

Scientific India

By the Scientists, for the People

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THE RISE OF ISRO

Why Sriharikota is an ideal launch pad?

A timeline of Isro's journey From Aryabhata to PSCV C-37 (1962-2017)



Blueprint For Future Indian Cities

Of Science And Scientists Making India Great

**TECHNOLOGY FOR
SPECIALLY ABLED PERSONS**

Hormone in the brain that stimulates Burning of Fat

Is breakfast most important meal of the day?



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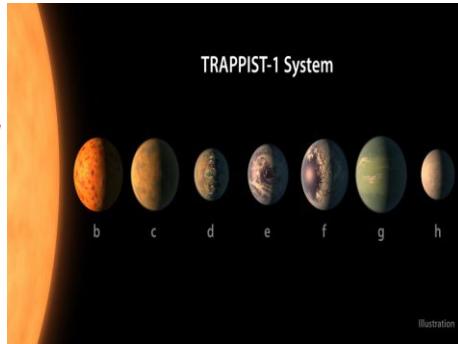
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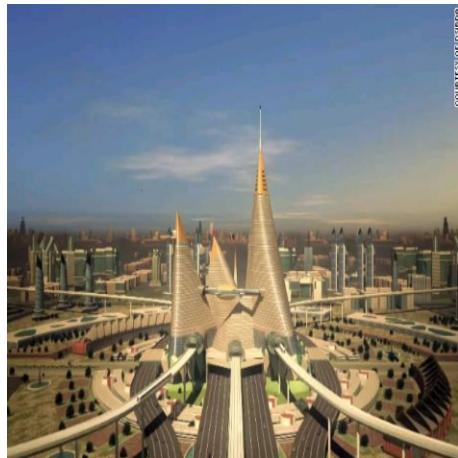
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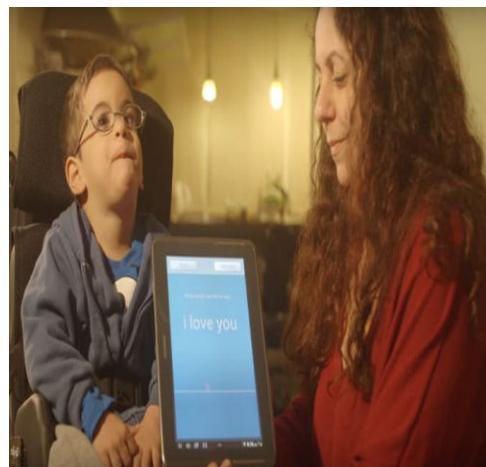
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EDITORIAL NOTE

Rise of the ISRO

Isro's beginnings were humble. Begun on India's independence day in 1969 by Dr Vikram A Sarabhai, the father of India's space programme some of its operations were planned from inside a cow shed. Its first achievement was the launch of the Aryabhatta

satellite using a Russian rocket. In 2017 India's space agency successfully launched 104 nano satellites into orbit, all onboard a single rocket, overtook the 2014 Russian record of 37 satellites in a single launch. In this issue we have explore a time line of Isro's journey from 1969-2017.

In addition to ISRO achievements, this year the government of India has celebrated National Science Day with a theme "Science and technology for specially abled persons" in order to encourage innovation, awareness and reach of accessibility solutions worldwide to over one billion differently-abled people in the world. As per records, 50 per cent of India's 100 million differently-abled persons are under the age of 30 and there is a huge need for assistive technology products. In this issue we have also explore the technology for specially abled persons. Apart from this other science and heath related topics discussed in this issue.

Dr. Vinod Kumar
Editor-in-Chief

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A time line of Isro's journey From Aryabhata to PSCV C-37(1962-2017)

Today ISRO is counted amongst top six government space agencies in the world and has thousands of scientists and technical experts of various fields working for future space missions. ISRO has recorded more than 100 successful space missions. Space research in India began in the 1920s with studies conducted by scientists S K Mitra, C V Raman and Meghnad Saha. However, it was only from the 1940s and 50s that institutionalised probe into space related activities started gaining nationwide attention.

The space research activities were initiated in our country during the early 1960's, when applications using satellites were in experimental stages even in the United States. With

the live transmission of Tokyo Olympic Games across the Pacific by the American Satellite 'Syncom-3' demonstrating the power of communication satellites, Dr. Vikram Sarabhai, the founding father of Indian space programme, quickly recognized the benefits of space technologies for India. Dr. Sarabhai was convinced and envisioned that the resources in space have the potential to address the real problems of man and society. As Director, Physical Research Laboratory (PRL) located in Ahmedabad, Dr. Sarabhai convened an army of able and brilliant scientists, anthropologists, communicators and social scientists from all corners of the country to spearhead the Indian space programme. History of

space activities in India reached its first milestone in 1962 when Pandit Jawaharlal Nehru along with scientist Vikram Sarabhai established the

Indian National Committee for Space Research (INCOSPAR). Following the establishment of the INCOSPAR, the first rocket launch from India took place in November 1963.

Why Sriharikota is an ideal launch pad?

Sriharikota, a spindle-shaped island on the East coast of Andhra Pradesh. It is the only spaceport in India from where satellites are launched.

Near the sea

Once a rocket ignites and lifts off, there's not much control over it even if it deviates from its set path or does not follow its trajectory. If such a situation however occurs, a destruct command is given out. This command destroys or completely disintegrates the rocket and makes it fall into the sea.

Near to the Equator

If the launch location is near to the Equator, a lot of fuel can be saved. The Equator falls towards the south in India- along with the country also having a 7,500km long coast line- and so several places in the southern region of India

Stable geographical platform

The landmass available should be solid enough to withstand the

Credit: Pragyan



the intense vibrations produced during the launch

A timeline of Isro's journey

- ❖ **1962** - Indian National Committee for Space Research set up by the Department of Atomic Energy.
- ❖ **1963** - First sounding rocket launched from TERLS Nov 21. Sounding rockets are one or two stage solid propellant rockets used for probing the upper atmospheric regions and for space research. They also serve as easily affordable platforms to test or prove prototypes of new components or subsystems intended for use in launch vehicles and satellites.
- ❖ **1965** - Space Science & Technology Centre (SSTC) established in Thumba on 1 Jan 1965.
- ❖ **1976** - Satellite Telecommunication Earth Station set up at Ahmedabad on 1 Jan 1967.
- ❖ **1968** - Experimental Satellite Communication Earth Station set up in Ahmedabad, Gujarat.
- ❖ **1969** - Indian Space Research Organisation (ISRO) formed.
- ❖ **1971** - Satish Dhawan Space Centre formed in Sriharikota, Andhra Pradesh.
- ❖ **1972** - Department of Space (DoS) established and ISRO brought under it.
- ❖ **1975** - First Indian satellite, Aryabhata, launched into space April 19. The Aryabhata

spacecraft that was named after the famous Indian astronomer was the country's first satellite. It marked a milestone in India's space programme because it was completely designed in the country and launched from a Russian facility in 1975.

- ❖ **1977** - Satellite Telecommunication Experiments Project
- ❖ **1979** - Bhaskara-1 and Launch Vehicle (SLV-3) Launched.
- ❖ **1980** - Second time SLV-3 launched with Rohini. Mission successful.
- ❖ **1981** - Rohini placed into orbit.
- ❖ **1982** - Launched Insat-1A communication satellite.
- ❖ **1983** - Second developmental flight of SLV-3 placed Rohini into orbit.
- ❖ **1984** - First Indian cosmonaut, Rakesh Sharma, spends eight days in Russian space station Salyut 7.
- ❖ **1987** - Launched ASLV with satellite SROSS-1.
- ❖ **1988** - Launch of Indian Remote Sensing satellite - IRA-1A
- ❖ **1991** - Launch remote sensing satellite IRS-1B.
- ❖ **1992** - First successful launch of ASLV.
- ❖ **1993** - It was developed in the 1990s and has become the Indian space mission's most reliable workhorse. The PSLV carried out its first mission in 1993 but its first successful outing was the next year. For the next 20 years, it launched various satellites for historic

missions such as the Chandrayaan and Mangalyaan. PSLV remains a favourite among various organisations as a launch service provider and has launched over 40 satellites for 19 countries.

- ❖ **1994** - Successful launch of PSLV with IRS-P2.
- ❖ **1996** - Launch of PSLV with IRS-P3.
- ❖ **1997** - Launch of PSLV with IRS-1D.
- ❖ **1999** - PSLV started carrying foreign satellites
- ❖ **2001** - Successful launch of GSLV
- ❖ **2002** - Launch of Kalpana-1 satellite.
- ❖ **2003** - Launch of GSAT-2.
- ❖ **2004** - Launch of Edusat.
- ❖ **2005** - Launch of Cartosat-1 and Hamsat by PSLV.
- ❖ **2006** - Launch of of GSLV with Insat-4C. Mission failed.
- ❖ **2007** - Launch of Cartosat-2.
- ❖ **2008** - Launch of Israeli satellite Tecsar by PSLV. India's first moon mission Chandrayaan-1 by PSLV. India's first unmanned lunar probe was launched almost a decade ago and was a landmark in India's space mission. Isro joined an elite list of just six space organisations to send an orbiter to the moon. A Tricolor was hoisted on the moon but Isro lost contact with Chandrayaan soon after.
- ❖ **2009** - Launch of Radar Imaging Satellite (Risat-2).
- ❖ **2010** - Launch of Cartosat-2B, STUDSAT and three small foreign satellites by PSLV.

❖ **2011** - Launch of Resourcest-2 and two small satellites by PSLV.
 ❖ **2012** - Launch of Risat-1 by PSLV.
 ❖ **2013**- Successful launches of PSLV-C22 with India's first indigenous Regional Navigation Satellite IRNSS-1A on 1st July 2013 and the PSLV-C25/Mars Orbiter Mission on 5th November 2013.
 ❖ **2014**- The GSLV D5 was successfully launched on 5th January, 2014. The Mars Orbiter Mission (MOM), also called Mangalyaan, was India's first interplanetary mission to the planet Mars. India became the first country in the world to insert a spacecraft into the Martian orbit in its very first attempt. The MOM entered Mars orbit on 24 September 2014. India joined an exclusive global club when it successfully launched the Mars Orbiter Mission on a shoestring budget that was at least 10 times lower than a similar project by the US. The Rs 450-crore project revolved round the Red Planet and to collect data on Mars' atmosphere and mineral composition. GSLV Mk-III,

the first experimental flight of ISRO's heaviest and upgraded rocket vehicle was launched on December 18, 2014 from Sriharikota.

❖ **2015**: Launch of India's 4th navigational satellite. 100 days of Mangalyaan. ISRO launches five British satellites. Astrosat, India's first dedicated multi-wavelength space observatory, was successfully launched onboard a PSLV-C30 rocket on September 28, 2015. India's latest communication satellite GSAT-15 was successfully launched by Ariane-5 rocket on early morning of November 11, 2015 from the spaceport of Kourou in French Guiana.

❖ **2016- PSLV-C31**

❖ Polar Satellite Launch Vehicle, in its 33rd flight (PSLV-C31), launches IRNSS-1E, the fifth satellite of the Indian Regional Navigation Satellite System (IRNSS). The launch took place from the Second Launch Pad (SLP) of Satish Dhawan Space Centre (SDSC) SHAR, Sriharikota on January 20, 2016.

PSLV-C32/IRNSS-1F

Polar Satellite Launch Vehicle, in its thirty fourth flight (PSLV-C32), launches IRNSS-1F, the sixth satellite of the Indian Regional Navigational Satellite System (IRNSS). The launch took place on March 10 2016 from the Second Launch Pad (SLP) of Satish Dhawan Space Centre (SDSC) SHAR,

Sriharikota. This is the thirty third consecutively successful mission of PSLV.

PSLV-C33/IRNSS-1G

The Polar Satellite Launch Vehicle, in its thirty-fifth flight (PSLV-C33), launches IRNSS-1G, the seventh satellite of the Indian Regional Navigation Satellite System (IRNSS) into a Sub-Geosynchronous Transfer Orbit (Sub-GTO). The launch took place from the First Launch Pad (FLP) of Satish Dhawan Space Centre (SDSC) SHAR, Sriharikota on April 28, 2016. As in the previous six launches of IRNSS satellites, PSLV-C33 uses 'XL' version of PSLV equipped with six strap-ons, each carrying 12 tons of propellant.

RLV-TD

RLV-TD was successfully flight tested on May 23, 2016 from SDSC SHAR Sriharikota validating the critical technologies such as autonomous navigation, guidance & control, reusable thermal protection system and re-entry mission management.

PSLV-C34 / CARTOSAT-2 Series Satellite

India's Polar Satellite Launch Vehicle, in its thirty sixth flight (PSLV-C34), launches the 727.5 kg Cartosat-2 Series Satellite for earth observation and 19 co-passenger satellites together weighing about 560 kg at lift-off into a



505 km polar Sun Synchronous Orbit (SSO). PSLV-C34 was launched from the Second Launch Pad (SLP) of Satish Dhawan Space Centre (SDSC) SHAR, Sriharikota on June 22, 2016 at 09:26 hrs (IST). This is the fourteenth flight of PSLV in 'XL' configuration (with the use of solid strap-on motors).

The co-passenger satellites are from USA, Canada, Germany and Indonesia as well as two satellites (SATHYABAMASAT and SWAYAM) from Indian University/Academic Institute. The total weight of all the 20 satellites carried onboard PSLV-C34 is about 1288 kg.

Scramjet Engine - TD

The first experimental mission of ISRO's Scramjet Engine towards the realisation of an Air Breathing Propulsion System was successfully conducted on August 28, 2016 from Satish Dhawan

Space Centre SHAR, Sriharikota.

GSLV-F05 / INSAT-3DR

GSLV-F05 is the tenth flight of India's Geosynchronous Satellite Launch Vehicle (GSLV), launching INSAT-3DR, an advanced weather satellite, weighing 2211 kg into a Geostationary Transfer Orbit (GTO). GSLV is designed to inject 2 - 2.5 Tonne class of satellites into GTO. The launch took place from the Second Launch Pad at Satish Dhawan Space Centre SHAR (SDSC SHAR), Sriharikota on September 08, 2016.

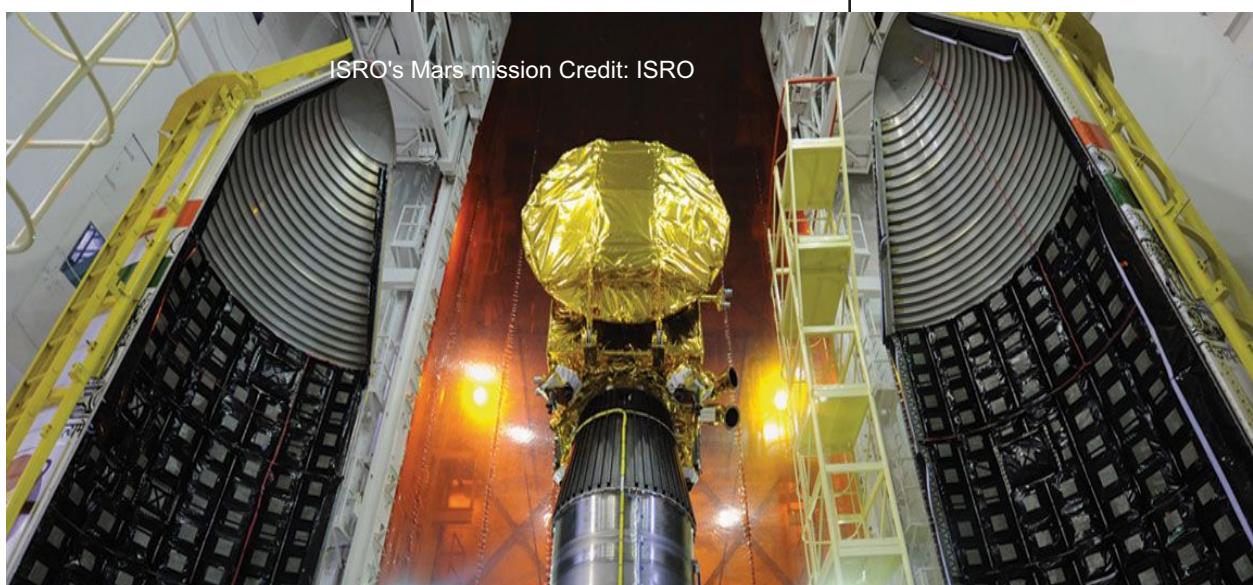
PSLV-C35 / SCATSAT-1

India's Polar Satellite Launch Vehicle, in its thirty-seventh flight (PSLV-C35), launches the 371 kg SCATSAT-1 for weather related studies and seven co-passenger satellites into polar Sun Synchronous Orbit (SSO). Co-passenger satellites are ALSAT-1B, ALSAT-2B, ALSAT-1N from

Algeria, NLS-19 from Canada and Pathfinder-1 from USA as well as two satellites PRATHAM from IIT Bombay and PISAT from PES University, Bengaluru. SLV-C35 was launched from the First Launch Pad (FLP) of Satish Dhawan Space Centre (SDSC) SHAR, Sriharikota on September 26, 2016.

GSAT-18

India's latest communication satellite, GSAT-18 was inducted into the INSAT/GSAT system on October 06, 2016 from Kourou, French Guiana by Ariane-5 VA-231. Weighing 3404 kg at lift-off, GSAT-18 carries 48 communication transponders to provide Services in Normal C-band, Upper Extended C-band and Ku-bands of the frequency spectrum. GSAT-18 carries Ku-band beacon as well to help in an accurately pointing ground antennas towards the satellite.



ISRO successfully launched its seventh and last satellite of Indian Regional Navigation Satellite System (IRNSS) constellation, IRNSS-1G into the orbit in April 2016. On 22 June, the Isro launched 20 satellites in one mission, a record for the space agency. Apart from Isro's own satellites and those built by university students in the country, the mission carried satellites from the US, Canada, Germany and Indonesia. In May, Isro successfully tested the Reusable Launch Vehicle — Technology Demonstrator (RLV-TD) that was built for Rs 95 crore.

PSLV-C29 / TeLEOS-1 Mission

India's Polar Satellite Launch Vehicle, in its thirty-second flight (PSLV-C29), launched six satellites of Singapore into a 550 km circular orbit inclined at 15 degrees to the equator. Of these six satellites, TeLEOS-1 is the primary satellite weighing 400 kg whereas the other five are co-passenger satellites which include two micro-satellites and three nano-satellites. PSLV-C29 was launched from the First Launch Pad at Satish Dhawan Space Centre (SDSC) SHAR, Sriharikota. This is the eleventh flight of PSLV in 'core-alone' configuration (without the use of solid strap-on motors). "PSLV-C29 Successfully Launches all the Six Satellites from Singapore from Satish

Dhawan Space Centre (SDSC), SHAR, Sriharikota on December 16, 2015" 2017- Indian Space Research Organisation (ISRO), India on Wednesday (February 15) scripted history by successfully launching 104 satellites using a single rocket from Sriharikota space centre.

With this achievement, ISRO not only bettered its previous best of sending 20 satellites in to the orbit in a single launch but also dethroned Russia (37 satellites in one go in 2014) from the top position.

Source: ISRO,firstpost.com, hindustantimes.com, Source: simplydecoded.com, http://indianexpress.com, infoindetail.com, thenewsminute.com, hindustantimes.com



Credit: eprahaar.in

7 Earth-size planets found orbiting a star

For the first time, astronomers have discovered seven Earth-size planets orbiting a single nearby star — and these new worlds could hold life. This cluster of planets is less than 40 light-years away in the constellation Aquarius, according to NASA and the Belgian-led research team who announced the discovery 22 Feb. 2017.

The planets closely circle a dwarf star named Trappist-1, which at 39 light years away makes the system a prime candidate to search for signs of life. Only marginally larger than Jupiter, the star shines with a feeble light about

2,000 times fainter than our sun.

TRAPPIST-1 is so small that it resembles Jupiter and its planets appear more like the Jovian moons when laid out, distance-wise.

TRAPPIST-1b has an orbital period of just 1.5 days and orbits at 1 percent the distance between the Sun and the Earth. Because TRAPPIST-1 is so small, though, instead of dooming the planet, it could give it just a slightly balmier-than-comfortable temperature.

Scientists said they need to study the atmospheres before determining whether these rocky, terrestrial planets could

support some sort of life. But it already shows just how many Earth-size planets could be out there — especially in a star's sweet spot, ripe for extraterrestrial life. The more planets like this, the greater the potential of finding one that's truly habitable. Until now, only two or three Earth-size planets had been spotted around a star.

They all appear to be tidally locked, which means the same side continually faces the star, just like the same side of our moon always faces us. Life could still exist at these places, the researchers explained.

Source: NASA, theguardian.com, timesofindia

TRAPPIST-1 System

Credit: NASA/JPL-CALTECH)



Illustration

Staying Cool Without the Air Conditioner and Energy

A team of University of Colorado Boulder engineers has developed a scalable manufactured metamaterial - an engineered material with extraordinary properties not found in nature - to act as a kind of air conditioning system for structures. It has the ability to cool objects even under direct sunlight with zero energy and water consumption.

When applied to a surface, the metamaterial film cools the object underneath by efficiently reflecting incoming solar energy back into space while simultaneously allowing the surface to shed its own heat in the form of infrared thermal radiation.

The new material, which is described today in the journal *Science*, could provide an eco-friendly means of supplementary

cooling for thermoelectric power plants, which currently require large amounts of water and electricity to maintain the operating temperatures of their machinery.

The researchers' glass-polymer hybrid material measures just 50 micrometers thick - slightly thicker than the aluminum foil found in a kitchen - and can be manufactured economically on rolls, making it a potentially viable large-scale technology for both residential and commercial applications.

The material takes advantage of passive radiative cooling, the process by which objects naturally shed heat in the form of infrared radiation, without consuming energy. Thermal radiation provides some natural nighttime cooling and is used for

residential cooling in some areas, but daytime cooling has historically been more of a challenge. For a structure exposed to sunlight, even a small amount of directly-absorbed solar energy is enough to negate passive radiation.

The challenge for the CU Boulder researchers, then, was to create a material that could provide a one-two punch: reflect any incoming solar rays back into the atmosphere while still providing a means of escape for infrared radiation. To solve this, the researchers embedded visibly-scattering but infrared-radiant glass microspheres into a polymer film. They then added a thin silver coating underneath in order to achieve maximum spectral reflectance.

During field tests in Boulder, Colorado and Cave Creek, Arizona, the metamaterial successfully demonstrated its average radiative cooling power larger than 110W/m² for continuous 72 hours and larger than 90W/m² in direct, noon-time sunlight. That cooling power is roughly equivalent to the electricity generated using solar cells for similar area, but the radiative cooling has the advantage of continuous running both day and night.

Credit: tokayair.com



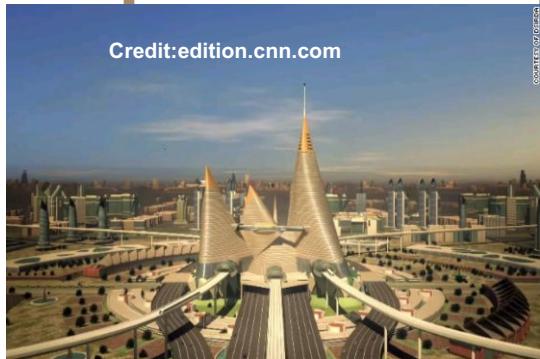
Blueprint for Future Indian Cities

Researchers at the University of Birmingham worked with children, young people and their families living in a new urban development in India to understand the everyday experiences of urban transformation – with the results informing the future development of Indian cities. Their research with 350 participants has led to findings which are intended to help make other cities across India, indeed any cities undergoing change, citizen-friendly and sustainable.

The researchers spent almost a year living in Lavasa, a new private sector-led urban development initiative in the Indian state of Maharashtra – currently under construction. It is planned that the development will be home to some 300,000 people.

Researchers gathered evidence from families across a diverse range of social backgrounds – investigating their experiences of living, playing, working and learning.

Credit:edition.cnn.com



This is the first in-depth ethnographic research to explore the lived realities of new, large-scale, city-building projects in India.

Dr. Sophie Hadfield-Hill and Dr. Cristiana Zara conducted interviews, guided walks, workshops and used a mobile app 'Map my Community' to gather data on children, young people (aged 5-23) and their families experiences of everyday life, particularly in terms of sustainable design, mobility and access to nature and green space.

A series of core themes emerged, associated with education provision, infrastructures, nature and green space in the city, deepening inequalities and the hopes and aspirations of urban change.

Funded by the Economic and Social Research Council (ESRC) the 'New Urbanisms in India: Urban living, sustainability and everyday life' project sets out 10 recommendations across the core project findings that apply to any new site of urban transformation, as well as future phases of the Lavasa development. These recommendations include:

- New urban spaces, whether they be entirely new cities or sites of urban change should not be visioned, designed and built without considering the everyday lives, needs and

desires of diverse groups of children, young people and families;

- Seek opportunities to utilise local resources, skills, labour and knowledge in urban development;

- Place schools at the heart of urban planning – they are essential to creating strong community relationships and enable families to commit to urban change;

- When planning, building and transforming urban spaces, developers and policies need to be sympathetic to the landscape of memories and ancestral land connections which families and communities hold;

- Play spaces are important for young people's lives and careful consideration needs to be given to their safe location, walkability and accessibility for all young people;

- Create shared spaces where people can meet, eat, walk and play to help foster a sense of community belonging;

- Connect all areas of a new development to services – electricity, water and transport must be a priority;

- Build and maintain road and footpath connections between different urban spaces, this is vital for social and economic prosperity;

- Ensure people have good access to natural spaces and water for recreation.

Technology for Specially Abled Persons

Our country celebrates National Science Day on February 28, 2017 to mark the discovery of the Raman effect by Indian physicist Sir Chandrashekara Venkata Raman on 28 February 1928 for his discovery, Raman was awarded the Nobel Prize in Physics in 1930. National Science Day is being celebrated every year to:

- widely spread a message about the Importance of science used in the daily life of the people
- display all the activities, efforts and achievements in the field of science for human welfare
- discuss all the issues and implement new technologies for the development of the science
- give an opportunity to the scientific minded citizens in the country
- encourage the people as well as popularize the Science and Technology.

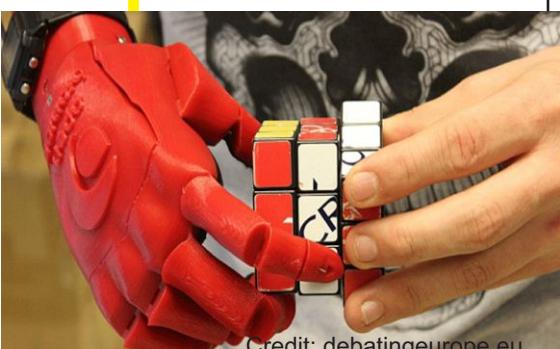
Having come across some specially abled people in our day-to-day life always make

us to thank GOD for our well being and force us to be considerate towards these people. Life with disabilities is very difficult and same is the care and motivation of such people towards leading a respectable and successful life. There are numerous examples in the society that with sheer dedication and love of their near and dear ones many persons with even high levels of disability have been very successful in leading a respectable and satisfying life. Our motive/duty as a human being should always be not only to be sympathetic towards these people but should contribute towards their well being and growth in their life. No doubt, there are many examples of people making their sincere efforts towards improving the life style of these especially abled persons but much have to done at government level and with the help of science and technology.

This year, the government of India has directed to celebrate National Science Day with a theme "Science and technology for specially abled persons" in order to encourage innovation, awareness and reach of accessibility solutions worldwide to over one billion differently-abled people in the world. As per records,

50 per cent of India's 100 million differently-abled persons are under the age of 30 and there is a huge need for assistive technology products. The government plans to bring together government, corporates, educators, NGOs and the differently-abled people so as to understand their needs and provide information on available solutions that can include differently-abled people to participate independently in all walks of life.

People with disabilities meet barriers of all types. For years, disabled people had to rely on somebody else doing things for them. But now with the help of assistive technology, disabled people can do things that would have never been possible before - from switching on a light to having a voice to express themselves. Technology has always lent a helping hand for people with disabilities such as visual impairment, speech impairment, people with motion disabilities or disorders etc. There are a lot of apps and gadgets that can help ease the difficulties people with disability face on a daily basis. Moreover, technologies that could help disabled people contribute more in the workplace - and improve their quality of life.



Credit: debatingeurope.eu

Some examples of assistive technologies are:

- People with physical disabilities that affect movement can use mobility aids, such as wheelchairs, scooters, walkers, canes, crutches, prosthetic devices, and orthotic devices, to enhance their mobility.
- Hearing aids can improve hearing ability in persons with hearing problems.
- Cognitive assistance, including computer or electrical assistive devices, can help people function following brain injury.
- Computer software and hardware, such as voice recognition programs, screen readers, and screen enlargement applications,

help people with mobility and sensory impairments use computer technology.

- In the classroom and elsewhere, assistive devices, such as automatic page-turners, book holders, and adapted pencil grips, allow learners with disabilities to participate in educational activities.
- Closed captioning allows people with hearing impairments to enjoy movies and television programs.
- Barriers in community buildings, businesses, and workplaces can be removed or modified to improve accessibility. Such modifications include ramps, automatic door openers, grab bars, and wider doorways.

- Lightweight, high-performance wheelchairs have been designed for organized sports, such as basketball, tennis, and racing.
- Adaptive switches make it possible for a child with limited motor skills to play with toys and games.
- Many types of devices help people with disabilities perform such tasks as cooking, dressing, and grooming. Kitchen implements are available with large, cushioned grips to help people with weakness or arthritis in their hands.

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First evidence that man-made pollutants have now reached the farthest corners of our earth

Shrimp-like creatures living in the deepest parts of the oceans contain high levels of man-made toxins. Tiny crustaceans, such as yellowish *Hirondellea gigas* living in darkness about 10,000 meters in the Pacific Ocean, are polluted

by PCBs, used in electric transformers or paints, and PBDE chemicals used as flame retardants. From the 1930s to when PCBs were banned in the 1970s, the total global production of these chemicals was in the region of 1.3million tonnes. Released into the environment through industrial accidents and discharges and leakage from landfills, these pollutants are invulnerable to natural degradation and so persist in the environment for decades.

The research team used

deep-sea landers - designed by Dr Jamieson - to plumb the depths of the Pacific Ocean in order to bring up samples of the organisms that live in the deepest levels of the trenches. The authors suggest that the pollutants most likely found their way to the trenches through contaminated plastic debris and dead animals sinking to the bottom of the ocean, where they are then consumed by amphipods and other fauna, which in turn become food for larger fauna still.



Credit:sea-globe.com

Of Science and Scientists Making India Great

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Learning gives creativity, Creativity leads to thinking. Thinking provides knowledge, Knowledge makes you great

This famous quote by Dr APJ Kalam is true not only for individuals but also for nations. Scientific knowledge, which mainly accounts for the technical progress in any society, has come to be looked upon as the foundation of a nation's economy in the modern world. This is amply brought to fore in a path breaking study by the Nobel laureate economist Robert Solow who showed that seven eighth of the growth of US from 1900 to 1950 was accounted for by technical progress, while only one eighth was driven by capital. In a treatise, 'Science—The Endless Frontier' on post-war science policy in US, Vannevar Bush observed, "New products, new industries, and more jobs require continuous additions to knowledge of the laws of nature ... This

essential new knowledge can be obtained only through basic scientific research." National Science Day, celebrated in India on 28 February every year to mark the discovery of the Raman Effect, provides us an occasion to remind ourselves of the contributions of science and scientists in making India great.

Science Roots of India
India is a nation with a soul and by all accounts thrived as a knowledge society in the past. It is not quite in the distant past that the country was known as Sone ki chidiya (golden sparrow). In an exhaustive work based on authentic references from across the world Dr.

Dharmapal discussed the highly developed status of science, technology and education in India till the 18th century before the invasion of British rule. The colonial interlude extending over centuries systematically eroded the knowledge base of India.

According to Felix Padel Darwin (<http://timesofindia.indiatimes.comcity/lucknow/>), "India was far more developed than Britain in terms of multi-cultural ethos and in its manufacturing skills. After the

British rule, the quality of manufacturing in many things like cloth declined radically and went in the 'de-developing' mode". About the indigenous culture of the tribal communities he observed, "They are egalitarian, have excellent environmental knowledge. Tribal societies are far more developed than the mainstream industrial society, especially if we look at living sustainably". It is motivating to rediscover our own strengths in science and technology through examples from history. Table 1 presents a few examples, taken from the work of Dr Dharmapal ('Indian Science and Technology in the Eighteenth Century', Other India Press, 2000), that convince us of our remarkable achievements in science and technology.

India Recognizing the Power of Science

The strong science roots helped India to quickly realise the power of science and technology in the shaping of a nation in modern times and several individual and group efforts in this direction contributed to making India a greatly developing nation. This is evident from our spectacular



Credit: scienceprofessionals.co.uk

Table 1 Examples from History of our Remarkable Achievements in Science and Technology

Smallpox inoculation was practiced in India long before the British knew about it. In ancient India smallpox was prevented through the <i>tikah</i> .
The drill plough, which was introduced in England in 1730, was used in India from time immemorial.
The observatory at Varanasi was treated as one of the five ‘celebrated observatories’ of the world by the <i>Encyclopaedia Britannica</i> in its editions till 1823.
There was considerable use of surgical techniques in different parts of India in the 18 th century. This included removing ulcers and cutaneous eruptions of the worst kind. Cataract operations were practiced with great success from time immemorial.
Plastic surgery has been reported to be prevalent in Western India and there were reports of ‘putting on noses on those who lost them’ and of ‘Caute’, the cement used for ‘uniting animal parts’.
Besides widespread artificial irrigation, the practices of (i) crop rotation, (ii) manuring, (iii) sowing by means of the drill plough, and (iv) use of a variety of other implements were fairly widespread. According to the observation by Alexander Walker, ‘the practice of watering and irrigation is not peculiar to the husbandry of India, but it has probably been carried there to a greater extent, and more laborious ingenuity displayed in it than in any other country’.
The sample of <i>wootz</i> steel sent to Sir J. Banks, the President of the British Royal Society, was found in general to match the best steel then available in Britain. He found it ‘excellently adapted for the purpose of fine cutlery, and particularly for all edge instruments used for surgical purposes.’

Table 2 India's Achievements in Science

- With the launch of the Mars Orbiter Mission, also called Mangalyaan, on 5 November 2013, India became only the fourth nation in the world to reach Mars, the first Asian nation to reach Mars orbit and the first nation to do so on its first attempt.
- PARAM, the superconducting machine built indigenously by the Centre for Development of Advanced Computing, placed India second after USA in the field of supercomputing.
- India has become only the second country outside Europe to join the European Molecular Biology Organisation, which consists of 1,700 eminent scientists and 84 Nobel laureates, and aims to encourage research in the field of life sciences.
- The proposed Laser Interferometer Gravitational-Wave Observatory (LIGO) facility in India will only be the third such laboratory in the world and the first outside the United States.
- With the development of the self-sustaining missile developing programme called BrahMos, India became one of the few countries to develop its own ballistic missiles. It is the world's fastest anti-ship cruise missile in operation.

achievements in the fields of space exploration, information technology, agriculture, healthcare and nuclear technology. Indian scientists have contributed significantly to scientific knowledge and elevated India's status as one of the major scientific centers of the world. We are the second largest group of scientists and engineers in the world and are among the very few countries which have developed indigenous nuclear

technology and ballistic missiles. Table 2 includes some of our monumental scientific achievements. However, roots of every great scientific achievement of a nation can be traced to the motivation of one or more individuals who enlivened the above quote by Dr Kalam. These individuals were driven by curiosity and passion that led them to learn in pursuit of creativity. This creativity led them to think beyond the

mundane goals of marks, degrees, power and money. Through this process they earned the precious knowledge and also the wisdom of using this knowledge for the benefit of society, nation and mankind. Knowledge and wisdom made them great and also brought rich laurels to India. Table 2 enlists some pioneers of scientific developments in India.

Sir J C Bose (1858 – 1937): One of the fathers of radio science, father of Bengali science fiction		Sir M Visvesvaraya (1861 – 1962): Father of modern Mysore state, Bharat Ratna (1955)		Sir C V Raman (1888 – 1970): Nobel Prize in Physics (1930), Bharat Ratna (1954)	
Sir Shanti Swaroop Bhatnagar (1894 – 1955): Father of research laboratories		S N Bose (1894 – 1974): Developed Bose –Einstein (BE) statistics and the theory of BE condensate		Homi Bhabha (1909 – 1966): Father of the Indian nuclear Program	
Vikram Sarabhai (1919 -1971): Father of India's space program		APJ Abdul Kalam (1931 – 2015): Missile Man of India, 11th President of India, Bharat Ratna (1997)		U. R. Rao (Born 10/3/1932): The man behind The first satellite launched by India – Aryabhata (1975)	
C.N.R. Rao (born 30/6/1934): One of the world's foremost solid state and materials chemists, Bharat Ratna (2014)		J V Narlikar (born 19/7/1938): Champion of steady state cosmology – an alternative to the popular Big Bang model		Sam Pitroda (born 4/5/1942): Pioneer of telecom revolution in India, Chairman of National Knowledge Commission (2005-2009)	

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were driven by curiosity and passion that led them to learn in pursuit of creativity. This creativity led them to think beyond the mundane goals of marks, degrees, power and money. Through this

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The Science, Technology and Innovation Policy-2013 of India aspires to position India among the world's top five scientific powers. Investing in our own rich legacy holds a sure promise for our aspiration towards a knowledge destination or rather towards regaining our own glorious knowledge status.

Credit: Study.com



Potential of Nuclear Power Generation

In the energy dominated civilization, we always talk about the energy crisis and work towards finding more environmental friendly and cost effective methods of energy generation in general and electricity generation in particular. Nuclear energy with a great potential towards electricity generation with low cost has not found much takers due to fear of its breakdown disasters and production of nuclear waste. However, the interest and development of nuclear power generation towards nuclear weapons is ever green with almost all the nations of the world. Many nations are having piles of nuclear weapons stored in their homelands and are not at all worried about their safety. Use of nuclear power towards electricity generation though was picked up in few developed nations but with time they (nations) took steps to step-away from the use of nuclear power generation. Nuclear power for electricity generation is finding it difficult to overcome its competition from thermal and hydro power generation methods in spite of many disadvantages associated with these modes of power

generation also. With many advantages and few simply exaggerated fears and disadvantages about nuclear power generation, there is a need to make use of this technology well supported with advanced technology to overcome the energy crisis, as nuclear power is important for any nation towards its self-sufficiency in energy. The use of renewables is increasing and will play an important part in the future energy mix, but it's questionable whether renewables alone will be able to satisfy rising energy demands. Technical advances in storage, transportation and efficiency are still required.

Just for a comparison

Millions of people in the developing world still live in poverty, which access to energy can alleviate. Global energy demand will continue to rise, so energy will continue to get more expensive as fossil fuels become more and more difficult to extract. People are nervous about nuclear power in the wake of the problems at some nuclear power plants in some places only, questioning whether nuclear power is a sensible option for energy production in light of the perceived risks. We're not

in a clean energy revolution; we're in a clean energy crisis and the surprising solution is nuclear energy. Compared with other sources of energy, nuclear power is one of the safest. We worry about radiation but are happy to accept air pollution from fossil fuels. The threat of climate change is much greater than the threat of radiation, but no one is scared of carbon dioxide. Coal-related air pollution from power plants is globally responsible for more than 100,000 deaths per year whereas the crisis at the Fukushima nuclear plant is unlikely to kill a single person. Coal mining accidents also kill thousands every year, but are seldom reported. Is it reasonable to decry nuclear power because of a crisis that it may kill people whereas natural disasters are killing thousands of people? The World Health Organization estimates that indoor air pollution from biomass and coal causes 1.5m premature deaths per year. It's time to overcome longstanding fears of the technology and it's past time to embrace nuclear as a viable and desirable source of clean power.

Radiation leaks

When people express their nuclear hatred, they usually argue about: the dangers from radiation leaks, the nuclear waste problem, that nuclear power is too expensive. Radiation leaks are undoubtedly serious. Is the risk natural or man-made? – solar radiation is natural, nuclear energy radiation is man-made so we fear nuclear radiation and welcome solar radiation. In fact solar radiation is more dangerous than nuclear radiation. It is worth remembering that we are subjected to background radiation every day as a result of natural processes – some people more than others. People routinely and willingly expose themselves to large amounts of radiation for medical checks, with dental x-rays providing perhaps the highest doses, often for purely cosmetic reasons. Safety limits for nuclear facilities are necessarily stringent and contamination

is taken extremely seriously. However, these precautionary limits can cause unnecessary alarm. Radiation isn't easily dealt with, especially in nuclear waste and maintenance materials, and expensive solutions are needed to contain, control, and shield both people and the environment from its harm.

Lessons learnt

Clearly we should learn from the mistakes that have been made during the crisis. In fact, the nuclear disasters show how safe nuclear reactors actually are. Reactors designed half a century ago survived an earthquake many times stronger than they were designed to withstand, immediately going into shut-down (bringing driven nuclear reactions to a halt). But the radioactive products in the reactor keep decaying, producing heat, so they must be cooled. New reactors have improved safety features, including passive systems that allow cooling to take place without power. Poor risk communication from government or agencies that are supposed to protect us like the International Atomic Energy Agency (IAEA) or the World Health Organization (WHO) can

sometimes fail to account for people's risk perceptions. This was a key factor in the long-term social/psychological/economic consequences of Chernobyl. A similar situation may have occurred at Fukushima.

Growth of nuclear power

- ❖ Nuclear power is once again considered a prominent alternative, despite the disregard it was met with in the 1970s. This is because it's now being touted as a more environmentally beneficial solution since it emits far fewer greenhouse gases during electricity generation than coal or other traditional power plants.
- ❖ Countries around the world (like USA, UK, France, Finland, Russia, China, India, South Korea, UAE) have continued to build new nuclear power plants to supply their growing need for energy.
- ❖ Japan has been generating nuclear power for 45 years and currently produces almost 30% of its electricity this way.
- ❖ There are 104 commercial nuclear power plants in the United States producing a whopping 806.2 TWh of electricity, in other words about 20 % of the entire electricity generation (2008).

Credit: Breitbart.com



- ❖ In 2015, the International Energy Agency reported that the prospects for nuclear energy remain positive in the medium to long term despite a negative impact in some countries in the aftermath of the nuclear accidents. The IEA noted that at the start of 2014, there were 72 nuclear reactors under construction worldwide, the largest number in 25 years.
- ❖ In March 2016, China had 30 reactors in operation, 24 under construction and plans to build more and that China planned to increase nuclear power capacity from 17 gigawatts (GW) in 2014, to 58 GW in 2020.
- ❖ In 2016, the US Energy Information Administration projected for its “base case” that world nuclear power generation would increase from 2,344 billion kW-hr in 2012 to 4,501 billion kW-hr in 2040.

Below is a nuclear energy pros and cons list, which covers the most important aspects of typical nuclear power



plants.

Pros

- ❖ Nuclear power is a sustainable energy source that reduces carbon emissions and increases energy security by decreasing dependence on imported energy sources.
- ❖ Nuclear power produces virtually no conventional air pollution, such as greenhouse gases and smog, in contrast to the chief viable alternative of fossil fuel.
- ❖ Low operating costs (relatively).
- ❖ Known, developed technology “ready” for market.
- ❖ Large power-generating capacity able to meet industrial and city needs (as opposed to low-power technologies like solar that might meet only local, residential, or office needs but cannot generate power for heavy manufacturing).
- ❖ Existing and future nuclear waste can be reduced through waste recycling and reprocessing.

Cons.

- ❖ High construction costs due to complex radiation containment systems and procedures.
- ❖ High subsidies needed for construction and operation, as well as loan guarantees.
- ❖ High-known risks in an accident.
- ❖ Long construction time.
- ❖ Target for terrorism (as

are all centralized power generation sources).

- ❖ Nuclear is a centralized power source requiring large infrastructure, investment, and coordination where decentralized sources (including solar and wind) can be more efficient, less costly, and more resilient.
- ❖ Uranium sources are just as finite as other fuel sources, such as coal, natural gas, etc., and are expensive to mine, refine, and transport, and produce considerable environmental waste (including greenhouse gasses) during all of these processes.
- ❖ The majority of known uranium around the world lies under land controlled by tribes or indigenous peoples who don't support it being mined from the earth.
- ❖ The legacy of environmental contamination and health costs for miners and mines has been catastrophic.
- ❖ Waste lasts 200 – 500 thousand years.
- ❖ There are no operating long-term waste storage sites.
- ❖ There are no operating “next generation” reactors, such as high-temperature breeder reactors and particle-beam activated reactors that are reported to produce less waste and have reduced safety concerns.

Tapping the potential

Nuclear energy is the mother lode of untapped potential. President-elect Trump's statement "I've spent my entire life in business looking at the untapped potential in projects and in people all over the world. That is now what I want to do for our country." may stimulate creative people who appreciate the capabilities of nuclear energy yet are saddened by the huge gap between the promise and the current reality.

Therefore, we have a golden opportunity to remind both our leaders and the public that nuclear energy development can be a great business full of optimism and ingenuity. The universe of challenges that can be mitigated or overcome with the intelligent use of the vast, emission free energy that our creator locked inside

the nuclei of certain super fuels - uranium, thorium and plutonium - continues to expand. The existing nuclear power plant sites all over the world are underdeveloped assets with available land, buildings that can support a much greater production level, transmission corridors, a trained workforce capable of expansion and supportive communities that recognize the value of having productive enterprises that serve important societal needs and desires. Development of a robust nuclear energy industry can and should be a unifying activity. A prosperous industry serving a growing appetite for affordable energy would be capable of funding the kind of research and development effort that will be needed to begin working up for technological development.

Conclusion

No doubt, nuclear energy has made its way towards the future but like other sources of energy, it also suffers from some serious drawbacks. Generally speaking, the electrical energy industry is aware of the substantial drawbacks of nuclear power generation. Nevertheless this industry is now spending an incredible amount of money and time, lobbying for the revival of nuclear energy. The main interest of the owners of existing nuclear power plants is however to prolong the life-span for existing nuclear plants. Because the existing plants will be amortized at the end of their originally planned life time, huge financial profits can be realized for any day longer which these plants can be kept in operation. This is much more lucrative than building new nuclear plants.

Credit: NBC News



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Let's know why we should include Beet Root in our diet?

The beetroot is the taproot portion of a plant named beet plant. It is not chiefly cultivated in India, it's a crop of Europe but grown at small scale in some areas of India. When we consider the total sugar production in world , 35% of the sugar is produced from sugar beet and the contribution of India in its production is approximately zero because the climatic condition of India is not favorable for sugar beet, so its basically crop of European countries. Beetroot's medicinal properties are well known. It is rich source of iron and it has great quality of healing. It was first cultivated by the Romans. In 19th century it became a famous vegetable because is discovered that sugar can be extacted from it. Now a days America is at top most position in production of beet root then Russia, France, Poland

and Germany comes in this chain. In European countries many of the dishes are made up by beet root t, the soup of beet is known as "Borscht". Beet root is widely use in making menus more attractive. Apart from being delicious and attractive its medicinal value can not be ignored. Because it belongs to the same family as spinach and chard, its leaves and root can be eaten. Beet root leaves have a harsh taste but the round root is sugary taste. Generally beet root has purple color, but also found in white and golden color. It has high sugar percentage, it is pleasant eaten raw but basically it cooked or pickled. Beetroot is of extremely dietary value; particularly the leaves are rich in calcium, iron and vitamins A and vitamin C. Beetroots are rich source of folic acid, iron and fair source of fibre, manganese and potassium. The leaves should not be thrown; they can be cooked as spinach. Beetroots are used for medicinal purposes, mainly for diseases related to liver because they helpful in stimulating the

detoxification function of the liver. A pigment is found in beet root named betacyanin that gives beetroot rich, purple-crimson color. It is a commanding agent, which suppress the development of some types of cancer. Beetroot is good for healing and avoidance of many disorders. Fresh and raw beets are best for squeezing into a juice. Beetroot juice is good remedy for high fever, anemia, influenza, pneumonia; it also helps in repairing of excretory system, hepatic system and bile. In treatment of different types of diseases half liter beetroot juice for adults and 250 ml for children is advised. Person suffering from diabetes should drink beet root with addition of honey which enhances its medicinal properties. Beetroot juice reduces body temperature immediately. Recently it has been reported that it is also beneficial in high blood pressure. Because potassium, drains water from the body so blood pressure reduces. Another beneficial component for human found in beet root is silicon. Our body can absorb easily the silicon present in beet root. This silicon strengthens the connective tissues basically of skin, blood vessels and bones.



Credit: Laura Bond

Silicon is helpful in removal of toxins as aluminum from organism. Silicon is considered to be one of the main elements for maintaining health and healing process. Beetroot is good source of folate and manganese and contain betaines that reduce the focus of homocysteine, a homolog of amino acid cysteine. Extremely main key element of beetroot juice is folic acid. Folic acid member of the group of vitamins B, human body normally lacks the mostly of it. Folic acid also has a vital role in metabolism. Beetroot juice contains much amount of folic acid so cells can easily absorb it. Eating beetroot makes our dermis more elastic and promote the growth of hair and nails. So drinking its red juice decreases hair fall. Potassium is found in beetroot juice that regulates the amount of water in organism, excretes excess fluid, binds fats and thus detoxifies our body, which is essential for the preservation of health. Anti cancerous property is found in beetroot anthocyanin is found in it, which has antioxidant effect and inhibits the growth of cancer cells in our body. Two other important substances found in beetroot are betalain and polyphenol. All these substances are natural inhibitors of cancer cells growth. These all substances are also found in aloe- Vera, garlic,

broccoli, Brussels, sprouts, cabbage, nuts and oil but in smaller quantities than beetroot. Beet juice is incredible remedy for anemia because it stimulates the formation of R.B.C. or red blood bodies. In addition with potassium it also cleans blood. Fresh beetroot juice helps in chemotherapy, more precisely; it is known that it has a soothing effect on the X-rays in radiotherapy. X-rays generally kill cancer cells but can also harm healthy cells. Some ingredients in the juice of beetroot prevent destruction of healthy cells. So cancer patients should consume half a liter of fresh beetroot juice per day, dividing into two or three meals. Mixing with honey has best effect as honey also has healing properties. Further substances mentioned above, beetroot juice contains abundant amount of iron, manganese, phosphorus, copper, zinc and vitamin C and fiber. Eating beetroot increases the formation of hormones and neurotransmitters signals for ex- dopamine and nor epinephrine. These two are responsible for psychological satisfaction of human. In studies it has been seen that without folic acid is responsible for to be happy and optimistic and it is found in beet root in sufficient amount. Beetroot makes skin cleaner and youthful and also make bones active. Beet root has healing effects that are

not so well known. Beetroot decreases high blood pressure, helps in dementia, helps with heart disease and cures cancer. Beetroot helps in detoxification of the liver and stomach; it improves cardiac circulation, digestion and controls thyroid function. So it is important how we are preparing and cooking beetroot. When beetroot is pulling out of the ground, we should not chop off the root as juice will start to leak. Oxidizing reactions can occur on cutting off the root and so some of the enzymes can lose their impression. So chop or grate beetroot quickly with a juicer and then squeeze the juice from it and drink it immediately, within 10 minutes. It should not be stored in the refrigerator, especially not for a long time. Its leaves can also be squeezed as juice of leaves also contain much of the substances. The leaves contain a lot of chlorophyll that is one of the most powerful antioxidants. Beets are rich source of nitrates which are curative in treat angina, chest pain and even congestive heart failure. Nitrates help in making wider our blood vessels and it also helps in proving more oxygenated blood to our heart muscle. Nitrates also give relaxation to our veins. Initially beets and its juice are not on stage of the body ecology system of health and healing because they have high

❖ sugar percentage for those who are suffering from systemic candida overgrowth. Sugar gives favorable condition for the growth of this pathogenic yeast in human body, blood stream and digestive tract. The sugar also makes human body more acidic and candida grows in an acidic environment very easily. Candidiasis is common in at least 70% of men; women and children have a candida overgrowth in their body which causes to chain of other symptoms including fatigue, brain fog, food indigestion and digestive disturbances. It can take some days to culture beet juice with a starter culture of friendly bacteria and yeast. Friendly microbes are generally known as probiotics. They eat the sugars in the beets, so they can be eaten without irritating candida symptoms.

Beet root helps our liver function properly. Liver is primary organ in detoxification. Liver's function is absolutely essential for throwing out body toxins on a daily basis. Beetroot has great quantity of fibre, beneficial for bowel function, which may help in preventing constipation and help to lower cholesterol levels too. Beetroot fibre helps to increase the level of an enzyme known as glutathione peroxidase and also increase the number of white blood cells that are responsible for detecting and eliminating abnormal

cells. Beets are also one of the richest sources of an amino acid named glutamine, essential for the health and maintenance of the intestinal tract. Eating fruits and vegetables is related with the increasing consumption of plant based foods like beetroot, decreases the chance of obesity, over weight and overall mortality, diabetes, cardiac problems and increases a healthy color and hair, increased energy, lowers body weight. In recent studies it has been seen that 500mls of beetroot juice in healthy reference men lower hypertension. In research it has been hypothesized it was due to the high nitrate levels in beet juice so high nitrate containing vegetables are prove to be a cheap and effective way to treat heart disease conditions and blood pressure. In another study that was held in 2010, similar results has been seen that drinking beetroot juice decreases blood pressure basically on a dose-dependent basis. Life acceptance of the person with heart disease, respiratory and metabolic diseases who find the activities of daily life physically difficult because of lack of oxygenation that can be cured.

We can include beet root in our diet by these tricks

- a. We can roast, steam, boil, pickle form or eat raw.
- b. We can make beetroot juice by peeling beetroot

and blending with a combination of fresh orange, mint and pineapple, lemon and ginger then blend and strain.

- c. We can grate raw beets and add it to our favorite salad.
 - d. Top roasted beets with goat cheese have a perfect pairing.
 - e. We can add sliced pickled beets to our favorite salad and top with goat cheese.
 - f. We can slice raw beets and serve it with lemon juice and a sprinkle of chili powder.
- There are some health risks of eating beet roots-
- a. If beet root stored improperly, its nitrate-content vegetable juice may accumulate bacteria which convert nitrate to nitrite and contaminate the juice. High levels of nitrite can be potentially dangerous.
 - b. A high-nitrate diet may interact with certain medications such as organic nitrate used for angina, sildenafil citrate, tadalafil.
 - c. Drinking beetroot juice may cause red excretory material.
 - d. It is the total diet or overall eating pattern that is most important in disease prevention and achieving good health. It is better to eat a diet with variety than to concentrate on individual foods as the key to good health.

-Richa Upadhyay, Krishna Deepak Tripathi

Health Benefits of Okra (lady's finger)

Ladies finger is a vegetable crop which can be basically grown in tropical and sub tropical areas. The origin place of okra is tropical and sub tropical Africa. Okra is grown for its young tender vegetable, used in curry and soups after cooking in Asia. Okra is also known as "Lady's finger". This vegetable is called 'Bhindi' in India. Okra has nutritional values and health benefits. Fiber can be extracted from the stem of this plant. Okra farming is a money providing crop and can be cultivated through out the year. Okra is member of "Malvaceae" family and its genus is "Abelmoschus". The texture of this vegetable is quite sticky and tastes very delicious specially when made them fried. India is no. one producer of okra in Asia as well as in the world. Not only in India it is also used for vegetable in

Brazil, West Africa and many other countries. In India major okra growing states are basically Uttar Pradesh, Bihar and West Bengal.

Health benefits and uses of Okra-

The health benefits and uses of Okra include the following-

- ❖ Okra has high fibre content.
- ❖ Okra is good source of folic acid.
- ❖ Okra is an excellent source of vitamin 'A', 'B', 'K' and 'C'.
- ❖ It is good source of iodine which cures goiter.
- ❖ Okra is beneficial for smooth hair and shining skin.
- ❖ Okra is beneficial in diabetes.
- ❖ Okra restricts colon cancer.
- ❖ Okra helps in maintaining cholesterol level.
- ❖ Okra is good remedy for

prevention of skin pigmentation.

- ❖ Okra may helpful in controlling asthma.
- ❖ Okra prevents constipation.
- ❖ Okra may restrict sunstroke.
- ❖ It is helpful in obesity and help in weight loss.
- ❖ Okra make immune system and eye power stronger.
- ❖ Dried fruits of okra contain 12-22% edible oil which is used for refined edible oil.
- ❖ The dry fruit skin and fibers are used in processing of paper, cardboard and fibers.

Production- Okra is grown best in warm season and will die with frost. Its flowering occurs as soon as 45 days after seeding, generally depend on the variety, and pods are ready for harvest 4-5 days after flowering. Tenderness decreases as pod's size increases. Most varieties will lose their tenderness, when they exceeded 3 inches in length desired by market. So for avoiding this, okra plant must be picked almost every other day. Before planting into the field, it should be grown for 4-6 weeks in the greenhouse. Most varieties have tiny hairs on all parts of the plant which is the reason for skin irritation, so one should wear gloves and long sleeves are recommended for harvest



Post –Harvest and packing-High respiration

rate is found in okra and okra is very sensitive to staining and rapid dehydration, so it's wholesale marketing difficult. The quality of okra can be maintained by cooling it to 500F after harvesting. Medicinal values of okra has been become well known recently as a super food for diabetic patients. Okra can be a boosting food on feeling unexpected mood, it have great nutritional quality and stabilize blood sugar. In recent studies it has been found that okra seeds contain a powerful anti depressant material and this effect has been demonstrated on mice. Basically depression is specially found in diabetic patients due partly to blood sugar fluctuations related with diabetes.

Medicinal properties of okra-

1-Okra as antioxidants- okra is as powerful antioxidant as blue berries and black berries. It has been seen some times that people with healthy diet seems to be in better moods generally, there is some reason for it, flavonoid are the main reason for it, scientists have known for long that flavonoid have mood elevating properties. For example, quercetin which is found in apple, citrus fruits, onions, parsley, red wine, tea, blackberries, blueberries, green leafy vegetables, has been shown to important improvement in mood scores in diabetic mice. The seed and the leaves of vegetables often contain the highest concentration of antioxidants so scientists have prepared extracts from okra seeds and leaves in this study, to test anti oxidant levels. And in the extract it was found that the antioxidants level is as same as extracts of

blueberry and black berry. 2-Okra exerts powerful antidepressant effects-In a study scientist used standard tests known as "forced swimming" and "tail suspension" to gauge the mood of the mice, as a measure of depression, based on their response time to these actions. And found okra seeds extracts considerably improve the mood-scores of the mice in both tests as nearly all doses tested. And remarkably, at the highest seed extracts really dose used, the seed extract in point of fact performed as well as imipramine, an FDA accepted drug for depression.

3-Anti cancer effects against breast and prostate cancer-Anti cancerous properties against breast and prostate cancer are found in okra.

**-Krishna Deepak Tripathi,
Richa Upadhyay**



Credit: XtremeRain

Aquaponics: A system for food security

By 2050, the world population will reach nearly 9.5 billion, which effectively means that we have to produce 70% more food for over two billion additional mouths. Hence, the food and agriculture systems need to adapt fast to the changing climate and become more resilient, productive and sustainable. This would require judicious use of natural resources. A plant consumes more water to produce food compared to us to survive in a day. As a matter of fact 15,000 litres of water is needed to produce one kilo of meat. This is why, with a growing population increasingly changing its diet towards 'water-hungry' products, all efforts must be made to improve the way we use water in agriculture to make the best out of the limited water resources. Aquaculture is one of the important source of

protein production and accounts for almost one-half of the fish eaten globally. Aquaculture has the potential to decrease the pressure on the world's fisheries and to significantly reduce the footprint of less-sustainable terrestrial animal farming systems in supplying humans with animal protein. However, two aspects of aquaculture may be addressed to improve the sustainability of this agricultural technique. One major problem for the sustainability of aquaculture is the treatment of nutrient-rich wastewater, which is a by-product of all the aquaculture methods mentioned above. Depending on the environmental regulations set by each country, farmers must either treat or dispose of the effluent, which can be both expensive and environmentally harmful. Without treatment, the release of nutrient-rich water can lead to eutrophication and hypoxia in the watershed and localized coastal areas, as well as macroalgae

overgrowth of coral reefs and other ecological and economical disturbances. Growing plants within the effluent stream is one method of preventing its release into the environment and of obtaining additional economic benefits from crops growing with costless by-products through irrigation, artificial wetlands, and other techniques. Therefore, as a catalyst of crisis and food insecurity; an aquaponics system will serve the purpose of producing food for a sustainable future.

Aquaponics is the integration of aquaculture and hydroponics, a soilless culture of growing crop. Aquaculture is the traditional way of culture of aquatic organisms. As soil provides nutrients to the crops grown. A plant can be nourished if nutrients for its growth can be provided through water. Thus, the concept of aquaponics came into the picture. In an aquaponic system, nutrient-rich fish culture water from fish tanks is used to provide plant food to vegetables and herbs grown in soilless system.



Credit: aquaponicsplan.com

Nitrifying bacteria in the soilless system converts ammonia and other toxic pollutants to an usable form of nutrients to be taken up by the plants. There are three general types of aquaponics systems: raft or deep water culture system, nutrient film system, and a system based on media-filled bed system. Raft culture typically is preferred for commercial operations, while the nutrient film systems are restricted to light weight leafy green vegetables. Media-filled beds are commonly used for home-based aquaponics gardening and require lower stocking rates than those used in raft systems.

Increasing population, shrinkage of land and scarcity of water approaches us to justifiable use of ever decreasing land and water resources. Therefore, an aquaponics system will be an effective method to fulfill our food and nutrition requirement.

Benefits:

In an aquaponics system no fertilizers, pesticides and herbicides are required as in a traditional way of culture of aquatic plants, animals and normal plants grown in the soil. Thus, it is a sustainable and intensive food production system having one nitrogen source and create less waste compared to traditional system of culture. In this system fish and plants can be grown almost anywhere, including warehouses, roof tops and basements.

Do it yourself- facts:
If we are planning to start a small scale aquaponics system at home, following are the points to consider:
1. Selection of tank: A tank is a crucial component in an aquaponic system. A round tank with flat or conical bottom is recommended as they are easy to clean. Durability and inertness of tanks is also a parameter to be considered.
2. Aeration and water circulation: Optimum level of dissolved oxygen concentration (5-6 mg/L). Proper water circulation from the fish culture tank to plant culture bed and plant culture bed to fish culture tank keep animals, bacteria and plants healthy.
3. Water quality: Proper maintenance of key water quality parameters, viz; dissolved oxygen, pH, temperature, total ammonia nitrogen and alkalinity are essential in any aquaponic system.
4. Stocking density: An aquaponic system will be easier to manage and will be insulated against shocks and collapse if the stocking density is kept at optimum level. The recommended stocking density is 20 kg/1,000 litres, which will still allow for substantial plant growing area.
5. No overfeeding and removal of uneaten food: Feeding everyday to fish is essential for its good health and proper growth. But overfeeding can be avoided. Wastes and uneaten food are very harmful for aquatic animals because they can rot inside the system. Rotting food

can cause disease and can use up all of the dissolved oxygen.

6. Selection of plant: Generally light weight leafy green plants viz; coriander, pepper etc. are extremely good to be grown in an aquaponic system.

7. Balance between plants and animals: Using a batch cropping system can help keep a steady harvest of both aquatic animals and vegetables to keep a consistent production level and maintain a constant balance between fish and plants.

Construction:

Some of the accessories required for a simple roof top small scale aquaponics system are:

1) Small plastic tank (cap:50 l) for fish culture, 2) Small plastic tank (cap:50 l) for plant bed filled with media (e.g., scrubber used for washing utensils) to support plant and substrate for nitrifying bacteria, 3) water pump 4) PVC pipe (dia: 12 cm and length as required), 5) PVC tubes (dia: 12-75 cm and length as required), 6) wooden table or platform made up of bricks to keep plant culture tank over it for gravity flow of water to fish culture tank and 7) electrical connections. The approximate cost of the above items may work out to be INR 5,000.

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The CRISPR Revolution in Crop Improvement

New technologies for enhancing crop productivity and improving crop quality have always been eagerly pursued by scientists worldwide. With time, technologies have emerged and evolved, and we now stand at the gates of an era of precision genome engineering of crop plants. The newest addition to the genome engineering toolkit is the precise editing of a specific gene by either removing or adding small bits of DNA to it, more easily than any of its predecessor techniques. This new addition to the group of genetic engineering techniques is popularly called CRISPR/Cas9 (Clustered Regularly Interspaced Short Palindromic Repeats/CRISPR associated nuclease9).

CRISPR/Cas9 system

The CRISPR/Cas9 is an adaptive immune system of bacterial cells against other foreign entities like bacteriophages and foreign plasmids. In structure, CRISPR loci are short repeat sequences separated by spacer sequences. These spacer sequences are remnants of genetic

sequence of pathogens that attacked the bacterial cell in the past, and act as a sort of a library to recognise any future attack by the same pathogen. If the same pathogen attacks the cell, the spacer sequences are used as a genetic memory to detect the invaders and activate Cas9 to degrade the intruder's DNA. The CRISPR/Cas9 system was explored by many researchers, and then in 2012, two scientists, Jennifer A. Doudna, and Emmanuelle Charpentier, demonstrated the adaptability of this system to cut any desired DNA sequence. At present CRISPR/Cas9 system is being used to edit specific genomic regions of a number of organisms, including plants, animals and viruses.

For editing plant genomes using CRISPR/Cas9 system, a synthetic CRISPR RNA called guide RNA (gRNA, usually 20 bp size) that matches the target gene to be edited is transferred to plant cells along with the Cas9 gene. Cas9, an endonuclease, which recognises only those sequences that are complementary to the gRNA, then precisely targets that particular genomic locus, introducing double stranded breaks in it. These breaks are repaired by the endogenous repair mechanism of the cell, but in the process some insertions/deletions occur in that region, thus leading to modification of the targeted sequences.

This technique is being

heralded for its accuracy as a technique, and holds promise of enabling breeding of crops having desired trait modification.

Application of CRISPR/Cas9 in agriculture

CRISPR/Cas9 has been tested in a number of crop plants, starting with the model plants tobacco and *Arabidopsis*. Since then, there has been no looking back. A large number of genes have been edited, and a multitude of edited crops are being developed.

A few CRISPR/Cas9 edited crops are already seeking regulatory approval for commercial release in the United States. DuPont Pioneer has developed waxy corn hybrid employing CRISPR/Cas9 strategy. In this corn, a gene, *Wx1*, has been deleted/ knocked out and without this gene the corn kernels develop a waxy appearance as they produce large amount of a certain type of starch, namely, amylopectin. These high starch grains will then be used to extract starch which is used in a variety of processed foods, adhesives and high-gloss paper. Another corn variety having drought tolerance is also under development at DuPont Pioneer. This group of researchers have utilized CRISPR to improve yield of maize plants under drought stress by increasing the expression of the ARGOS8 gene, which is a negative regulator of ethylene response. Apart from maize another CRISPR product seeking commercial approval emerged in the form of white button mushrooms that won't turn brown easily. These mushrooms, developed at the

Credit: EskiPaper.com



Pennsylvania State University, have a gene leading to browning removed, i.e. knocked out.

Apart from these products that are on the verge of release, a large number of crops are being edited to incorporate some or the other desired characteristic. A team of Chinese scientists knocked out all the three copies of a wheat gene resulting in wheat plants completely resistant to one of the most devastating wheat fungal diseases, powdery mildew. While in Japan researchers have developed late ripening tomatoes by turning off genes responsible for quick ripening. Similarly, disease resistance in rice, herbicide tolerance in canola, hybrid technology in wheat, oil quality in soybean, storage quality in potato, low phytic acid and herbicide tolerance in maize, and many other such traits have been incorporated into cultivated crops using this technique.

A few other examples are enlisted in the table below.

Regulatory approval to CRISPR/Cas9 edited crops

Genetically modified crops have been a topic of debate since the first attempts to commercialize them, as they raise a lot of speculations among the consumers. But as of now, the CRISPR/Cas9 derived crops have had a smooth sailing at the hands the regulatory bodies. Ruling in favour of the technique, in 2015, the Swedish Board of Agriculture declared that plants derived through CRISPR/Cas9 did not fall under their definition of genetically modified organisms. CRISPR/Cas9 crops have fared pretty well with the US regulatory body. The United States Department of Agriculture (USDA) in April 2016, ruled that it would not regulate the edited mushroom as a genetically modified organism (GMO) as it did not contain any introduced

or foreign genetic material. This judgement has further stimulated hopes of the scientific fraternity and scientists are predicting that there would be many more such crops seeking regulatory approval soon. USDA has also in another ruling stated that it will also not subject the corn variety of DuPont Pioneer to the same regulations as other GMOs.

The advent of CRISPR/Cas9 and its wide scale application to crop improvement has brought in a new perspective to genetically modified crops. Scientists are emerging as strong proponents of these edited crops and believe this technique holds promise to usher in crops better suited to the current environment and needs.

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Table: Use of CRISPR/Cas9 in plant trait improvement

Plant	Traits targeted
Rice	Disease susceptibility Herbicide resistance Grain number Aroma Seed size Plant height Tiller number
Maize	Herbicide resistance Low phytic acid Male fertility
Barley	Grain dormancy
Poplar	Lignin content Reduced tanin condensation Wood discolouration
Soybean	Herbicide resistance
Tomato	Pigment accumulation Delayed ripening

Micronutrients: Key to stay healthy

Nutrients needed in minute amount are called micronutrient and those required in high amount are called macronutrient. Both micronutrients and macronutrients are essential elements for human life and equally for the growth and propagation of microbes. The most commonly recognized micronutrients include calcium, magnesium, phosphorus, iron, copper, zinc etc. Both type of nutrient micro and macro are available in the environment. They are necessary for

healthy functioning of all our body system. Some essential micronutrients are not synthesized in the body or if at all synthesized are not enough, therefore obtained from food. Improper consumption of micronutrient leads to several health problems and makes human body more prone to microbial infections. The nutritional supplements are required to make the immune system strong.

Micronutrient and human health

The function of micronutrient

is to prevent and treat disease. It provides essential cofactor for different metabolic functions. These micronutrients are essential for proper development and help to provide basic requirement to maintain or improve health. It includes regulation of internal metabolism, heartbeat, cellular pH, bone density. For instance, sodium is essential for maintaining fluid balance in your body and regulates the appropriate hormone level in your blood. Magnesium helps to maintain the normal heartbeat of the

Micronutrient	Function	Source
Zinc	Required for growth and tissue repair and help to release energy from food	Milk, Meat, egg, nut and pulses
Iron	Development of normal blood cell	Fruits, nuts ,eggs, pulses and green leaf vegetable
Magnesium	Important for strong muscles formation and help to keep blood pressure normal	Green leaf vegetable, eggs , milk, nuts
Calcium, Vitamin D , Fluoride	Important for formation of bones and teeth	Fish, egg, milk and through sunlight
Vitamin K	It helps in blood clotting	Meat, cheeses , egg
Vitamin A	It promotes good vision and essential for healthy immune system	Milk, carrots, butter, dark green leafy vegetables
Vitamin E	It works as a antioxidant and protect the cell against damage	Vegetable and seed oils

body and it also helps to convert glucose into energy and necessary for the metabolic activity. Iodine essential for thyroid gland functioning. Iron is necessary for the development of red blood cell and lymphocytes. Vitamin A helps in the production of white blood cell that fights against the infection.

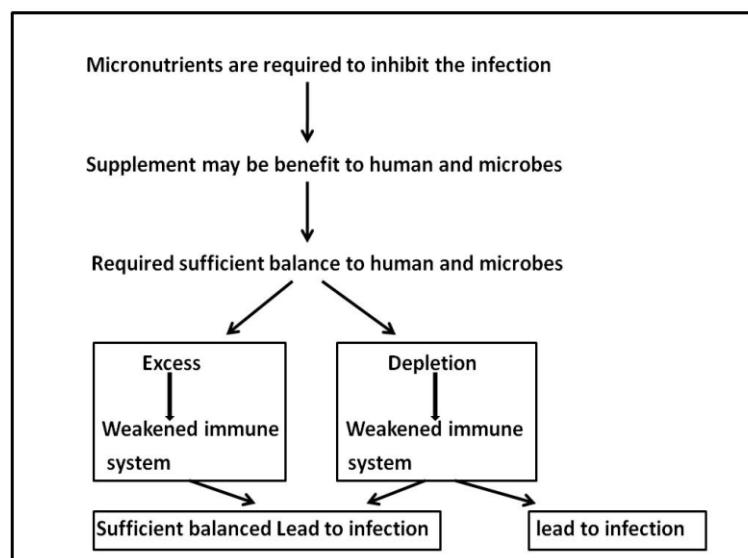
The world health organizations (WHO) identified that micronutrient deficiency presents a large problem to the health of the human population. Iron deficiency is the most common around the globe, one third of the population suffer from anemia due to iron deficiency. Vitamin A deficiency causes blindness in human and night blindness in pregnant women. Calcium, vitamin D and fluoride deficiency weaken the bone, teeth and lead to abnormal heart beat. The

absence of zinc causes number of problems including anemia, retardation of growth, less bone growth, brain problem, problem associate with genital function and poor hair, nail, skin condition. The important factors of zinc deficiency effect children resistance to infectious disease that increases the risk of severity of infection.

Role of micronutrient in microbes

Micronutrients are essential for the proper functioning and development of microbes as well. The trace elements are the essential requirement for the growth and propagation of microbes. Microorganisms need these nutrients for their various metabolic and biosynthetic pathways as enzymatic cofactors and help to maintain their growth. Mostly protein and enzyme require metals for

their functionality. For example iron and copper are redox active and able to produce free radical through Fenton reaction. The level of zinc, copper and iron are tightly regulated to maintain the homeostasis condition. Metals also play role in signaling, immune responses physiology and development similar to that of human. Copper and iron play an important role in fungal infection. Fungi consume more copper and iron to establish fungal infection which they acquire from their own host cells. Others metal like manganese and zinc also essential for many activities. During infection Zn and Mn level reduce in the host due to efficient consumption of these metals by immune cell. Insufficient micronutrient like iodine, vitamin A and iron lead to some common deficiencies.



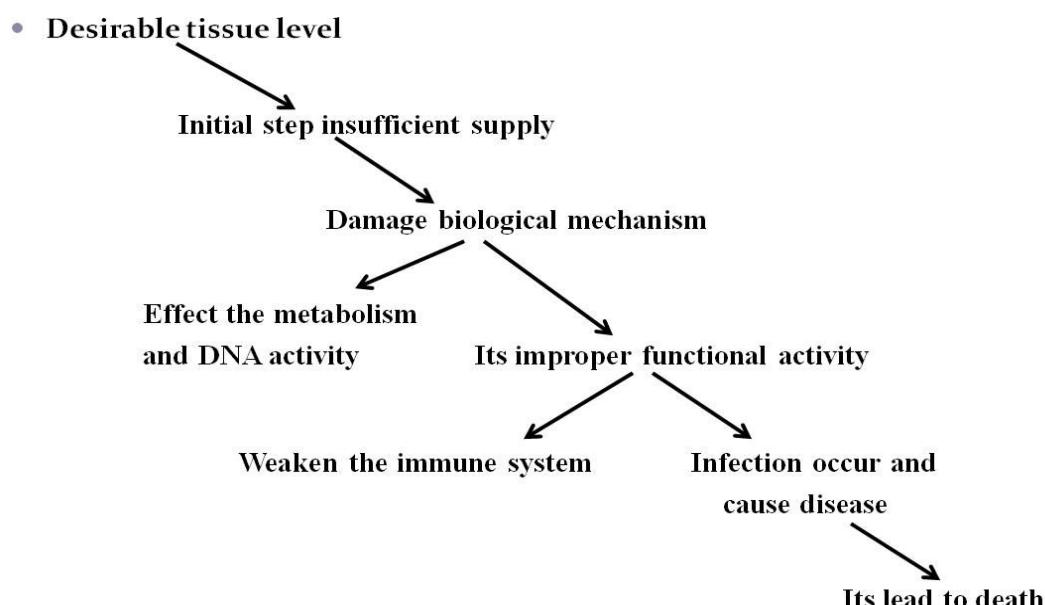
Phenomenon of micronutrient deficiencies All metals are interlinked with each other like copper is essential to initiate pathway of iron and vice versa. They are required in appropriate amount because excess amount cause severe problem than deficiency. It is important that to maintain the right balance between them. For example excess uptake of calcium and not sufficient magnesium can cause problem in the muscles. Similarly excessive amount of calcium without other metals cause problem of heart attack. Micronutrients have antioxidant properties that inhibit the oxidation like vitamin C, K help in removing oxides material from the living organism. The trace element involves in modifying enzyme activity for example zinc

and selenium is a cofactor over hundred enzymes. Vitamins are required to play important role in biochemical processes, for example vitamin B and folic acid help in electron transport chain and make sure that proper utilization of essential nutrients to provide energy and protein. Zinc acts a transcriptional factor that attach to the DNA and control transcriptional receptor for hormone and others factor. Treatment of micronutrient deficiencies Micronutrient deficiencies can be prevented by ensuring the right amount of nutrients in the diet and supplements. In case of major problem dietary plan shall be changed. One has to need to take nutrient food and multivitamin to get rid of micronutrient deficiency. The symptoms

fade away when right diet is followed and help to gain good health. To overcome the micronutrient deficiencies diet must be supplemented with few essential ingredients like traditional spices, dry fruits, dates etc.

"HEALTH IS WEALTH"- AND FOR GOOD HEALTH MICRONUTRIENT IS NECESSARY

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Scope of Food processing industry in India

Food processing is one of the largest areas not only in India but also in the whole world in terms of development, utilization and sending overseas. Generally food processing sectors include fruit, vegetable, spices, meat and poultry, milk and milk's byproducts, alcoholic beverages, fisheries plantation, grain processing and other product group like confectionary, chocolate, cocoa product, soya based product, mineral water, concentrated protein food etc. In this, foreign speculation is over Rs. 10,000 million. Even though mother's milk is a rich basis of protein and minerals but after six months it become essential for baby to have plant

based protein and minerals which have more active nutrients than animal source. At this time strained canned baby food product based on cereals and vegetables can be good source of minerals and proteins. Processed food can be preserved 6 months to 5 years. In the processing of toddler foods, vegetables and fruits are blanched that preserve the color of the food and also inactivate the action of the enzyme so there is no probability of spoilage in food product. Straining of food product assists to keep out the frustrating and hard to digest fibers out. Canning of toddler food product done for preserving food in which powder is conserved in a air tight bottle. It gives a distinctive shelf life up to five years.

Even though under precise conditions a freeze dehydrated canned product can saved as long as 30 years in cooked state. In 1975 the French forces get a currency reward of 1200 francs for a new technique

to protect food. Canning was first suggested by Nicolas Apperent and this process was first proven in 1806 in test by French navy and awarded in 1809-1810. The benefit of packaging is that it prevents micro-organisms from entering and proliferating inside the food. Processed cereal based foods and toddler foods for infants and grown up children and older are very strictly monitored in European Union. The legislation lays down coordinated values for the compositions or list of approved foodstuffs and category of products of this type. Processed cereal vegetable based foods are categories into following four categories-

- Common cereals that are have to be reconstituted with milk or other suitable nourishing liquids.
- Cereal with other concentrated protein food or have to be reconstituted with water or other protein free liquid.
- Pastas that are to be used after cooking in boiling water or other suitable liquids.
- Rusk and biscuits that are to be used either openly or after pulverization with admixture of water, milk or other suitable liquids.

Credit: SupportBiz



Processed food can be arranged by multi-use flour like wheat flour, gram flour, rice flour with merging vegetable and fruits like sugar beet, papaya, carrot etc. Sensory individuality is analyzed by a 9 point hedonic scale, nutritional quantities should be assessed by A.O.A.C, 1980, methods.

A result proves that assimilation of vegetables and fruits powder in baby food were fully adequate. In a normal healthy child, carbohydrate provides 45-50%, fat 25-35% and proteins 10-15% of the total calories, require to body. A child of one year desires approximately 1000-1100 calorie which is fulfill by giving him a diet that give 600-650 calories from carbohydrate, 40-50 calories from proteins and 300-350 calories from fats. Besides supplying these nutrients of carbohydrates, proteins and fats other nutrient like vitamin and minerals are vital.

A processed health food has following nutrient in a firm amount of-

- Nitrates- 200mg
- Aflatoxins B1- 0.1micrograms/kg
- Ochratoxin A- 0.5micrograms/kg
- Pauline- 10micrograms/kg
- D-oxy-nivalenone- 200micrigrams/kg
- Zearalenone- 20micrograms/kg

- Fumonsins- 200microgram/kg
- Lead- 0.020mg/kg wet weight.

India has chief agri business sector which has achieved extraordinary success over last three and a half decades.

Unprocessed foods are prone to spoilage by biochemical process, microbial molest and invasion. The right post yield practices such as excellent processing technique and appropriate packaging; carrying and storeroom can play a important role in tumbling spoilage and increasing shelf life. The business consists of section like processed fruits and vegetables, cereal based product, dairy based product, poultry, meat, fishery products, drink and confectionary. The worldwide processed food market is probable at \$3.2 trillion. The Indian food market is projected at \$123 billion. Food processing business in India is increasing at 14% annum. The total food making in India is likely to be double in next ten years and there is an prospect for a large project in food and food processing technology particularly in areas of canning, dairy, and food processing, wrapping, ice-covered foods and refrigeration and

packaging. Fisheries, milk and milk product, packaged or convenience food, alcoholic beverages, confectionaries, fruits and vegetables, poultry, meat, grains and health food supplements are another quickly rising segment of this sector which gaining much popularity among health cognizant. Coming to the refreshments food sector function of modern technology has helped in elevating the value of produce. It has great expansion prospect in country. Rising population, rapid urbanization, changing consumer liking etc are expected to keep the requirement increasing in future too. India's food processing industry is unexpected to benefit from this and to produce to approximately \$260 billion from the present USD 200 billion in next 6 years. India produces 41% of the world mangoes, 30% of cauliflower, 36% green peas, 23% cashew and 16% onion. Daily sector is approximately \$62 and will grow up to \$108 billion. The Indian production is predicted 500 million tones and food processing business has huge latent.

-Krishna Deepak Tripathi,
Richa Upadhyay

Emerging waterborne pathogens: The serious threat to public health

Water is essential for all life forms. A clean and safe drinking water supply may be the norm in European and North American countries, but in developing countries, the assessment of both clean and safe drinking water is not, the rule and hence, waterborne illness outbreaks are common. In Asian and African countries, diarrheal diseases transmitted through contaminated drinking water primarily affect children below 5 years of age. It is also reported that around two and half billion people have no access to clean and safe drinking water and more than 1.5 million children die each year from diarrheal diseases. This is due to the contamination of drinking water with different types of pathogenic microorganisms present in urban sewage, and feces of

infected humans and animals. Today, the global burden of infectious waterborne disease has become a matter of serious concern because waterborne pathogens have created a serious threat to the safety of public health. The emerging waterborne pathogens pose major health hazards in both the developed and developing countries. An emerging pathogen can be a microorganism that is totally new (e.g., human immuno-deficiency virus: HIV), one that was previously known, but only recently identified as a pathogen (e.g., Helicobacter pylori), or one that is old, but has undergone some changes (e.g., resistant microbes). Emerging pathogens have potential to be spread through the supply of drinking water, but their

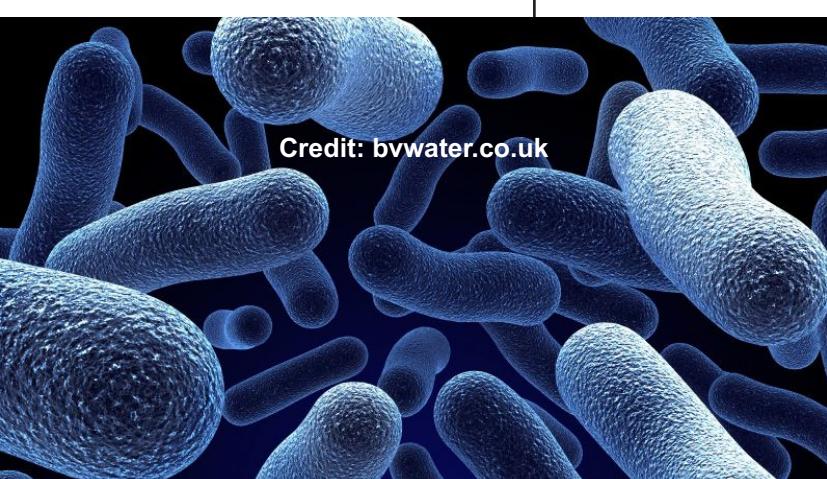
presence in water environment does not correlate with the presence of E. coli or other

indicator microorganisms such as coliforms, which are commonly used in different countries as a tool to monitor the microbiological quality of drinking water. However, the current indicator microorganisms have no more space for their improvement. In most cases, there is no perfect indicator microorganism to indicate the presence of emerging waterborne pathogens because of some serious limitations such as:

- a. Sensitive to inactivation through wastewater treatment processes and sunlight exposure.
- b. Short survival period as compared to microbial pathogens.
- c. Not indicative of exclusive faecal source.
- d. Ability to multiply in some natural environments.
- e. Inability to recognize faecal contamination source (point or non-point).
- f. Less correlation with the presence of pathogens.

The clinical illnesses associated with the emerging waterborne pathogens may be more severe, transmitted more rapidly or widely within the population or more difficult to prevent or treat as compared to other closely related pathogens.

Credit: bwwater.co.uk

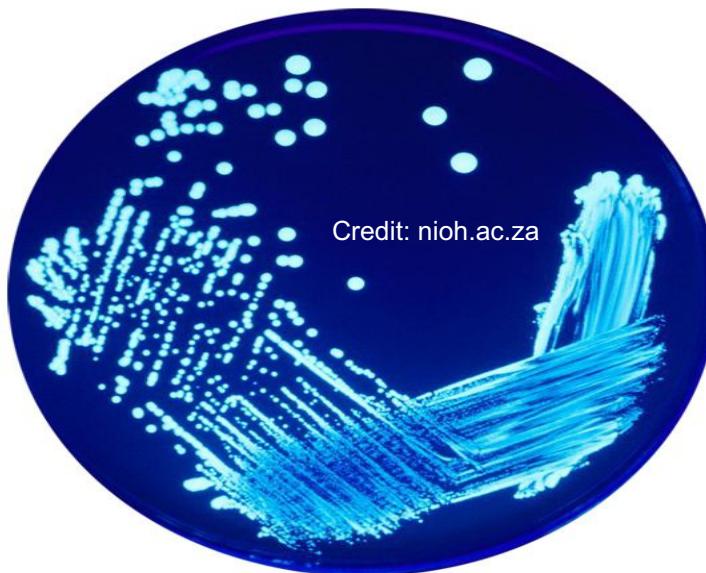


The primary mode of transmission is faecal-oral route and consumption of contaminated water and vegetables that has been irrigated with contaminated water. Recently, several "new or emerging" pathogens have arisen or arising as a continuing problem in drinking water due to the rapid emergence of waterborne pathogens. A complex relationship between host, pathogens and natural environment play a central role in the emergence of pathogens. The microbial agents, which may qualify as emerging waterborne pathogens include environmental mycobacteria, aeromonads (*Aeromonas sobria*, *A. caviae* and *A. hydrophila*), *Legionella pneumophila*, *Vibrio* sp. (*V. cholerae* O139 and *V. cholerae* O1), pathogenic *E. coli* (enteroinvasive *E. coli*, enteropathogenic *E. coli*, enteroaggregative *E. coli* and shiga toxin producing *E. coli*), *Yersinia enterocolitica*, *Helicobacter pylori*, multi-drug resistant *Pseudomonas aeruginosa*, *Klebsiella pneumoniae*,

Campylobacter jejuni and some viruses such as Enteroviruses, Noroviruses, Hepatitis A and E viruses, Adenoviruses, Influenza viruses etc. The rapid and continuous emergence of waterborne pathogens may be due to the following reasons:

- Increase in sensitive populations.
- Globalization of trade and travel.
- Lack of suitable techniques for their detection and source tracking.
- Changes in drinking water treatment technologies.
- Changes in food production processes and

pathogens.
I Lack of public health awareness and services. However, the rapid emergence of waterborne pathogens has created a serious threat to public health and therefore affects the economy of the world. Hence, there is an urgent need to develop the strategies for identification of these potentially emerging waterborne pathogens. Moreover, the development of microbial source tracking (MST) has allowed the identification of contamination sources of these waterborne pathogens. MST includes a group of molecular techniques particularly nucleic acid amplification methods that provide the sensitive, rapid and quantitative means for the detection of specific pathogens of public health concern including newly emerging pathogenic strains. These techniques are used to evaluate the microbiological quality of drinking water and pathogens removal efficiency of drinking and wastewater treatment plants.



supply.
f. Changes in climatic conditions and weather.
g. Molecular evolution (genetic re-assortment).
h. Multi-drug resistance (MDR) amongst the

These molecular techniques include:

- a. Ribotyping.
 - b. Amplified Ribosomal DNA Restriction Analysis (ARDRA).
 - c. Ribosomal RNA Intergenic Spacer Analysis (RISA).
 - d. Pulse-field Gel Electrophoresis (PFGE).
 - e. Denaturing-gradient Gel Electrophoresis (DGGE).
 - f. Terminal-restriction Fragment Length Polymorphism (T-RFLP).
 - g. Fluorescent in-situ hybridization (FISH).
 - h. Quantitative Polymerase Chain Reaction (qPCR).
 - I Multiplex Polymerase Chain Reaction (mPCR).
 - j. Repetitive DNA sequences (Rep-PCR).
 - k. Length heterogeneity-Polymerase Chain Reaction (LH-PCR).
 - l. Host-specific 16S rDNA analysis.
 - m. Nucleic Acid Microarrays.
 - n. On-chip technology.
- However, the best way to combat the newly emerging pathogenic microbes is to avoid the initial exposure

because the exposure routes are the common sources of human infection such as food, water and direct human contact. Further, it is also important to follow the precautionary guidelines for the safe handling of food, adequate water treatment and good personal hygiene. In addition, the general strategies should also be used at personal level to minimize the spreading of waterborne pathogens effectively like chlorination and boiling. However, waterborne pathogens promise to continue emerging as we recognize their presence in water environments. Improved or adequate treatment of source water supply is only one option for their control, but maintaining the constant water quality throughout the distribution system is a major challenge. Moreover, the adequacy of guidelines and standards are also required to be reassess and tightened for the safety of drinking water at both local and national level. Further, there is a need to expand and coordinate the surveillance systems for the early detection and tracking of emerging waterborne pathogens at local and national level to identify the cause of illness outbreaks and also to understand the environmental factors

contributing to these illness outbreaks. Further, the development of new, simple and quick molecular techniques is also required for the detection of pathogens in order to determine the extent of fecal contamination, types of pathogens involved and the correlation between pathogens and environmental factors. Nevertheless, the progress made in water and wastewater treatment technologies, emerging waterborne pathogens will always be a serious concern for public health in both developed and developing countries. Further, more studies are also required to understand the behavior and ecology of waterborne pathogens, so that their true potential as emerging waterborne pathogens could be evaluated for the safety of human health.

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Credit: bayareaplumbers.wordpress.com

Getting kids used to vegetables

Getting children to eat their vegetables might not be an endless battle if parents follow some research-based advice from a nutrition expert at Kansas State University.

Pregnant rodents' eating habits and their offspring's taste preferences shows that children's tastes start being shaped while they are still in the womb.

Studies also show that pregnant women who eat more foods with bitter polyphenolics, such as kale and Brussel sprouts, have children who are more receptive to them when they try them for the first time.

Infants can learn through repeated exposure and dietary variety. So focusing more on a child's willingness to consume a food rather than relying on the facial expressions they give when eating it. For example, some infants may frown at bitter vegetables,

but if they still swallow the food, their desire toward the food can be increased over time by continuing to serve it to them.

Babies as young as 6 months can detect what eating behaviors are normal and abnormal. They react when their parents eat foods they don't usually eat, and they take cues from parents as to what is and isn't desirable.

Babies start to think, 'Why does he keep putting this stuff in front of me, but he never eats it. We're being watched by our kids from very young ages.

Parents take advantage of watching eyes by eating vegetables similar to the ones they serve their babies and toddlers. Researchers advises starting with sweeter vegetables like corn and carrots because people of all ages generally prefer sweeter foods. To develop toddlers' growing tactile and fine motor skills,

parents can chop carrots into bitesize pieces and encourage toddlers to pick up corn kernel by kernel.

Young school-aged children are more likely to eat veggies that are cut and arranged into smiley faces or animals than served plain in a bowl. If you cut fresh vegetables into fun shapes or use grape tomatoes for eyes, suddenly the kids are taking something healthy they never would have eaten and actually enjoying it.

Involving children in cooking and food preparation as early as kindergarten and increasing their roles in the kitchen as they grow.

Research shows a direct connection between food preparation and vegetable consumption, so if children can help prepare veggies in the kitchen, grow them in the garden or select them at the grocery store, they will likely eat more of them. As children get older, their vegetable consumption tends to decrease, with the lowest consumption found in teenagers. One way to increase teenagers' vegetable consumption is to provide fully prepared vegetables in easy-to-access places. For example, parents could make sure a vegetable tray with dip is sitting on the counter when teens come home from school, or they could have a grab-and-go vegetable conspicuously placed in the refrigerator.

Credit: Kansas State University



Is breakfast most important meal of the day?

Breakfast provides the body and brain with fuel after an overnight fast - that's where its name originates, breaking the fast! Without breakfast you are effectively running on empty, like trying to start the car with no petrol! Breakfast kick-starts your metabolism, helping you burn calories throughout the day. It also gives you the energy you need to get things done and helps you focus at work or at school. Those are just a few reasons why it's the most important meal of the day.

Nutritionists advise:

- breakfast should be eaten within two hours of waking
- a healthy breakfast should provide calories in the range of 20-35% of your guideline daily allowance (GDA).

Breakfast immediately raises the body's energy level and restores the blood glucose level to normal after an overnight fast. It also raises the muscle and liver glycogen stores. Carbohydrate is the preferred fuel for muscle and the nervous system. Breakfast immediately lowers the blood level of the stress hormone cortisol, which peaks during the early morning hours.

Many studies have linked eating breakfast to good health, including better memory and concentration, lower levels of "bad" LDL cholesterol, and lower chances of getting diabetes, heart disease, and being overweight.

Children who habitually consume breakfast are

more likely to have favorable nutrient intakes including higher intake of dietary fiber, total carbohydrate and lower total fat and cholesterol. Breakfast also makes a large contribution to daily micronutrient intake. Iron, B vitamins (folate, thiamine, riboflavin, niacin, vitamin B6, and vitamin B12) and Vitamin D are approximately 20–60% higher in children who regularly eat breakfast compared with breakfast skippers.

Consuming breakfast can also contribute to maintaining a body mass index (BMI) within the normal range.

Studies show that most people who lose weight and keep the weight off eat breakfast every day. So, breakfast really is the most important meal of the day!

Credit: wholefoodsmarket.com



EATING BREAKFAST HAS LONG TERM HEALTH BENEFITS. IT CAN REDUCE OBESITY, HIGH BLOOD PRESSURE, HEART DISEASE AND DIABETES.

NATIONAL HEALTH SERVICE

Source: shakeupyourwakeup.com, webmd.com, doi: 10.3389/fnhum.2013.00425, John L Ivy, PhD- University of Texas at Austin (<http://easacademy.org/>)

-Dr shuchi upadhyा, Dept. of Food Science, Uttarakhand University

Zika virus protection by a single dose of nucleoside vaccine

A new Zika vaccine candidate has the potential to protect against the virus with a single dose, according to a research team led by scientists from the Perelman School of Medicine at the University of Pennsylvania. As reported in *Nature* this week, preclinical tests showed promising immune responses in both mice and monkeys.

The research involved a collaboration among Weissman's laboratory at Penn and several others, including the laboratories of Barton F. Haynes at Duke University and Theodore C. Pierson at the National Institute of Allergy and Infectious Diseases (NIAID), part of the National Institutes of Health (NIH).

Prompted by the recent Zika virus outbreaks in Latin America and some parts of the United States, scientists around the world have been racing to develop candidate vaccines, and already several have been tested in animals. The new candidate vaccine is the first to show such potent and long-lasting protection without the use of a live virus.

Traditional viral vaccines contain a weakened or killed version of the virus or isolated viral proteins. By contrast, the new Zika candidate vaccine uses tiny strands of RNA that

hold the genetic codes for making viral proteins. These RNA molecules are modified versions of the so-called messenger RNAs (mRNAs) that normally carry information from genes and serve as blueprints for the making of proteins within cells. In this case, the mRNAs -- produced and purified in a laboratory or biotech production facility - are delivered like a normal vaccine in an injection. Injected mRNAs normally would be cleared from the body within minutes by a patient's immune system, but these mRNAs are modified so that they are ignored by the immune system and can easily enter cells. Once inside cells, they are taken up by cellular protein-making machinery and induce the production, over weeks, of the viral proteins they encode. This extended production of viral proteins mimics what a live virus vaccine would achieve. Live virus vaccines - using slow-replicating versions of the virus they are meant to protect against -- tend to induce much more powerful immune protection compared to vaccines that are based on non-replicating versions of a virus or isolated viral proteins. Live virus vaccines have serious potential drawbacks, though, including harmful infection with the virus in

people who have weakened immune systems. Some newer vaccine candidates use harmless viruses such as modified adenoviruses to deliver genes that encode immunizing viral proteins. To date, an adenovirus-based strategy is the only Zika vaccine candidate that has shown strong protection in monkeys with a single dose; however, the immune system tends to attack adenoviruses and in some cases may neutralize them before they can deliver their immunizing payloads.

The mRNA-based strategy has none of these drawbacks.

The new candidate vaccine contains mRNAs encoding two key proteins from a Zika virus strain isolated in a 2013 outbreak. The researchers found that in mice, a single injection of 30 millionths of a gram of these mRNAs - a small fraction of the dose used for a typical vaccine -- induced a rapid immune response, which protected mice from intravenous exposure to a separate Zika strain two weeks later. That protection, resulting in zero detectable virus in the bloodstream a few days after exposure, was maintained even when the mice were exposed to Zika virus five months after vaccination.

An Engineered Herpesvirus Activates Protective Immunity

Currently, no vaccine is available to treat HSV infections. The herpes simplex virus, also known as HSV, is an infection that causes herpes. Herpes can appear in various parts of the body, most commonly on the genitals or mouth. There are two types of the herpes simplex virus. HSV-1, also known as oral herpes, can cause cold sores and fever blisters around the mouth and on the face. HSV-2 is generally responsible for genital herpes outbreaks. According to The American Social Health Association, under a microscope herpes simplex 1 and herpes simplex 2 are virtually identical, sharing

approximately 50% of their DNA. Both herpes type 1 and herpes type 2 infect the mucosal surfaces of the body – most often the mouth or the genitals and then establish latency in the nervous system. For both herpes simplex 1 and 2, it is estimated that two thirds of those infected have no noticeable symptoms or no symptoms at all. Studies have shown that both herpes 1 and herpes 2 can be spread when there are no symptoms present. Researchers from University of Illinois College of Medicine, Chicago, Illinois, USA report that recombinant HSV-1 with a mutation in the γ 134.5

protein, a virulence factor, stimulates dendritic cell (DC) maturation which is dependent on TANK-binding kinase 1 (TBK1). When exposed to CD11+DCs, the mutant virus that lacks the amino terminus of γ 134.5 undergoes temporal replication without production of infectious virus. Results suggest that activation of TBK1 by engineered HSV is crucial for DC maturation, which may contribute to protective immunity. Their findings were published in *Scientific Reports*.

Source: doi:10.1038/srep41461, healthline.com

Researchers have found a hormone in the brain that stimulates Burning of Fat

Peptides in the mammalian hypothalamus did not lead to the identification of neuroendocrine hormones that control body weight, and endocrine factors that potently stimulate body fat loss have since remained unknown. For the first time, researchers have found a hormone in the brain that stimulates fat metabolism. Biologists at The Scripps Research Institute (TSRI) in San Diego made the discovery, which could

affect future development of fat-burning drugs. Their findings were published in *Nature Communications*. The central nervous system plays a critical role in regulating energy balance and body fat stores, distinct from its effects on feeding behaviour. Researcher reported FLP-7 and NPR-22 function together as a ligand-receptor pair and define a conserved signalling pathway with an unexpected role in fat metabolism. They also reported that the FLP-7

peptide is secreted from neurons, and acts in the intestine via the tachykinin 2 receptor orthologue NPR-22 to mobilize fat stores body fat loss in *Caenorhabditis elegans*. This research will help in identifying novel and selective neuroendocrine factors that underlie the central control of body fat metabolism.

Source: Nat. Commun. 8,14237 doi: 10.1038/ncomms14237 (2017), <http://now.howstuffworks.com/>

Electronic Devices for Specially Abled Persons

This year, the government of India has directed to celebrate National Science Day with a theme "Science and technology for specially abled persons" in order to encourage innovation, awareness and reach of accessibility solutions worldwide to over one billion differently-abled people in the world. As per records, 50 per cent of India's 100 million differently-abled persons are under the age of 30 and there is a huge need for assistive technology products. The government plans to bring together government, corporates, educators, NGOs and the differently-abled people so as to understand their needs and provide information on available solutions that can include differently-abled people to participate independently

in all walks of life. People with disabilities meet barriers of all types. For years, disabled people had to rely on somebody else doing things for them. But now with the help of assistive technology, disabled people can do things that would have never been possible before - from switching on a light to having a voice to express themselves. Technology has always lent a helping hand for people with disabilities such as visual impairment, speech impairment, people with motion disabilities or disorders etc. There are a lot of apps and gadgets that can help ease the difficulties people with disability face on a daily basis. Moreover, technologies that could help disabled people contribute more in the workplace - and improve their quality of life.

Electronic Devices for Disabilities

Technology has always lent a helping hand for people with disabilities

such as visual impairment, speech impairment, people with motion disabilities or disorders etc. From providing help with reading despite a visual impairment, to keeping the deaf included in a group conversation, to helping patients with shaky hands have a meal independently there are many assistive technologies that are helping the disabled get assistance when and where they need it. There are a lot of apps and gadgets that can help ease the difficulties people with disability face on a daily basis and this article presents some of these. Technology well coupled with electronics advances, electronic based technology has already taken a very special place towards illuminating the lives of specially abled people and much more is expected in the days to come. The aim of the article is to present the development of various electronic based technological aids/gadgets/devices which are really proving to be very helpful in making the lives of specially abled persons more comfortable. We have to further think about how these developments will reach the common people who need these aids and how the lives of these people will be transformed.

Credit: blog.scope.org.uk



Devices for seeing
Dot: is a wearable that is also the world's first Braille smartwatch. Dot is a practical solution that is more affordable than regular e-Braille devices which may cost thousands, yet still works well for the blind. Dot helps the blind access messages, tweets, even books anywhere and at any time. It can connect via Bluetooth to any smartphone then retrieve and translate the text (from an email or messaging app) into Braille for its owner.

Braille ebook reader: The amazing Braille e-reader, a Kindle style e-reader, makes blind and partially sighted people to read easily. Its alphabets enable them to read by tracing lines of raised bumps with the help of their fingers. It also helps in understanding graphics, figures and even graphs.

Tactile Wand Electronic Stick: this helps visually impaired people to determine the object that comes in their way. Stick detects the object in front of the user and vibrates with the increasing intensity as soon as you get closer to it.
Finger Reader: is a wearable tool to help read text with two functions: to help the visually impaired read printed text on a book or on an electronic device, and also to be used as a language translation tool. A user can wear this device on a finger, then point it on a body of text, one line at a time. The small camera on

the Finger Reader will scan the text and give real-time audio feedback of the words it detects. It also notifies the reader via vibrations when it is at the start of a line, end of a line, moving to a new line or when the user is moving too far away from the text baseline.

Be My Eyes: is an application that helps blind people "see" the world. It works by making a network that connects the blind with volunteers from around the world. It is an easy way to ask for help for simple tasks like checking on the expiry date on a milk carton. Volunteers will receive notifications or requests for help, and if they are too busy, the app can find someone else to step in and help. Each request will trigger a video call to volunteers so they can help the user.

Sesame phone: is a touch-free smartphone designed for people with disabilities. This phone is designed to be used with small head movements, tracked by its front-facing camera so to access all the features of a smartphone without even touching this device. Gestures are recognized as using a finger to operate it: swipe, browse, play and more. Voice control is also added to provide a real hands-free experience on the phones.

The Kapten PLUS Personal Navigation Device: Traveling

anywhere alone can be a challenge for the visually impaired. There is always the possibility of taking a wrong turn or getting disoriented in the shuffle of busy pedestrians. The Kapten PLUS Personal Navigation Device is a very small GPS locator designed to be carried on one's person. As the user walks down the street, the device speaks direction and location, so the user always knows where they are and where they're heading. In addition, the user can plan and store routes and tag locations for later reference. Designed as an affordable GPS accessory (and not a total replacement) to cane or guide-dog travel, the Kapten offers an incredible amount of security, confidence and a wealth of useful information, allowing blind people to travel independently without fear of getting lost or wandering in the wrong direction.

The Car for the Blind: Speaking of mobility for the blind, engineers are developing a car that can actually be driven by the blind. The aim is to integrate several computer systems, sensors and cameras to observe the environment around the vehicle and provide alternate forms of sensory input, including sound and vibration. This may include seat vibrations of various strengths and locations, pulsing vibration signals in gloves worn by the driver, auditory alerts from a headset and a sort of

screen that paints a virtual picture of the surroundings using compressed air.

Assisted Vision Smart Glasses: is a pair of glasses that gives a little sight so that the blind people can walk around unfamiliar places, can recognize obstacles. This gadget gives a great independence, consists of two small cameras, gyroscope, compass, GPS unit, headphone and transparent OLED displays. With this, visually impaired people would be able to distinguish between light and dark. The glasses will make anything a little brighter when comes near so that they can discern people and obstacles.

Devices to help listening **Cochlear Implant:**

Cochlear implant is not new but this little device is still pretty amazing and only grows more so as the software and hardware continue to improve. The single-channel implant provided mostly static, while early commercial implants with five channels allowed for some indication

of cadence and rhythm. Today's cochlear implants, however, have more than twenty sound channels, allowing wearers to hear with much better quality. The implant is still far from perfect, with background noise continually being a problem, but the technology has advanced to such a point now that voices can be heard with enough clarity to be readily understood and identified, making verbal communication possible and productive.

UNI: is a two-way communication tool for the deaf using gesture and speech technology. This tool works by detecting hand and finger gestures with its specialized camera algorithm, then converting it to the text in very short time to provide meaning of a given sign language. Also equipped is voice recognition software that will convert speech into text for two-way communication. UNI also enables to create own sign language with its sign builder, so it is easy to add custom language to the

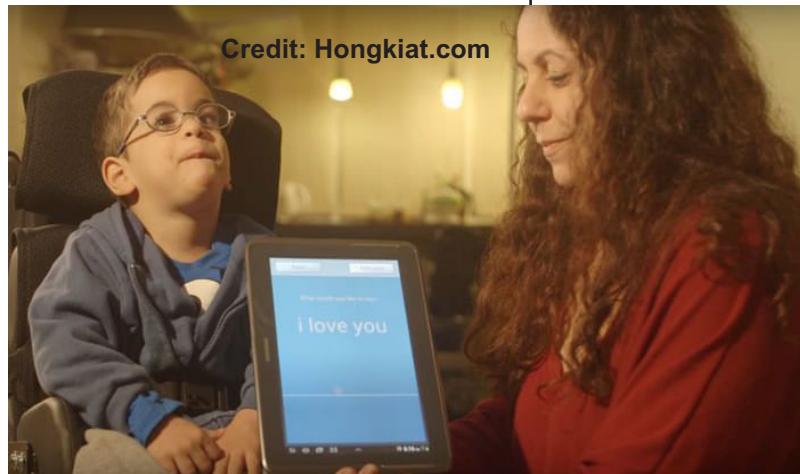
dictionaries. It is a subscription-based app with two versions, one that requires a data connection and another that doesn't.

Transcence: the deaf can communicate via one-on-one conversations using sign language or lip-reading, but difficult about when a group conversation arises. Transcence offers a great solution that can still keep the deaf in group conversations. In a conversation, with the use of each participant's smartphone's microphone, the app catches what they are saying then converts it into text in real time. Each speaker has its corresponding text bubble, differentiated by color, just like what we would find in a regular group messaging chat room.

Technology for speaking **The DynaVox EyeMax**

System: gives individuals with paralysis, cerebral palsy and stroke victims the ability to participate in spoken communication using only their eyes. Using a sophisticated eye tracking system, users can interact with an on-screen keyboard, allowing them to enter words and phrases, which are then translated into spoken text via the device's text-to-speech mechanism. In addition to the on-screen keyboard, the language software on the device offers hundreds of pre-defined phrases and words, which can be selected from lists or chosen via pictures and scenes, making the device instantly accessible to young children and the mentally disabled who may be unable to grasp written language.

Credit: Hongkiat.com



Talkitt: is an innovative application to help people with speech and language disorders to communicate with someone else. It will translate unintelligible pronunciation into understandable speech so we can understand what they meant to say, despite the speech impediment. It works in any language. Works by learning the user's pattern speechs first, creating a personal speech dictionary; then will identify and recognize the unintelligible pronunciation and translate them into speech we can understand.

Technologies for other means

Axs map: many public sites are not equipped with facilities like wheelchair ramps and wheelchair-accessible restrooms. This is a source of inconvenience to those who require a

wheelchair to move around. AXS Map is a crowd sourced map that carries information about wheelchair-accessible ramps and restrooms in public places such as restaurants, hotels, shopping malls and more. The map also carries information about how well-designed these facilities are with the help of star ratings.

Assist-Mi: is an assistance application that helps disabled people to get assistance in real-time. It is basically an app that connects service providers and caregivers with the disabled who may need their assistance at a moment's notice. Services include help in getting to work, to go shopping for essentials or for travel. It has a feature called Mi-Profile which provides a user's needs so the service provider know what to do when

assistance is requested. The app also has two-way communication and GPS for better location info.

Liftware: is a self-stabilizing handle on which one can attach an eating utensil like a fork or spoon. It is very helpful for patients who suffer from Parkinson's disease or other forms of motion disorders that causes hand tremors. Liftware stabilizes up to 70% of the disruption and helps reduce the spilling of contents from the utensil before food reaches the patient's mouth. Each liftware comes with the stabilizing handle, a charger and three utensils, a spoon, fork and soup spoon. Each charge can last for several meals and the handle can be wiped down while the spoons and fork can be washed like a normal utensil.

Head Mouse Nano: enables people to control a computer wirelessly using head movements. It requires slightly more motor ability in its users, but is cheaper.

Bionics: advances in 3D printing and bio-electronics are also helping replace missing limbs with prosthetics and give disabled people extra functionality. Bionics makes prosthetic limbs, including hands that can be controlled via mobile app.

The DEKA Robotic Arm: is a highly sophisticated, highly functional prosthetic arm for injured with such precision and control that it can peel a grape. The arm supports a number of customizable controls and modular components, making it easy to tailor to the wearer's individual needs, whether he requires only a hand or an entire arm and shoulder socket. Another promising feature of the arm is its sensory feedback system.

Credit: Hongkiat.com



A RoboDesk For Electronic Devices:

Electronic Devices: it's a special sensor device for people in wheelchairs who face the problem of "pressure sores". Pressure sores "happen when someone is sitting in the same position for too long. It decreases blood circulation to that area and eventually leads to a breakdown of the skin in that area. The sensor device developed fits easily on a wheelchair seat and it's connected to a smartphone app via Bluetooth. If the app notices that the pressure hasn't changed in a certain period of time it will notify the user as a reminder to move. It's raising that awareness for the user because we're often paying attention to other things throughout our day and don't remember to move. Further, they hope to bring the product to market and develop a version for hospitals where patients face health problems related to bedsores.

Head Mouse Extreme:

replaces the standard keyboard for the people who can't make use of or have limited use of their hands. It translates the head movements into proportional mouse pointer movements and performs the respective operation.

Skinniest Disability Scooter:

scooter: works the same way like other scooter does in public road but it gives an easy way for disabled people who can't travel or walk by their own. It is four-wheeler scooter and full lightning system with lockable but removable doors.

Gesture Search: This app

is designed for people who have paralysis or have lost partial limbs. You are required to draw the initial letter or number of anything that you want to operate on the device's screen. It helps the specially-abled to quickly navigate through contacts, applications, settings, bookmarks, and much more with utmost ease. This application is available on android devices.

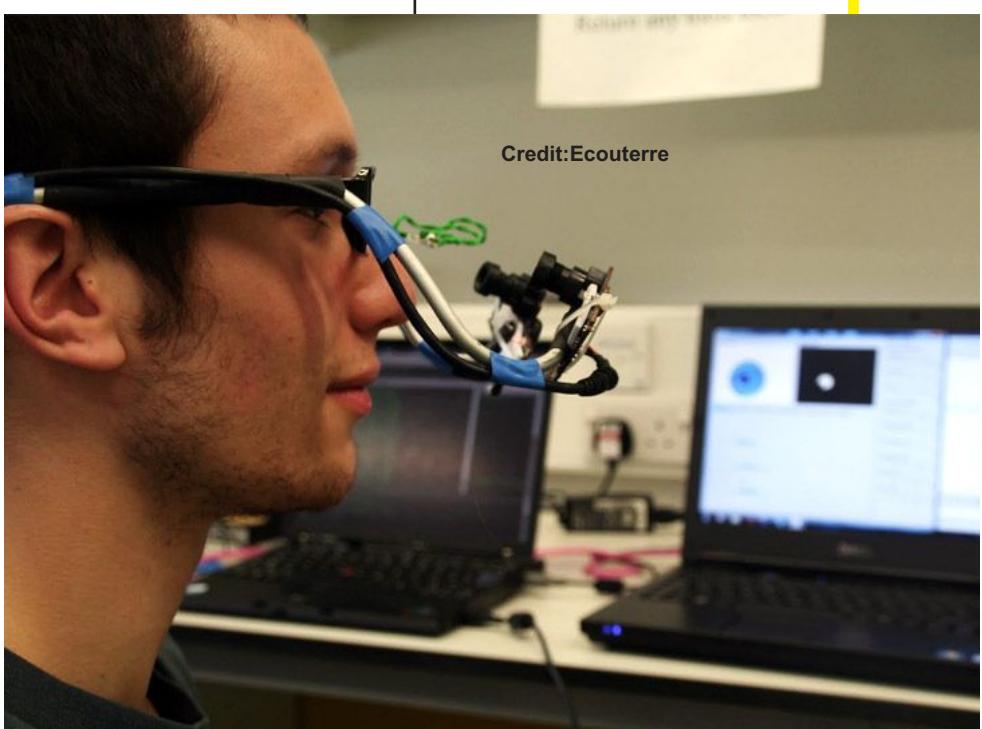
Conclusion

People with disabilities meet barriers of all types. However, technology is helping to lower many of these barriers. By using computing technology for tasks such as reading and writing documents, communicating with others, and searching for information on the Internet, students and employees with disabilities are capable of handling a wider range of activities independently.

Adaptive technology is a fairly new term, but the basic idea is not. Some adaptive devices are simple, like the cane, which has a history as old as mankind itself. Others seem to come more from the realm of science fiction. However, mundane or complicated, all are a testament to human determination, creativity and ambition. As much as disabled people often benefit from technology developed for regular consumers, it also works the other way around. It is discovered that when we focus on users with disabilities our products get better for everybody. While it's great news for disabled people that tech companies are increasing their interest in making products for them in order to make life better for people with disabilities, there's still a long way to go

Dr. S. S. Verma, Department of Physics, S.L.I.E.T., Longowal, Distt.-Sangrur (Punjab)-148106

Credit:Ecouterre



Researchers create 3-D beating heart

Matters of the heart can be complicated, but York University scientists have found a way to create 3D heart tissue that beats in synchronized harmony, like a heart in love, that will lead to better understanding of cardiac health and improved treatments.

York U chemistry Professor Muhammad Yousaf and his team of grad students have devised a way to stick three different types of cardiac cells together, like Velcro, to make heart tissue that beats as one.

Until now, most 2D and 3D in vitro tissue did not beat in harmony and required

scaffolding for the cells to hold onto and grow, causing limitations. In this research, Yousaf and his team made a scaffold free beating tissue out of three cell types found in the heart - contractile cardiac muscle cells, connective tissue cells and vascular cells.

The researchers believe this is the first 3D in vitro cardiac tissue with three cell types that can beat together as one entity rather than at different intervals.

In addition, the substance used to stick cells together (ViaGlue), will provide researchers with tools to create and test 3D in vitro cardiac tissue in their own

labs to study heart disease and issues with transplantation.

Cardiovascular associated diseases are the leading cause of death globally and are responsible for 40 per cent of deaths in North America.

Although the 3D cardiac tissue was created at a millimeter scale, larger versions could be made, said Yousaf, who has created a start-up company OrganoLinX to commercialize the ViaGlue reagent and to provide custom 3D tissues on demand.

The Power of Tea

A compound found in green tea could have lifesaving potential for patients with multiple myeloma and amyloidosis, who face often-fatal medical complications associated with bone-marrow disorders, according to a team of engineers at Washington University in St. Louis and their German collaborators.

Credit: quirkybyte.com



The compound epigallocatechine-3-gallate (EGCG), a polyphenol found in green tea leaves, may be of particular benefit to patients struggling with multiple myeloma and amyloidosis. These patients are susceptible to a frequently fatal condition called light chain amyloidosis, in which parts of the body's own antibodies become misshapen and can accumulate in various organs, including the heart and kidneys.

Bieschke's team first isolated individual light chains from nine patients with bone marrow disorders that

caused multiple myeloma or amyloidosis, then ran lab experiments to determine how the green tea compound affected the light chain protein.

Bieschke previously examined EGCG's effect in both Parkinson's and Alzheimer's disease, and found it prevented dangerous buildups of protein present in both diseases. His team had a similar conclusion in this study: In bone marrow patients, the EGCG transformed light chain amyloid, preventing the misshapen form from replicating and accumulating dangerously..

Soft robot helps the heart beat

Harvard University and Boston Children's Hospital researchers have developed a customizable soft robot that fits around a heart and helps it beat, potentially opening new treatment options for people suffering from heart failure.

The soft robotic sleeve twists and compresses in sync with a beating heart, augmenting cardiovascular functions weakened by heart failure. Unlike currently available devices that assist heart function, Harvard's soft robotic sleeve does not directly contact blood. This reduces the risk of clotting and eliminates the need for a patient to take potentially dangerous blood thinner medications. The device

may one day be able to bridge a patient to transplant or to aid in cardiac rehabilitation and recovery.

This research demonstrates that the growing field of soft robotics can be applied to clinical needs and potentially reduce the burden of heart disease and improve the quality of life for patients. The research, published in *Science Translational Medicine*.

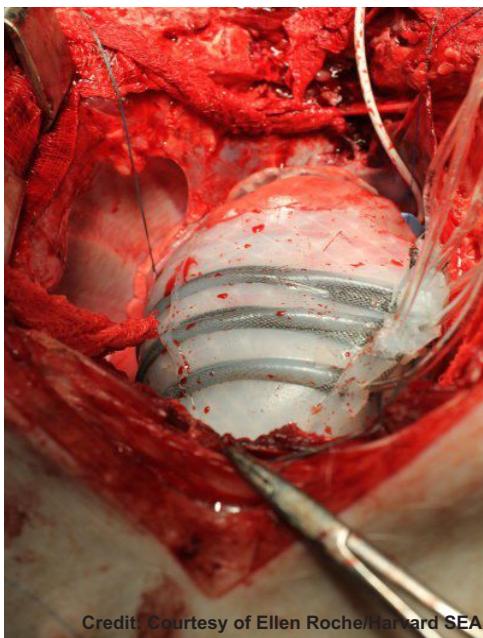
This work represents an exciting proof of concept result for this soft robot, demonstrating that it can safely interact with soft tissue and lead to improvements in cardiac function. Heart failure affects 41 million people worldwide. Today, some of the options to treat it are mechanical pumps called ventricular assist devices (VADs), which pump blood from the ventricles into the aorta, and heart transplant. While VADs are continuously improving, patients are still at high risk for blood clots and stroke. To create an entirely new device that doesn't come into contact with blood, Harvard researchers took inspiration from the heart itself. The thin silicone sleeve uses soft pneumatic actuators placed around the heart to mimic the outer

muscle layers of the mammalian heart. The actuators twist and compress the sleeve in a similar motion to the beating heart. The device is tethered to an external pump, which uses air to power the soft actuators. The sleeve can be customized for each patient, said Roche. If a patient has more weakness on the left side of the heart, for example, the actuators can be tuned to give more assistance on that side. The pressure of the actuators can also increase or decrease over time, as the patient's condition evolves.

The sleeve is attached to the heart using a combination of a suction device, sutures and a gel interface to help with friction between the device and the heart.

The SEAS and Wyss engineers worked with surgeons at Boston Children's Hospital to develop the device and determine the best ways to implant the device and test it on animal models.

More research needs to be done before the sleeve can be implanted in humans but the research is an important first step towards an implantable soft robot that can augment organ function.



Credit: Courtesy of Ellen Roche/Harvard SEAS

Indian Multi-Role Helicopter (IMRH)

The 12t helicopter, if developed, would serve as a replacement for India's fleet of MiL Mi-8 and Mi-17 utility helicopters. Hindustan Aeronautics (HAL), aerospace and defence major, aims to indigenously develop 12-tonne class Indian Multi Role Helicopter (IMRH) with service ceiling of around 20,000 feet, 3,500 kg payload and a seating capacity of 24. The major roles to be performed are tactical troop transport, casualty evacuation, under slung load, combat search & rescue, anti-surface operations, off-shore operations, VIP/VVIP



Credit: rediff.com

transport and air ambulance. The Army/IAF version will have a significant hovering and payload capability especially at high altitude

The proposed IMRH will be powered by twin engines (yet to be identified), equipped with automatic flight control system, state-

of-the-art mission systems, advanced cockpit display and avionic systems, etc, to meet the utility and armed roles of the Indian Armed Forces.

HAL also hopes to find export customers for the proposed type.

Source: Financialexpress.com, flightglobal.com

Credit: Indian Defence Analysis





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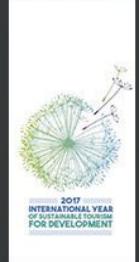


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