
JJGYASA Programme 2020-21

(ATL - JJGYASA)

Drug Discovery And Development

By- Dr.Geetha Vani Rayasam

Held on 6th June 2020, 2:00 pm– 3:00 pm

Report of the webinar presented by

Dona Debnath, XII-A

Kendriya Vidyalaya, Ballygunge

ATL-Jigyasa Webinar Series

Drug Discovery and Development



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Head-Science Communication and
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6th July 2020



2:00 PM to 3:00 PM

#ATLWebinarSeries

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- *Drug classification*
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What is a drug?

A drug is any substance which, when taken into the body, alters the body's function either physically and/or psychologically. A drug is a chemical that interacts with proteins in the body to affect a physiological function. This is the general idea behind all medicine. Once these chemicals are absorbed into the systemic

circulation they bind with certain proteins and this changes the functioning of the cell slightly.

Via Cisco Webex

What is a Drug?



- In pharmacology, a drug is a **chemical substance**, typically of known structure, which, when administered to a living organism, produces a **biological effect**.
- A pharmaceutical drug, also called a medication or medicine, is a chemical substance used to treat, cure, prevent, or diagnose a disease or to promote well-being.
- Traditionally drugs were obtained through extraction from medicinal plants, but more recently also by **organic synthesis**.
- Pharmaceutical drugs may be used for a limited duration, or on a regular basis for chronic disorders.

Drugs can also include **Biologics**.

According to the Biotechnology Industry Organization (or BIO), "A **biologic is manufactured in a living system such as a microorganism, or plant or animal cells**."

<https://en.wikipedia.org/wiki/Drug>

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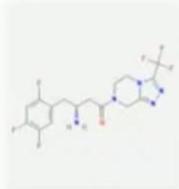
Drug Classification

Medications are regularly ordered into tranquilize classes—gatherings of related drugs that have comparable compound structures, the same component of activity (authoritative to the

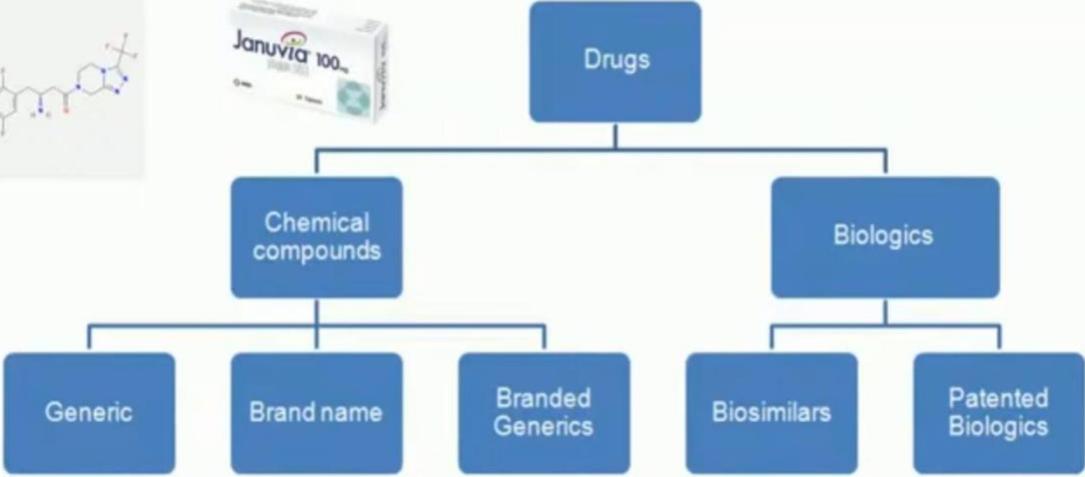
equivalent organic focus on), a related method of activity, and that are utilized to treat the same sickness.

Via Cisco Webex

Sitagliptin (Januvia)



Drug Classification



Market Realist[®] Source: Market Realist

7-[(3R)-3- amino-1-oxo-4-(2,4,5-trifluorophenyl)butyl]-5,6,7,8-tetrahydro-[3-(trifluoromethyl)-1,2,4-triazolo[4,3-a]pyrazine phosphate (1:1) monohydrate

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Drug Discovery and Development Process

It is done advance insightful:

Step 1. Discovery and development

Specialist for new medication starts in research facility

Step 2. Preclinical exploration

Drug undergo laboratory and animal testing to reply essential inquiries concerning security.

Step 3. Clinical research

Medications are tried on individuals to ensure they are safe and effective.

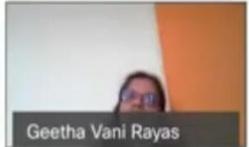
Step 4. FDA review

FDA survey groups altogether look at all of the submitted information identified with the medication or gadget and make a choice to favour or not to support it.

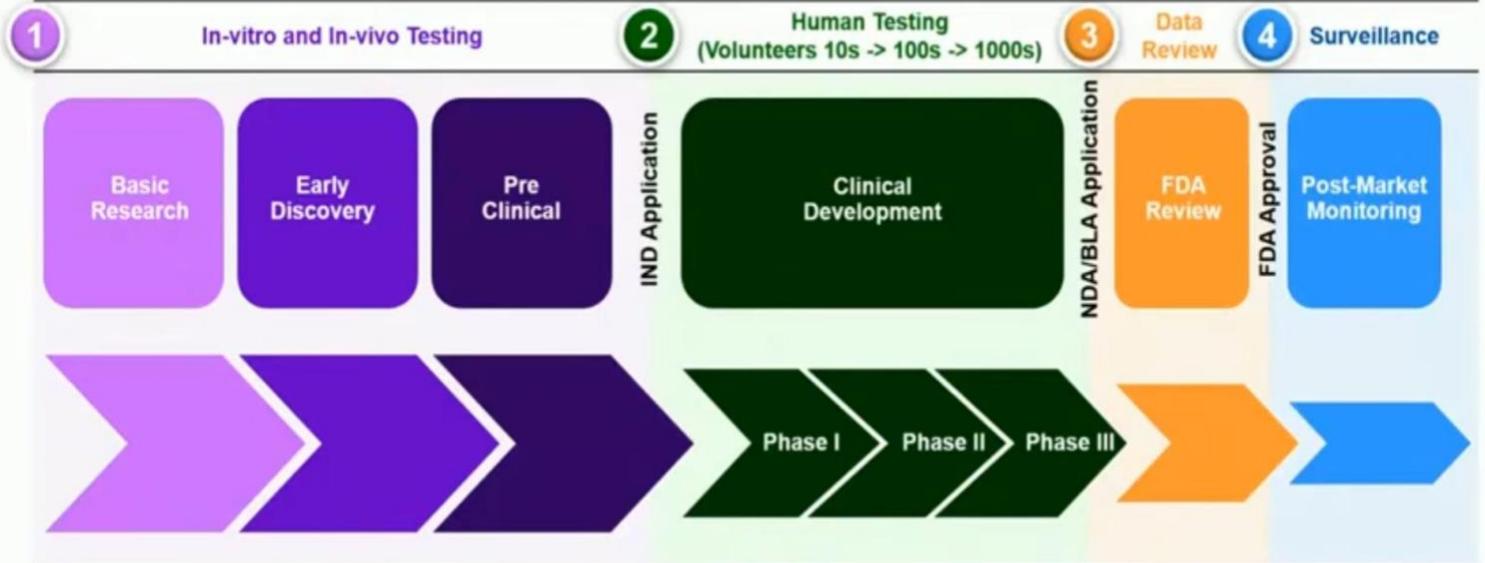
Step 5. FDA Post -Market safety monitoring

FDA screens all medication and gadgets wellbeing once items are accessible for use by the general population.

Drug Discovery and Development Process

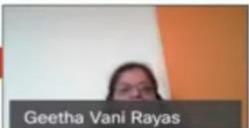


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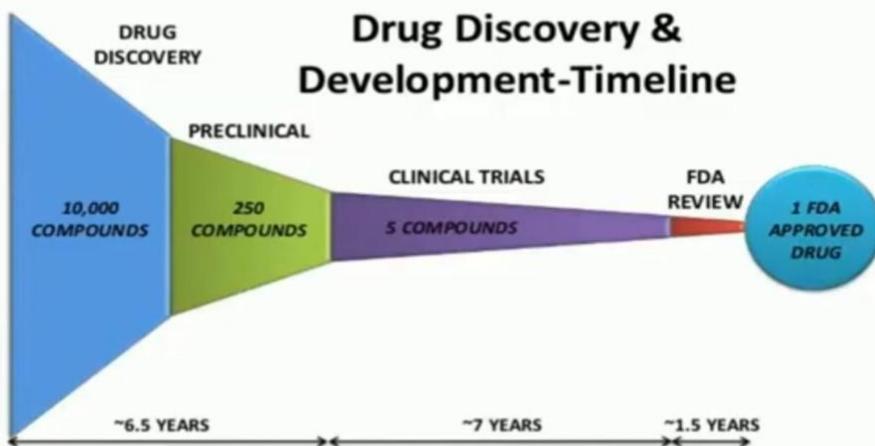


<https://www.nebiolab.com/drug-discovery-and-development-process/>

Novel Drug Discovery: ~10-15 years; billions of dollars

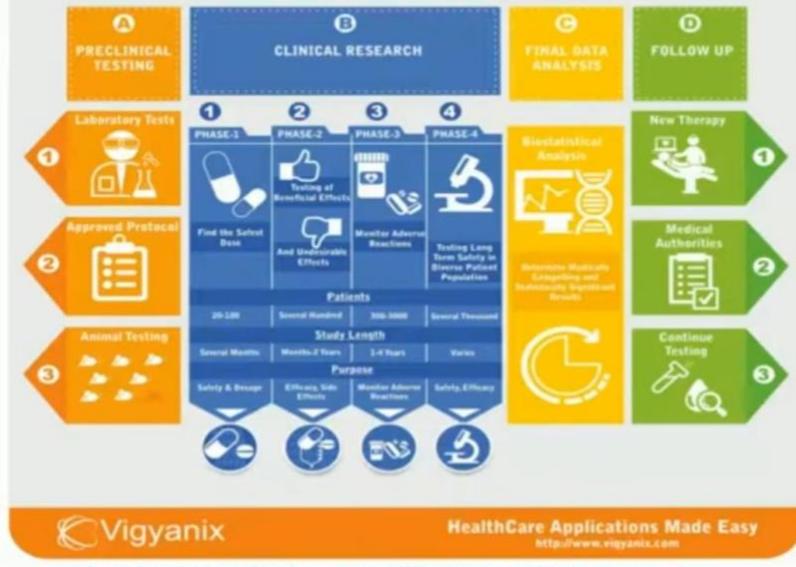


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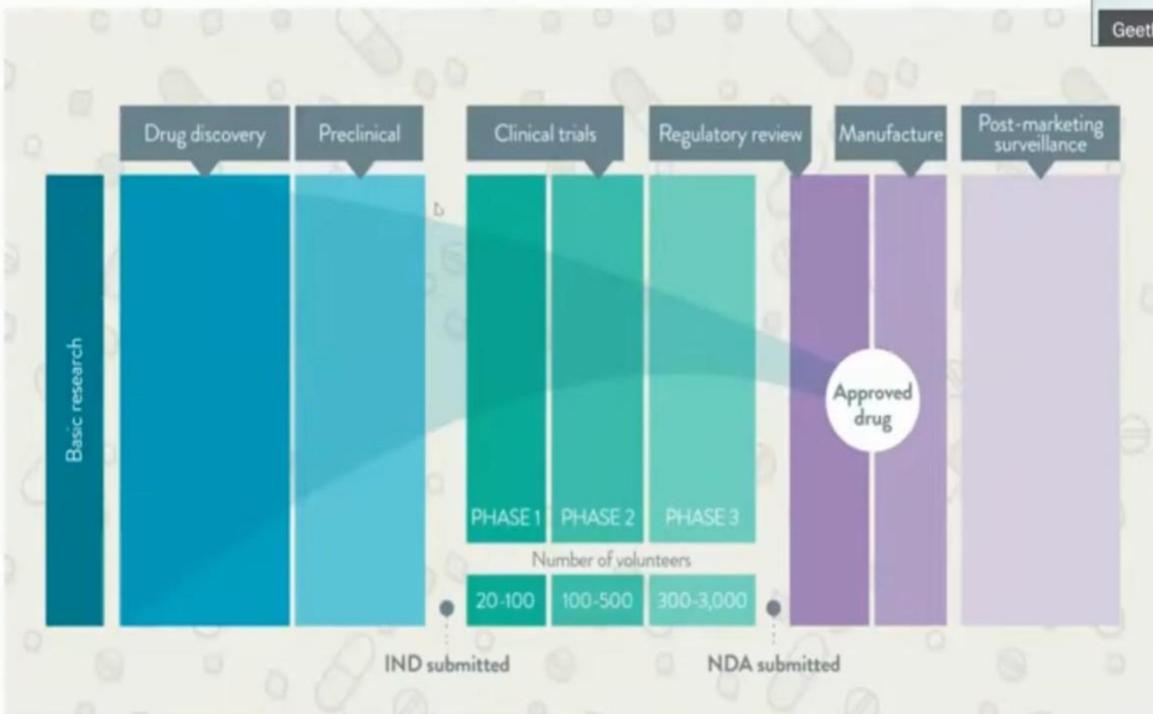
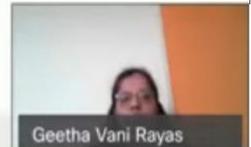




How Do Clinical Trials Work From Trial to Treatment

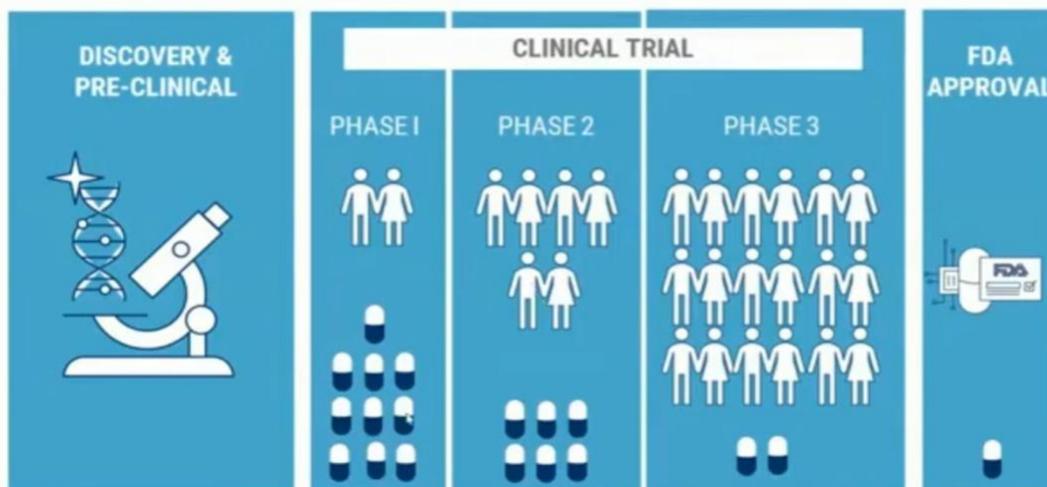


<https://vigyanix.com/blog/how-do-clinical-trials-work-from-trial-to-treatment/>



<https://www.technologynetworks.com/drug-discovery/articles/exploring-the-drug-development-process-331894>

Bringing a drug to market is a drawn-out process



Source: cbinsights.com

<https://www.cbinsights.com/research/clinical-trials-ai-tech-disruption/>

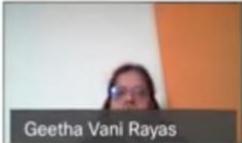
CBINSIGHTS



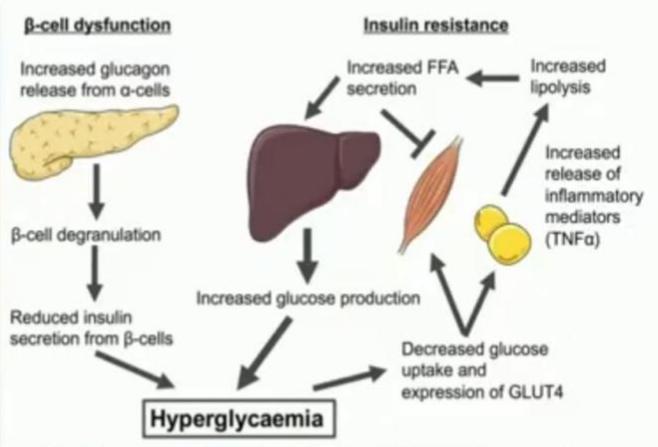
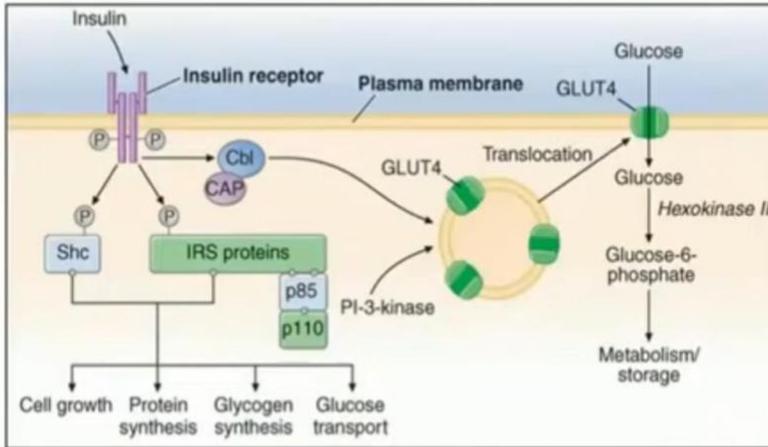
Basic research on Type 2 Diabetes

An incessant condition that influences the way the body forms blood sugar (glucose). With type 2 diabetes, the body either doesn't create enough insulin, or it opposes insulin.

BASIC RESEARCH



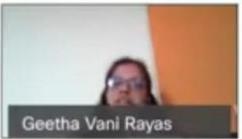
Type 2 Diabetes



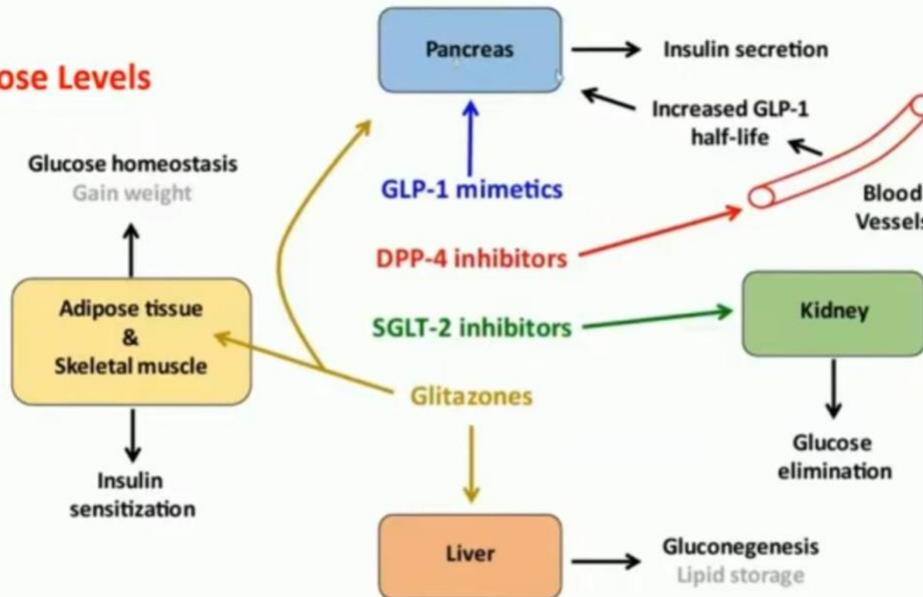
https://www.researchgate.net/figure/Mechanism-of-action-of-insulin-17_fig1_325007874

<http://pharmrev.aspetjournals.org/content/70/1/39/tab-figures-data>

DPP IV Inhibitors for Type 2 Diabetes



High Glucose Levels

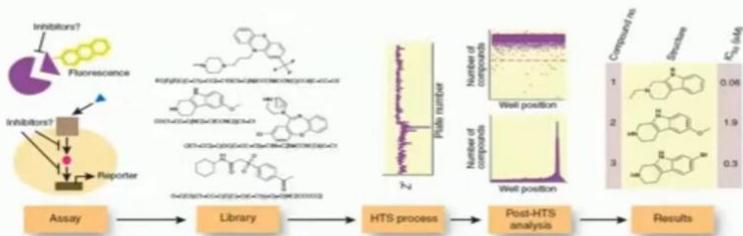


High Through Put Screening for Drug like Compounds



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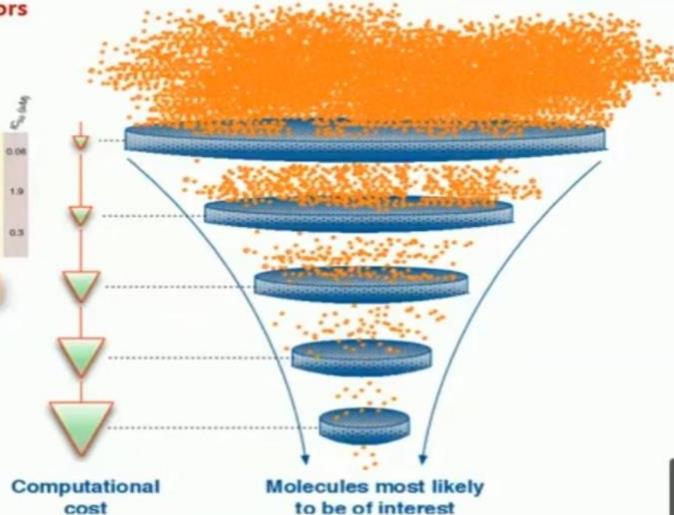
Millions to Thousands of Compounds are Screened For Inhibitors
Mostly industry and few R&D Institutions



<https://www.nature.com/articles/nchembio0807-438/figures/1>

- Specificity, Selectivity, Potency
- Test on multiple enzymes, targets: DPP8/9; 11
- Test on cell lines or tissues/organoids...
- Several rounds of Synthesis and Testing
- It can take 2-3 years

Computation and AI can dec efforts, Cost



PRE CLINICAL DEVELOPMENT



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ANIMAL MODELS of DISEASE

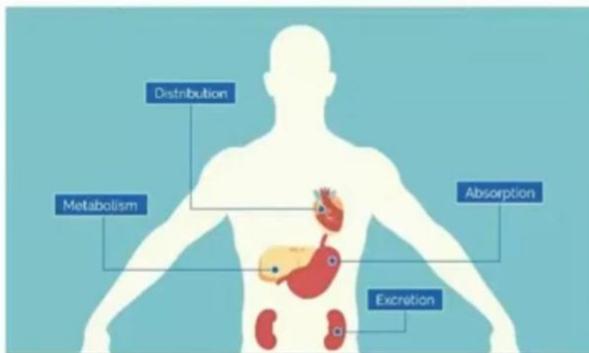


<https://www.jax.org/>

EFFICACY

SAFETY and TOXICITY

ADME STUDIES in ANIMAL MODELS



What body does to drug?

What drug does to body?

<https://www.technologynetworks.com/drug-discovery/articles/what-is-adme-336683>

Industry

Scale up of Drug

Regulatory Studies for Investigational New Drug (IND) Filing

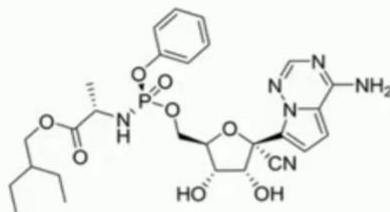


Drugs for Covid 19

Specialists are attempting to utilize various ways to deal with control the spread and spare lives, including recovering plasma treatment (CPT) mix of medications like hydroxychloroquine(HCQ), remdesivir and other enemy of viral prescriptions. In any case, specialists accept that the one medication which may be most encouraging is a modest irritation battling drug, Dexamethasone.

Via CiscoWebex

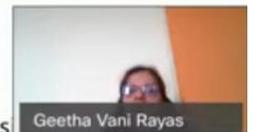
Repurposed Drugs for Covid-19



Remdesivir

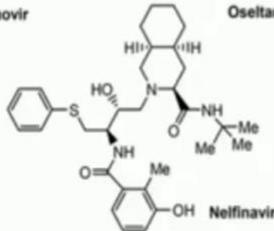
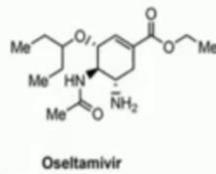
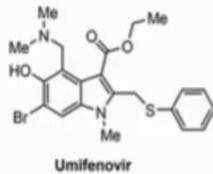
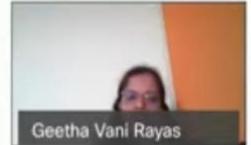
- Series of phase 3, randomized, double-blind, placebo-controlled trials.
- These preliminary findings support the use of remdesivir for patients who are hospitalized with Covid-19 and require supplemental oxygen therapy.
- However, given high mortality despite the use of remdesivir, it is clear that treatment with an antiviral drug alone is not likely to be sufficient.
- Future strategies should evaluate antiviral agents in combination with other therapeutic approaches or combinations of antiviral agents to continue to improve patient outcomes in Covid-19.
- **FDA authorized the use of this intravenous antiviral drug for emergency treatment of COVID-19 patients.**
- **Remdesivir can be administered only to hospitalized patients with severe illness, defined as patients with low oxygen in blood or needing breathing assistance.**
- **Restricted emergency use approved in India and Gilead has given voluntary license to some Indian Manufacturers**

<https://www.nejm.org/doi/full/10.1056/NEJMoa2007764>



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Repurposed Drugs for Covid-19

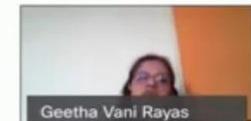


- **Favipiravir** is a generic version of Fujifilm Toyama Chemical's influenza drug Avigan, which showed activity against influenza viruses and holds approval in Japan for treating new influenza virus infections.
- It inhibits viral RNA polymerase
- **Favipiravir has received "restricted emergency use" in mild to moderate cases of COVID-19 in India,**

- **Arbidol (umifenovir)** is able to block viral fusion against IFVs.
- The antiviral activity of umifenovir against SARS-CoV-2 has been confirmed *in vitro*.
- The first clinical data from patients with laboratory-confirmed COVID-19 points to a superior efficacy of umifenovir monotherapy over lopinavir/ritonavir treatment.
- Also, other drugs used for influenza, such as Avigan (favipiravir) and Tamiflu (oseltamivir), have been used in COVID-19 patients



Drugs Targets for SARS-CoV-2



Target the Virus: Drugs developed for Ebola, influenza, HIV etc

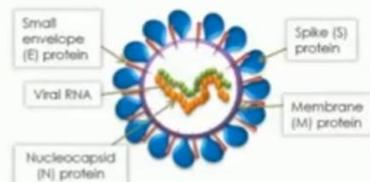
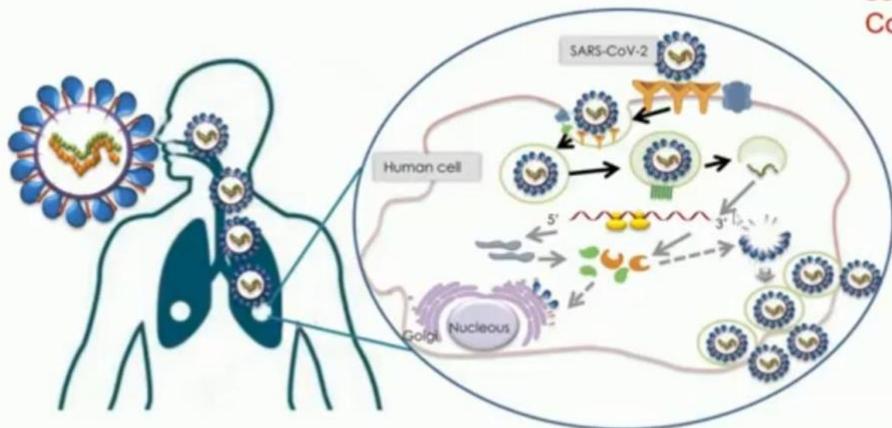
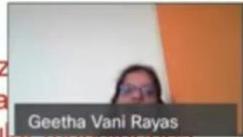
Target the Host:

- **Anti-viral:** Camostat, Nefamostat
- **Anti Inflammatory Drugs:** Steroids such as dexamethasone

COVID-19: Drug Targets and Potential Treatments

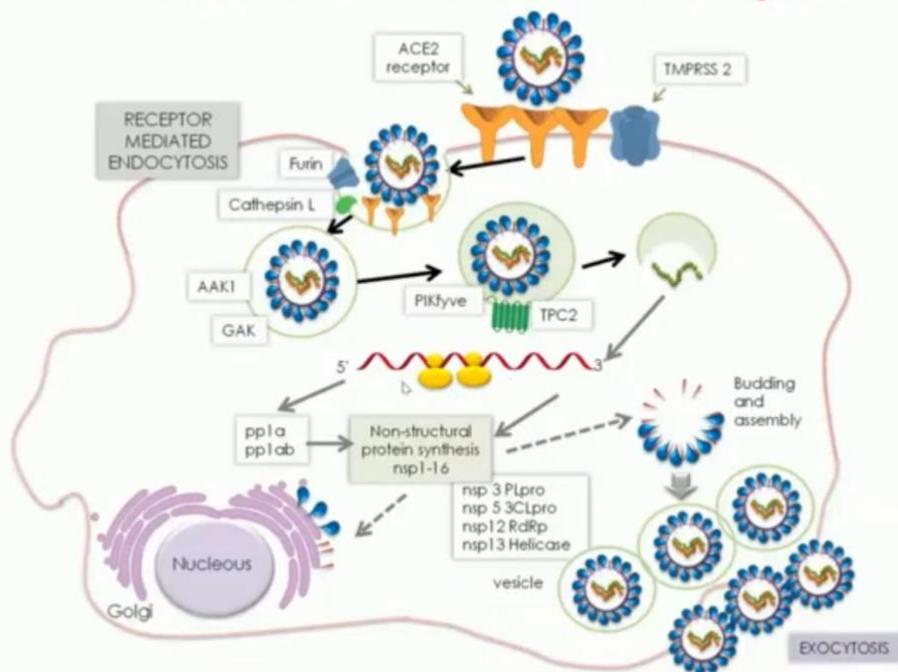
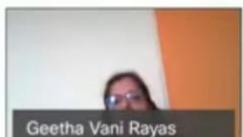
Carmen Gil et al., Publication Date: June 8, 2020

In principle, all CoV enzymes and proteins involved in viral replication and the control of host cellular machineries are potentially druggable targets in the search for therapeutic options for SARS-CoV-2.



<https://pubs.acs.org/doi/10.1021/acs.jmedchem.0c00606>

SARS-CoV-2 Infection Life Cycle



<https://pubs.acs.org/doi/10.1021/acs.jmedchem.0c00606>

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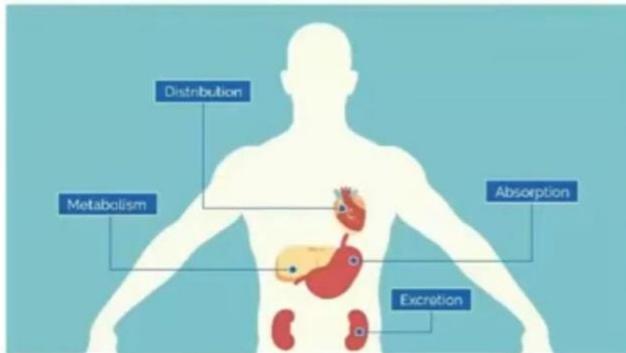


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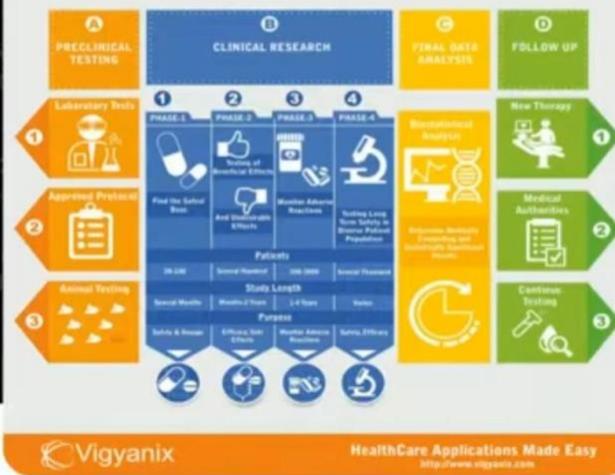
Clinical Trials and Regulatory Approval



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How Do Clinical Trials Work From Trial to Treatment



Awareness about COVID 19

The most ideal approach to forestall and hinder transmission is being well educated about the COVID-19 infection, the ailment it causes and how it spreads. Shield yourself as well as other people from disease by washing your hands or utilizing a liquor based rub habitually also, not contacting your face. Try not to trust in the rumours. Researchers and Specialist Doctors are attempting their best to concoct the appropriate treatment and immunization.

Via CiscoWebex

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Be **READY** for #coronavirus

WHO is giving advice on how to protect ourselves & others:

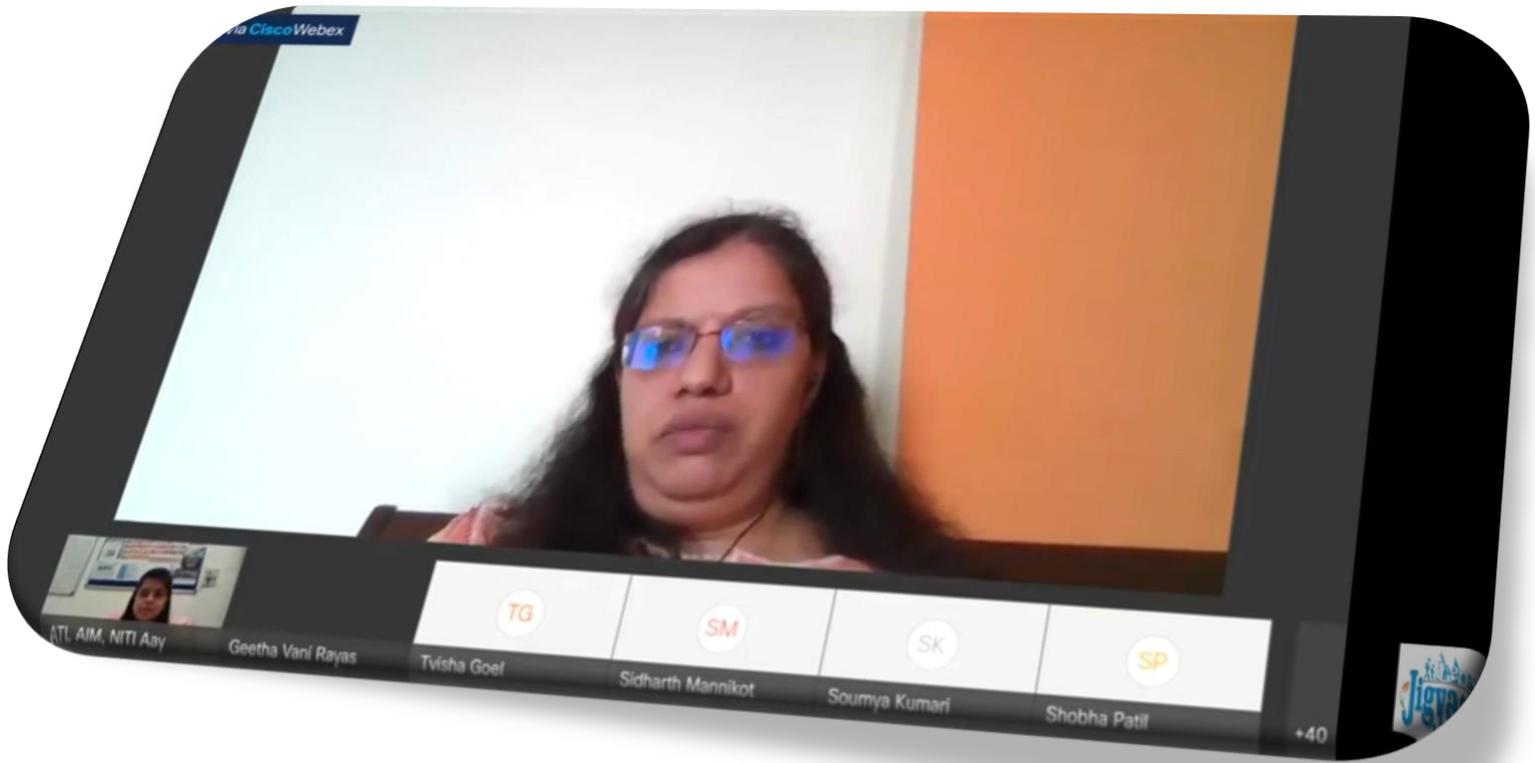
Be **SAFE** from coronavirus infection

Be **SMART** & inform yourself about it

Be **KIND** & support one another

Learn more about #COVID19 & share with your loved ones: www.who.int/COVID-19





Lecture by Dr. Geetha streamed live on 6th July 2020 on <https://youtu.be/8ITtRaKQz4c>