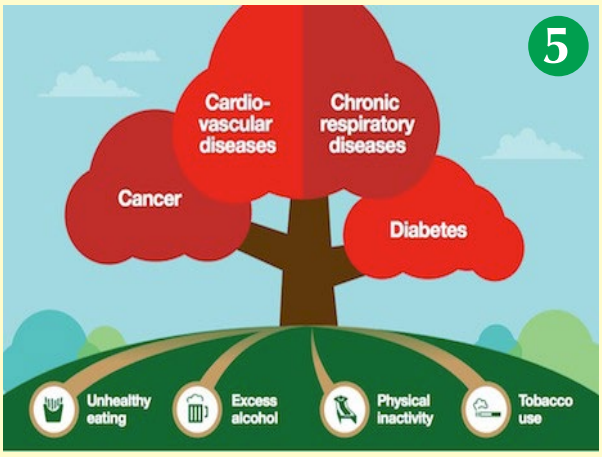
KAVI - ICR News

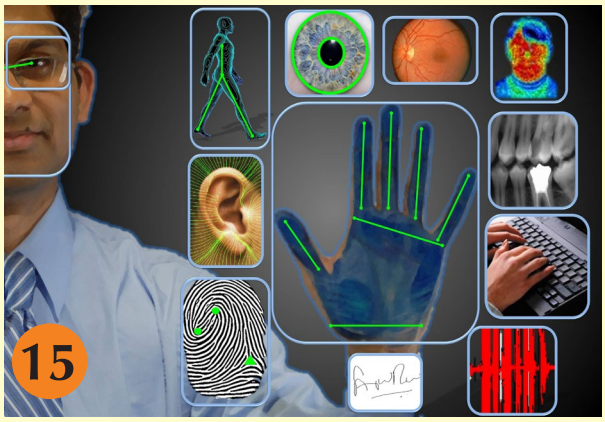
KAVI - Institute for Clinical Research
University of Nairobi

July, 2017 Issue No. 3

Research and Innovation

Inside this issue





KAVI - ICR

KAVI - ICR Newsletter Issue No. 3, 2017

Professor Omu Anzala,
Director,
KAVI – Institute of Clinical Research

Message from the Director

Since KAVI-ICR was elevated to an institute, we have set our sights on diversification with a purpose. We do this taking into account the prevailing circumstances in the country.

We are witnessing the emergence and re-emergence of infections; diseases that were previously confined to specific geographical pockets are being transmitted in unlikely areas. This is exemplified by the Chikungunya outbreak in Mandera and is a clear indication of vector adaptation.

Our research direction is also informed by our collaborations, for example we are seeking to initiate studies on viral fever at our research station in TaitaTaveta.

Over the past few years, Kenya has been grappling with the emergence of cancer. It is still unclear if this can be attributed to improved diagnosis or an increase in occurrence. The burden of cancer and its incidence must therefore be scrutinised further to paint a clear picture of the situation.

We have other non-communicable diseases such as obesity, hypertension and diabetes. Although these are not getting as much attention as cancer recently, these conditions may be the underlying causes of some cancers.

We are looking to utilise stem cell therapy for cancers such as leukaemia, as well as the cure and management of sickle cell anaemia.

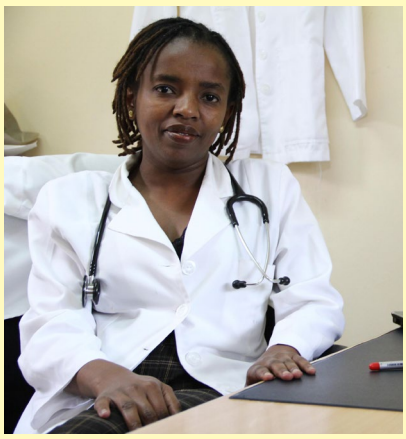
Our interest in stem cells is informed by the understanding of cell biology, and at the same time the need to incorporate other specialists at the College of Health Sciences.

Our outlook for the future is to ensure that the work on stem cells eventually leads to a centre for stem cell research and regenerative medicine.

We are excited about enhancing our thematic areas while being cognizant of the country's needs. We strive to keep collaborating with local, regional and international researchers.

This issue touches on KAVI-ICR's pursuit of knowledge in various ways; I extend a warm welcome to you to join us on our journey.

Ebola Vaccine Study



Dr. Gaudensia Mutua

Ebola virus disease (EVD) is an infection caused by one of the Ebola virus species. The virus is highly infectious and the disease can kill up to 90% of those infected. The virus was discovered in 1976 in the Democratic Republic of Congo (DRC) by Dr Peter Piot. Since then there have been sporadic outbreaks involving several hundreds of people mainly in the DRC but also in Uganda and Sudan.

In March 2014, the World Health Organization reported the first case of EVD in Guinea. This marked the beginning of the largest and most devastating outbreak ever recorded. The outbreak has remained mainly in West Africa, especially affecting Sierra Leone, Guinea and Liberia, crippling the health care system in these three countries by killing a large number of their health care providers. By mid-July 2015, there were approximately 30,000 suspected or confirmed cases of EBV which resulted in about 10,000 deaths. It was not until June 2016 that WHO officially declared the end of the Ebola Transmission in Guinea more than two years after the first case.

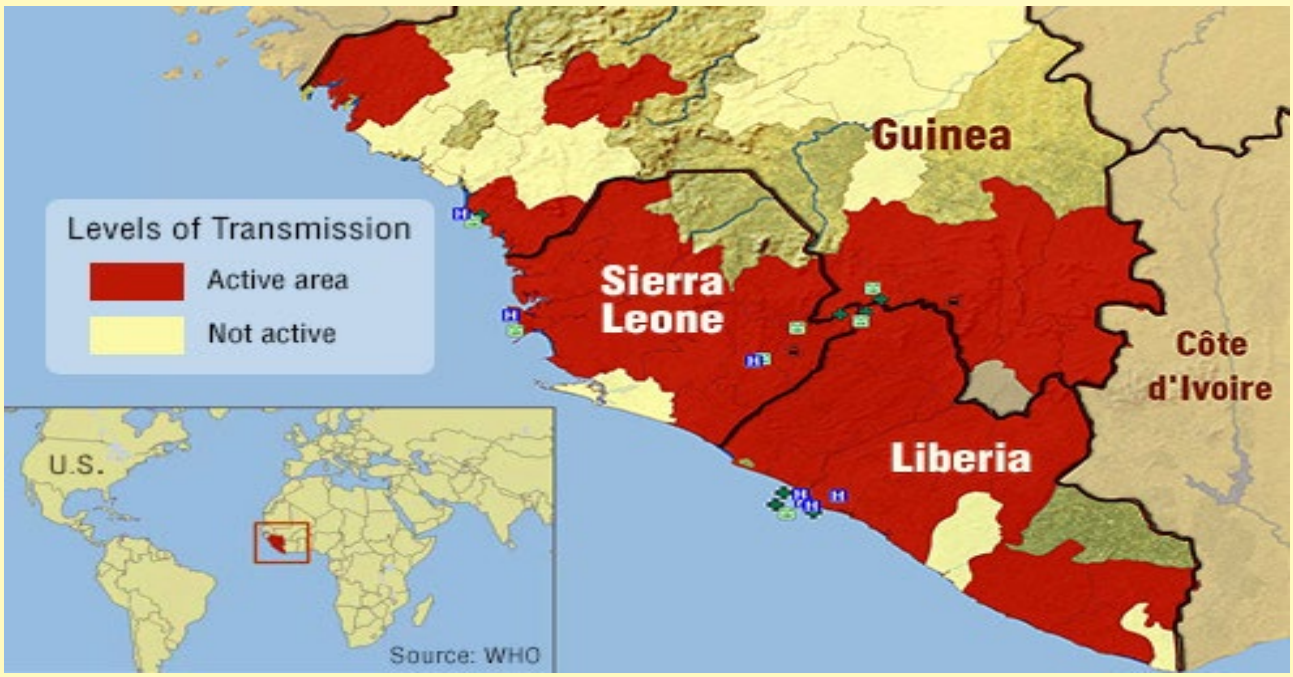
Among EVD survivors, long-term complications are being observed in what is now being termed as the "Post-Ebola Syndrome". The syndrome is characterized by among other things: eye complications resulting in blindness, hearing loss, recurrent headache, muscle and joint pains with extreme fatigue.

At this moment, it is still unclear whether this syndrome is due to the disease, the treatment or the body's immune response during the disinfection process. There are also reports of the virus persisting in semen and in the eye even after being cleared from the blood in the absence of any symptoms of the disease. Survivors also experience the social and psychological effects of coming home to face the loss of their loved ones, who during an outbreak are often buried in unmarked graves.

This outbreak has caused widespread fear across the world with countries watching fearfully as isolated cases were being reported in the United States of America, Spain and Britain due to international travel. In the midst of this apprehension, Kenya has taken centre stage in supporting efforts to contain this outbreak.

On 9th January 2015, the President of the Republic of Kenya, His Excellency Uhuru Kenyatta flagged off the first team of Kenyan health volunteers to Sierra Leone and Liberia. The team comprising mainly of doctors, nurses and lab technologists were part of the African Union Support to Ebola Outbreak in West Africa (AESEOWA) whose mission was to help their West African colleagues contain the worst Ebola outbreak documented in recent times.

In his speech, HE the President underscored Kenya's commitment to International Service in times of crisis. In the immediate term, our Kenyan delegation helped to support the global efforts to contain the current outbreak.



Ebola outbreak in West Africa, 2014
[Source: http://www.webmd.com/a-to-z-guides/ebola-fever-virus-infection]

[Source: https://www.unicefusa.org/mission/survival/ebola]

In the long-term, a safe, effective, affordable and accessible vaccine against the Ebola Virus is the best hope for preventing future outbreaks. Development of such a vaccine is now viewed as an urgent international priority and concerted efforts are underway to achieve this. Kenyan Scientists have stepped up to the challenge and are part of this global undertaking.

KEMRI Wellcome Trust Kilifi was the first research institution to test a recombinant replication-competent vesicular stomatitis virus based candidate vaccine (rVSV-ZEBOV). This study was done to assess the safety of and immune responses to the vaccine. Subsequently the vaccine was found to be safe and was further tested for efficacy in Guinea. Preliminary results provided by investigators indicate that the vaccine has been highly efficacious even after a single dose.

On 1st April 2015, KAVI-Institute of Clinical Research (KAVI-ICR) became the second research organization to initiate an Ebola Vaccine study. This study is testing two candidate vaccines based on the Adenovirus type 26 (AD26) and Modified Vaccinia Ankara (MVA) vectors. By 22nd June 2015 the study was fully enrolled with a total of 72 volunteers at both our clinics in Kangemi and at the College of Health Sciences- UoN (Kenyatta National Hospital).

The aim of this study was to assess the safety of the 2 vaccines and immune responses stimulated by vaccination. In February 2016, a Phase 2 follow-up study was initiated at KAVI to enrol a broader range of study participants including volunteers aged less than 18years in order to establish safety and immune responses in younger populations. These studies are part of a global network of investigators committed to finding a vaccine against the Ebola Virus.

In conclusion, Kenya remains highly vulnerable to an EBV outbreak due to several factors: the country is a hub for international travel both on the continent and globally, and we neighbour countries that have had outbreaks of Ebola; this presents the potential for spill-over through our cross-border interactions.

Finally, Kenya has had more than its fair share of terrorism and there exists the dangerous possibility of using the Ebola Virus as an agent for bioterrorism. We therefore cannot afford to sit passively waiting for others to solve our problems. It is our duty and responsibility to participate actively in finding a lasting solution to this problem. The scientists in Kenya call upon all Kenyans to support this effort and we continue to thank and appreciate all those who have volunteered to participate in our clinical trials.

References:

1. Henao-Restrepo, A.M. et al., 2015. Efficacy and Effectiveness of an rVSV-vectored vaccine expressing Ebola surface glycoprotein: interim results from the Guinea ring vaccination cluster randomised trial. *The Lancet*, 386(9996) pp.857-866.
2. Kanapathipillai, R. et al., 2014. Ebola Vaccine – An Urgent International Priority. *New England Journal of Medicine*, vol. 371(24) pp.2249-2251.

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[Source: http://www.sciencemag.org/tags/ebola]

Non-Communicable Diseases (NCDs)

Geoffrey Ombati Oino

Non-communicable diseases (NCDs) are diseases that are not directly passed from one person to another. They commonly involve hereditary predispositions (genetic risks), environmental exposures, lifestyle factors, aging, birth defects, and malnutrition (including deficiencies and overeating). Also of importance are socio-economic status and the social conditions that impact the behaviour of many diseases.

NCDs affect people of all ages, nationalities and classes. They are typically of long duration (chronic) and progress slowly. Around the world, they affect women and men almost equally. Not only are they a health problem, but also a development challenge. Most chronic diseases do not result in sudden death; they are likely to cause people to become progressively ill and incapacitated, especially if their illness is not managed correctly. The four most common categories of NCDs are cardiovascular (mainly heart disease and stroke), diabetes, cancers and chronic respiratory conditions (such as chronic obstructive pulmonary disease and asthma). Others include arthritis and accidents.

Surprisingly, NCDs cause the greatest global share of death and disability, nearly reaching epidemic proportions worldwide. They account for two out of three deaths; this is double the number of deaths resulting from infectious diseases (including HIV/AIDS, TB and malaria), maternal and perinatal conditions, and nutritional deficiencies combined.

The World Health Organization in January 2015 estimated that NCDs kill about 38 million people each year (60% of all deaths globally) with 75% of these deaths occurring in low and middle income countries. Of these, 16 million deaths occur before the age of 70 years, and 82% of these "premature" deaths occurred in low and middle income countries. It also estimates that the total number of deaths from NCDs will increase by a further 17% over the next 10 years.

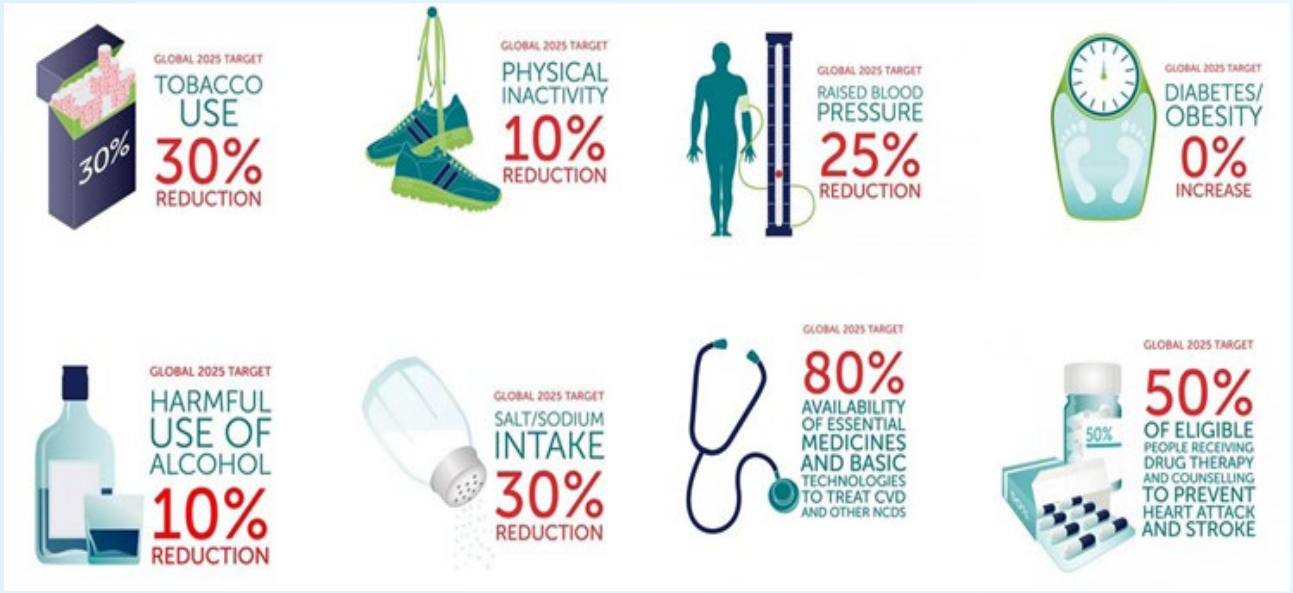
Cardiovascular diseases account for approximately 17.5 million deaths annually, followed by cancers at 8.2 million, then respiratory diseases at 4 million and finally diabetes at 1.5 million. In Kenya, NCDs account for 29% of all deaths with cardiovascular diseases at 12%, cancers at 6%, respiratory diseases at 3%, diabetes at 2% and others taking up 6%.

Fortunately, NCDs are largely preventable. Up to 80% of premature deaths from heart disease, stroke and diabetes can be averted with known behavioral and pharmaceutical interventions.

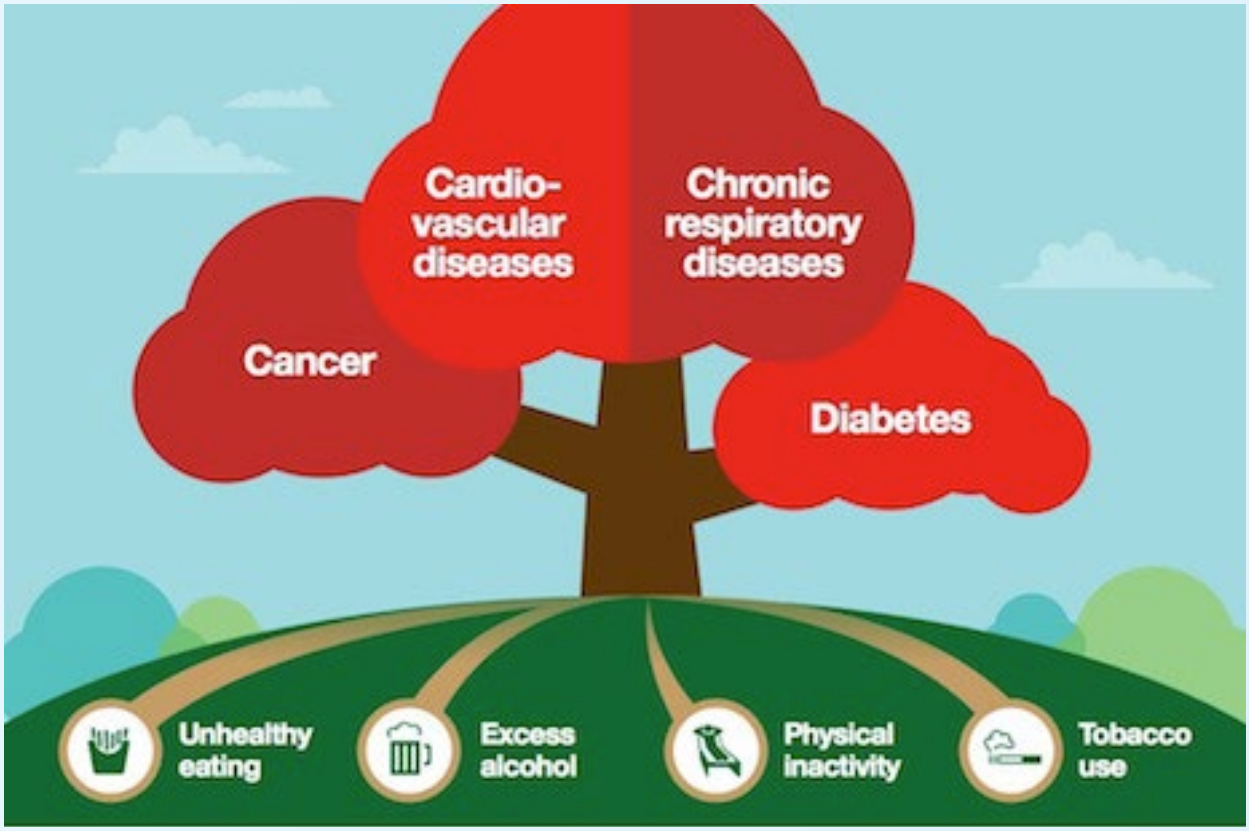
Non-communicable diseases share several common, modifiable risk factors that include tobacco use, harmful alcohol use, physical inactivity and globalised unhealthy diets. Mitigating the effects of these common risk factors is critical to combating NCDs.

The WHO Global Action Plan for the Prevention and Control of NCDs includes a target to have a 25% relative reduction in NCD-related mortality by 2025

Other factors influencing NCDs include ageing and rapid unplanned urbanisation, which leads to environmental degradation, population demands that outstrip service capacity and industrial waste poisoning. These risk factors induce metabolic or physiological changes that increase the risk of NCDs. The changes include high blood glucose levels, obesity/being overweight, raised blood pressure and increase in blood fat levels.



[Source: http://www.physiospot.com/2014/08/25/have-you-heard-of-the-25x25-strategy-to-reduce-mortality-from-ncds/]



[Source: http://www.ifrc.org/en/what-we-do/health/diseases/noncommunicable-diseases/ncds-toolkit/]

On the flip side, there are challenges to the realisation of a decrease in NCDs, or rather, in their prevention and management. In my opinion, they include the following in order of priority:

1. **Raising public awareness:** It may be true that even a large number of health officers are not aware of the true burden of NCDs. The public must therefore be made aware of these diseases and health promotion messages made available. This should also include political priority for the same.

2. **Modification of risk factors:** This includes promotion of physical activity across the country, deploy measures to reduce tobacco and harmful alcohol use, promote modification or understanding of environmental and cultural factors which change behavior and finally, work towards increasing availability and consumption of healthy foods.

3. **Enhancing legal and environmental policies:** This includes strict regulation of tobacco and alcohol use, strict laws on environmental pollution, and also general medical practices targeting both behavioral and pharmaceutical management of the chronic conditions.

4. **Re-orientation of health service systems:** This includes building health systems for screening/early detection and treatment, capacity building among health workers especially towards prevention, allocating more resources to NCDs prevention and treatment sector and finally provision of medication for treatment and prevention of complications from NCDs.

The initial motivation or mandate of KAVI in 1998 was to spearhead research in HIV and the development of a HIV vaccine in Kenya. With its establishment as a clinical research institute in 2013, its mandate expanded to include research in other communicable and non-communicable diseases such as TB and cancer.

References:

1. World Health Organization, 2015. *Non-communicable Diseases Progress Monitor*. Geneva: World Health Organization.

2. Kenya NCD Info, 2013. *Knowledge portal*. Available at: http://www.ncdinfo-kenya.org/knowledge-portal/data

Geoffrey Ombati Oino has worked as a study clinician at KAVI-ICR for 7 years. He enjoys reading and is enthusiastic about learning new things.

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[NAIROBI INNOVATION WEEK 2017, 6TH – 10TH MARCH 2017]

Cabinet Secretaryfor the Ministry of ICT Mr. Joe Mucheru (centre) engages Dr. Marianne Mureithi, a basic science researcher at KAVI-ICR during the 2017 Nairobi Innovation Week (6th – 10th March). With him are (L-R): University of Nairobi's Chancellor, Dr. Vijoo Rattansi; Ag. Chairperson of the University of Nairobi Council, Ms. Pascalia Koske; Managing Director/CEO of Barclays Bank of Kenya, Mr. Jeremy Awori; and University of Nairobi's Vice Chancellor Professor Peter Mbithi.

[MAISHA HIV & AIDS CONFERENCE 28th – 31st May 2017]

Professor Omu Anzala (KAVI-ICR director) was awarded the inaugural Maisha Conference Recognition award for Basic Science Research for HIV vaccine development.

[BIOETHICS TRAINING, 1ST – 3RD MARCH 2017]

A participant from Africa International University (AIU)(right) receives a certificate from the deputy director of KAVI-ICR Professor Walter Jaoko to mark the successful completion of a Bioethics Training course at KAVI-ICR between the 1st and 3rd of March 2017.

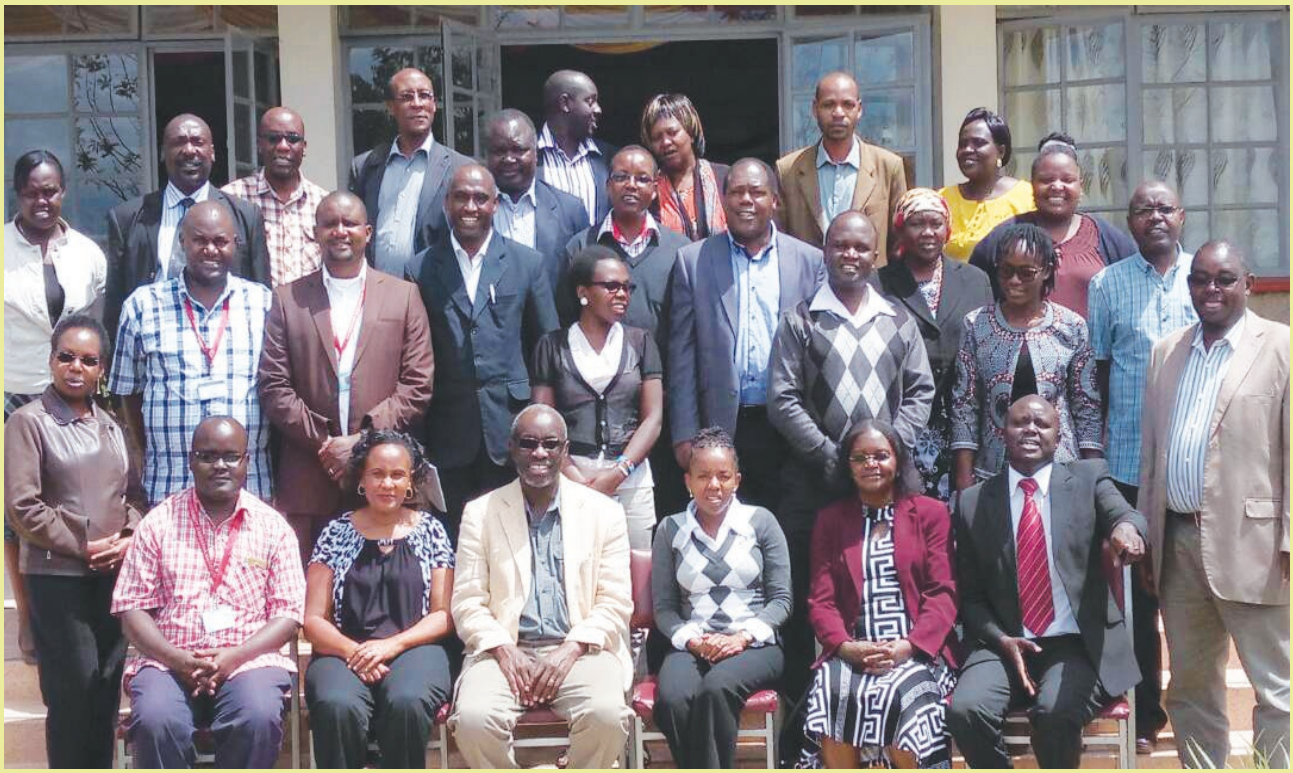
[BIOETHICS TRAINING, 1ST – 3RD MARCH 2017]

Participants from Africa International University (AIU) and the United States International University (USIU) pose with facilitators from KAVI-ICR at the end of a three day Bioethics Training course held in March 2017.

[USAID/IAVI VISIT, 10TH NOVEMBER 2016]

Dr. Wambui Kiai (former director of the School of Journalism and Mass Communication at University of Nairobi) introducing the partnership between the school, KAVI-ICR and the Nation Media Group at a stakeholder's meeting on 10th November 2016.

[KABARAK UNIVERSITY BIOETHICS TRAINING 17TH – 19TH MAY 2017]



Professor Walter Jaoko (KAVI-ICR deputy director) led a team of KAVI staff to conduct bioethics training for senior faculty members at the Kabarak University.

[UON STI/HIV COLLABORATIVE MEETING, 23RD - 27TH JANUARY 2017]

KAVI-ICR staff at the University of Nairobi collaborative meeting on HIV and sexually transmitted infections (STIs) held at the Mayfair Southern Sun Nairobi between 23rd and 27th January 2017.

PROFESSOR ARNOLD CAPLAN, 17TH MARCH 2017

Professor Arnold Caplan, 'the father of mesenchymal stem cells' delivers a talk on stem cells at the KAVI-ICR boardroom in Kenyatta on the 17th of March 2017.

Stem Cell Research and Regenerative Medicine

Stem cell research is one of the most fascinating areas of contemporary biology, given the cells' unique regenerative abilities. However, a great deal of work remains to be done in laboratories and clinics to understand the application of these cells in cell-based therapies to treat diseases. This is also referred to as regenerative and reparative medicine.

Stem cells, whether harvested from the body or cultured in the lab, are defined by two properties: self-renewal, which is the ability to generate perfect copies of themselves upon division, and differentiation, which is the ability to produce specialised cell types that perform specific functions in the body as shown in Figure 1.

The promise of stem cells as new tools for research and for benefiting human health resides in these two properties. Stem cells are classified based on the range of specialised cells they can generate:

(a) Tissue (or adult) stem cells: They are found in a variety of tissues and organs throughout the body. Their role is the maintenance of tissues and organs in which they reside.

(b) Pluripotent stem cells: Currently, there are three types of pluripotent stem cells:

1. **ectoderm** — giving rise to the skin and nervous system
2. **endoderm** — forming the gastrointestinal and respiratory tracts, endocrine glands, liver, and pancreas
3. **mesoderm** — forming bone, cartilage, most of the circulatory system, muscles, connective tissue, and more

Basic experimental stem cell research has opened up the possibility of many diverse clinical applications; however, translation to clinical trials has been restricted to only a few diseases.

To broaden this clinical scope, pluripotent stem cell derivatives provide a uniquely scalable source of functional differentiated cells that can potentially repair damaged or diseased tissues to treat a wide spectrum of diseases and injuries.

However, large-scale availability of treatments involving pluripotent stem cells remains some years away, because of the long and demanding regulatory pathway that is needed to ensure their safety.

Active debates are underway to adapt regulatory frameworks to address the specific challenges of developing, standardising, and distributing cell-based therapies, while advances in basic research continue to provide a fuller understanding of how stem cells can be safely and effectively used.

Cell replacement or transplantation therapies are not the only application of stem cell research; already, the first steps are being taken towards the use of cells derived from pluripotent stem cells in drug discovery and testing.

It is with great interest and anticipation that we watch the evolution of this exciting field of science. Kenya need not be left behind; in our pursuit to pioneer and contribute to quality and impactful science, we must support efforts to establish stem cell and regenerative medicine research in the region, and for the region.

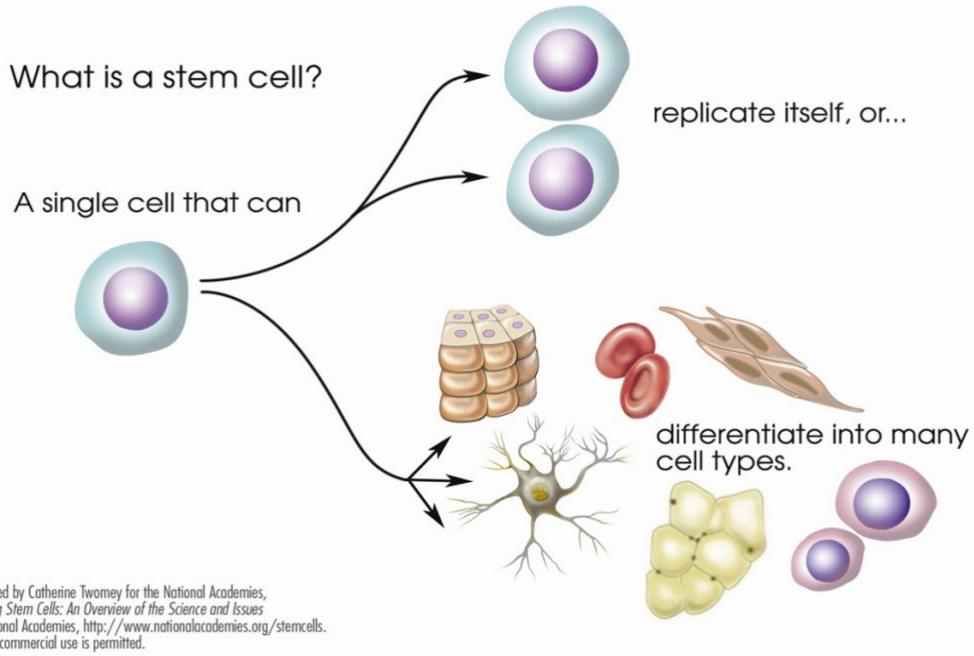


Image prepared by Catherine Twomey for the National Academies, *Understanding Stem Cells: An Overview of the Science and Issues* from the National Academies, http://www.nationalacademies.org/stemcells. Academic noncommercial use is permitted.

Figure 1: Definition of Stem Cells

The primary objectives of the stem cell research at KAVI-ICR are to:

(a) Establish core facilities to accelerate and promote stem cell research within KAVI-ICR by providing resources and services which are beyond the means of most individual labs.

(b) Promote training in stem cell and regenerative medicine.

(c) Promote basic discoveries in stem cell biology and regeneration, and to translate those discoveries into new therapies that may alleviate suffering and disease.

(d) Conduct clinical trials in stem cell and regenerative medicine and linking this to patient care and management.

(e) Co-ordinate cord blood and bone marrow bio-banking.

(f) Educate the public about regenerative biology and importance of stem cell research.

(g) Foster a culture of interaction and collaboration that will stimulate new approaches in stem cell biology.

So far, KAVI-ICR in collaboration with Department of Surgery and Obstetrics & Gynaecology has been participating in a stem cell research project for the last two years.

The aim of this project is to optimize stem cell harvesting, as well as laboratory isolation, characterization and identification of stem cells from umbilical cord blood and adipose tissue (Figure 2 and 3).

The project has so far achieved its aims; in order to enhance the project, we must initiate studies looking into the expansion of stems cells, while maintaining their totipotent potential.

The expanded stem cells are critical for interventional and/or replacement studies that are under development. Our first abstract *"Establishment of assays for culture and manipulation of haematopoietic stem cells"* was presented both at the Research for Prevention Meeting in Chicago, Illinois in October 2016 and the University of Nairobi HIV/AIDS Collaborative Centre Annual Meeting in January 2017.

Overall, the stem cell and regenerative medicine research at KAVI-ICR will aim to bridge the gap between 'Bed and Bench side', i.e. it will bolster the collaboration between stem cell researchers and clinicians.

The clinicians from various local institutions such as Kenyatta National Hospital and Moi Teaching and Referral Hospital, regional institutions such as the Muhimbili University as well as international collaborators will create interventional stem cell research for direct benefit to the patient.

KAVI-ICR will ultimately spearhead research, training and translation of cell biology and regenerative medicine in Kenya as well as the sub-Saharan Africa region.

Our intent is to promote basic research and training in stem cell biology and regeneration, and most importantly, to translate these discoveries into new therapies that may alleviate much suffering and disease.

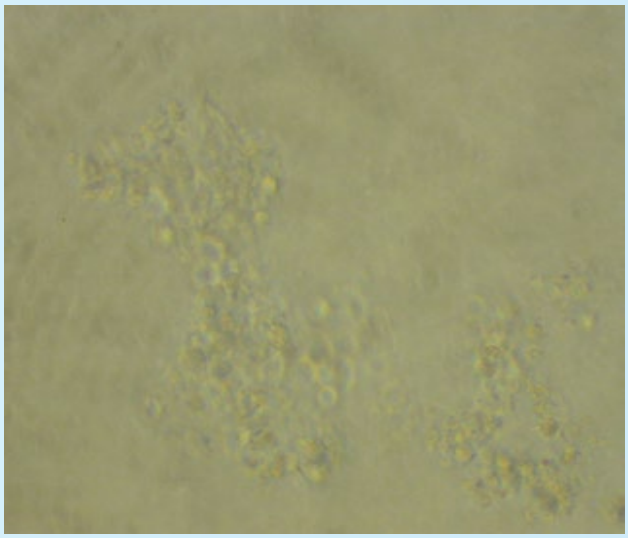


Figure 2: Hematopoietic stem cells isolated from cord blood at KAVI-ICR laboratories showing distinctive Cobblestone morphology.

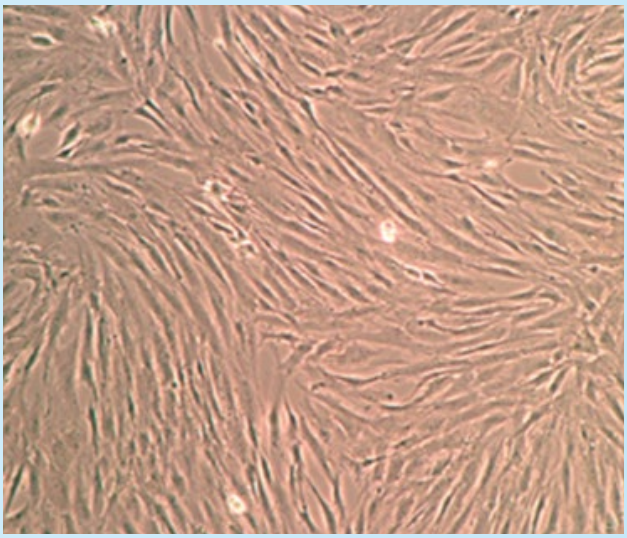


Figure 3: Adherent spindle shaped morphology characteristic of mesenchymal stem cells isolated from adipose tissues at KAVI-ICR laboratories.

Marianne Mureithi is a Basic research Manager at KAVI-ICR.
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In 2013, KAVI-ICR became a clinical research institute, thus expanding its mandate. Part of this was passing on scientific skill and encouraging scientific inquiry, through enrolling students in postgraduate degrees.

Robert Kipyegon Langat is currently carrying out part of his research at the International AIDS Vaccine Initiative – Human Immunology Laboratory (IAVI-HIL) at Imperial College London in the Department of Medicine.

He briefly describes his project:

My project title is*"Role of HIV-1 viral replicative capacity on infection of primary cells in the Female Reproductive Tract"*.

Understanding the first immune cells infected during transmission of HIV is vital for designing prophylactic interventions. The aim of my project is to describe the first cells infected during transmission of HIV in peripheral blood and genital (vaginal) mucosa utilising human tissues.

I will assess phenotypic profile of infected cells in peripheral blood and mucosal explants (assessing viral growth rates, dissemination throughout the tissue, cell types infected etc.) When infected with viral isolates from IAVI's Protocol C which cover a range of clades and exhibit broad phenotypic characteristics and different replicative capacities.

The secondary component of the project will describe the effect of distinct viral differences on this process, utilising viruses and samples relevant to an African population.

So far, I have established assays for use in future experiments. **[assays are procedures investigating – either qualitatively or quantitatively – the action, amount or presence of a target; this could be a drug or cell or another biochemical product]**

In terms of the impact of this research, I think that because this study will characterise the initial events of HIV infection and its spread via the genital mucosa, it may highlight new targets for prophylactic interventions.

Dr. Marianne Wanjiru Mureithi, a Basic Research manager and member of faculty, Department of Medical Microbiology, School of Medicine.

Dr. Mureithi received the Joan-Franklin Adams Studentship Award in International Health in 2005 to support her PhD research in the United Kingdom and was subsequently awarded her PhD degree at the tender age of 27 from the University Of Bristol, UK. Her PhD research project was a joint collaboration with the Medical Research Council-UK unit in The Gambia, West Africa, highlighting her ability to integrate projects linking different institutions in different continents.

Here, she demonstrated that both the children and adult populations studied harboured naturally acquired T-cell-mediated immunological memory to *Streptococcus pneumonie* bacteria and this protection would be boosted with the introduction of a pneumococcal vaccine. Several years later, there is now a universal roll-out of the pneumococcal vaccine which has saved countless of lives and reduced the mortality and morbidity rates of especially children younger than 5 years, emphasising the importance of her research and discovery.

She was then competitively awarded a Fogarty Research Clinical Fellowship Award from the National Institute of Health (NIH, USA) and a Harvard University Center for AIDS Research (CFAR) award from Harvard University in 2008 to support her Postdoctoral Research at the Ragon Institute of Massachusettes General Hospital (MIT and Harvard University, USA) and the University of KwaZulu Natal, South Africa where her research aimed to characterise the impact and role of the immune system in HIV-TB co-infection. This research explored the innate immunological pathways involved in HIV/TB pathogenesis which could be harnessed in developing effective vaccines and treatments to gain more control over HIV and TB co-epidemic especially in the sub-Saharan region, which bears the highest burden of disease and mortality.

Dr. Mureithi then made an important decision of returning back to Kenya in 2011 to build scientific capacity and transfer the skills she had acquired from her research and work abroad. She is now at the fore-front in efforts of scientific discovery of novel HIV/AIDs vaccines at KAVI-Institute of Clinical Research (KAVI-ICR), University of Nairobi.

In Addition, Dr. Mureithi was also recently appointed the Chair of the Cell Biology and Regenerative Medicine Network of Young Scientists in Africa under the mentorship of the African Academy of Sciences (AAS) to spearhead and lead a dynamic team of talented scientists in regenerative medicine research.

She has also authored several peer-reviewed scientific publications and presented her findings in numerous international and regional conferences and workshops, highlighting her research findings. These have contributed to novel approaches in understanding several infectious diseases and how to treat and manage them better to boost the health of the population. These publications can be found at *https://scholar.google.com/citations?user=vlPmMr0AAAAJ&hl=en*

All this she has achieved whilst juggling and balancing a happy marriage and enjoying bringing up 3 active children.

We need to Bridge the Communication Gaps between Researchers in science and the Non-Scientific public

Science is, and has been, advancing by leaps and bounds. There are researchers carrying out various studies in different scientific fields, from physics and chemistry, to psychology and health. They do some very interesting work, sometimes spending years trying to answer a particular research question: what colour object is a tsetse fly more likely to land on and why?

The answer, in case you are interested, is blue. Which is probably because of the fly's perception, or due to the colour's association with shadowy resting sites which to the fly are tinted blue on a sunny day.

If researchers are successful, people – usually within their branch of the scientific community – take interest; journals are one of the avenues where the latest research in specific fields is presented. Others are conferences, newsletters and smaller meetings.

The readership of these journals tends to be limited to a small percentage of society working within that field. A researcher in HIV for example, may be subscribed to several journals, but it is unlikely that even a person who is part of the scientific community would read up on subjects unrelated to his/her own. The result? Knowledge is not widely disseminated.

A senior researcher recently relayed an experience that illustrated the communication gaps that impede scientific research. The researcher and his team went into a community to carry out a study on elephantiasis (also known as lymphatic filariasis).

This disease is caused by parasitic worms and is spread from person to person by mosquitoes. The team had a sound theoretical foundation, with publications in the area, and many had carried out field work relating to various disease control. In short, they would be deemed experts by most standards.

In order to foster acceptance of their work, they had designed activities to assist in "community engagement". One of the methods widely used to do this is focus group discussion (FGD), and they decided that this would be appropriate. FGDs are usually a series of discussions in which facilitators meet with people of interest and have guided -and hopefully open - discourse on the matter at hand. The team carried these out, and felt satisfied at their efforts to lay the ground-work for their study.

Part of the study involved collecting blood samples from the people in that community. The worms that cause elephantiasis circulate in the infected person's blood at night so as to increase the chance of being taken up by a biting mosquito which spreads the disease on to another person. Therefore, the blood samples had to be collected at night.

One night, the team knocked on the door of one house in the study area. The man within cleared his throat to make it known that he was inside. "We are here to collect some blood for our study as discussed in the sessions", they explained from outside his doorstep, because he seemed reluctant to open the door. They then heard the man sharpening a tool, before announcing to them, "If you are here to kill me and take my blood, I will kill you first!".

Now, while this story may be humorous (no-one was hurt), it demonstrates an all-too-common lack of communication between scientists and non-scientific members of the public. It was only later that the team learnt that it was harvest season in the area; most people were engaged in harvest activities and were therefore unavailable to attend the FGDs. For this simple reason, there was limited opportunity for effective communication between the researchers and the population about the collection of blood

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samples. Time and again, local and international researchers have carried out projects without having an understanding of the people involved in their studies. Some researchers are completely ignorant of people's needs and priorities, and are unable to effectively communicate their goals and intentions as investigators.

For others, truly engaging with those who are most impacted by their work features mostly as an afterthought. This should be a core component to their project design, as it is key to successful people-based research.

We must also give serious thought to disseminating scientific information and findings widely. Scientists must consider the most suitable and impactful ways to communicate even – or in deed especially – before they undertake their studies.

This should be an integral element throughout the process, including after the work is done. Researchers should connect with story-tellers whose work and passion it is to distil information in a way that is engaging, so that people see the relevance of their work.

Biometrics is a technological system used for measuring and analysing a person's physiological or behavioural characteristics. These characteristics are unique to individuals hence can be used to verify or identify a person. Biometrics comes from the Greek words 'bio' which means life and '*metric*' which means to measure. One's face, retina, iris, fingerprint, voice, palm print, hand geometry, DNA, signatures, gait and keystroke are examples of characteristics that can be utilised for verification of persons. Fingerprinting is the most commonly used technology for verifying a person.

The story of the lost Afghan girl…

In December 1984, Steve McCurry, a National Geographic photographer, took a picture of a young girl from a refugee camp in Pakistan. The little girl had such striking green eyes, that her picture was featured as the cover of the magazine, eventually becoming among the 100 best National Geographic pictures. Through the '90s, McCurry tried to trace this girl without much luck.

Seventeen years later he eventually found her, with the same stunning green eyes. How sure was he that this was the same girl? 17 years had elapsed; could she be a look-alike? She appeared different due to age and life's challenges but had the same striking green eyes. Verification using the United States' FBI facial recognition techniques and a private firm's iris scanning technology was then done. The iris image from the new photograph was verified against the one initially taken in 1984, and declared a match. This was certainly the same girl; the possibility of a false match was 1 in 100 million as the pattern of the iris is as unique as a fingerprint, and remains unchanged throughout one's life.

SharbatGula, the "Afghan girl" pictured in 1984 (left) and later in 2002 (right)

[Source: https://www.cl.cam.ac.uk/~jgd1000/afghan.html]

Hospitals, banks, airports and offices are now increasingly using biometrics technology to verify individuals. How much more then would biomedical research centres need to embrace the biometric technology to authenticate their participants?

Iris biometric technology shows increased reliability in the verification of individuals. In biomedical research for example, participants may take part in different studies at the same time, sometimes even the same study in different centres; this technology could be important to identify such individuals. To make this possible, a database managed from a central co-ordinating point would be required, as this would inform all research centres of the possible involvement of the possible duplication of participants in different studies or in multi-centre studies.

Biometric identification (a one-to-many comparison) or verification (one-to-one comparison) also poses several advantages over more traditional forms such as passwords, personal identification numbers (PINs) or tokens (keys, cards, passports) as these can be lost, stolen or forged.

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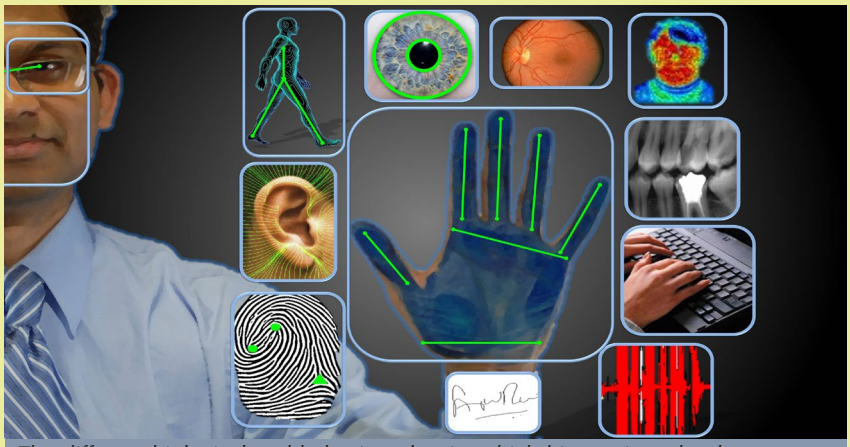

The different biological and behavioural traits which biometric technology uses to identify or verify an individual.

[Source: http://apachebooster.com/kb/what-is-biometrics-and-what-are-its-latest-and-future-inventions/]

I will focus on one of the most stigmatized diseases in ancient times: leprosy. In the Old Testament, leprosy was considered a result of sin, hence anyone who suffered from leprosy was considered unclean both physically and spiritually and had to live in isolation.

Leviticus 13:44-46 [English Standard Version (ESV)]; [44]…he is a leprous man, he is unclean. The priest must pronounce him unclean; his disease is on his head.[45] "The leprous person who has the disease shall wear torn clothes and let the hair of his head hang loose, and he shall cover his upper lip and cry out, 'Unclean, unclean.' [46] He shall remain unclean as long as he has the disease. He is unclean. He shall live alone. His dwelling shall be outside the camp.

However, in 1873, Dr. GerhadHenrick Hansen from Norway identified the germ that causes leprosy under a microscope, proving that leprosy was caused by a germ and was thus not hereditary from a curse or from a sin.

Thereafter, researchers continued looking for treatments. One such treatment was derived from **Chaulmoogra nuts** (*Hydnocarpuswightiana*) and formulated into injections which were very painful. In 1921, U.S. Public Health Service established the Gillis W. Long Hansen's Disease center in Carville, Louisiana which became a center for research and testing to find a cure for leprosy, and a live-in treatment center for leprosy patients.

In the 1970s, the first successful multi-drug treatment (MDT) regimen for leprosy was developed through drug trialson the Island of Malta. In 1981, the World Health Organization (WHO) began recommending MDT (a combination of Dapsone, Rifampicin and Clofazimine). This is still the best treatment for preventing nerve damage, deformity, disability and further transmission. Currently, researchers are working on developing a vaccine and methods of early detection in order to start treatment promptly.

LESSON LEARNT

If no research had been conducted for the nearly 6,000 years that leprosy has existed, - however small the proportion of infected - people would still be living in isolation out of the community's fear of infection. We would also not have treatment. Through the tireless devotion of the community at large, scientists find a cure or develop vaccines for various diseases, demonstrating the significance of community participation in research. KAVI-ICR holds all of its study participants with high esteem and looks forward to more community support in its research mandate.

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Chaulmoogra Nuts
[Source: https://www.google.com/search?q=Chaulmoogra+Nuts&source]

Did You Know... If Your DNA was stretched out It would reach the moon 6,000 times?

DNA stands for deoxyribonucleic acid and it is found in all living things. It was first isolated in 1869 by Friedrich Miescher but it was James Watson and Francis Crick, based on work by Rosalind Franklin, who figured out the structure in 1953. They described it as a double helix structure which can be likened to a twisted ladder.

DNA is the blueprint of life and almost all the cells in our body have DNA with the exception of mature red blood cells which do not have nucleus. If the strands of DNA in one cell are unwound and linked together, they would stretch almost six feet. The entire DNA sequence is called a genome. If the entire human genome is unwrapped, it could reach the moon 6000 times. It would also reach the sun and back over 600 times.

How then does such a long strand fit inside a cell's nucleus that is only about six microns wide or .0002 inches? The answer lies in the way the DNA is packaged to fit in the nucleus.

DNA is wrapped around proteins known as histones to form chromatin. Packing the DNA into nucleosomes condenses the DNA approximately sevenfold. It can be further organized by winding the chromatin into more compact structures. Coiling the chromatin around itself decreases the space it occupies by another six-fold or so.

Through a series of similar compacting strategies, the entire genome can fit inside the nucleus of a single cell. The cell further compacts the DNA in a process known as chromosome condensation. Chromosome condensation is able to produce a mitotic chromosome structure that's approximately 10,000 times more compact than how the DNA started.

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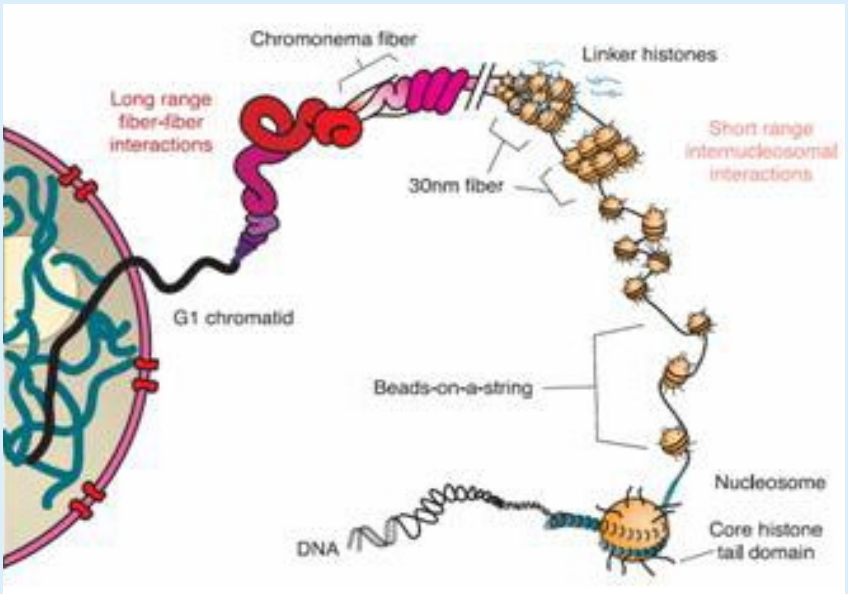

Stages of DNA compaction
[Source: http://www.ntu.edu.sg/home/larsnor/research.html]

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