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Aptamer Technologies for Detection and Control of Residual Pharmaceutics, Antibiotics, & EDCs

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Detection or control of low molecular weight chemicals are very critical, especially when the chemicals cause toxic or hazardous impacts severely even with very low concentrations in forms of adverse or disrupting effects on human and environment. Those chemicals damaging on human and environment with very low concentrations includes residual pharmaceutics, antibiotics, endocrine disrupting chemicals (EDCs), etc. Difficulties involved in sensitive and robust detection and control of these compounds in environment are prevailing, mainly due to lack of capturing moieties such as antibodies not formed or other bioprobes not discovered. Aptamers have long been considered to be placed as capturing molecules due to its affinity characteristics with small molecules which were even known to not forming antibodies, since its first appearance as an enzyme or protein inhibitors. Aptamer is a single-stranded oligonucleotide which binds to various target molecules such as proteins, peptides, lipids and small organic molecules with high affinity and specificity. DNA or RNA aptamers specific for certain targets could be selected via SELEX (Systematic Evolution of Ligands by EXponential enrichment) process from random olionucleotide libraries. DNA aptamers selected so having high affinity and specificity to a certain target could be used in platforms for detection or control of low molecular weight chemicals which generally do not induce forming antibodies that have a variety of applications. A DNA aptamer showing a high affinity to a certain targets could be used for developing biosensors by immobilizing them on a surface of 200 μm gold electrode or gold chip for surface plasma resonance (SPR) analysis. The current of gold electrode or SPR signals was a reporting signal representing the binding of a specific target to DNA aptamer immobilized on gold surfaces. Those aptamers could be arrayed to make a biochip that has high-throughput characteristics. In addition, aptamers themselves could be utilized as binding molecules to control those love molecular weight chemicals in a form of affinity column as a separation moiety. In that case, aptamers could be used to concentrating or recovering targets. The multiplexing on the manage and control of multi-components system should be possible.

Therefore, in this presentation, how aptamers were developed for a few low molecular weight chemicals such as 17-beta estradiol and oxytetracyclin (OTC) and will be implemented in the detection and control of the low molecular weight chemicals.