Development of a Portable Toxicity Test System for Rapid Environmental Monitoring

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Background

Toxicity testing using Photobacterium *Aliivibrio fischeri* is the fastest ISO Standardized method for environmental monitoring and requires only 15 - 30 minute incubation time. We have developed a novel field test for this assay using a patented device called the LumoStix™ that provides reliable, portable and cost effective toxicity analysis and employs robust reagents for easy storage and transportation.

Figure 1: Kikkoman PD20 Luminometer for ATP detection

Materials and Methods

Portable luminometers for ATP hygiene measurements (**Figure 1**) are available at relatively low cost compared to bench top laboratory equipment and can be used to detect bacterial bioluminescence.

Four luminometers (models PD10, PD20, PD30, C100) Kikkoman, Japan, were employed for initial tests using the LumoStix™ portable device. Light inhibition (toxicity) results from the novel method were compared to ISO Standard 11348, which is the most common industry assay employing luminescent bacteria.

Samples were run in parallel for both methods and alternative bacterial reagent preparations were also investigated for their utility in the new method.

The LumoStix™ device **(left),** developed for this project, contains swabs at each end and provides both a sampling and test location with the same reagent aliquot. Once added, the reagent is sealed inside the device and is transferred to the test sample by simple shaking. Operators can employ contact time from 1 min to 30 min or use several contact times to observe toxic effects.

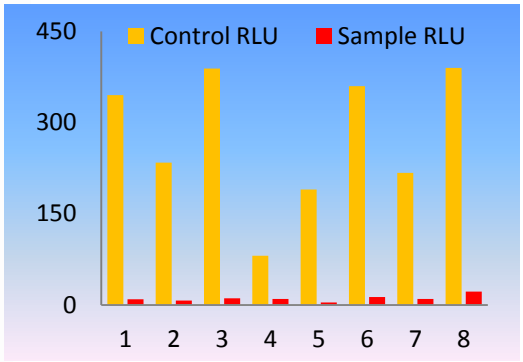

Figure 2. Light inhibition from eight AMK student samples using the LumoStix™ device.

Results

- The novel LumoStix™ method demonstrated excellent sensitivity for sample toxicity in all tested samples (**Figure 2**).
- Freeze dried reagent preparations are stabile at 4 °C for 1 month if stored properly.
- Rehydrated reagent can be used if initial luminescence is observed.
- Results are comparable to ISO Standard 11348 results.

References

EN ISO 11348-3:2008/prA1 - Water quality. Determination of the inhibitory effect of water samples on the light emission of *Vibrio fischeri* (Luminescent bacteria test).

Acknowledgements

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