Production and Application of Immunoassay for Chemical Exposures in Occupational Health: Studies in Northern Part of Thailand

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I. Abstract

This topic describes some of the work on developing and applying immunoassay approaches for detecting agricultural used chemicals, i.e., parent compounds of pesticides, metabolites, and biomarkers of effect from exposure. The immunoassays for agricultural used chemicals were developed. A hapten was crucial in mimicking the target chemical conjugated to a protein carrier to raise antibodies (immunogen). Immunogens were used for immunizing animal immune system to raise antibodies. The specific antibody was used for immunoassay development. Most of the immunoassay types commonly applied to analyzing pesticides and other chemicals were competitive immunoassays. The developed immunoassays were used for detecting agricultural products and biological samples from farm and non-farm workers in Northern Thailand.

II. Results & Discussion

The developed immunoassays were validated against the standard method such as the chromatographic-based method by the limit of detection (LoD), the limit of quantitation (LoQ), precision, and accuracy. The results show in table 1.

Table 1. Laboratory parameters, samples, detection, and concentration of detected compounds by the developed immunoassay

	LoD (ppb)	LoQ (ppb)	Precision (%CV)	Recovery (%)	Samples	Detection (%)	Concentration (ppb)	Ref.
Chlorpyrifos	0.26	0.40–41.8	4.6–6.7	95.3–118	Vegetable (n=160)	33.8	35.3 ± 58.4	[1]
DDE	3.50	10.5	5.7–10.4	88.8–117	Milk (n=245)	86.1	108.8 ± 224.1	[2]
3-PBA	0.63	1.26	1.34–11.1	88.4–120	Urine (n=50+50)	24 28	1.05 ± 24.2 (Consumers) 0.73 ± 10.2 (Farmers)	[3]
	0.86	1.72	0.70–8.57	85.6–143	Plasma (n=50+50)	15 14	2.68 ± 4.31 (Consumers) 0.35 ± 0.54 (Farmers)	
AB1-42	16.83		–	–	Urine (n=128)	Non-detect	–	[4]

The laboratory parameter of the developed immunoassay was similar to chromatographic-based methods and could be used for detecting in real samples. Currently, several studies indicate that immunoassay can be used to analyze agricultural products and biological samples after solvent extraction. The developed immunoassay is very useful for analyzing large sample size: it is a simple process and can be done rapidly. The chromatographic-based methods used 50 min per sample (one run), while immunoassay can analyze 50 samples in approximately 4 h. The

immunoassay exhibited good accuracy and reproducibility, and it is ideally suited as a fast, high sample-throughput, and low-cost screening test before chromatographic analysis for confirmation.

III. Conclusion

In-house developed immunoassay can be used for detecting agricultural product and biological samples. It is considered to be an easy and inexpensive method for monitoring and epidemiological study.

IV. References

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