Poster Abstracts

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RAPID DETERMINATION OF LITHIUM IN BLOOD BY COLOR REACTION USING FLUORINE SUBSTITUTED TETRAPHENYLPORPHYRIN LIGAND (F28TPP)

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Objectives: Lithium (Li) preparation is widely used as an agent for bipolar disorder. Serum Li concentrations are related to Li toxicity: therapeutic and toxic levels of Li are estimated to be 0.6-1.2 mEq/L and >1.5 mEq/L, respectively. Serum Li concentrations are measured by advanced, often very expensive devices, such as an atomic photospectrometer, or an inductively coupled plasma mass spectrometer. We developed new method for rapid determination of serum Li by a color reaction, which obviates the need for using these devices. Specifically, our reaction uses the fluorine substituted tetraphenylporphyrin ligand (F28TPP) solution. For the color reaction, changes of the color phase depend on serum Li levels: green, orange, and red indicate less effective levels, effective levels (0.6-1.2 mEq/L), and toxic levels (>2.0 mEq/L), respectively. We report here an application of the method to Li intoxication cases. Additionally, to be applicable to autopsy cases, we examined the application of the method to whole blood samples.

Methods: [Application to Li intoxication case] Four microliters of serum from a patient with Li intoxication was added to 240 µL of the F28TPP solution. The mixture solution was irradiated with LED light for 1 min, and the color phase in the resulting solution was observed. The serum concentration of Li was determined on the basis of the color phase as compared with that of the reference Li standard solution (Li conc. 0, 0.9, 1.7, 3.4 mEq/L).
[Application to whole blood sample] One-hundred fifty microliters of whole blood (Li conc. 0, 0.5, 1.0, 1.9, 3.0 mEq/L) was deproteinized with 150 µL of 10% (w/v) sulfosalicylic acid solution. The solution was centrifuged, followed by the addition of 8 µL of supernatant to 240 µL of the F28TPP solution. The mixture solution was irradiated with LED light for 1 min, and the change of the color phase in the solution was observed.

Results: For Li intoxication cases, Li concentrations determined using our color phase method showed good agreement with those measured by an analyzer. In addition, the entire process was performed within only 10 min. For whole blood samples, the color phase at the concentrations of 0 mEq/L, 0.5-1.0 mEq/L, and 1.9-3.0 mEq/L presented green, orange, and red colors, respectively. These color phases were stable for 60 min.

Conclusion: Our method helps in the rapid diagnosis of clinically Li intoxication cases, and is applicable to the screening test of Li in autopsy cases.