

The contribution of venture business in DDS research and development

特集 ■ 医薬品開発における DDS の活用

Richard L DiCicco*

DDSの研究開発に対するベンチャービジネスの貢献

本稿では、DDS 領域に特殊な技術を有する DDS 研究開発受託会社の発展にベンチャービジネスがどのように機能しているかを説明する。ベンチャービジネスは、DDS 受託会社が製薬企業と共同で研究開発を行うための整備を行っている。本稿は、1980年に立ち上げ今日まで絶え間なく更新されてきた、DDS 会社、ベンチャー投資会社、技術、および DDS の共同研究開発事例を含む膨大なデータベースに基づいている。

This article explains how the venture business acts as a catalyst in the evolution of DDS contract research and development companies with special technology in a DDS field. The venture business prepares the DDS contract company for their research and development collaborations with pharmaceutical companies. The article is based on a large DDS database created in 1980, and maintained daily to date, involving DDS companies, venture capital, technologies and collaborations in drug delivery R&D.

Richard L DiCicco*

key words : venture capital, DDS start-ups, DDS generics, Drug delivery collaborations

Drug delivery systems date back to the ninth century A.D. when Abu Bakr Mohammad Ibn Zakariya al-Razi, known as Al-Razi, or Rhazes, discovered gum and pear seed mucilage could be used to mask the taste of medicines¹⁾. Twelve centuries later, we still define DDS as including taste-masking as a component in orally disintegrating tablets and oral thin films, and DDS includes many other technologies which can be classified in the following way according to its market value²⁾ :

- Oral : Delayed, Extended or Sustained Release, Modified Release (Chronotherapy, Pulsed Release, Colon Targeted Release), Fixed Dosage Combination IR/SR, Fast Dissolve Tablets, Oral Thin Films or Wafers, Taste-Masked Chewables
- Trans-membrane : Ocular, Nasal, Pulmonary (Nebulizer, Soft-Mist, MDI, mDPI, CFC-Free, HFA), Buccal, Rectal, Vaginal
- Parenteral : 30, 60, 90 Day SR Depots, Implants, PEGylated Proteins, Microneedles,

Drug Polymer Conjugates, Fusion Proteins, Formulations Using Functional Particles

- Dermal : Topical (Gels, Skin Permeation Enhancers), Transdermal, Electro-Transport, Iontophoresis, Microporation (Thermal Pulses), Needle-free Delivery (Jet Injectors)
- Solubility enhancement : Nanoparticles, Nanocrystals, Emulsions, Microemulsions, Colloids, Liposomes, Lipids, Complexation, Carrier Systems, Permeation Enhancement.

Venture capital provides a source of funds through investment, usually in companies or projects that are start-up or at a very early stage of product development³⁾. These projects and organizations usually would not attract sources of finance such as loans and could not raise money in the major public stock markets. The usual mechanism for venture investment is through the formation of a new company. The company will own rights to the intellectual property that originate from earlier research activities and will probably employ or have contracts with the scientists behind the research work. The venture

* Technology Catalysts International Corporation (www.technology-catalysts.com)