Detection of Exosomal CEMIP as a Prognostic Biomarker of Brain Metastasis

Lead Inventor:

David Lyden, M.D., Ph.D.
Professor of Pediatrics, Weill Cornell Medical College
Director of the Physician Scientist Training Program, Weill Cornell Medical College
Stavros S. Niarchos Professor in Pediatric Cardiology, Pediatrics, Weill Cornell Medical College
Professor of Cell and Developmental Biology, Cell and Developmental Biology, Weill Cornell Medical College

Business Development Contact:
Brian Kelly
Director, Technology Licensing
(646) 962-7041
bjk44@cornell.edu
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**Background & Unmet Need**

- Brain metastasis most commonly arises from lung and breast cancers, and it has a 10-fold higher incidence than that of all primary brain tumors combined
- Despite its high lethality, brain metastasis is poorly prognosed and lacks effective therapies
- Current protocols for prognosis rely on brain scans of patients who already have symptoms, and it is difficult to predict who will develop brain metastasis
- Predicting brain metastases could be useful to put at-risk patients under closer surveillance and intervene before metastasis has occurred
- Tumor-secreted factors, including exosomes, can reshape distant microenvironments, such as pre-metastatic niches, in order to drive organ-specific metastasis
- **Unmet Need:** Methods for prognosis of brain metastasis to guide early intervention

**Technology Overview**

- **The Technology:** A method to predict likelihood of brain metastasis based on the expression of cell migration-inducing and hyaluronan-binding protein (CEMIP) on tumor exosomes
- **The Discovery:** CEMIP is enriched in brain metastatic breast and lung tumor-derived exosomes
- CEMIP promotes brain metastasis by altering the brain niche to be more favorable to brain metastasis
- **PoC Data:** CEMIP was found to be enriched in the exosomes from brain metastatic cells
- Loss of CEMIP in brain-tropic breast cancer cells reduced the number of brain metastatic foci by 70%
- Patients with brain metastasis had significantly higher CEMIP expression, and metastases of the brain had higher CEMIP expression than other sites
- Patients with high levels of CEMIP expression had a shorter latency period for metastasis and significantly poorer prognoses

**Inventors:**
David Lyden
Goncalo Rodrigues

**Patents:**
US Application Filed

**Publications:**

**Biz Dev Contact:**
Brian Kelly
(646) 962-7041
bjk44@cornell.edu

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Technology Applications

• Prognostic biomarker for risk of metastasis to the brain
• Method to non-invasively screen patients for primary and recurrent brain metastasis
• A biomarker for treatment selection for CEMIP-targeted therapies to prevent metastasis to the brain

Technology Advantages

• CEMIP can detect likelihood of metastasis at an early stage before metastasis has occurred, facilitating use of preventative treatments
• CEMIP can be detected from patient plasma, allowing for non-invasive testing for this biomarker

Supporting Data / Figures

Figure 1: CEMIP is enriched in exosomes from brain-trophic breast cancer cells compared to other organ-specific metastatic cells, including lung-trophic (LuT1), bone-trophic (BoT1), and parental cells (Par). ACTB is a loading control. CD81 is an exosomal marker.

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Figure 2: Left: CEMIP expression is higher in brain metastasis in both primary and metastatic tumors Right: Patients with high CEMIP expression had decreased progression-free survival for brain metastasis.

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