

A METHOD FOR BLOOD EXAMINATIONS IN OVERSEAS MOBILE CLINICS: CLINICAL APPLICATION IN THE RURAL AREAS OF LAO PDR

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Abstract: We conducted an overseas mobile clinic in Lao PDR and examined the results of biochemical tests and blood examinations. For the biochemical tests, we used a method involving plasma skimming film and filter paper, called "plasma separation plate." In this study, we report the usefulness of the plasma separation plate, which is a newly developed method for the screening of biochemical tests in Japan. We were able to apply this method in a mobile clinic in Lao PDR. The quantitative concentration of plasma from blood collected from pricked fingers was measured by this method. Using the plasma skimming film and filter paper, the non-cell components in the blood were separated, and a quantity of the plasma was adsorbed by filter paper. Neither elaborate equipment nor electricity was required. The results of our test data indicated that few inhabitants suffered from adult diseases for which we were screening. We concluded, therefore, that this method is suitable for use in mobile clinics in the rural areas of developing countries.

Key words: plasma skimming film, mobile clinic, biochemical tests, Lao PDR, rural areas

INTRODUCTION

Until now, the results of biochemical tests conducted in mobile clinics in the rural areas of developing countries have been very difficult to review because centrifugal separation and preservation are not easy and require multiple pieces of equipment. The purpose of this study was to use plasma skimming film and filter paper, a newly developed method for the screening of biochemical tests called "plasma separation plate," and to apply this method in the mobile clinics of rural areas in Lao PDR.

MATERIALS AND METHODS

We conducted an overseas mobile clinic (medical checkup for inhabitants) in DakEuy village, SeKong province, Lao PDR from April 24 to May 16 (21 days) in 2002. Blood was collected on the basis of informed consent from the inhabitants of DakEuy village (168 subjects among 210 inhabitants: 0-5 years old, 26 people; 6-15 years old, 57 people; 16-65 years old, 85 people; 83 men and 85 women). This village is located near the Sekaman River, the rice fields cultivated by the villagers stretching along the riverbank. It is about 8 km from the Dakchung district town, which has a market that the villagers access by a day trip on

foot. The village is about 20 km from the border of Vietnam. Most villagers travel on foot because there is no public transportation.

We conducted biochemical tests and blood examinations. The plasma separation plate was used for the biochemical tests. The plasma from blood collected by finger pricking was measured quantitatively using this method (Figure 1). We were able to examine the following parameters using the plasma separation plate: GOT (AST), GPT (ALT), γ -GTP, BUN, creatinine (Cr), total cholesterol (T-CHO), HDL-cholesterol (HDL-CHO), triglyceride (TG), amylase (AMY), uric acid (UA), and hemoglobin (Hb). HBs Ag and HCV Ab were examined using dry blood samples spotted on filter paper [1, 2]. Blood sugar (BS) was measured by the rapid blood glucose level monitor (Glutest sensorTM, Sanwa Kagaku Kenkyusho Co. Japan) [3]. The data were confirmed to assure the accuracy of this method, and a storage stability of 3 days was also confirmed by drying plasma samples that had been absorbed on the filter paper in the plasma separation plate at room temperature. Furthermore, a temperature of 50 °C for 12 hours was confirmed for storage stability (Ishizuka *et al.*, 2001) [4].

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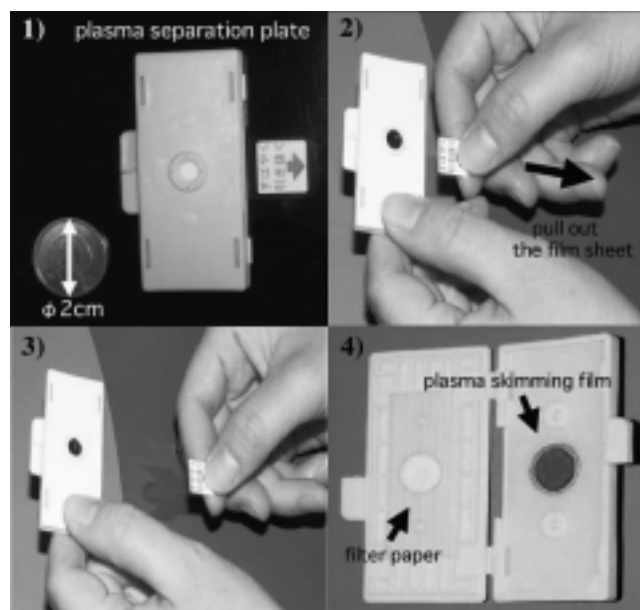


Figure 1 Plasma separation plate method

- 1) Four drops of blood are inserted into a hole in the middle of the opening on the surface of the plasma separation plate, and a small quantity of blood accumulates until a sufficient amount is obtained.
- 2) The storage is terminated by pulling out the film sheet.
- 3) The blood is left for 5 minutes after removal of the film sheet. Only the non-cell component is allowed to pass through the plasma skimming film, and the filter paper is allowed to adsorb it.
- 4) By opening the equipment, the conversion of the cell component in the blood is prevented (right arrow). For about 1 hour, the degradation of the component adsorbed in the filter paper (left arrow) is prevented by the aeration of the filter paper.

RESULTS

The results of the examinations were GOT (AST): 35.5 ± 16.7 (8 ~ 38 IU/l), GPT (ALT): 31.7 ± 10.3 (4 ~ 44 IU/l), γ -GTP: 35.5 ± 14.1 (16 ~ 73 IU/l), BUN: 11.5 ± 3.4 (8 ~ 20 IU/l), Cr: 0.4 ± 0.1 (0.4 ~ 1.1 mg/dl), T-CHO: 135.1 ± 21.2 (130 ~ 230 mg/dl), HDL-CHO: 31.7 ± 6.4 (35 ~ 88 mg/dl), TG: 107.9 ± 45.6 (50 ~ 130 mg/dl), AMY: 113.4 ± 82.0 (43 ~ 116 IU/l), UA: 3.3 ± 0.9 (2.5 ~ 8.3 mg/dl), Hb: 16.1 ± 1.8 (12.0 ~ 18.0 g/dl), BS: 88.6 ± 13.6 (70 ~ 110 mg/dl): Values are means \pm SD (normal limit). From the results of the superscription, some inhabitants showed a higher than normal level of transaminase. Twelve persons (7 adults and 5 children) showed a higher than normal level of both GPT and GOT. The other results of the medical checkup were as follows: 7 cases of cold symptoms, 6 cases of ascariasis, and 1 case of suspected Behçet disease. In 4 cases of liver dysfunction, we measured HBs Ag and HCV Ab. Two cases were positive for HCV Ab, but none was positive for HBs Ag. Two women (one 40 and one 30 years old) were HCV Ab positive. The other cases were a 9-year-old girl and a 7-year-old boy who

had cold symptoms. Some inhabitants showed higher than normal amylase levels. Six persons (3 adults and 3 children) showed levels over 200 IU/l. The breakdown was as follows: 3 cases of cold symptoms, 2 cases of ascariasis, 1 case of suspected Behçet disease. None of the subjects showed a higher than normal (upper range) for total cholesterol, uric acid or renal function. However, some inhabitants showed higher than normal triglyceride levels. Also, although the inhabitants were sufficiently nourished, no cases of diabetes mellitus were diagnosed. In DakEuy village, the hemoglobin values of inhabitants tended to be high but were within normal limits.

DISCUSSION

In this study, we used the plasma separation plate (mailing medical checkup kit), a method newly developed by the Aichi Medical Foundation of Diagnostic Technology, a co-author of this paper. Using plasma skimming film, the non-cell components in the blood are separated, and a certain quantity of the plasma is adsorbed by the filter paper. The specimens are transferred by mail and stored at room temperature. A multiphasic health screening method that utilizes convenience stores and the mailing of specimens is established in Japan [5]. With this method, blood can be collected by a prick of the finger and mailed to the Aichi Medical Foundation of Diagnostic Technology, thus making it possible for examinees to undergo the examination at home. The method does not require a centrifugal separator or power supply. Also, the sample, even when large, is light in weight and not bulky. This method is also useful for mobile clinics in the rural areas of developing countries because there is no need for elaborate equipment. Furthermore, the blood is not taken from the vein, making collection easy. There is also the advantage that the burden of the inhabitants is lowered because only small samples are required and the fear of injection is relieved [6, 7]. In this study, no inhabitant showed a higher than normal level of total cholesterol, uric acid or renal function. No diabetes mellitus patients were diagnosed. These findings indicated that few inhabitants suffered from adult diseases [8]. From this fact, we concluded that either the caloric intake of the inhabitants is comparatively low or that there are small groups who show hyperglycemia. Among the inhabitants who showed a higher than normal level of transaminase, amylase, and triglyceride, however, other factors such as meals, intake of alcohol, and viral or parasitic infection may be involved. We intend to further investigate this situation in the near future [9, 10]. In DakEuy village, the hemoglobin values of inhabitants tended to be high but within normal limits, perhaps because this village is located at an alti-

tude of over 1000 m [11]. We concluded that this method is suitable for the mobile clinics in rural areas of developing countries. Our results may contribute to the future development of medical checkups in rural areas without access to electricity.

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