The era of domestic synthesised biomedical polymeric nanoparticles in Finland

- **The development of biomedical polymeric nanoparticles in Finland can be dated back to the beginning of the eighties.**
- **The target was to develop and synthesise polymeric nanoparticles for cell labelling and separation purposes.**
- **This work was mainly carried out at the Department of Medical Genetics of University of Helsinki and also at the Laboratory of Polymer Chemistry of Helsinki University of Technology during 1981- 1984.**
- **Main contributors in this project were professor Albert de la Chapelle, Dr. Jim Schröder and Juhani Luotola acting as a project leader.**
- **This applied research project was finansed by the Ministry of Trade and Industry and Oy Medix Biochemica Ab.**

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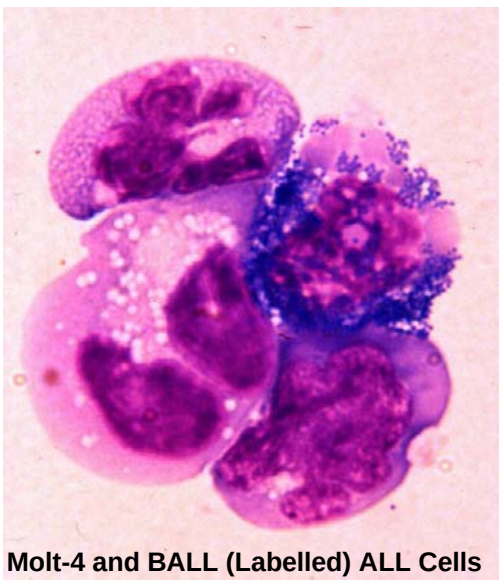
The nanoparticles were applied for:

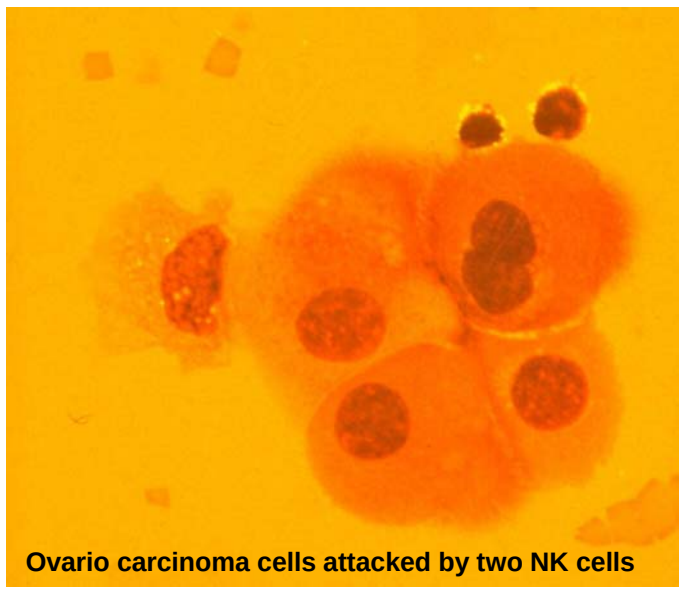
- **Separation and identification of white blood cells (ao. T and B lymphocytes)**

- **Separation and identification of fetal cells in maternal blood (for chromosome and DNA analysis).**

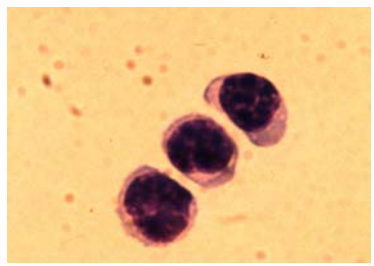
- **Nanoparticles were also used for labelling and removing cancer cells from patients bone marrow.**



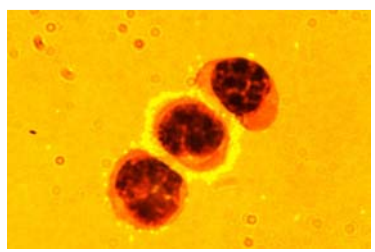
Molt-4 and BALL (Labelled) ALL Cells



Ovario carcinoma cells attacked by two NK cells



T and B lymphocytes (labelled)



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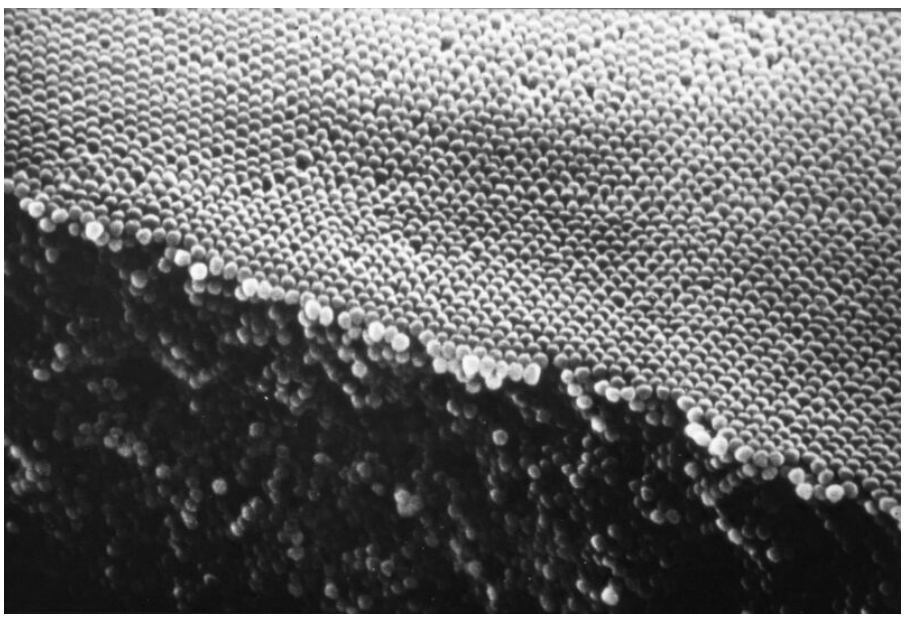
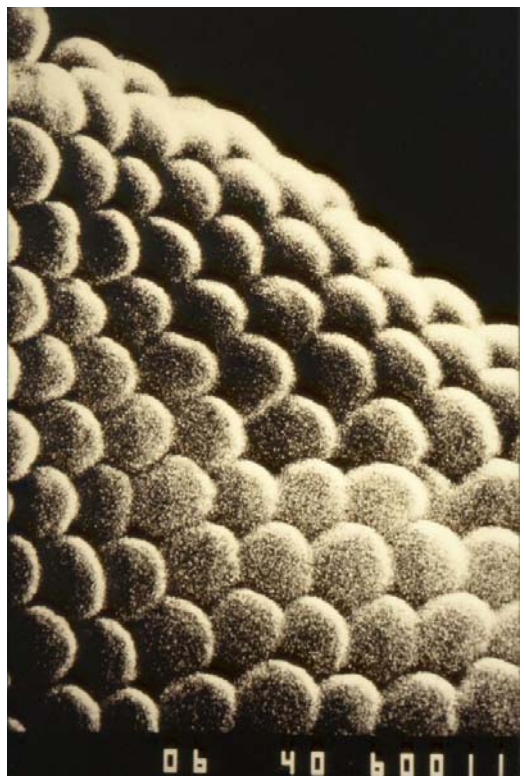
Many types of nanoparticles were developed in this project...

-Hydrophilic (for cell labelling purposes)
-Preactivated
-Spacered with different spacer molecules
-Conjugated with biomolecules (antibodies, DNA etc.)
-Magnetic
-Dyed with fluorescent dyes
-Particle sizes: 10 nm – 1000 nm





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Scientific co-operation partners in this project were:

- **Laboratory of Polymer Chemistry, Helsinki University of Technology (Prof. N. Tammela, B. Träskman)**

- **Transplantation Laboratory of University of Helsinki (Prof. P. Häyry, Dr. E. von Willebrandt)**

- **Laboratory of Patology, University of Helsinki (Prof. Eero Saksela, Prof. Leif Andersson)**

- **Oy Medix Biochemica Ab, Kauniainen (Dr. T. Weber)**

- **NASA Jet Propulsion Laboratory, California Institute of Technology (Dr. A. Rembaum)**

- **Laboratory of Genetics and Molecular Biophysics and Biochemistry, Yale University (Prof. D.C. Ward)**

The era of domestic synthesised biomedical polymeric nanoparticles in Finland

- **After finalising the cell labelling project at Helsinki University in 1984 applied nanoparticle reseach continued at Labsystems premises in Helsinki. This work was financed by Labsystems Oy.**

- **Hence, a more industry-oriented role was gained into nanoparticle development.**

- **Five patents were filed concerning the use of nanoparticles in laboratory instruments – especially in fluorometry, immunodiagnostics and blood grouping - during years 1984 – 1989.**

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A decision was made at Orion Diagnostica early in 1989 to strenghten technological know-how especially in the quantitative particle technology. Since 1989 Orion Diagnostica has commited in development and production of nanoparticle reagents for sophisticated IVD products.

Orion Diagnostica's first patent concerning the preparation of nanoparticle reagent was granted 1998.

Since 1994 principal academic co-operation partners in nanoparticle projects have been Laboratory of Polymer Chemistry, Helsinki University (Prof. H. Tenhu), Department of Biochemistry, Turku University (Prof. T. Lövgren) and Arctic Diagnostics, Turku (Prof. E. Soini) and Tekes.