FOSTERING A NEW INDUSTRY

HEALTH

RUSNANO. 2015

ELECTRONICS

METALLURGY & INSTRUMENT MANUFACTURE

NANOMATERIALS

NANOINDUSTRY INFRASTRUCTURE
THE RUSNANO PORTFOLIO OF MEDICAL AND BIOTECHNOLOGY COMPANIES INCLUDES:
- Russia’s first national network of nuclear medicine centers
- The manufacturer of Kagocel, one of the most popular antiviral drugs on the Russian market
- Companies developing systems for targeted delivery of drugs within the human body, including cancer drugs
- The developer of a unique technique and equipment used to diagnose blood clotting disorders
- One of the largest Russian pharmaceutical producers

RUSNANO INVESTED

25.2 billion rubles

- PROJECTS 18
- REGIONS 20

PARTNERS
- Flagship Ventures
- Biomark Capital
- Polaris Venture Partners
- Domain Associates
- OPKO PHARMACEUTICALS
- Pharmsynthez

RUSNANO. MEDICINE
The project objective was to create a universal, full-cycle enterprise to produce Kagocel, an innovative medicine used to treat flu, respiratory infections, and a range of other viral infections. Kagocel consistently ranks among the ten best-selling medicines in its segment in Russia, occupying about one quarter of the entire national market for antiviral drugs in 2014 and enjoying a rapidly growing market share even today.

The drug is highly efficient, safe, and affordable: a course of treatment with Kagocel costs less than with competing drugs. Kagocel is recommended by the Russian Ministry of Health for the treatment and prevention of influenza and has been included since 2010 in the national list of essential drugs. Kagocel is a non-prescription drug and can be taken by children aged three and up. RUSNANO exited from Nearmedic Pharma in December 2013 with an IRR (Internal Rate of Return) in excess of 41%.
Kagocel induces the production of α-, β- and γ-interferons in the body, all of which pack a powerful antiviral punch.

Kagocel accounted for about one quarter of the Russian market for antivirals in 2014.
NBT is Russia’s only full-cycle manufacturer of microsources for brachytherapy that uses the iodine-125 radionuclide. The project creates an import-substitution capacity in advanced health care, as Russia has previously been reliant on German microsources. Brachytherapy is a new, high-tech form of radiation therapy that minimizes the side effects typical of remote radiotherapy by delivering the active isotopes directly to the tumor. The surrounding tissues and organs, meanwhile, are left untouched.

Applications include the treatment of prostate cancer, which is now one of the most frequent oncological diseases among Russian men: in Russia about 14,000 males are diagnosed with the condition each year. Brachytherapy is an increasingly popular treatment strategy in many countries, being used at 800 medical centers in the United States and Western Europe.

**COMPETITIVE ADVANTAGES**

- No analogues in Russia
- Competitive pricing
- Minimal side effects
- Minimum required hospital stay
[1] Clean production line where microsources are encapsulated and tested

[2] Diagram of a brachytherapy microsource containing the X-ray marker and iodine-125 radionuclide

[3] Production process for microsources (Dubna, Moscow region)

Gold thread: X-ray marker and iodine-125 radionuclide

Surface-modified titanium capsule
As Russia’s first inter-regional network of PET centers funded by private capital, the centers will use positron emission and computer tomography (PET/CT) to provide highly accurate cancer diagnosis for patients in Russian regions. PET/CT is a new and advanced technique used to diagnose cancer at an early stage, monitor treatment effectiveness, and reduce the side effects of chemotherapy. In spring 2014 the first PET center was launched in Ufa, and by April 2015 more than 3,700 patients had undergone diagnostic tests there.

The equipment available at the center is capable of processing twice as many patients as are handled at similar European clinics each day. Experience demonstrates that timely and accurate diagnosis leads to successful treatment in 90% of cancer cases. In 2015-2017 PET centers will open in a number of other Russian cities: Tambov, Orel, Lipetsk, Kursk, Bryansk, Novosibirsk, Samara, Ekaterinburg, Kaluga, Orenburg, Perm, Izhevsk, and Vladivostok. A number of «anchor» sites will be equipped with medical cyclotrons to produce radiopharmaceuticals for use at the centers.

**APPLICATIONS**

- Medicine, oncology
- Early-stage cancer diagnosis
- Identifying the extent and virulence of cancers
- The ability to select the most appropriate treatment and monitor its effectiveness
- A single technology chain stretching from radiopharmaceutical production to diagnosis
HIGHLY ACCURATE
PET/CT diagnosis of cancer

[1] PET/CT scanner
[2] Production of pre-packed individual radiopharmaceutical doses
[3] Hot chamber for radiopharmaceutical synthesis
The project objective is to launch a number of unique drugs aimed at treating cancer as well as multiple sclerosis and sold on the Russian and global markets. RUSNANO investments in particular funded clinical trials, production launch, and international marketing. Pharmsynthez is a Russian pharmaceutical company producing and marketing a wide range of innovative pharmaceuticals. The company combines three functions (laboratory research and new medicine development, manufacturing original substances and medications, and product marketing) in a way that is unique in the Russian pharmaceutical market. Building its own industrial site as opposed to contracting production will reduce manufacturing costs for the company significantly, leading to annual savings of about USD 2 million.

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Pharmsynthez has its own up-to-date and unique high-tech facilities where it manufactures active pharmaceutical ingredients that meet highly exacting international GMP standards.

Segidrin® is the first Russian-produced palliative care drug, boosting quality of life for cancer patients.

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Nanoceramics are resistant to wear, corrosion, and temperature fluctuations. Adding nanopowders reduces porosity and increases density, making the material highly durable without adding weight. The medical nanoceramics produced by NEVZ-CERAMICS are used to fashion dental and intervertebral implants (cages) as well as hip replacements. Ceramic endoprostheses last for up to 25 years, as opposed to the maximum of ten years offered by traditional metal. Medical ceramics also have the advantage of being completely bio-inert and therefore invulnerable to rejection by the human body.

The first surgical operations using NEVZ-CERAMICS intervertebral implants were carried out in the spring of 2013, and the company’s products have now been certified by Roszdravnadzor (the Russian healthcare watchdog). Clinical trials of ceramic hip replacements will be completed in 2015. At present, 90% of implant operations use imported products, something that will dramatically change with the launch of serial production by NEVZ-CERAMICS in 2015. Output volumes during the first stage will reach 10,000-15,000 implants per year.
How ultrasonic compaction works*

Friction of the walls and between particles prevents the even distribution of nanoparticle density

Ultrasonic vibrations give a periodic gap between surfaces in the friction pairs “wall-to-compactor” and “particle-to-particle”, so that the friction forces only begin to act at the moment when the surfaces touch

* Nanoparticles in the chamber are not shown to scale

CERAMIC IMPLANTS

last 2.5 times longer than metal alternatives

[1] Ultrasonic compaction for the production of ceramics with the addition of nanopowders

[2] Fixing elements for intervertebral attachments

[3] Visit by Anatoly Chubais, RUSNANO executive chairman, to the NEVZ-CERAMICS production site in Novosibirsk
FOR NOTES