

SPACEPHARMA Remote-Controlled Miniaturized Microgravity Solutions

Yossi Yamin Founder & CEO

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"Every cubic inch of space is a miracle."

– Walt Whitman











Microgravity Research Fields

IR1

Slide 5

IR1 Ifat Rotbein, 15/07/2014

Access to Microgravity Research today is limited to International Space Station (ISS)



Current issues - Space agenda today:



Current issues - Space agenda today Background: Climate Change and Virus Outbreak



Climate change may have triggered Zika outbreak

Israeli and Swedish researchers find link between the virus pandemic and northeast Brazil's very hot, dry winter and spring.

By ISRAEL210 Stoff | FEBRUARY 4, 2016, 12:29 PM

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SpacePharma's Contribution Areas Education Enabling research in space will allow us to learn on how space can be used and improve Global Health and Sustainable Development **Sustainable Development** R&D **Global Health** +" SPACEPH All rights are reserved by SpacePharma ©

SpacePharma Contribution



Space and Sustainable Development

Space Farming
New Vaccines
Improved Shelf life of collodial-based products



International cooperation

Novel Antiviral & Antibiotics Drug Screening +50

UNISPACE+50

Space and Global Health

+

• Stem cell therapy

• Differential Gene Expression in Space

SPACEPHARMA

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Current issues - Space agenda today
I. Stem Cells in Microgravity

- In both space-based and simulated-microgravity experiments, various types of stem cells and progenitor cells have shown distinct responses.
- Some types of cells show increased proliferation and viability. Others show enhanced differentiation
- Microgravity research has the potential to advance stem cell therapies by identifying novel cell properties and pharmaceutical targets







Current issues - Space agenda today

II. Bacterial Virulence In Microgravity

- In microgravity bacterial virulence increases
- Experiments executed across a number of bacterial species reported a reduced lag phase, increased growth rate and increased final cell population densities under microgravity conditions
- In μ G, bacteria were shown to become more resistant to common antibiotics and presented enhanced biofilm formation
- Discovering the factors responsible for growth and virulence of bacteria is very important
- Thus, microgravity has the potential to lead to the identification of novel regulation of genes, providing novel potential targets for vaccine and development of new antibiotic drugs









Current issues - Space agenda today

III. Differential Gene Expression in Microgravity

- In the absence of gravity, certain genes in cells turn off and others turn on. Studying these changes will allow scientists to develop a better understanding on how cells function and how to manipulate them in labs on Earth
- Out of 10,000 genes evaluated, 1632 genes were altered in μG
- Genetic expression of cytokines (interleukins, interferon-gamma, tumor necrosis factor) in human cells is changed during spaceflight
- Expression of proto-onco-genes, c-fos and c-jun, in human epidermoid A431 cells flown on sounding rockets are altered









Current issues - Space agenda today IV. Improved shelf-life of colloidalbased products

Examples of colloidal systems strongly affected by gravity include macromolecular crystallization, self-assembly of proteins and polymers, liquid crystals, suspensions, emulsions and foams

- Particles are under constant motion → aggregation → sedimentation & phase separation
- The behaviour is not well modeled (unpredictable) since gravity is a masking and catalytic factor
- The lack of sedimentation and buoyancy in μG helps understanding the process allowing differentiation between aggregation/phase separation and sedimentation









Current issues - Space agenda today V. Space Farming: Plant Biology





Microgravity effects on plants growth

Exposure of cells to microgravity results in various cellular alterations that affect structure and function, including signal transduction, gene-expression, immune response and metabolism



Current issues - Space agenda today

V. Space Farming: Plant Biology



'Space Cherry' Tree Blossoms 6 Years Early Following Trip Aboard The ISS, Cosmic Forces May Have Spurred Growth

By Philip Ross on April 12 2014 4:23 PM



Microgravity enables the examination of fundamental plant biology and contributes to the understanding of main processes such as gravitropism, phototropism, and juvenility





SpacePharma's Solution – µGnify

Simple, Affordable, Accessible, End-to-End µG solution:





SpacePharma's Technology

- Miniaturized Nano-laboratory
- Easily customized
- Fits inside multiple microgravity platforms
- Remote controlled by customers
- Flexible usage model
- Secured data protection





SpacePharma's First Satellite – DID01

Upcoming launch:

SPmgLab:

Bacterial growth, Antibiotics resistance, Self-assembly, Enzymatic reactions, Polymerization, Nanoparticle synthesis, Particle aggregation dynamics, Emulsion stability, Crystallization







SpacePharma's First Satellite – DID01

Upcoming launch:







Status

- Ground station : April 2016
- ITU frequencies : May 2016 •
- First satellite launch: May 2016
- First parabolic flight: August 2016
- 2nd satellite launch: August 2016



Thanks for your attention

