Nanodetector for *in vivo* Isolation of rare cells

GILUPI NANOMEDIZIN

Oncology

The Nanodetector circumvented the limitation of the in vitro isolation of circulating tumor cells (CTCs) by the volume of blood sample. The new medical device is for *in vivo* application which enables the capture of CTCs from the patient´s blood stream with high sensitivity. Enumeration and characterization of those CTC will serve to improve and monitor clinical cancer treatment.

The interaction of target CTCs with the FSMW is mediated by an antibody directed against the epithelial cell adhesion molecule (EpCAM), an epithelial cell surface antigen which is expressed by many carcinomas. CTCs were isolated and identified by performing immunocytochemical staining against commonly used tumor markers.

Current clinical studies

Title study	Total No. subjects	Information
FSMW EpCAM-Breast (Poznan-Poland)	36	Subjects suffering from breast cancer (diagnosed) 30 patient with one insertion of FSMW 6 Patients with two insertions of FSMWs
FSMW EpCAM-Lung (Poznan-Poland)	48	36 Cancer Patients suffering from non small cell lung cancer (NSCLC) 12 Non-Cancer Patients
FSMW EpCAM-Breast (Munich-Germany)	78	48 Cancer Patients suffering from breast cancer (diagnosed, >M0) 30 Non-Cancer Patients
FSMW EpCAM-Prostate (Halle-Germany)	80	40 Cancer Patients suffering from prostate cancer (multiple application) 40 Non-Cancer subjects (20 BPH-patients, 20 women)

Table 1: Number of subjects of all ongoing studies, the application of the Nanodetctor is pre- and postoperatively

Examples for *in vivo* captured CTCs

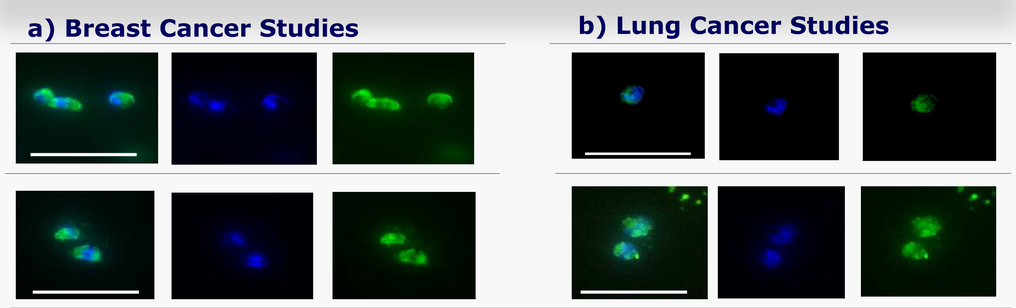

Figure 1: Immunocytochemistry analysis of CTCs captured *in vivo* with the FSMW in the blood of breast and lung cancer patients. The CTCs were identified and enumerated via positive EpCAM and DAPI staining (respective green and blue staining in top panels) and size and morphological characteristics. The white scale bar corresponds to 50µm.

First results *in vivo* captured CTCs

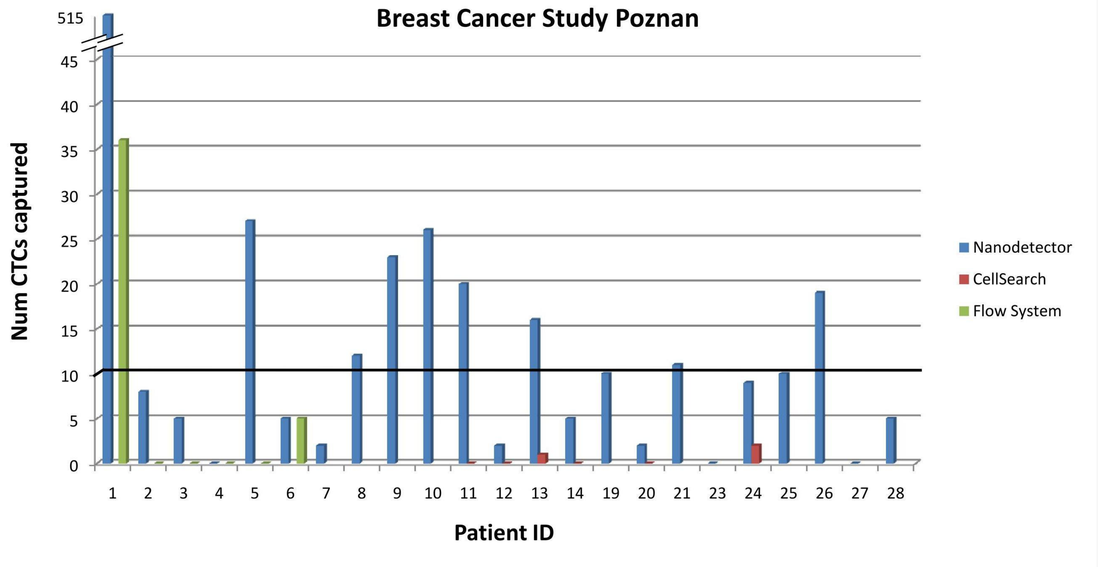

Figure 2: Comparison of the number of CTCs captured in breast cancer patients with the Nanodetector *in vivo* and the flow system respectively the Cell Search® method *in vitro*.

Prenatal

Embryonic trophoblast cells are very rare in the maternal blood stream (~ 1 cell per ml blood). So far no practicable method is available for the isolation of fetal cells from maternal blood. Our Nanodetector will provide an easy way to capture these rare cells *in vivo.* In combination with *in vitro* diagnostics for chromosomal abnormalities the Nanodetector could replace the widely used amniocentesis with its relatively high risk of micarriage.

Our Nanodetector for prenatal diagnostics uses a combination of two specific antibodies against different trophoblast antigens: one (G233) is directed against the human leukocyte antigen G (HLA-G); the second was developed by GILUPI specifically for binding trophoblast cells.

Current clinical studies

Title study	Total No. subjects	Information
FSMW Prenatal (Poznan-Poland)	36	12 non pregnant subjects 24 pregnant subjects
FSMW Prenatal (Göttingen-Germany)	28	12 non pregnant subjects 16 pregnant subjects

Table 2: Number of subjects, application between 10. and 24. pregnancy week

New development

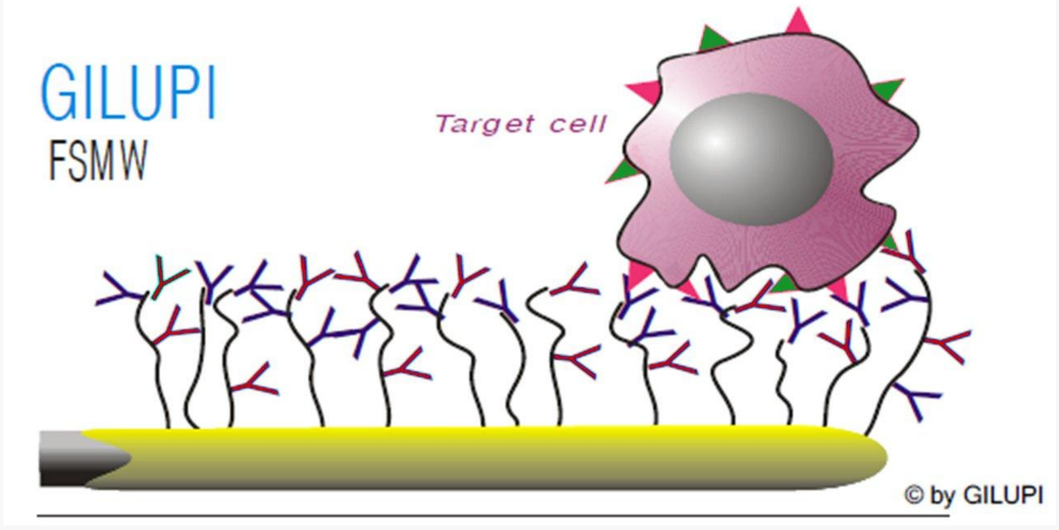

Figure 3: Schematic drawing of the new Nanodetector for prenatal diagnostics functionalized with two different antibodies specific for fetal trophoblast cells.

Summary prenatal

- the proof of concept has already been confirmed, the Nanodetector is able to detect fetal trophoblast cells in pregnant women
- the newly developed Nanodetector for prenatal diagnostics with higher sensitivity is actually tested in two clinical studies

Summary cancer

- up to now CTCs *in vivo* captured with the Nanodetctor resulted to **80% detection rate**
- in 50% of patients more than 10 CTCs were detected
- CTCs detection rate with the Nanodetector is **10 times** higher than CTC capturing rate compared with the Cell Search analysis

Also founded by: InvestitionsBank des Landes Brandenburg, ZAB ZukunftsAgentur Brandenburg, High-Tech Gründerfonds, S-UBG, Andreas Pawlik Schatz, BC Brandenburg Capital Ein Tochterunternehmen der ILB