

Early Cancer Screening with P-Scan technology

Presented March 9th 2010 to
UM Life Science Summit

Yinfa Ma

Department of Chemistry

Missouri University of Science & Technology

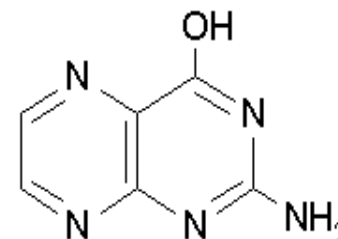
Cancer and Diagnostics Market

- Cancer is still the 2nd leading cause of death world wide.
- Total US costs for cancer treatment \$129B (NIH estimate)
- Number of Americans diagnosed with cancer each year is 1.5M
- Each year over 500,000 people in the US die from cancer (one every minute)
- Lung, colorectal, breast and prostate account for 53% of all cancer deaths
- “A key challenge in cancer control and prevention is detection of the disease as early as possible...” P. Srinivas
- Since an effective way to cure cancers has not been found, early detection becomes an important alternative.
- Cancer Diagnostics worldwide market estimated at \$7.4B in 2009
- Tumor marker segment expected to reach \$2B by 2010 and grow at 8-10% into the foreseeable future
- PSA marker for prostate cancer alone accounts for \$400M

Introduction

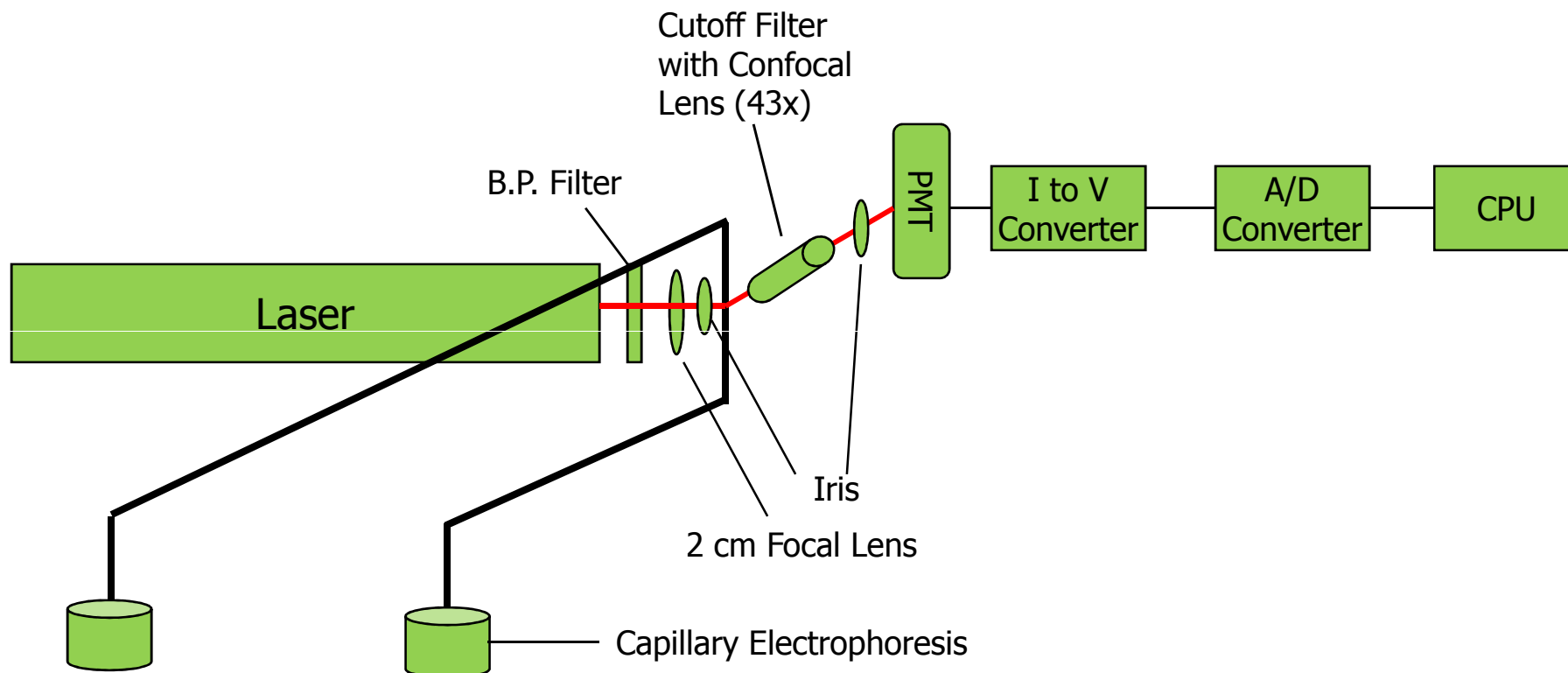
- Research Goal
 - To develop a **rapid, sensitive non-invasive** technique to detect biomarkers that indicate whether or not an individual has cancer at the **earliest possible point**
 - Biomarkers are compounds in the body that can be indicative of medical conditions or biological states.
 - Examples
 - Tumors
 - Proteins & peptides
 - Hormones
 - Small molecules
 - DNA

Pteridines



- Pteridines: A group of heterocyclic compounds containing a wide variety of substitutions on the basic compound pterin
- Pteridine: A class of compounds excreted in the urine, whose levels are found to elevate significantly in tumor related diseases
- Pteridines are believed to exist in the body in predetermined levels that are indicative of a healthy individual. We hypothesize that changes in these levels indicate that the body was being attacked by cancer.
- Different cancer types are believed to give unique fingerprints that differ from a non-cancer patient and will even provide fingerprints whose levels will correlate with the severity of the cancer in the body.

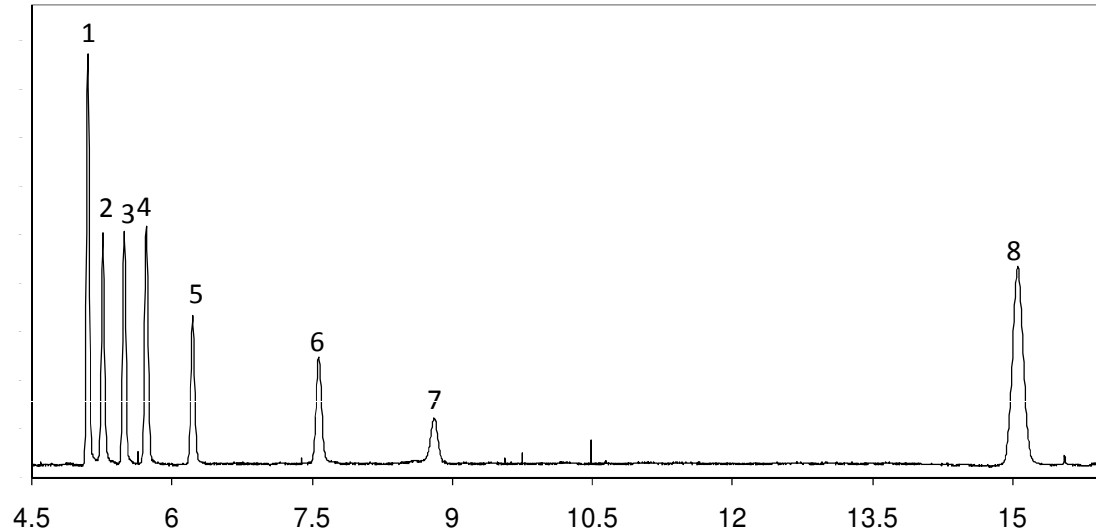
Instrumental Setup



Features of the Instrumental Design

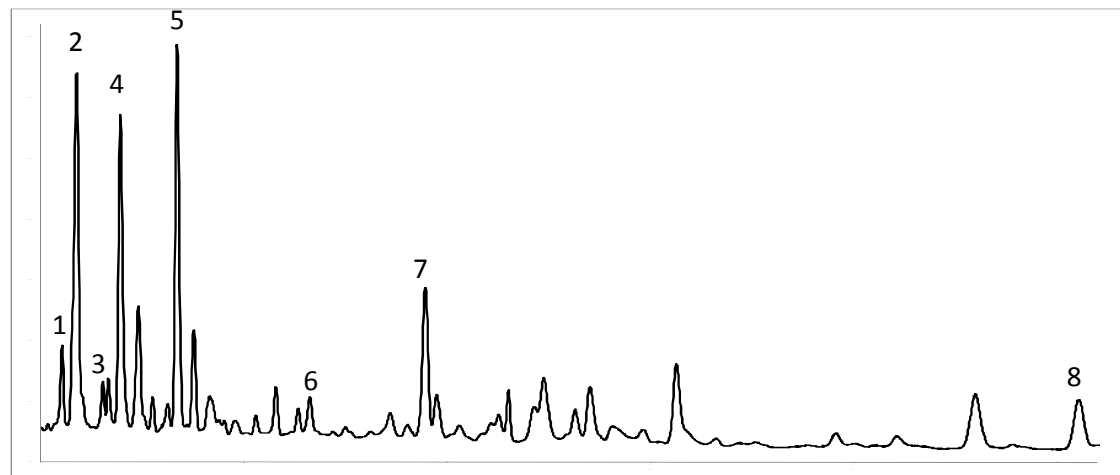
- Due to the unique design of the instrument, it has:
 - Very high sensitivity
 - $\sim 1.0 \times 10^{-11} \text{M}$ (detection limit)
 - Good reproducibility
 - < 8% RDS for multiple injections over multiple days
 - Low noise
 - < 1mV
- Easy to operate
- Can be upgraded for automatic analysis and data output

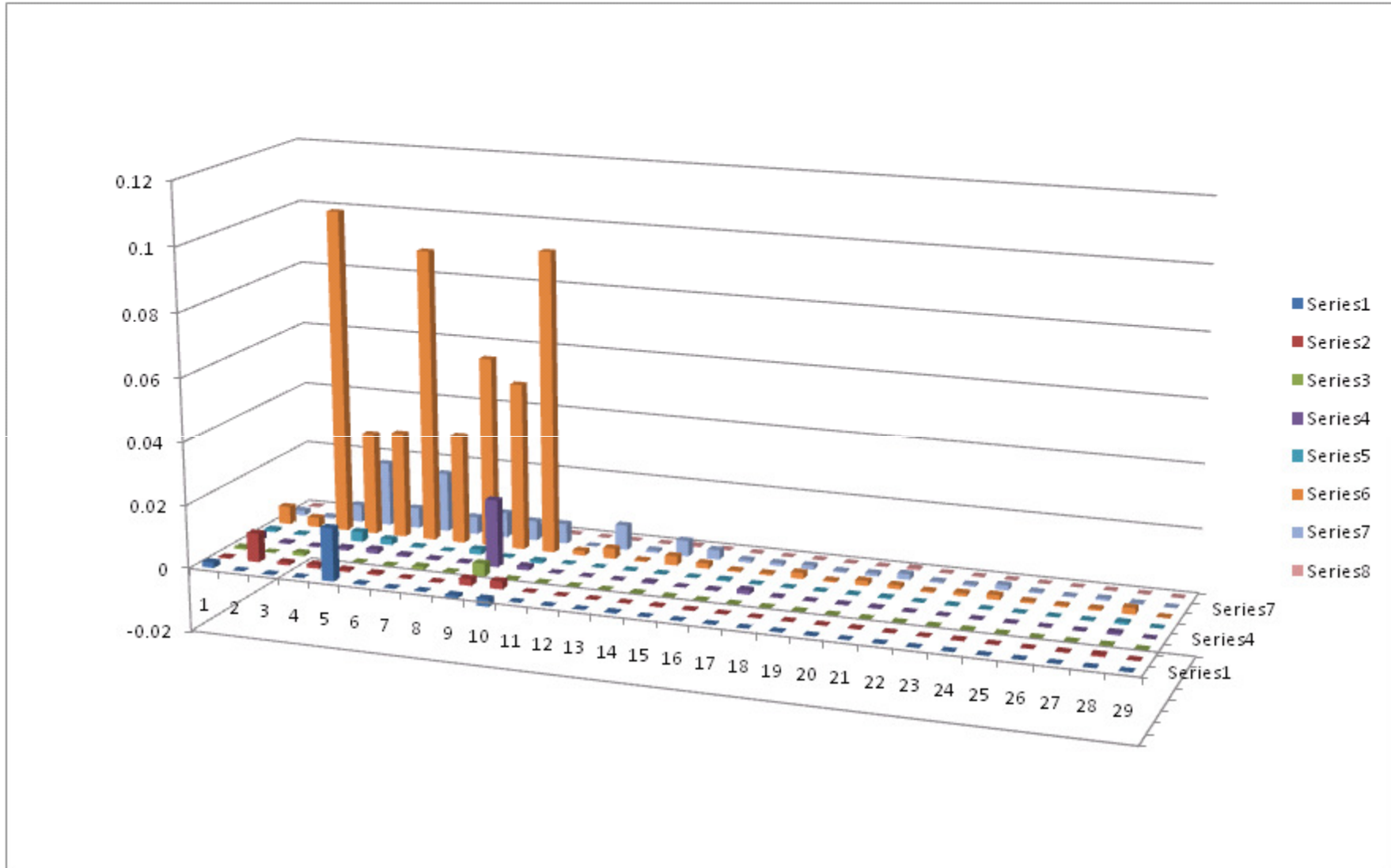
Standard & Sample Injection



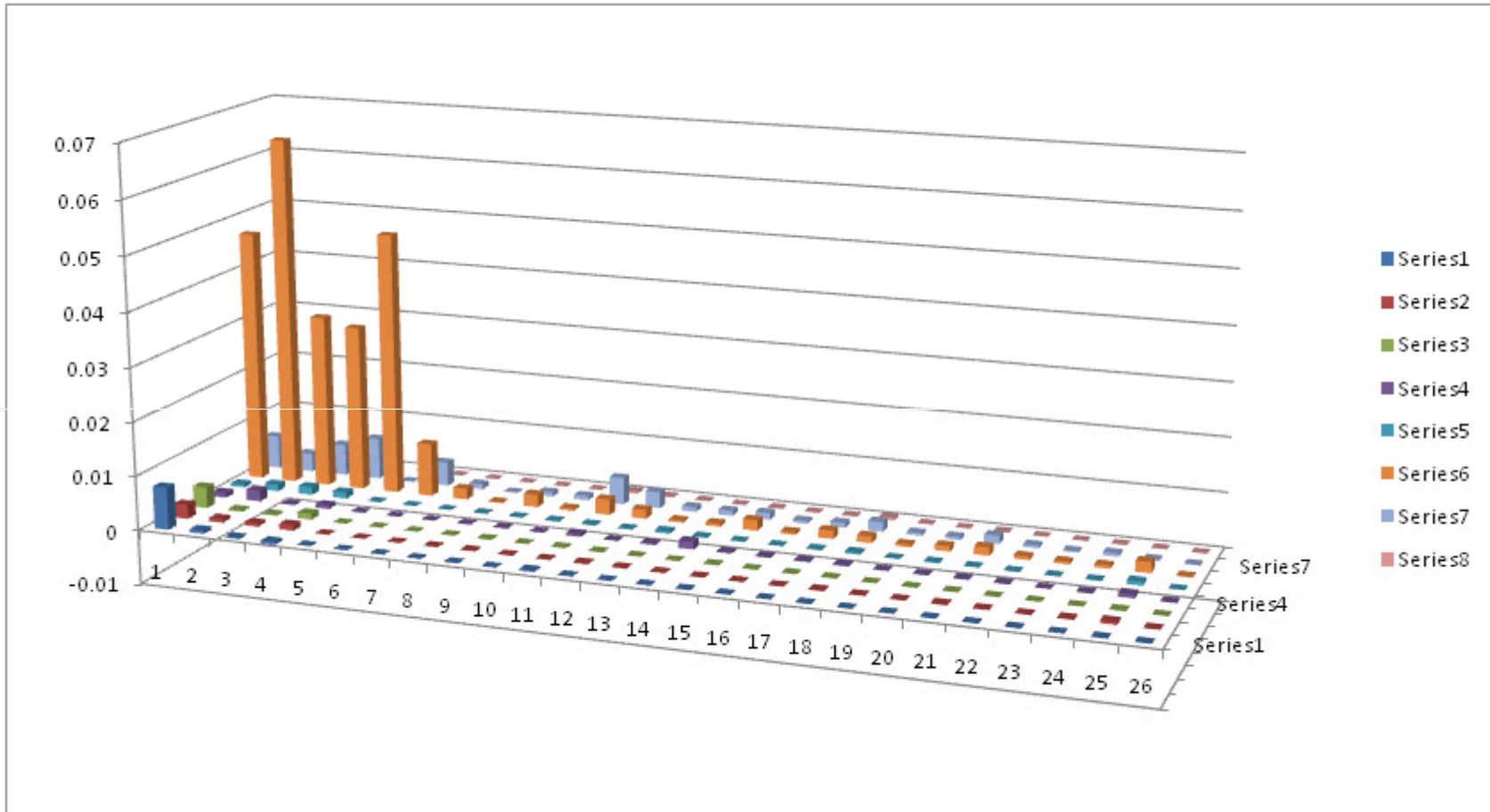
- 1) 6,7-dimethylpterin
- 2) 6-biopterin
- 3) D-(+)-neopterin
- 4) 6-hydroxymethylpterin
- 5) Pterin
- 6) Isoxanthopterin
- 7) Xanthopterin
- 8) Carboxypterin

Final Parameters
 pH: 9.63±0.02
 EP: 26kV

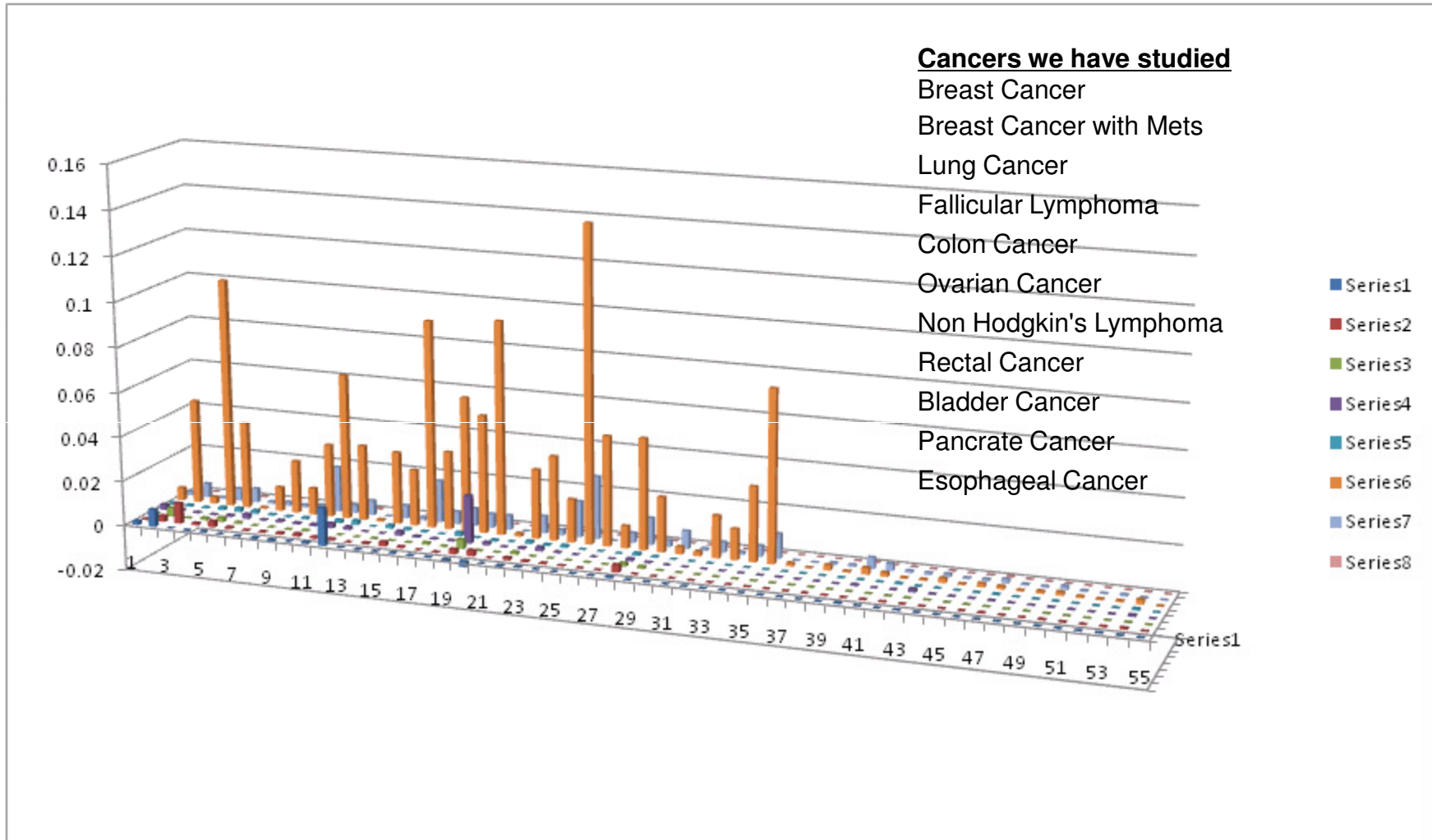




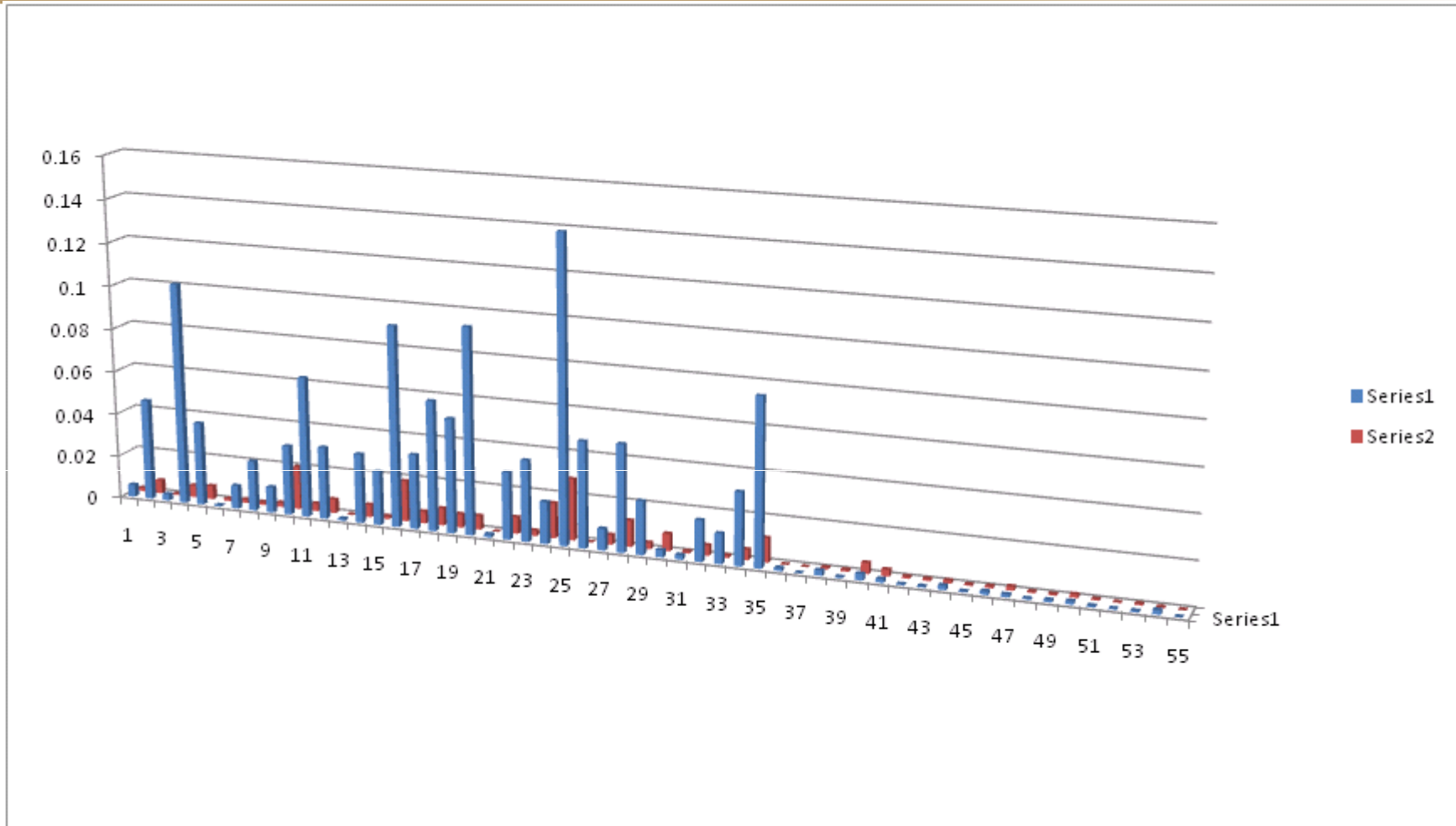
1 to 10: Breast Cancer Urine Samples
 11 to 29: Normal Urine Samples



1 to 11: Lung Cancer Urine Samples
 12 to 29: Normal Urine Samples



1 to 38 All 11 Cancer Urine Samples we have studied
 39 to 55 Normal Urine Samples



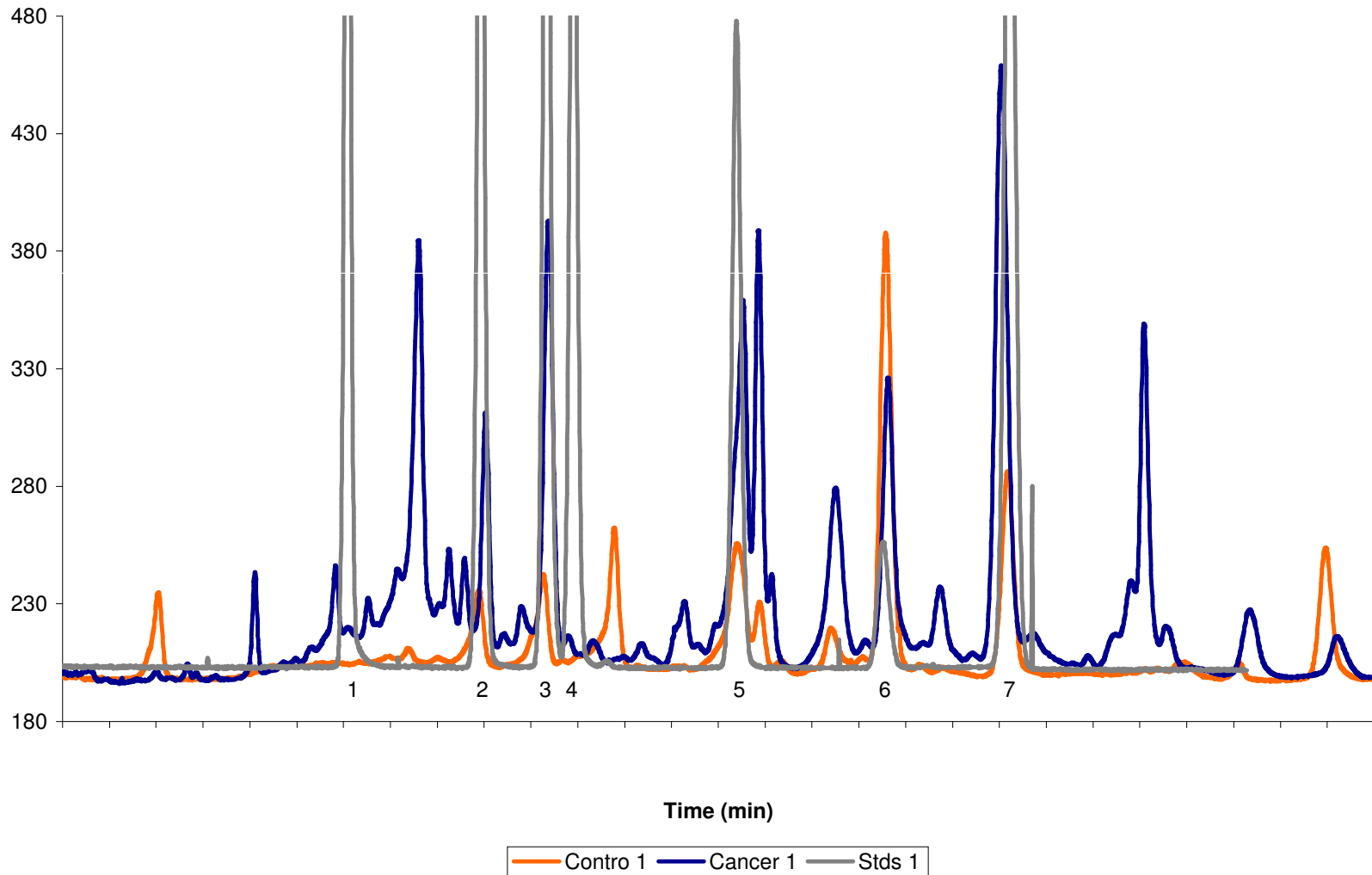
1 to 38 All 11 Cancer Urine Samples

39 to 55 Normal Urine Samples

Series 01 : Isoxanthopterin Series 02 : Xanthopterin

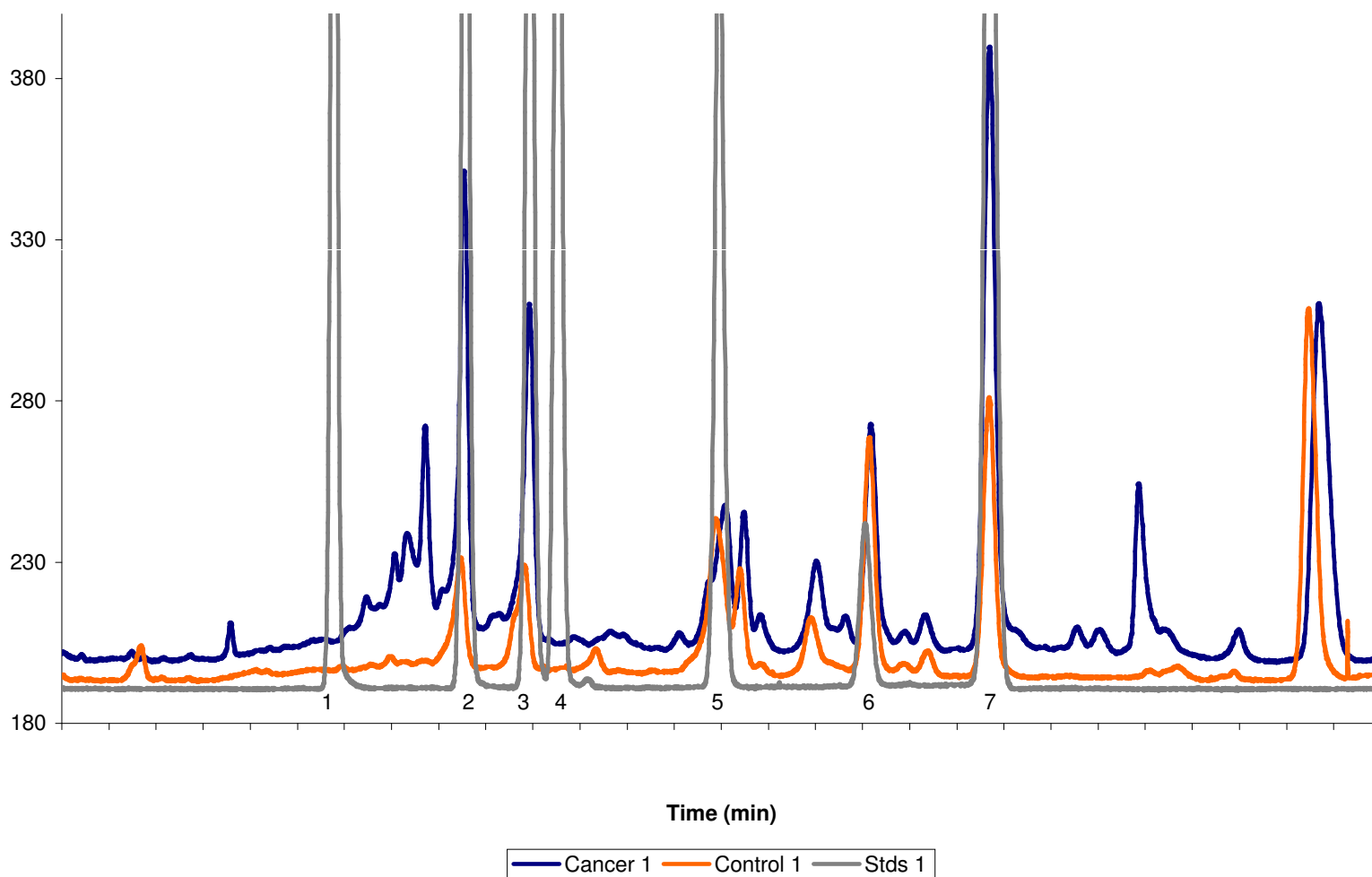
1. 6,7-Dimethylpterin,
2. 6-Biopterin,
3. Neopterin,
4. Hydroxymethylpterin,
5. Pterin,
6. Isoxanthopterin,
7. Xanthopterin

Nov 19, 2005 Standard, Cancer, Non-Cancer Urine for Pteridine Study



1. 6,7-Dimethylpterin, 2. 6-Biopterin, 3. Neopterin, 4. Hydroxymethylpterin,
5. Pterin, 6. Isoxathopterin, 7. Xanthopterin

Nov. 21, 2005 Standard, Cancer, Non-Cancer Urine for Pteridine Study



- Oncopterin – It has presented itself as a potential indicator for a positive / negative test for cancer.
 - It was discovered that only oncopterin was observed in cancer patients where it was not detectable in normal people.
 - We plan to synthesize the oncopterin at Missouri S&T and test both control and patient samples for the presence of this new discovery.

Current system achieves these goals

1. A specific instrument for pteridines screening
2. Three solution kits for the screening process
3. One quick method for giving an “yes” or “no” answer based the detectable oncopterin.

Current Status

- We are collaborating with **Dr. Anthony Kaczmarek (Urologist)** to conduct further research to find finger prints for each cancer.

Acknowledgements

- Ellis Fischel Cancer Center
 - Dr. Michael Perry
 - Dr. Clay Anderson
 - Dr. Rami Owera
 - Dr. Justin Floyd
- Funding
 - Foundation of Chemical Research
 - Missouri Research Board
 - Missouri University of Science and Technology (MS&T) Department of Chemistry
- Sample
 - Ellis Fischel Cancer Center