

EXTRAMURAL RESEARCH

Promoters of *Mycobacterium tuberculosis*, All India Institute of Medical Sciences (AIIMS), New Delhi

Product/Process: Hypoxia responsive promoters of *Mycobacterium tuberculosis*.

Application/Uses: The study demonstrates the utility of *M. smegmatis* as a surrogate host to study hypoxia responsive promoters of *M. tuberculosis*. The study provides a whole cell assay to monitor *M. tuberculosis* promoter activity and would find use in the screening of compounds that inhibit these promoters.

Salient Technical Features: The environment within granulomas is believed to be hypoxic. *Tubercle bacilli* within this environment are thought to be in a non-replicative persistent state. The current anti-tubercular drug target actively replicating bacilli and therefore persistent bacteria are refractory to the conversational anti-tubercular drugs. Hypoxic or anaerobic conditions and nutrient limitation trigger non-replicative persistence of *M. tuberculosis*. Up-regulation of dev R- dev S under hypoxia suggests the essentiality of this system in the adaptation of *M. tuberculosis* to hypoxic conditions. *M. tuberculosis* being a slow growing pathogen is relatively difficult to handle and hence *M. tuberculosis* a fast growing non-pathogenic species of the same genus, is often used to study these physiological aspects of *M. tuberculosis* that are common to both species. By the use of *M. tuberculosis* model, hypoxia responsive gene activity can be studied and evaluated for the efficacy of candidate compounds in blocking hypoxia - modulated gene expression.

Scale of Development: The technology has been developed up to laboratory scale.

Status of Commercialization: An Indian Patent has been granted (no. 211217).

Antitubercular Drug Targets from *Mycobacterium tuberculosis*, Delhi University, South Campus, New Delhi

Product/Process: The invention relates to identification of the role of protein tyrosine phosphates (MtpA and MtpB) in the pathogenesis of *Mycobacterium tuberculosis*.

Application/Uses: These secretory proteins represent attractive targets for the development of new anti-tubercular drugs for short-term therapy against tuberculosis.

Salient Technical Features: The invention provides a method for demonstration of the role of MptpA and MptpB in the pathogenesis of *M. tuberculosis*. The mutant strain lacking tyrosine phosphatases associated with either MptpA or MptpB was employed to understand the role of these proteins in the survival of *M. tuberculosis* in murine macrophages and in the ability of the mutants to cause disease in guinea pigs. These mutant strains were constructed by homologous recombination and showed impaired ability to survive in guinea pigs.

Scale of Development: The technology has been developed up to laboratory scale.

Status of Commercialization: An Indian patent (Application no. 882/DEL/2003) has been filed. A PCT application (Application no. PCT/IN04/00203) has also been filed with countries U.S., Europe, Brazil, Japan and Singapore as national phase applications.

Styrene Maleic Anhydride - a male contraceptive, Indian Institute of Technology (IIT), New Delhi

Product/Process: RISUG (Reversible Inhibition of Sperm Under Guidance).

Application/Uses: It is a copolymer compound - Styrene Maleic anhydride (SMA) used as male contraceptive.

Salient Technical Features: The original compound of RISUG is a co-polymer of maleic anhydride and styrene and used as male contraceptive. When it comes in contact of body fluids, the acid maleic anhydride is hydrolyzed and the carboxyl group exerts a pH lowering effect, which is limited to the immediate vicinity of the polymer. The polymer generates electrical charge, which alter normal negative charge of sperm head, resulting in defects on sperm membranes. Because of these defects, sperm enzyme leaches out from the acrosome and sperm loses its fertilizing ability.

Scale of Development: The technology has been developed at laboratory and pilot scale. Phase I and Phase II clinical trials have completed and restricted Phase III clinical trial is underway.

Status of Commercialization: An US patent (no. 5488075) has been granted on this product. Commercialization of this product is being explored.

Process of preparing male contraceptive, Indian Institute of Technology (IIT), New Delhi

Product/Process: Process of preparing injectable copolymer - Styrene Maleic anhydride (SMA).

Application/Uses: This injectable co-polymer used as male contraceptive.

Salient Technical Features: The process comprises of co-polymerizing styrene and maleic anhydride monomer to a polymer having molecular weight ratio of 1:1 subjecting the polymerized product (co-polymer) to the step of irradiation, precipitating solid co-polymer and subjecting the same to the step of washing for the removal of traces of monomers and homopolymers.

Scale of Development: The technology has been developed at both laboratory and pilot scales. Phase I and Phase II clinical trials and restricted Phase III clinical trials are going on.

Status of Commercialization: Two Indian patents (no. 179093 & 183196) have been granted on the process of preparing SMA. Commercialization of this product is being explored.

Fluoride containing Dental Varnish, Sri Ram Institute for Industrial Research, New Delhi

Product/Process: Duraphet - fluoride containing indigenous dental varnish.

Application/Uses: It is used for caries prophylaxis, which permanently bound on the enamel surface and used in treatment of hypersensitive necks of teeth.

Salient Technical Features: Fluoride content in the indigenous varnish ranged from 20510 to 21000 ppm. After post evaluation intervals of 1 week, considerable amount of fluoride leached out. In spite of leaching out of unstable forms of fluoride, the amount retain was statistically significant. This fluoride is relatively permanently bound on surface and responsible for the caries preventive effect of the varnish.

Scale of Development: The technology has been developed up to laboratory and pilot scale at Sri Ram Institute, New Delhi.

Status of Commercialization: A patent has been applied by NRDC, New Delhi. Technology has been transferred to M/s ICPA Health Product, Mumbai.

Anti-neoplastic compound and process for its preparation, University of Kolkata, Kolkata

Product/Process: An anti-neoplastic compound and process for its preparation.

Application/Uses: The invention provides a novel anti-neoplastic compound and obtained from the skin extract of the Indian snake head fish, *Channa striatus*, locally known as shol fish. It also provides a process for the isolation of a novel anti-neoplastic agent useful for therapeutic application in neoplasia and as a biomedical research probe/tool.

Salient Technical Features: A novel and potent anti-neoplastic compound has been purified from the skin extract of Indian common murrel *Channa striatus* by thin layer chromatography followed by two step silica gel column chromatography. The anti-neoplastic compound is devoid of hemorrhagic, hemolytic and defibrinogenating activity. This novel anti-neoplastic compound had no toxic effects on liver and kidney tissues. It possesses haematinic effects and showed potent anti-neoplastic effect in animal (*in vivo*) and human carcinoma cell line studies (*in vitro*).

Scale of Development: The technology has been developed up to laboratory scale.

Status of Commercialization: An Indian patent (Application no. 832/DEL/2003) has been granted. Technology is being commercialized.

Anti-diabetic Drug - Vijyasar, Regional Research Laboratory (RRL), Jammu

Product/Process: Vijyasar - an Ayurvedic drug obtained from *Pterocarpus marsupium*.

Application/Uses: It is used in the treatment of newly diagnosed or untreated non-insulin dependent diabetes mellitus (NIDDM).

Salient Technical Features: The therapeutic option in the treatment of NIDDM includes dietary modification. Oral hypoglycaemic effects have been attributed to various active principles in Vijayasar. An active principle epicatechin isolated from the heartwood of the *P. marsupium* was found to have protective and restrictive effect in alloxan-induced diabetic rats. Other active principles are three phenolic constituents viz. marsupin, ptorosupin and pterostilbene, which have been shown to significantly reduce the blood glucose level in hyperglycemia. Well conducted clinical trials have been made to see the effect of Vijayasar in NIDDM patients.

Scale of Development: The technology has been developed up to laboratory and pilot scale.

Status of Commercialization: Two Indian patents (no. 192163 and 194292) have been granted. Technology commercialization is being explored.

Herbal Therapeutic Product from *Eugenia jambolana*, University College of Medical Sciences (UCMS), New Delhi

Product/Process: Process for the preparation of an herbal therapeutic product extracted from the pulp of a species *Eugenia jambolana*.

Application/Uses: The product is effective against controlling diabetes mellitus.

Salient Technical Features: The present invention relates to a herbal therapeutic product for controlling diabetes mellitus comprising of at least one hypoglycemic compound extracted from the pulp of fruit *Eugenia jambolana*. The process comprises cleaning and drying the fruit of *Eugenia* to remove extraneous material. De-seeding the fruit and soaking the said de-seeded fruit in water under controlled cooled conditions overnight to retain the activity of hypoglycemic compound.

Scale of Development: The technology has been developed up to laboratory scale.

Status of Commercialization: Three patents have been granted (US Patent no. 6,428,825 and two Indian patents no. 216784 & 188759).

Resistance Modifying Agent against Multidrug Resistance, Chittaranjan National Cancer Institute (CNCI), Kolkata

Product/Process: Non-toxic Resistance Modifying Agent (RMA) against multi-drug resistance.

Application/Uses: Application of non-toxic RMA sensitizes drug resistance cell to anti-cancer drugs and overcome the problem of multidrug resistance (MDR).

Salient Technical Features: The development of this product is based on transition metal and organic moiety (ligand). Three transitional metal complexes of same ligand have been prepared and exhibit resistance modifying properties. By the application of RMAs along with anticancer drug (doxorubicin), the life span of mice increased tremendously. The study was performed in mouse model with drug resistance *Ehrlich ascites* carcinoma cells and drug resistance-lewis lung carcinoma cells. The metal complexes are novel and characterized by detailed spectroscopic studies.

Scale of Development: The technology has been developed up to laboratory and pilot scale.

Status of Commercialization: A patent (Application no. 1210/DEL/2004) has been filed at Indian Patent Office, New Delhi. Technology commercialization is being explored.

New phosphor based UVB phototherapy lamp, Baba Ramdeo Kamla Nehru Engineering College, Nagpur

Product/Process: A process to prepare rare earth activated phosphor compounds.

Application / Uses: The present invention relates to new, narrow UVB emitting phosphors for indigenous production of narrow UVB phototherapy lamps.

Salient Technical Features:

- Rare earth activated phosphor compound are prepared in a single step.
- These phosphors are produced from indigenously available raw materials.
- The process of preparation of these phosphors is cost effective.

Scale of Development: The technology has been developed up to laboratory scale.

Status of Commercialization: An Indian Patent (Application no. 2665/DEL/2006) has been filed.

