

## Gene Signature to Distinguish between Metastatic Urothelial Carcinoma and Squamous Cell Carcinoma (Primary Lung and Metastatic Head & Neck)



*A 19-gene signature can distinguish between metastatic urothelial carcinoma (UC) and squamous cell carcinoma (primary lung SCC or metastatic head & neck SCC). Determining whether a lesion is a metastasized urothelial carcinoma or squamous cell carcinoma is important because the treatments are different—for example, a urothelial metastasis might require platinum based combination chemotherapy while a primary lung cancer might require surgery. Because current immunohistochemical diagnostic techniques often give ambiguous results, pathologists could also use this signature for a more precise diagnosis. The test has an accuracy of greater than 98%. A follow-on signature developed at Moffitt could be used to determine if the SCC is a primary lung lesion or a metastasized head & neck cancer.*

### COMMERCIAL OPPORTUNITY

- Urothelial carcinoma is one of the most common malignancies of the urinary system and accounts for 90% of bladder cancers in the United States and Western Europe. The American Cancer Society has estimated that in 2018 there will be 81,190 new cases of bladder cancer.
- About 25% of new bladder cases will present with muscle-invasive disease with metastases at presentation or metastases that will develop later. Because about 40% of bladder metastases migrate to the lungs, a conservative estimate of the number of patients who would need the test for a lesion found in the lungs would be 40% of 25% of all new bladder cases.
- The current immunohistochemical pathological standard uses a set of keratin markers that are more likely to be in squamous cell carcinoma versus urothelial carcinoma. However some of the markers can be found in both types of carcinoma resulting in only a probability that the carcinoma has been correctly identified. The Moffitt signature could help make a more precise diagnosis.
- The 19-gene signature could be measured by multiplex PCR using tumor biopsy samples, allowing easy integration into the current procedure for screening. If the test were priced at \$3,000, then the market size could be estimated at  $81,190 \times 0.25 \times 0.40 \times \$3,000 = \$24.3M$ .

### TECHNOLOGY

161 UC samples, 268 lung SCC samples and 38 head & neck SCC samples from the Moffitt Cancer Center Total Cancer Care (TCC) database were used as the training dataset. The gene expression data are on HuRSTA chips, each with 60607 probe sets for 26356 genes. The top 19 most differentially expressed genes were selected for PCA. PC1 of the 19 genes was used as the signature on the TCC training dataset. The signature was further validated on external publicly available GEO datasets resulting in the data shown below.

Data Source	# samples	Actual type	Classified Type		Accuracy
			Urothelial	Lung, H&N	
TCC	161	Urothelial	157	4	97.52%
TCC	306	SCC lung and H&N	4	302	98.69%
GEO	93	Urothelial	93	0	100.00%
GEO	114	SCC lung and H&N	2	112	98.25%

### PUBLICATION/PATENT

- US provisional patent application filed October 20, 2017 for Drs. Magliocco, Altiock, Dhilon and Xiong.

### CONTACT

Haskell Adler PhD MBA  
Senior Licensing Manager  
Haskell.Adler@Moffitt.org  
(813) 745-6596

### LICENSING OPPORTUNITY

