroughly clean your hands for at least 20 seconds with an alcohol-based hand rub or wash them with soap and water. This eliminates germs, including viruses.

Keep surfaces clean: Clean and disinfect surfaces in your home frequently, especially those people touch regularly, such as door handles, faucets and phone screens.

Recognise the symptoms: Being able to recognise the symptoms of COVID-19 is important. Common symptoms of COVID-19 include fever, dry cough and fatigue. Other symptoms that may affect some patients include loss of taste or smell, aches and pains, headache, sore throat, nasal congestion, red eyes, diarrhoea or skin rash.

Take care of your mental health: During the stress and upheaval of the pandemic, do not forget to take care of your mental health and well-being. Connecting with friends, loved ones and your community via social media, phone, video or text can help reduce feelings of social isolation. Eating well, exercising daily and getting enough sleep are important for health and coping.

