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Providing High-Quality Innovation and Technology Support Services – University Experience and Best Practices

Professor Stanley Kowalski

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Overview:

- Technology Transfer Defined
- Mission and Policy
- Statutory Basis of Technology Transfer in the USA
- Benefits of Technology Transfer
- Technology Transfer Offices (TTOs)
- Overview of the Technology Transfer Process
- **SWITCH GEARS**
- The Future of Technology Transfer: Challenges/New Models
- Open Innovation and the Global Innovation Market
- Important Points to Consider

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Technology Transfer Defined

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Technology transfer is the sharing of skills, knowledge, technologies, and facilities among industries, universities, governments and other institutions to make scientific and technological developments accessible to a wider range of people who can further develop and exploit the technology.
[IP Advocate]

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Technology transfer is the process of transferring scientific findings from one organization to another for the purpose of further development and commercialization. [AUTM]

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The technology transfer process typically includes:

- Identifying new technologies
- Protecting technologies through patents and copyrights
- Forming development and commercialization strategies such as marketing and licensing to existing private sector companies or creating new start-up companies based on the technology [AUTM]

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The ultimate benefits of technology transfer, however, are the public benefits derived from the products that reach the market and the jobs that result from the development and sale of products. [AUTM]

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Investments in intellectual property are returned to the public through products that benefit the public, increased employment, and state and federal taxes.

These activities can be pursued without disrupting the core values of publication and sharing of information, research results, materials and know-how. **[AUTM]**

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As the transition from a manufacturing-based economy to a knowledge-based economy continues, the role of university intellectual property will play an increasingly important part. Many states are developing programs to enhance economic development through technology transfer from local research universities. [AUTM]

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Institutional Intellectual Property Policy

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An institutional IP (intellectual property) policy forms the very foundation of IP management and, as such, serves as the starting point for a system of institutional best practices.

The IP policy should be entirely consistent with the mission of the institution.

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Whether the role of the institution, as defined by its mission, is primarily disseminator of knowledge through teaching and publication, generator of research, technology transfer engine, or promoter of economic development through education and service and/or through technology transfer, ***the institutional IP policy should be drafted and enforced in a manner consistent with the mission***.

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Intellectual Property Rights Covered by IP Policy

- **patents;**
- **utility models;**
- **industrial designs;**
- **copyright in literary works;**
- **geographical indications;**
- **trade and service marks;**
- **new plant varieties;**
- **trade secrets.**

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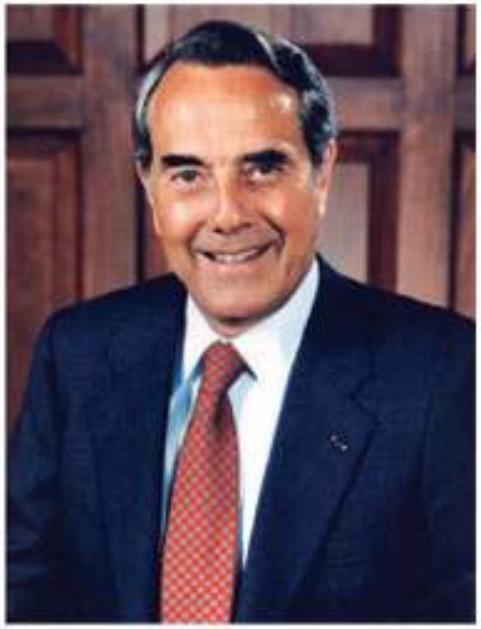
Statutory Basis: University Technology Transfer in the USA

Birch Bayh



Bob Dole

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Enacted in 1980, the Bayh-Dole Act created a uniform patent policy among the many federal agencies that fund research, enabling small businesses and non-profit organizations, including universities, to retain title to inventions made under federally-funded research programs.

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Bayh-Dole Impact

According to a study by the Council on Government Relations (COGR), University patenting and licensing efforts under the Bayh-Dole Act have fostered the commercialization of many new technological advances that impact the lives of millions of people across the nation.

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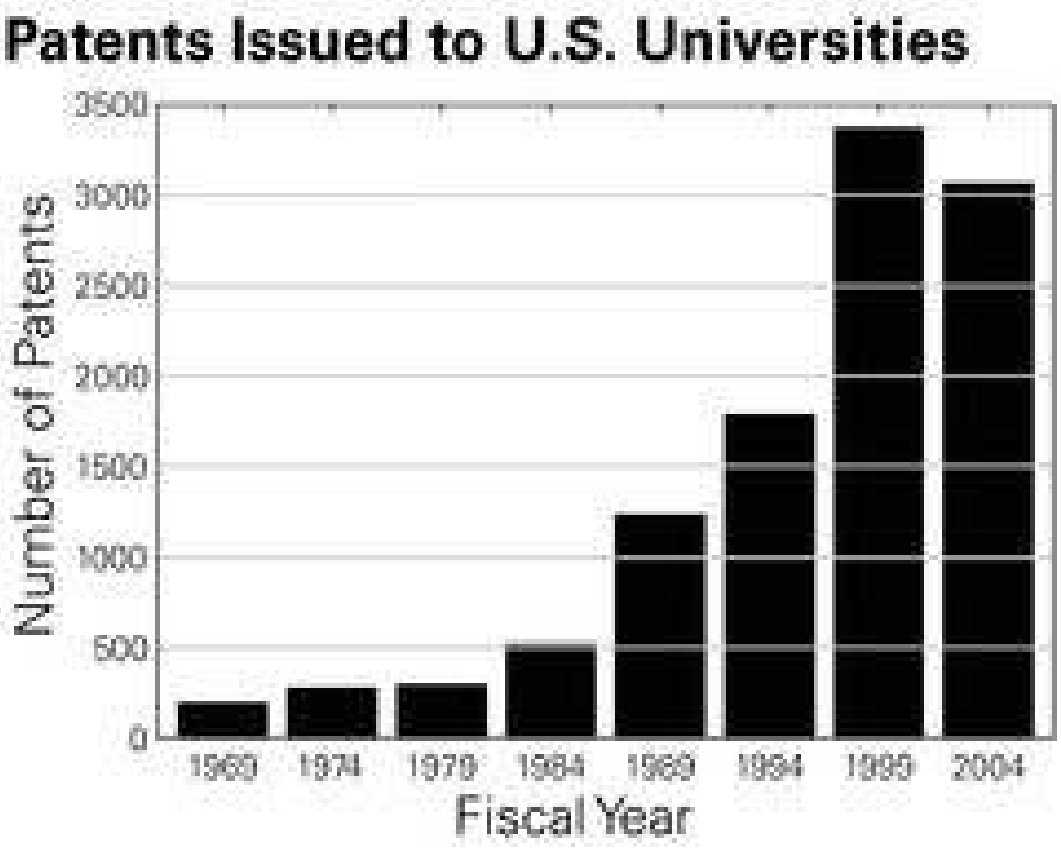

Bayh-Dole Impact:

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Bayh-Dole Impact:

A recent survey by the Association of University Technology Managers (AUTM) revealed that many of the active licenses of responding institutions are in the life sciences - yielding products and processes that diagnose disease, reduce pain and suffering, and save lives. Most of the inventions involved were the result of federal government funding.

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A few widely notable examples follow….

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Artificial lung surfactant for use with newborn infants, University of California

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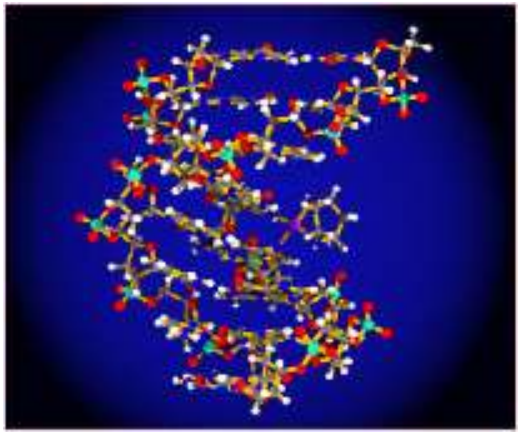
Cisplatin and carboplatin cancer therapeutics, Michigan State University



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Citracal calcium supplement, University of Texas Southwestern Medical Center

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Haemophilus B conjugate vaccine, University of Rochester

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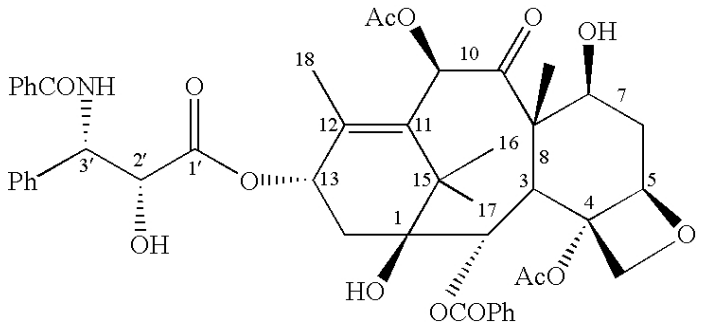
Metal Alkoxide Process for taxol production, Florida State University



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Neupogen used in conjunction with chemotherapy,
Memorial Sloan Kettering Cancer Institute

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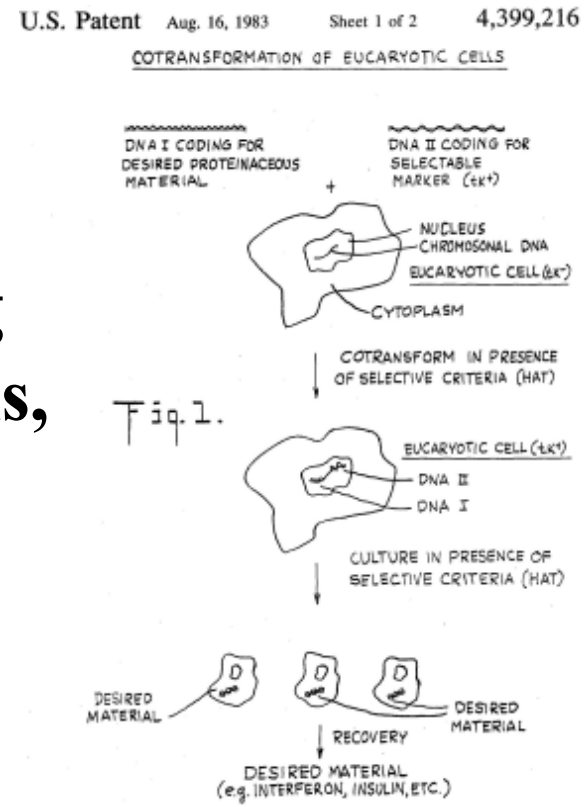
Process for inserting DNA into eukaryotic cells and for producing proteinaceous materials, Columbia University



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Recombinant DNA technology, central to the biotechnology industry,
Stanford University and University of California

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TRUSOPT(r) (dorzolamide) ophthalmic drop used for glaucoma, University of Florida

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Technology Transfer Offices

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Technology Transfer Offices (TTOs) - an organization within a university or government body that identifies research initiatives that have the greatest commercial potential, and facilitates their commercialization. They provide strategies for these discoveries and help to guide the process to fully exploit its opportunity. They are also known as "Offices of Technology Transfer."

Technology Transfer Offices (TTOs)

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In the U.S., research universities establish Technology Transfer Offices:

- **To assist faculty and researchers**
- **To evaluate inventions**
- **To determine whether or not to protect intellectual property rights, and to manage patenting process**
- **To market innovations to industry partners**
- **To negotiate legal contracts with these industry partners to transfer rights in exchange for royalties or other consideration**
- **To assist in creation of spin-off companies**

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TTO Organizational Structures:

- A TTO as an office within the university
- An external TTO owned by the university, which can be "not for profit" or "for profit"
- Combination of an internal and external office
- A company contracting with the university to manage its innovations and tech transfer
- One TTO serving a "consortium" or collection of universities in a region
- A Government Agency serving as a TTO

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Overview of the Technology Transfer Process

[NIH]

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Technology Transfer Process

- The predefined steps taken by the research university
- to assert and protect its patent rights and
- to monetize inventions where possible.

Steps in the process may include pre-disclosure, disclosure, assessment, protection, marketing, licensing, commercialization and revenue distribution.

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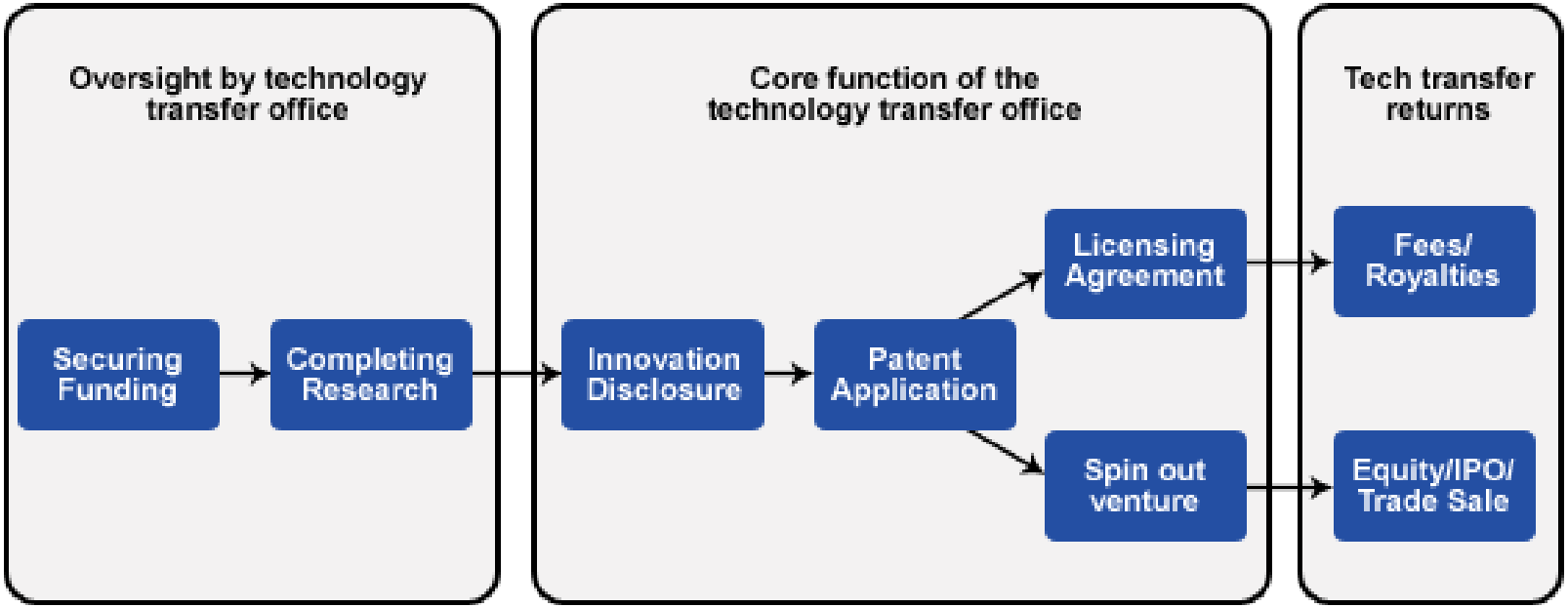
The Tech Transfer Process



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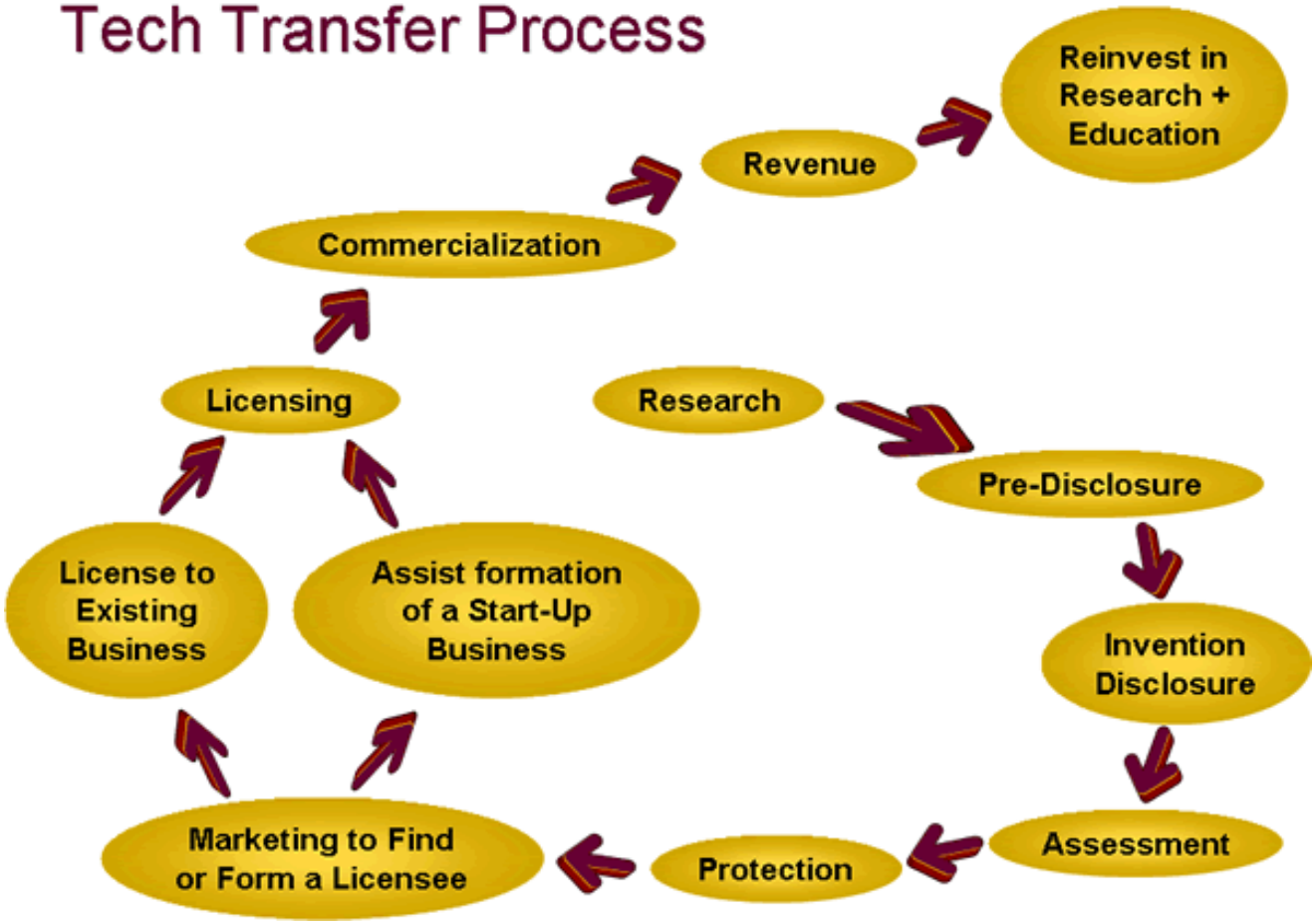
Tech Transfer Process



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Switch Gears

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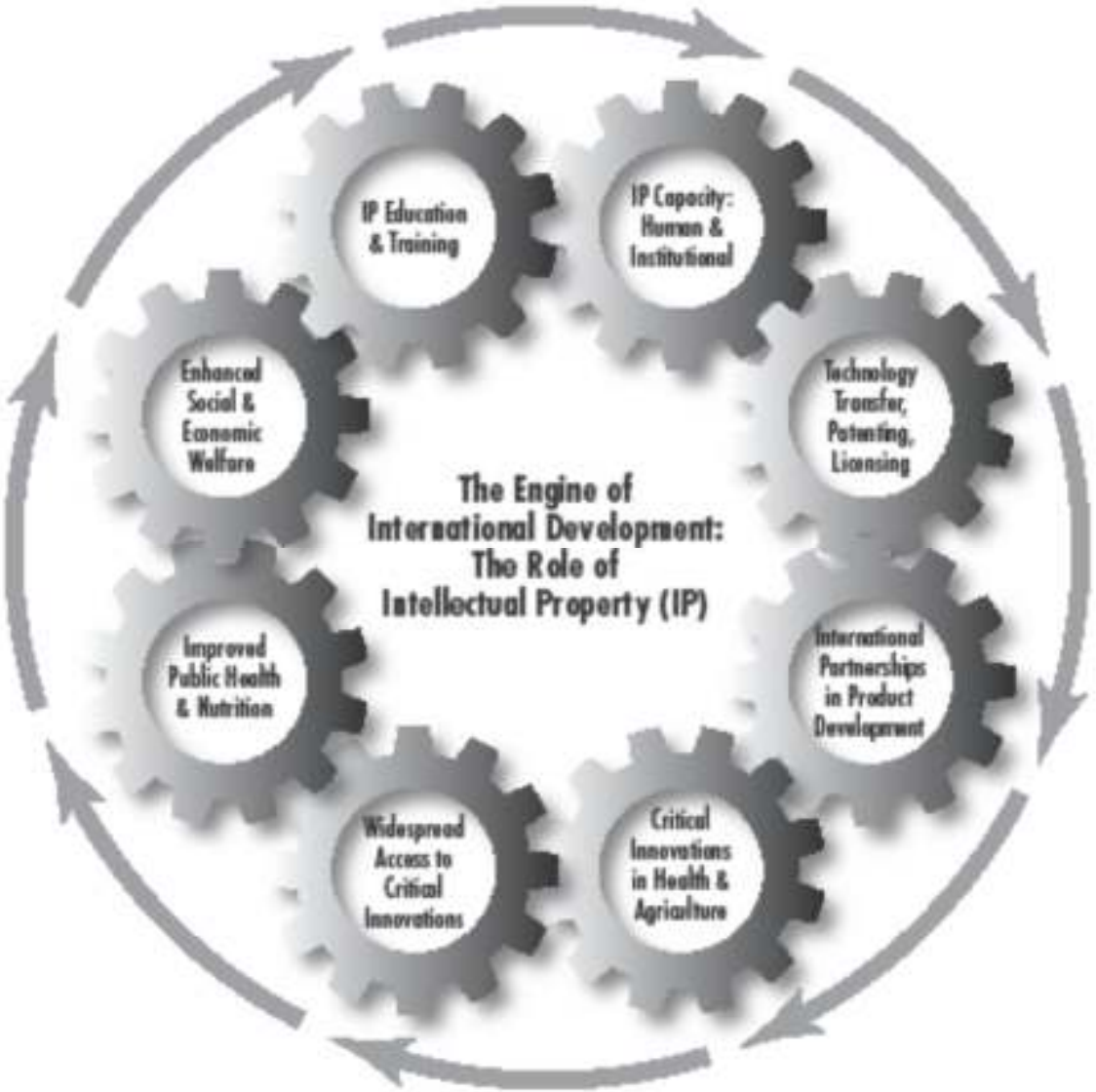

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The Future of Technology Transfer: Challenge and New Models

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Valley of Death: where good lab discoveries go to die because they lack the funding necessary to become a commercial product.

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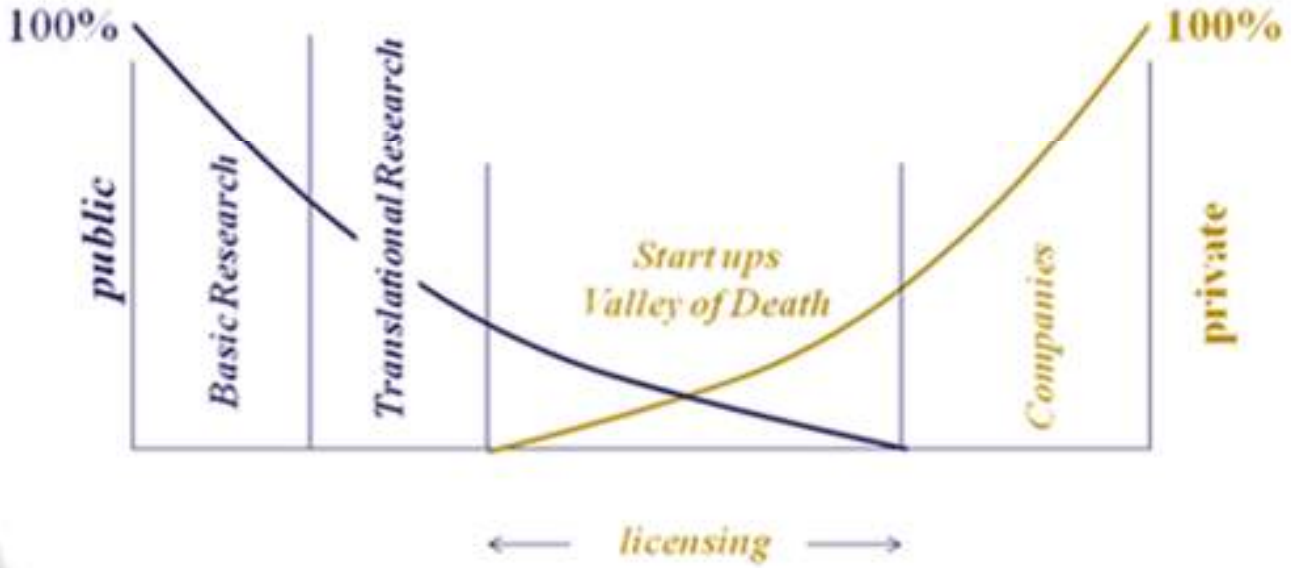
The Continuum of Innovation



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New model: a public/private collaboration specifically around that area of translational research, and assistance to start-ups from incubators and innovation centers.

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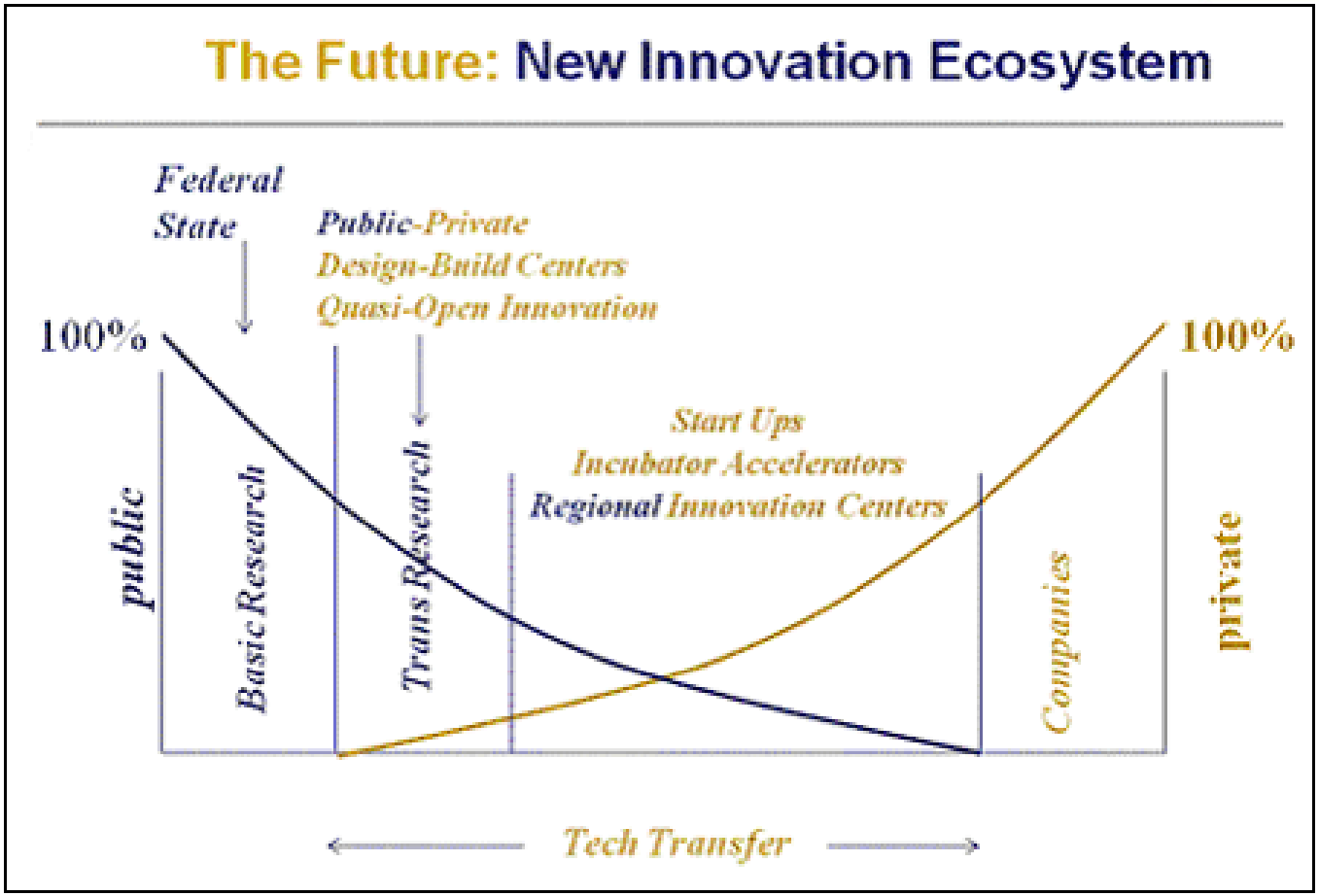
The Future: New Innovation Ecosystem



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- **Develop a National Framework for Translational Research**
- **Create Design-Build Innovation Centers**
- **Understand the Innovation Ecosystem and Develop Sustainable Business Model**
- **Consider Quasi-Open Innovation Models**
- **Expand Public-Private Collaborations to Fund Translational Research**

[http://www.ipwatchdog.com/]

Open Innovation

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Closed innovation consists of a contained, ***straight and sequential*** line from basic and applied research to product development, manufacturing and sales.

Open innovation consists of ***networking*** with other companies, R&D facilities, ***interacting*** with start-up ventures, public research institutes, universities, external suppliers and ***sharing and accessing*** outside information and technology.

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Open Innovation Basics

Key aspects of Open Innovation:

- Networking
- Collaboration
- Entrepreneurship
- ***IP management***
- Global Vision
- ***Knowledge***
- Access to finance
- ***Access to information***

Open Innovation Basics

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In the emerging global knowledge economy, ***knowledge itself*** has become the key resource. Open innovation needs to be embedded in an overall business strategy that emphasizes the interchange of ideas, knowledge and technology in value creation.

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Open Innovation Basics

The Open innovation paradigm foundation is knowledge. Information access is therefore key to successfully navigating the global innovation marketplace, to accelerate technology transfer, absorption, adoption.

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"[We] are now linked … physically, intellectually, socially and culturally … in ways that were impossible to imagine. The intellectual property system is part of this linking process. It facilitates the sharing of information … such as the wealth of technological know-how contained in WIPO's free data banks. It provides a framework for trading and disseminating technologies."

(Takagi and Czajkowski quoting Francis Gurry, Director General, WIPO)

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"Just as participation in the physical economy requires access to roads, bridges to transport goods, a similar infrastructure is needed in the virtual and knowledge economy. However, here the highway is represented by the Internet and other networks, bridges are inter-operable data standards, and vehicles are computers and databases."

(Takagi and Czajkowski quoting Francis Gurry, Director General, WIPO)

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Indeed, as Takagi and Czajkowski further articulate:

"It is the … 'global interlinks' which now help the developing world to leap forward. The interlinked infrastructure of intellectual property should bring additional value to intellectual property stakeholders in the world and allow them to participate in the global market."

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Takagi Y, Czajkowski A.: WIPO services for access to patent information——building patent information infrastructure and capacity in LDCs and developing countries. World Patent Information 2012, 34:30–36.

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Innovation and Technology Entrepreneurship Challenge:

- **To benefit from the global pool of technology, developing countries need to build the capacity to find, absorb and use it.**
- **This will entail building the capacity to plug into global technology networks and institutions that will facilitate this connectivity.**
- **Partnerships have a vital role to play in helping developing countries build this capacity.**

Global Forum Action Plan: Science, Technology and Innovation Capacity Building Partnerships for Sustainable Development, September 1, 2010, Compiled by Alfred Watkins and Joshua Mandell (with Alistair Brett)

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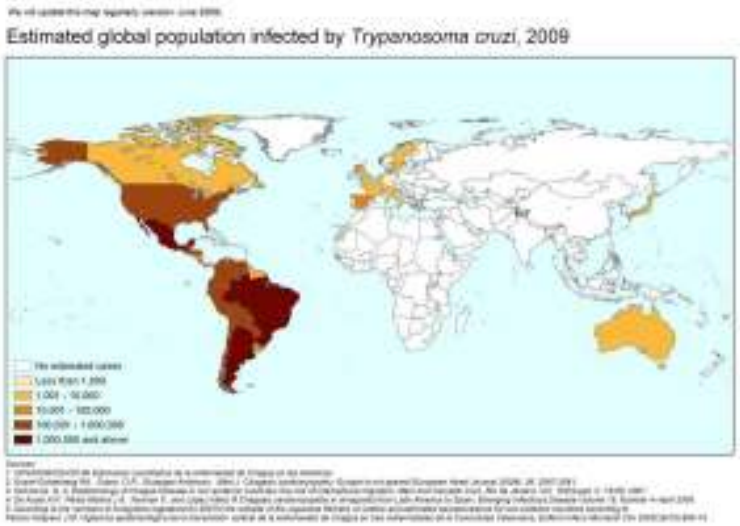
Inclusive Innovations in Health and Agriculture that are the Subject of Patent Applications and/or Grants:

1. Chagas Disease Vaccine
2. Parasitic Roundworm Vaccine
3. Phytoremediation of Dioxin
4. Drought Resistant Maize
5. Cholera Vaccine
6. Rotavirus Vaccine
7. Red Detect Landmine Detection System

Chagas Disease Vaccines



(12) **United States Patent**
Tarleton et al.

(10) **Patent No.: US 6,875,584 B1**
(45) **Date of Patent: Apr. 5, 2005**

(54) **PROPHYLACTIC AND THERAPEUTIC IMMUNIZATION AGAINST PROTOZOAN INFECTION AND DISEASE**

(75) Inventors: **Rick L. Tarleton**, Watkinsville, GA (US); **Nisha Garg**, League City, TX (US)

(73) Assignee: **University of Georgia Research Foundation, Inc.**, Athens, GA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/518,156**

(22) Filed: **Mar. 2, 2000**

Related U.S. Application Data

(60) Provisional application No. 60/122,532, filed on Mar. 2, 1999.

(51) **Int. Cl.**[7] **C12P 21/06**; C12P 15/09

(52) **U.S. Cl.** **435/69.1**; 435/69.2; 435/69.3; 435/69.5; 514/44

(58) **Field of Search** 435/69.1, 69.2, 435/69.3, 69.5; 514/44

Armah et al., "*S*–Myristoylation of a Glycosylphosphatidylinositol–specific Phospholipase C in *Trypanosoma brucei*," *J. Biol. Chem., 274*(9):5931–5938 (Feb. 26, 1999).

Abrahamson, "Cytokines in innate and acquired immunity to *Trypanosoma cruzi* infection," *Braz. J. Med. Biol. Res., 31*(1):117–121 (Jan. 1998).

Alberti et al., "Specific cellular and humoral immune response in Balb/c mice immunised with an expression genomic library of *Trypanosoma cruzi*," *Vaccine, 16*(6):608–612 (Apr. 1998).

Al Qahtani et al., "A 5' untranslated region which directs accurate and robust translation by prokaryotic and mammalian ribosomes," *Nuc. Acids Res., 24*(6):1173–1174 (1996).

Andrerws et al., "Presence of antibodies to the major surface glycoprotein of *Trypanosoma cruzi* amastigotes in sera from chagasic patients," *Am. J. Trop. Med. Hyg., 40*(1):46–49 (1989).

Andrews, "The Acid–Active Hemolysin of *Trypanosoma cruzi*," *Exp. Parasitol., 71*:241–244 (1990).

Barry et al., "Protection against mycoplasma infection using expression–library immunization," *Nature, 377*(6550):632–635 (1995).

Barry et al., "Biological features of genetic immunization," *Vaccine, 15*(8):788–791 (1997).

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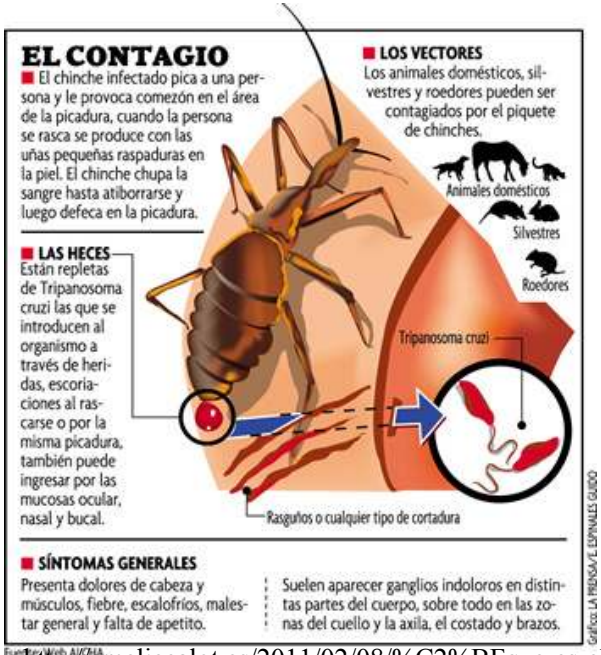
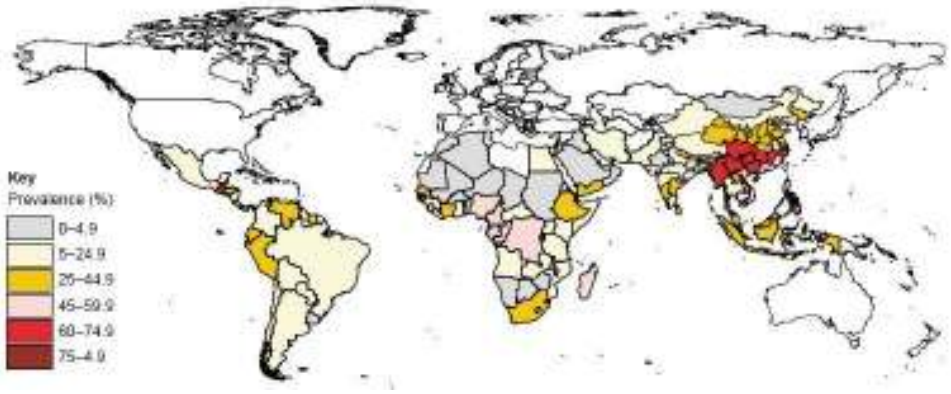


http://ameliecalot.es/2011/02/08/%C2%BFque-es-el-chagas/



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Parasitic Roundworm Vaccine

US005942413A

United States Patent [19]
Sharp et al.

[11] **Patent Number: 5,942,413**
[45] **Date of Patent: Aug. 24, 1999**

[54] **NEMATODE VACCINE**

[75] Inventors: **Phillip John Sharp**, Glebe; **Barry Maxwell Wagland**, Carlingford; **Gary Stewart Cobon**, Frenchs Forest, all of Australia

[73] Assignees: **Biotech Australia PTY Limited**, Roseville; **Commonwealth Scientific and Industrial Research Organization**, Campbell, both of Australia

[21] Appl. No.: **08/460,998**

[22] Filed: **Jun. 5, 1995**

Friedlander et al., "Immunological Aspects of Murine Infection With The Rat Nematode Strongyloides ratti Sandground, 1925, "Z Parasitenkd, 72: 493–509 (1986).

International Journal for Parasitology, vol. 15, No. 2, pp. 129–136, O'Donnell, Attempts to Probe the Antigens and Protective Immunogens of Trichostrongylus, etc.

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V. Kumar et al., Proc. Natl. Acad. Science USA 87:1337–1341 (1990).

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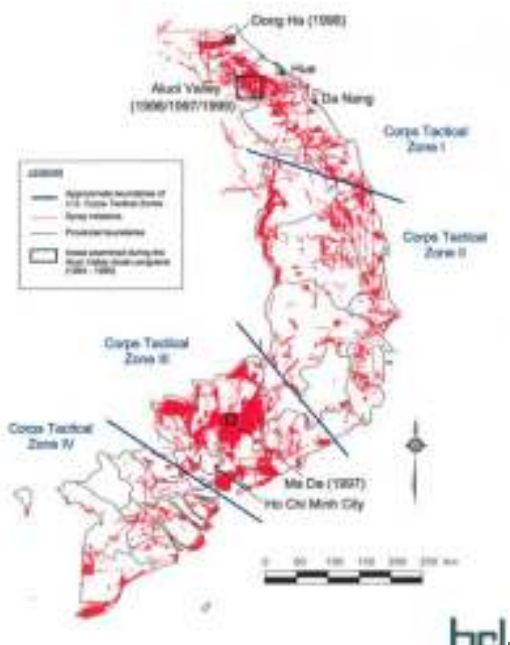

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Dioxin Phyto-remediation

US 20060095982A1

(19) **United States**

(12) **Patent Application Publication**
Daniell

(10) **Pub. No.: US 2006/0095982 A1**

(43) **Pub. Date: May 4, 2006**

(54) **PHYTOREMEDIATION OF CONTAMINANT COMPOUNDS VIA CHLOROPLAST GENETIC ENGINEERING**

(75) Inventor: **Henry Daniell**, Winter Park, FL (US)

Correspondence Address:
SALIWANCHIK LLOYD & SALIWANCHIK
A PROFESSIONAL ASSOCIATION
PO BOX 142950
GAINESVILLE, FL 32614-2950 (US)

(73) Assignee: **University of Central Florida**, Orlando, FL (US)

(21) Appl. No.: **10/520,204**

(22) PCT Filed: **Jul. 2, 2003**

(86) PCT No.: **PCT/US03/20868**

Related U.S. Application Data

(60) Provisional application No. 60/393,451, filed on Jul. 3, 2002.

Publication Classification

(51) **Int. Cl.**
A01H 1/00 (2006.01)
C12N 15/82 (2006.01)

(52) **U.S. Cl.** **800/278**; 435/468

(57) **ABSTRACT**

A plastid transformation vector for stably transforming a plastid genome, comprising, as operably-linked components, a first flanking sequence, at least one DNA sequence coding for a polypeptide suitable for remediating a contaminant compound, and a second flanking sequence, wherein a plant is stably transformed with the plastid transformation vector, and the plant is capable of phytoremediating a contaminant compound.

Drought Resistant Maize

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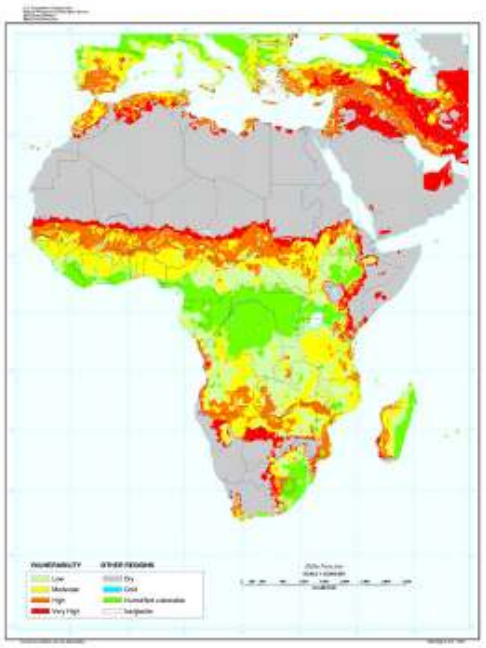
Over the next several decades, the risk of drought is expected to intensify; the impact on agriculture will increase in Africa. (Source, USDA)



(19) **United States**
(12) **Patent Application Publication**
Guo et al.

(10) **Pub. No.: US 2008/0078004 A1**
(43) **Pub. Date: Mar. 27, 2008**

(54) **THE MAIZE ERECTA GENES FOR IMPROVING PLANT GROWTH, TRANSPIRATION, EFFICIENCY AND DROUGHT TOLERANCE IN CROP PLANTS**

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Related U.S. Application Data

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A01H 5/00	(2006.01)
C07H 21/00	(2006.01)
C12N 1/00	(2006.01)

Cholera Vaccines

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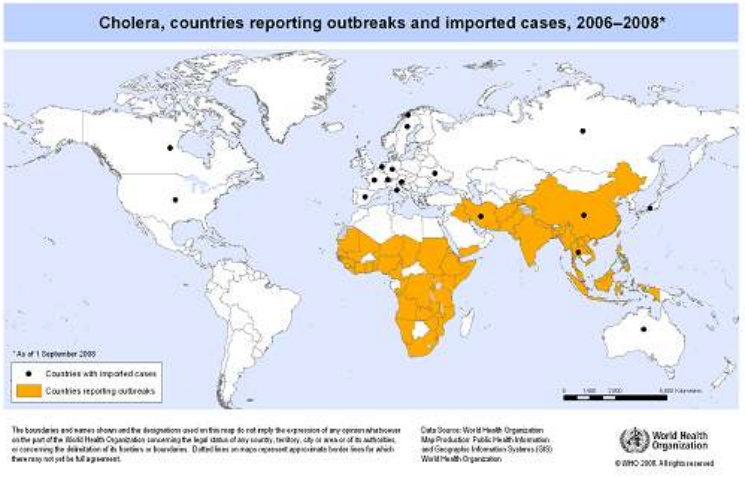
Cholera continues to plague developing countries across the globe. (WHO)



US 20100247566A1

(19) **United States**

(12) **Patent Application Publication**
Camilli et al.

(10) **Pub. No.: US 2010/0247566 A1**

(43) **Pub. Date: Sep. 30, 2010**

(54) **CHOLERA VACCINES**

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Related U.S. Application Data

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Publication Classification

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A61K 39/106	(2006.01)
C12N 1/20	(2006.01)
A61P 37/04	(2006.01)
A61P 31/04	(2006.01)

(52) **U.S. Cl.** **424/203.1**; 424/261.1; 435/252.1

(57) **ABSTRACT**

Rotavirus Vaccines

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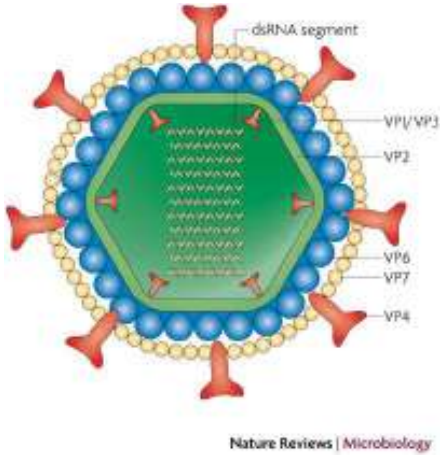
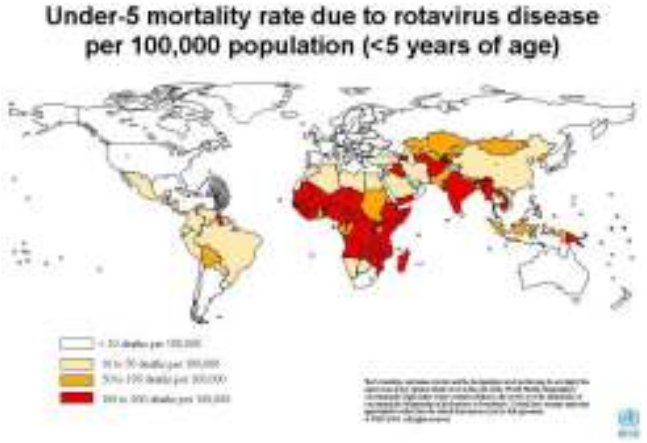


A leading cause of severe diarrhoea in children under five years of age, rotaviral infections kill more than 500,000 children each year worldwide. Nearly 50% of all rotavirus deaths occur in Africa (250,000 annually). (WHO)



United States Patent [19]

Burke et al.

[11] **Patent Number: 5,932,223**

[45] **Date of Patent: Aug. 3, 1999**

[54] **ROTAVIRUS VACCINE FORMULATIONS**

[75] Inventors: **Carl J. Burke**, Pennsburg; **David B. Volkin**, Doylestown, both of Pa.

[73] Assignee: **Merck & Co., Inc.**, Rahway, N.J.

[21] Appl. No.: **08/938,260**

[22] Filed: **Sep. 26, 1997**

Related U.S. Application Data

[60] Provisional application No. 60/046,760, May 16, 1997, and

FOREIGN PATENT DOCUMENTS

0 192 404	2/1986	European Pat. Off. .
WO 96/01651	1/1996	WIPO .

Primary Examiner—Jeffrey Stucker
Attorney, Agent, or Firm—Michael D. Yablonsky; Jack L. Tribble

[57] **ABSTRACT**

Red Detect, Landmine Detection Technology

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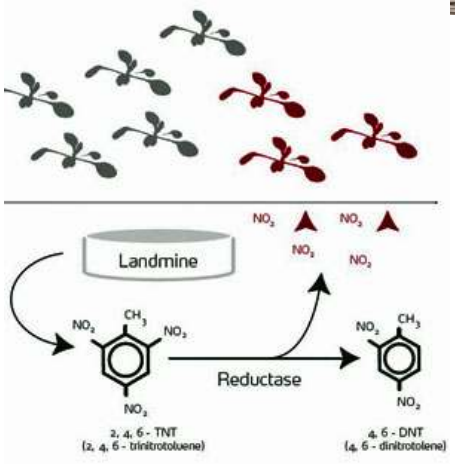

US 20050289662A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2005/0289662 A1**

Meier (43) **Pub. Date: Dec. 29, 2005**

(54) **REPORTER SYSTEM FOR PLANTS**

(76) Inventor: **Carsten Meier**, Copenhagen (DK)

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(21) Appl. No.: **10/515,988**

(22) PCT Filed: **May 30, 2003**

(86) PCT No.: **PCT/IB03/02081**

(30) **Foreign Application Priority Data**

May 29, 2002 (DK) PA200200823

Publication Classification

(51) **Int. Cl.**[7] **A01H 1/00**; C12N 15/82

(52) **U.S. Cl.** **800/278**; 435/468

(57) **ABSTRACT**

A reporter system capable of giving rise to a directly monitorable phenotypic trait in a plant, in the presence of an outer stimulus such as for example a pollutant, is provided. The system optionally also has the ability to remediate soil. Genetically modified plants comprising said reporter system and optionally the remediation capability, a process for detection of soil pollution and optionally for bioremediating soil by employing said genetically modified plants, as well as the use of genetically modified plants for monitoring soil pollution and optionally for bioremediating soil are also provided.

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Closing Thoughts

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- **Technology transfer and commercialization CAN be compatible with, and in fact enhance, the traditional missions and roles of a university or research institute.**
- **Technology transfer and commercialization requires a dedicated effort to be successful**
- **The skills necessary for successful technology transfer and commercialization are different than the skills necessary to do good science.**
- **The research organization of the 21st century will be heavily involved in technology transfer.**