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快速檢測於急診醫療的應用

Application of Rapid Testing in Emergency Medical Care

時　　間：113 年 6 月 22 日(星期六) 08:30~12:00
地　　點：臺北榮民總醫院 致德樓第十會議室

08:30-08:40	***Opening Remarks***	侯重光部長 Chorng-Kuang How
	座長：李怡姿 醫師 (Yi-Tzu Lee)	
08:40-09:30	急診診斷進展：側流式檢測 Advancing Emergency Diagnostics: The Impact of Lateral Flow Assays	陳正翰醫師 Cheng-Han Chen
09:30-09:40	***Coffee Break***	
	座長：洪榮志 教授 (Jung-Jyh Hung)	
09:40-10:30	新式快速檢測工具開發 Development of Rapid Diagnostic Tools	鄭兆珉教授 Chao-Min Cheng
10:40-11:30	尿液巴拉刈紙質檢測裝置與光學法驗證 A Paper-Based Analytical Device for Analysis of Paraquat in Urine and Its Validation with Optical-Based Approaches	王則堯醫師 Tse-Yao Wang
11:30-11:50	討論與回饋 Discussion	李怡姿醫師 Yi-Tzu Lee 侯重光部長 Chorng-Kuang How

Advancing emergency diagnostics: The impact of lateral flow assays

急診診斷進展：側流式檢測

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In the realm of contemporary medical diagnostics, point-of-care testing (POCT) signifies a seminal shift from centralized laboratory paradigms to bedside analyses, catalyzing real-time clinical judgments. This essay will scrutinize the ascendancy and implications of such innovations, particularly through the prism of lateral flow assays (LFAs). LFAs have catapulted to prominence amidst the COVID-19 pandemic, emblematic of rapid, simplistic, and cost-effective diagnostic methodologies. Their pivotal role in expedient disease detection, especially tailored for mass screening and resource-constrained environments, epitomizes the advent of accessible healthcare technology.

The proliferation of COVID-19 antigen LFAs underscores their utility in navigating public health crises. The facility of these assays, necessitating merely a nasal swab and minutes to yield results, has fomented decentralized testing. Consequently, this has expedited case identification, and subsequent isolation and treatment – a linchpin in curtailing the spread of contagion. During the zenith of the pandemic, emergency departments globally were inundated with cases, yet LFAs provided a respite by diminishing wait times and stratifying confirmed cases, alleviating medical infrastructural strains. Reports from Taipei Veterans General Hospital's emergency department corroborate this, aligning with international literature on LFAs' efficacy.

Furthermore, the confluence of portable spectrophotometric technologies with LFAs harbors the potential for enhanced quantitative analysis. In emergency medicine, LFAs are being refined to discern an array of biomarkers – such as interleukin-6 or procalcitonin – pertinent to the severity and monitoring of diseases. The design of LFAs facilitates continual monitoring, bestowing upon healthcare professionals' timely data to inform patient care. This rapid diagnostic capacity is indispensable in acute medical scenarios where temporal economy is paramount, potentially preserving life and ameliorating prognoses.

To encapsulate, the infusion of POCT and LFAs into medical praxis has been transformative, and their prospective evolution promises to amplify their utility. Advancements in sensitivity, specificity, and digital integration anticipate a future where enhanced patient care and outcomes are not aspirational but assured, especially within the exigent confines of emergency departments.

Development of rapid diagnostic tools

新式快速檢測工具開發

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Following the outbreak of COVID-19, a myriad of rapid diagnostic tools emerged and quickly received broad public endorsement. COVID-19 pandemic catalysed a transformative period in the biomedical engineering field, with collaboration between academic researches and medical units accelerating the development of innovative rapid diagnostic tools from academic investigations into how the fundamental principles of infectious diseases, immunology, and bioengineering can be amalgamated to create robust rapid diagnostic tools. The swift development of rapid diagnostic tools post-COVID-19 represents a watershed moment in medical science, where the collaborative efforts of academic researches and practical applications have yielded a suite of tools that are reshaping the landscape of disease diagnosis and treatment monitoring.

I will talk about what we have done in terms of the development of new diagnostic tools for last few years such as COVID-19-relevant diagnostic tools, biofilm diagnostic tool, IL-6 diagnostic tool for disease severity monitoring, but not limited to. I would look forward to exchanging the ideas with audience as well during the lecture.

A paper-based analytical device for analysis of paraquat in urine and its validation with optical-based approaches

尿液巴拉刈紙質檢測裝置與光學法驗證

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Background: Paraquat is a highly toxic herbicide, posing a significant public health threat due to its potential for fatal poisoning. The rapid identification and timely treatment initiation based on the accurate analysis of paraquat concentration in urine or serum is crucial for enhancing patient prognosis. However, the conventional methods for measuring paraquat concentration are hampered by their time-consuming nature and the requirement for expensive, bulky equipment.

Methods: In response to these challenges, this study introduces a paper-based analytical device as an innovative diagnostic tool aimed at facilitating point-of-care testing. The device utilizes colorimetric methods for the quantification of paraquat concentration in urine, offering a practical solution to the limitations associated with traditional analytical techniques.

Results: The evaluation of the paper-based analytical device revealed an R^2 value of 0.9989 for the paraquat standard curve, spanning a dynamic range of 0-100 ppm, with a detection limit of 3.01 ppm. Comparative analysis with two other optical-based approaches, Spectrochip and NanoDrop, indicated that the paper-based device's performance is on par with these methods, as supported by Bland-Altman analysis. Clinical validation was conducted using urine samples from six patients with paraquat poisoning, further affirming the device's accuracy and practical utility.

Conclusion: The findings from this study confirm the efficacy of the developed paper-based analytical device in accurately detecting urine paraquat concentration. Its ease of use, efficiency, and comparable performance to other colorimetric methods make it a valuable tool for improving the clinical management of paraquat poisoning. By enabling quicker decision-making in treatment initiation, this device represents a significant advancement in the field of point-of-care diagnostics, potentially leading to better patient outcomes in cases of paraquat poisoning.