1. Introduction

- Prostate cancer (PC) is the most common cancer diagnosed worldwide in men. About 4/5 PC are diagnosed at early stage (I and II), with nearly 100% 5-year survival rate. The 5-year survival rate for distant stage IV (M1) prostate cancer decreases to 28% [1].
- Better markers for early detection of PC, progression, therapeutic resistance and minimal residual disease are still needed.

2. Methods and Workflow

- **Patient Cohort:** 23 patients with metastatic prostate cancer (mPC), resistant to castration.
- **Controls:** 5 healthy donors, age-matched, 5 healthy donors, < 30 years old.
- **CTC isolation using a label-free microfluidic device that utilizes inertia and laminar microvortices (Vortex technology):** CTCs (>13μm), larger and more deformable, are trapped in vortices while smaller cells (red and white blood cells) pass through [3].
- **CTCs play a role in cancer metastasis.**
- **CTCs are extremely rare but are minimally invasive biomarkers for patient prognosis, disease monitoring, personalized medicine, and biological studies [2].**

3. Results

1. **Performance with prostate cell lines**
   - LNCaP prostate cancer cells were spiked in healthy blood and processed through Vortex HT chip (N=3).
   - Recycling the blood sample increases Capture Efficiency from 24.5% (Cycle 1) to up to 90% (Cycle 5) at the expense of Purity (74% to 55%).
   - After Vortex collection, LNCaP cells are proliferating for up to 7 days.

2. **Patient samples: CTC enumeration & staining pattern**
   - Harvesting of LNCaP on 2 different days (different confluency) provides cells with very different size range, i.e. different cell recovery (N=1).
   - Limitation of using cell lines as a model to evaluate performance of CTC enrichment technologies.

3. **Patient samples: Markers of EMT**
   - Staining for Vimentin and N-cadherin (markers for Epithelial to Mesenchymal Transition, EMT) identifies some DAPI only cells as CTCs going through EMT.

4. Conclusions & Future Directions

- Using a label-free CTC enrichment method (Vortex technology) and enumeration, 80% of metastatic castration-resistant PC samples were positive for CTCs using a threshold derived from age-matched healthy controls (3.37 CTCs / 7.5 mL). Purity ranged from 25 to 316.9 WBCs / 7.5 mL. 
- Large variation in CK and PSA expression observed between CTCs. Vim/Ncad staining helps characterize further CK- CTCs.
- Processing the sample through the chip multiple times increases capture efficiency significantly.
- Limitations of using cell lines as model to evaluate performance of CTC enrichment technologies.

5. Acknowledgements & References

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