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## **STARPHARMA INVESTEE COMPANY DNT, INC. ANNOUNCES DEVELOPMENT OF NEW LOW-COST FAMILY OF PRECISION NANOSTRUCTURES**

Dendritic NanoTechnologies, Inc. (“DNT”), an investee company of Starpharma Holdings Ltd (ASX:SPL, USOTC:SPHRY) today announced the development of a new family of scalable, precision dendrimer nanostructures. A copy of the DNT press release is attached.

Starpharma is the largest shareholder in DNT, with a 33% equity holding, and also has commercialisation rights for DNT technology in polyvalent pharmaceutical applications.

Commenting on the announcement, Starpharma CEO Dr John Raff said: “This is a new method of manufacturing dendrimers, and is significant because the lower cost has the potential to open up new markets.”

Dr Raff, speaking from DNT headquarters in Mt Pleasant, Michigan, said: “This is a very significant development in the broad area of the practical application of dendrimers and further illustrates DNT’s leading international position in nanotechnology.”

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### **About Starpharma:**

Starpharma Holdings Limited (ASX:SPL, USOTC:SPHRY) is leading the world in nanomedicine. Its lead product in development is VivaGel™, a vaginal microbicide gel that is being developed for women as a preventative against the sexual transmission of HIV. It has also shown activity in animal studies for the prevention of other sexually transmitted infections including genital herpes. The Company has a broad range of opportunities arising from its innovations involving the discovery and development of pharmaceutical nanotechnology products using dendrimers and the multi-binding phenomenon of polyvalence. Development programs include multi-acting respiratory and anti-cancer applications.

Starpharma also has equity interests in two companies:

- Dendritic NanoTechnologies, Inc. (DNT) – established with the pioneer of dendrimer nanotechnology Dr Donald A. Tomalia and based in Michigan, USA.
- Dimerix Bioscience Pty Ltd – a specialist drug development company established to commercialise unique technology developed at the Western Australian Institute for Medical Research in the new field of receptor coupling, specifically G-Protein coupled receptors (“GPCRs”).

**Microbicides:** A microbicide inactivates, kills or destroys microbes. Microbicides may be formulated as gels, creams, sponges, suppositories or films with the purpose of reducing significantly the incidence of STDs. There are currently no vaginal microbicides on the market. They are intended for vaginal or rectal

use to afford protection for varying periods, from several hours up to days. Microbicides may also be designed to have a contraceptive function by inhibiting sperm.

**Dendrimers:** Dendrimers are a type of nanoparticle. They are man-made chemicals that form tiny balls made up of a dense network of branches. Dendrimers have applications in the medical, electronics, chemicals and materials industries.

**American Depositary Receipts (ADRs):** Starpharma's ADRs trade under the code **SPHRY** (CUSIP number 855563102). Each Starpharma ADR is equivalent to 10 ordinary shares of Starpharma as traded on the Australian Stock Exchange. The Bank of New York is the depositary bank.

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## FOR IMMEDIATE RELEASE

### Dendritic NanoTechnologies Announces New Low-Cost Family of Precision Nanostructures

*DNT's Priostar dendrimer family broadens potential applications of DNT's dendritic nanotechnology to a wide range of industries*

**MOUNT PLEASANT, MI—May 18, 2005—**Dendritic NanoTechnologies Inc. (DNT), a technology company that develops advanced dendritic polymers used to produce commercial products, today announced a patent-pending development: a new family of scalable, precision dendrimer nanostructures. The new technology, developed by DNT, is called Priostar™ and offers a significant advantage over other precision nanostructures by reducing the complexity and duration of the synthesis process. The new Priostar family of scalable, precision dendrimers breaks through previous cost barriers and addresses industry needs for nanostructures that can be manufactured in high volumes at costs attractive for a wide variety of uses.

"Our new Priostar dendrimers, as nanoscale building blocks, radically change the current economics of nanotechnology. They place DNT in the enviable position of controlling a dominant nanoscale platform with many applications in multiple billion-dollar markets," said Robert Berry, DNT's chief executive officer. "This new technology is a potentially disruptive technology since it will establish a new price point for an essential technology. Furthermore, Priostar extends DNT's patent estate while accelerating commercialization of our dendrimer technology."

Priostar dendrimers ("Prio" comes from the Greek for fast, while "star" represents the shape of the dendrimer) are unique in that they can be produced in large quantities to precise tolerances. For example, they can be engineered to meet the FDA's rigid requirements for precision, scalability, and reproducibility needed for biomedical products, and yet can be produced in the larger quantities required for use in advanced materials, coatings, personal and household applications, and other commercial markets. The Priostar family of dendrimers promises to offer unique competitive advantages to DNT's commercial business partners.

In a recent research report, "Sizing Nanotechnology's Value Chain," leading nano-research firm Lux Research noted that: "Nanotechnology is approaching a phase change that will see it spread exponentially across manufactured goods in the next 10 years. In 2004, \$13 billion worth of products will incorporate emerging nanotechnology, less than one-tenth of 1% of global manufacturing output. In 2014, we project that this figure will rise to \$2.6 trillion – 15% of manufacturing output in that year."<sup>1</sup>

#### **Priostar Dendrimers Break New Ground in Time, Cost to Produce**

The Priostar family of dendrimers share and improve upon the physical properties of the widely researched PAMAM dendrimers, which were invented by Dr. Donald Tomalia, DNT's president and chief technology officer. Dendrimers are sphere-shaped nanostructures that can be precisely engineered to carry molecules — either encapsulated in the interior or

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<sup>1</sup> "Sizing Nanotechnology's Value Chain," October 2004, Lux Research Inc [www.luxresearchinc.com](http://www.luxresearchinc.com)

attached to the surface. The size and shape of a dendrimer are determined by shells (known as generations) grown around a core structure, while the reactivity of the dendrimer is determined by its surface chemical functionality together with size and shape. The ability to attach many different biological and chemical compounds to the surface or to encapsulate them within the interior of the dendrimer have made PAMAM dendrimers attractive to pharmaceutical, biotechnology and materials companies.

The traditional process for creating PAMAM dendrimers includes an amidation step that involves thermodynamically driven, lower reaction rate, chemistry, accompanied by long reaction times involving non-differentiated, difunctional intermediates (i.e. ethylene diamine and methyl acrylate). These process features require high excesses of reagents and high dilutions resulting in low production capacities per reactor volume and thus high costs, particularly at higher generations.

The Priostar family of dendrimers involves the use of faster, kinetically driven chemistry (e.g. "click type" or other fast reactions), combined with the use of polyfunctional branch cell reagents to rapidly and precisely build dendrimer structures in a controlled way, generation by generation. This present process yields precise structures with cleaner chemistry, requires lower excesses of reagents, and lower levels of dilution, thus offering a higher capacity method that is more easily scaled to commercial dimensions, and providing new ranges of materials at lower costs. Preliminary studies show a cost reduction of between two to three orders of magnitude.

The Priostar family of dendrimers is based on a proprietary production process that is both rapid and selective. This new process allows the introduction and control of six critical nanostructure design parameters that may be used to engineer over 50,000 different major variations of sizes, compositions, surface functionalities and interior nanocontainer spaces that are expected to offer new properties for use in a wide variety of commercial applications.

"Industry researchers are always looking for innovations and new technology to enhance their businesses," said Ryan Hayes, DNT's director of development. "Such new technologies must be easy to manufacture, scale to large volumes, have unique properties that clearly establish a sustainable competitive advantage for them, and be inexpensive. The new DNT Priostar family of dendrimers meets these criteria. Many of our industry contacts have always been enthusiastic about the versatility of the dendrimer platform but, in the past, cost and manufacturing complexity were concerns."

### **New Process Takes Less Time and Adds Functionality**

"It takes approximately eight steps and one month of processing time to create Generation 3 of a PAMAM generation. In contrast, Generation 3 of a Priostar dendrimer can be created in three steps and just a few days. Our new dendrimer process also vastly reduces the amount of labor and reagents normally required by the PAMAM process," said Dr. Donald Tomalia, DNT's president and chief technology officer. "An exciting and new feature of the Priostar family of dendrimers is the ability to add extenders or functionality to the interior of the dendrimer to customize interior spaces and reactivity. These features give the Priostar dendrimers customizable encapsulation properties that allow for greater flexibility to tailor a solution for our customers."

According to Tomalia, the Priostar family of dendrimers captures all of the important PAMAM dendrimer properties and exhibits encapsulation properties in earlier generations, thus making it less expensive and easier to produce this highly desired feature. A new unique feature is the amplification process. Priostar dendrimers surface groups increase by a factor

of three (3) for each succeeding generation (G1=12 surface groups, G2=36 surface groups, G3=108 surface groups). The PAMAM surface groups only increase by a factor of 2 for each succeeding generation (G1=8 surface groups, G2=16 surface groups, G3=32 surface groups). This unique amplification process allows rapid building of surface functionality and molecular weight, therefore obtaining container properties in fewer generations than for PAMAM. Since each generational addition adds significant costs due to increases in unit operations, the attainment of high molecular weights and surface functionality in fewer steps indicates significant cost reduction potential. In addition, Priostar dendrimers are more thermally stable (approximately 350°C for Priostar versus 130°C for PAMAM).

### **Target Markets and Availability**

The Priostar family of dendrimers serves as a major nanostructure platform that will have broad commercial application. The Priostar family of dendrimers could have a significant impact on many markets including medical and health, food and agriculture, energy and electronics, environmental and industrial safety, personal and household, and chemicals and manufacturing. These dendrimers will find value in all these industries as they are used to develop new products and improve existing technologies for diagnostic imaging, drug delivery, gene therapy, surface coatings, sensors, catalysts, nanofabrication, solid state lighting, surfactants, binders, antimicrobials, lotions, cosmetics, pigments, dyes, ion exchange media, and ultrafiltration.

Initially, Priostar dendrimers will not be made available to the research community. However, DNT plans to establish a limited number of business partnerships for commercial research which could lead to direct commercialization.

### **About DNT**

DENDRITIC NANOTECHNOLOGIES INC. (DNT) develops dendrimer structures that assist business partners in producing commercial products – where dendrimers are the added value differentiator. DNT was incorporated in 2003, is a U.S. company with 19 employees, and is located in Mount Pleasant, Michigan. DNT's technology development is directed by Donald A. Tomalia, Ph.D., President and Chief Technical Officer. Dr. Tomalia is the inventor of dendrimers and has led numerous commercial developments during a 25-year management and senior scientist career with The Dow Chemical Company.

Dendrimers are nanostructures with specific, precise and predictable physical properties that make them especially useful for pharmaceuticals, medical imaging, electronics, materials, and the mass commercial markets. DNT has a broad and comprehensive IP portfolio that comprises over 200 patents in 41 patent families—a unique level of IP concentration among nanotechnology companies—and has existing licensing agreements with established revenue streams for dendrimer technology. See <http://www.dnanotech.com>.

Priostar is a trademark of Dendritic Nanotechnologies Inc. All other trademarks mentioned herein are held by their respective owners.

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