Happiness Kumburu
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# Role of genomics in management of infectious diseases

# What is genomics??

- **Genomics** is a discipline in genetics that applies recombinant DNA, DNA sequencing methods, and bioinformatics to sequence, assemble, and analyze the function and structure of genomes.
  - **Genetics** is the study of heredity and the variation of here inherited characteristics.
  - **DNA**(Deoxyribonucleic acid)-a carrier of genetic information**.**
  - **DNA sequencing** is the process of determining the precise order of nucleotides within a DNA molecule **.**
  - **Bioinformatics** is application of computational techniques to analyze the information associated with biomolecules on a large scale.

# How does Next generation genomics work in infectious diseases

- Next-generation genomic technologies allow clinicians and biomedical researchers to drastically increase the amount of genomic data collected on large study populations.

- When combined with new informatics approaches that integrate many kinds of data with genomic data in disease research, allowing researchers to better understand the genetic bases of drug response and disease.

# Development of sequencing technology

Historically, sequencing was done in sequencing centers, centralized facilities (ranging from large independent institutions such as Joint Genome Institute which sequence dozens of terabases a year, to local molecular biology core facilities) which contain research laboratories with the costly instrumentation and technical support necessary.

To date as sequencing technology continues to improve, however, a new generation of effective fast turnaround benchtop sequencers has come within reach of the average academic laboratory.

On the whole, genome sequencing approaches fall into two broad categories, shotgun and high-throughput (aka next-generation) sequencing

# The role of genomics in identification, prediction and prevention of biological threats

- **As epidemiological tool**
  - Following outbreak of infectious diseases, example during the Severe Acute Respiratory Syndrome (SARs) in 2002-2003.
  - Emergency and worldwide spread of Pandemic H1N1 2009 influenza virus.
- **Determine Hot sport for the emergency of infectious diseases.**
  - Example Ebola virus which first emerged by infecting human in Zaire in 1976. and acqiusiton of antimicrobial resistance by *Acinetobacter baumanii*

- **Simple genomics, population genomics and Metagenomics**
  - **Simple genomics-**greatest resolution for identifying genetic factors for specific virulence phenotypes**.**
  - **Population genomics-**Provide info on pangenomic gene pool and potential of species to evolve into a novel pathogen.
  - **Metagenomics-(**set of genes carried by all member of a community **)** inform on genetic potential to individual to acquire gene by horizontal gene transfer**.**

# Genomics at KCMC/KCRI biotechnology lab

Introduction of Next generation sequencing by using

Illumina Miseq system.

Thank you