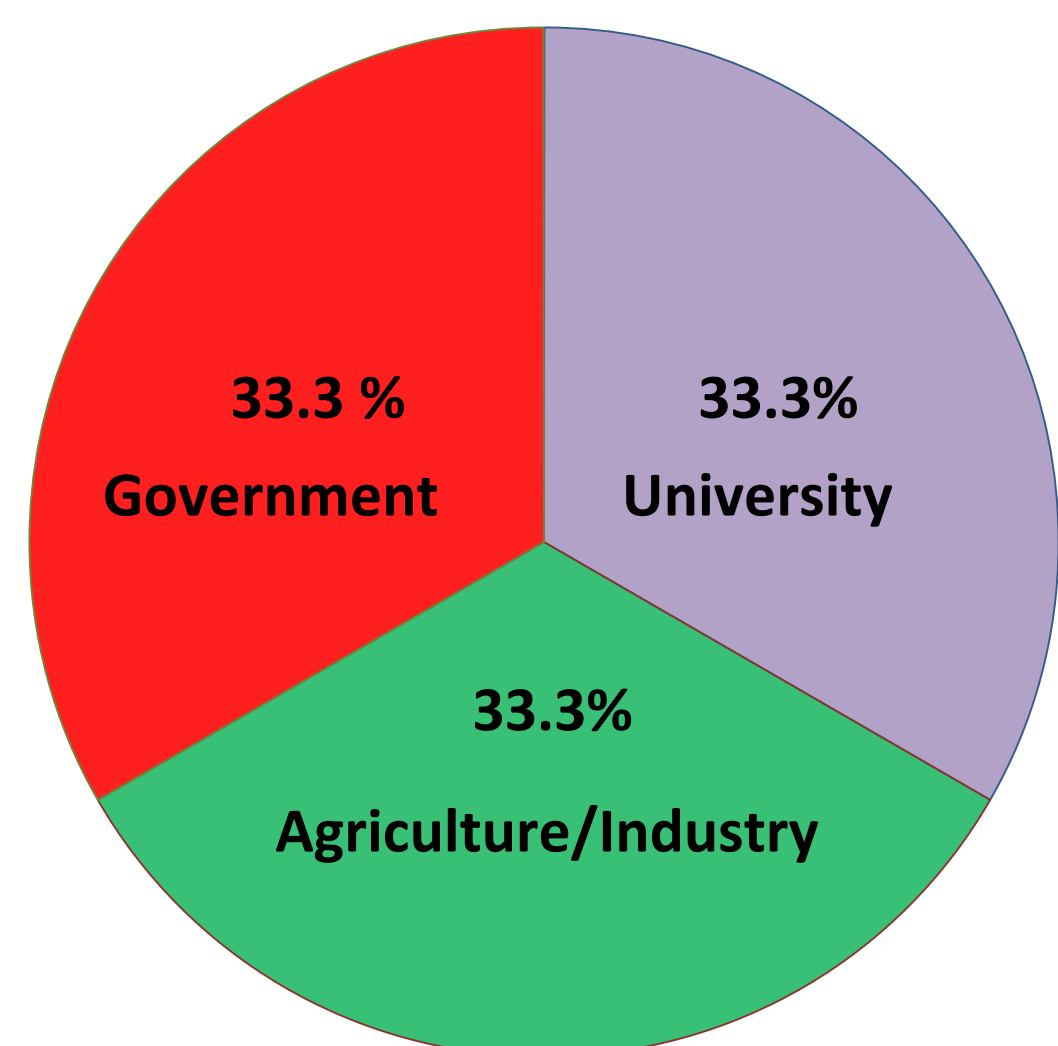


Ontario Based Comprehensive & Interdisciplinary Initiative for Natural Health Products (NHP)

We are:

- A multi-disciplinary, multi-centered research project
- Developing cutting-edge scientific methodologies for ginseng product quality and pharmacological evaluation
- Training highly-qualified personnel
 - Post-doctoral Fellows
 - Graduate Students
 - Technicians
- Advancing Ontario's bio-economy

Funded Through Matching Contributions

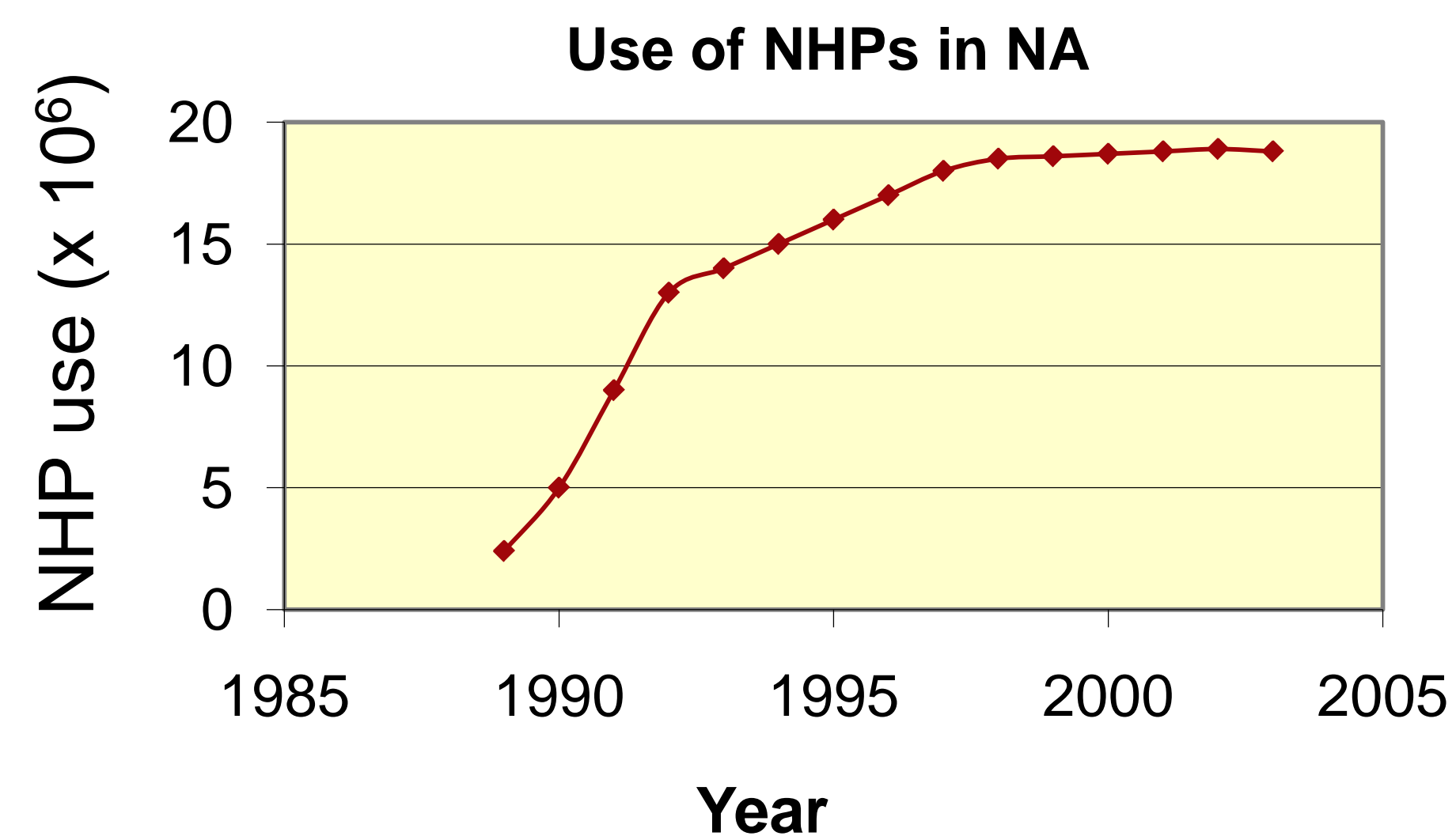


“New Technologies for Ginseng Agriculture and Product Development”

Total Budget of \$20 million (5 years)

Use of NHPs in North America

- NHPs in Canada is a \$4 B industry
- 15% of Canadians use NHPs daily

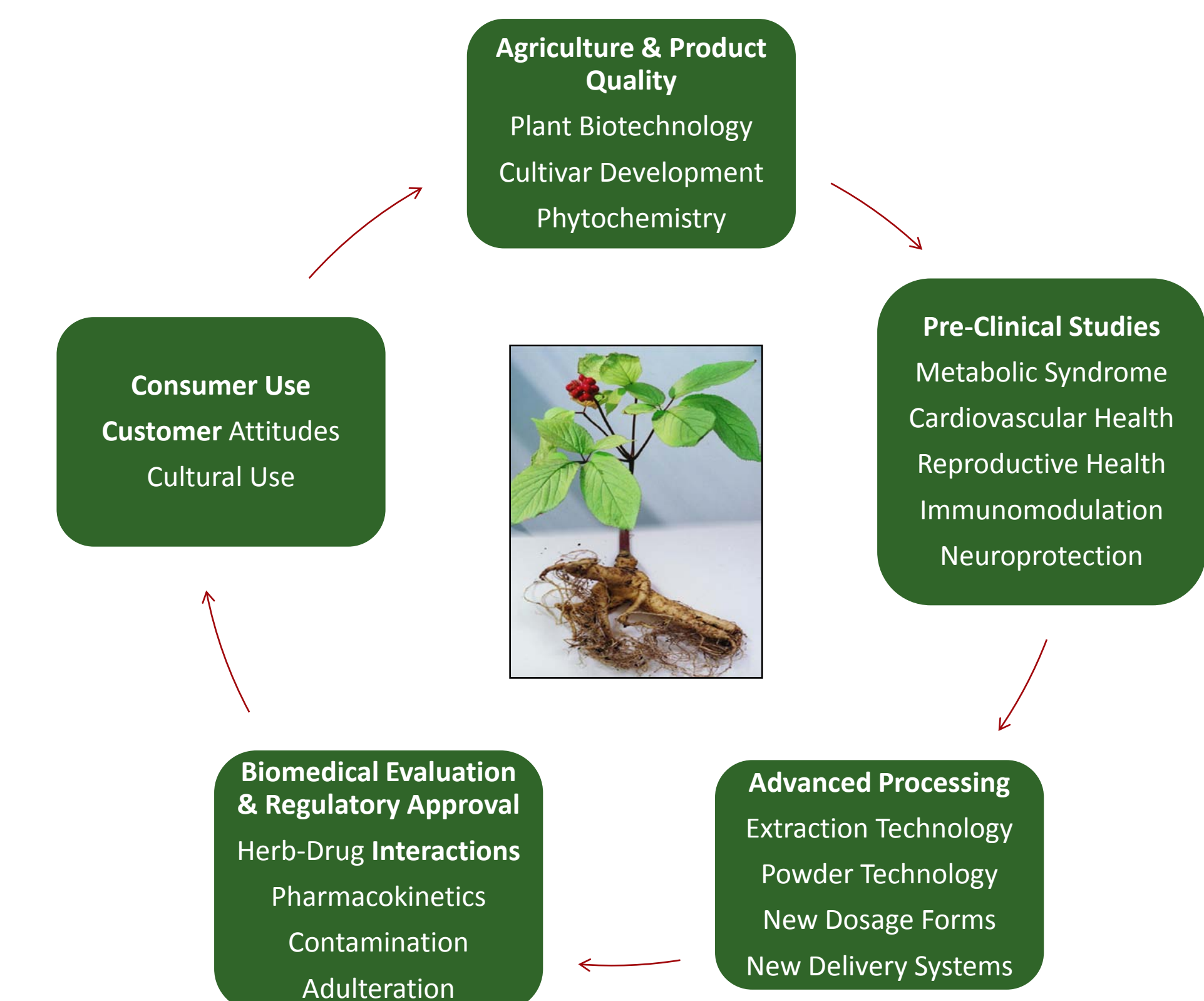


Use of NHPs is levelling off and/or declining because:

- Lack of scientific evidence to support health claims
- Lack of product quality and consistence

Cyclic Nature of NHP R&D

- Ontario-grown ginseng is a good case study for the development of other medicinal herbs and NHPs
 - A top selling herb
 - Represents > 60% of the global supply of cultivated NA ginseng
 - Annual export of \$50 – 70 million



Ontario Ginseng Innovation & Research Consortium

Expertise and Technology for Four Areas (I – IV) of R&D in Natural Health Products:

Ontario Ginseng Innovation and Research Centre Partners and Resources: Value-chain Model

Academia: Western, Ivey School of Business, King's University College, U Guelph, U Ottawa, McMaster U, Northern Ontario School of Medicine

Government: MRI, AAFC

Multiple Disciplines:

- Medicine
- Agriculture
- Plant Biotechnology
- Sciences
- Biochemical Engineering
- Business
- Sociology

Agricultural Sector:

Grower - OGGA

Analytical Facility - A&L Canada Labs Ltd.

Botanical Extract Producer:

Naturex

NHPs Manufacturer & Distributor:

Jamieson Laboratories Ltd

Opportunity for Joint Venture and Contract Research

I. Agriculture & Plant Biotechnology

Improving Ontario Medicinal Plant Agriculture

Team Lead: Dan Brown (brownnc@agr.gc.ca)

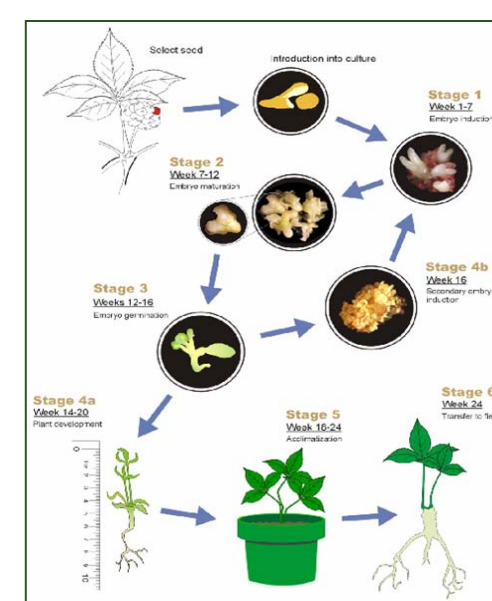


Agriculture and Agri-Food Canada

Agriculture et Agroalimentaire Canada

- Resourcing of medicinal plants
- Genetic characterization
- Cultivar development

Micropropagation protocol for NA ginseng



Ontario Ginseng Growers Association

GinsengOntario

- Good Agricultural Practices
- Field Studies



A&L Canada Laboratories:



- Agricultural analysis for contaminants, nutrients, soil quality & fertility
- GPS based nutrient management systems

II. Advanced Processing

New Products, Delivery Methods and Dosage Forms

Team lead: Jesse Zhu (jzhu@uwo.ca)

Pathway of Advanced Processing I: Powder Technology Research



Fine Ginseng Powder Made with Jet Mill

- Jet mill: high pressure air grinding machine
- Ginseng coarse powder is fed into the grinding chamber of jet mill
- Particles collide with each other under high speed and fragment
- Method avoids overheating and loss of therapeutic components



Structure of Jet Mill (from <http://pesticide.blog.sohu.com>)

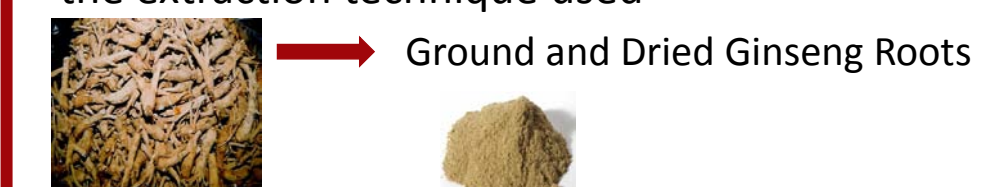
Other Ginseng Products

- Chewable ginseng tablets
- Instant soluble ginseng granules
 - made by spray dry technology
 - dissolves instantly in a little cold water
 - alternative for customers who cannot take tablets.



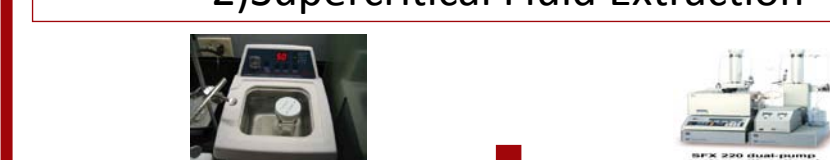
Pathway of Advanced Processing II

- Ginsenosides are thermally instable
- Extract ginsenoside composition is sensitive to the extraction technique used



Extraction Method

- 1) Ultrasound-assisted Extraction
- 2) Supercritical Fluid Extraction



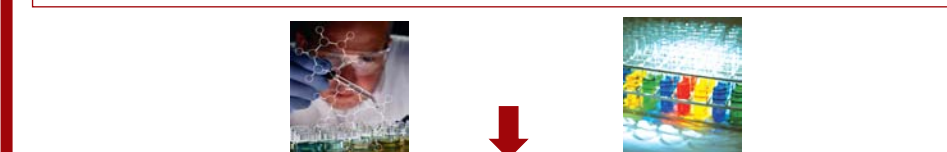
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Analytical Method

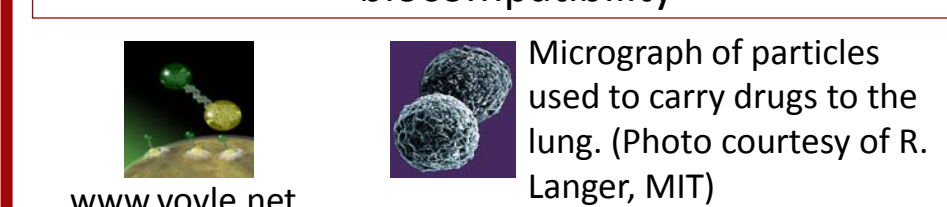
- 1) HPLC
- 2) LCMS
- 3) Supercritical fluid chromatography (SFC)



Measurement of biological activity in novel ginsenoside extract



Develop polymer for ginsenoside Drug Delivery system for enhancing bioavailability and biocompatibility



Micrograph of particles used to carry drugs to the lung. (Photo courtesy of R. Langer, MIT)



Ontario Ginseng Innovation & Research Consortium