Early cancer detection is vital to improving patient outcomes

Late stage cancers often lack an effective treatment option. Five-year survival rates for certain cancers, such as colon cancer, are as high as 92% if detected in stage I; however, the survival rate drops dramatically as cancer progresses to later stages.

Circulating tumor DNA (ctDNA) as a cancer marker

Tumors or circulating tumor cells release ctDNA into the blood when undergoing apoptosis or necrosis. Approximately 0.1% to 10% of cell-free DNA originates from cancer cells. While ctDNA mutations (SNVs, indel, and CNAs) can be used as markers for cancer detection, the signals can be noisy due to molecule loss during library construction, PCR artifacts, and sequencing errors.

PanSeer reduces noise by looking for distinct tumor-specific methylation patterns in adjacent methylation sites. The ctmDNA (circulating tumor methylated DNA) technology interrogates over 12,000 methylation marker patterns. Noise is also reduced by employing a highly efficient targeted sequencing library construction method.
PanSeer can detect cancer up to 4 years prior to conventional diagnosis

**Sensitivity**

- **89.4%**
  - 161/180
  - Post-diagnosis

- **71.0%**
  - 22/31
  - 0-1 Year

- **76.9%**
  - 30/39
  - 1-2 Years

- **74.5%**
  - 35/47
  - 2-3 Years

- **61.9%**
  - 26/42
  - 3-4 Years

**Specificity**

- **92.6%**
  - 461/498
  - Healthy

PanSeer performance by covariate analysis

**ROC for post- and pre-diagnosis samples**

(Star shows cutoff from training set)

**Sensitivity in post-diagnosis samples by stage**

- **Early Stage (Stage III)**
  - Sensitivity: ~1.0

- **Late Stage (Stage III/IV)**
  - Sensitivity: ~1.0

**Sensitivity in post-diagnosis samples by tissue**

- Colorectal Cancer: ~1.0
- Esophageal Cancer: ~1.0
- Liver Cancer: ~1.0
- Lung Cancer: ~1.0
- Stomach Cancer: ~1.0

The Taizhou Longitudinal Study monitored the health of ~120,000 participants over the course of 2008-2018. Plasma samples were collected at the start of the study and participant health was monitored regularly over this time period. 1,379 randomly selected samples were used to train and test the PanSeer assay.

Wang X. et al. (2009). Rationales, design and recruitment of the Taizhou Longitudinal Study. BMC public health, 9(1), 223.