PROTEIN ELECTROPHORESIS - NEED FOR IMPROVEMENTS IN CONVENTIONAL METHODS

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The technique of electrophoresis has provided the clinical laboratories with simple and rapid methods for the separation of proteins in serum and other biological fluids. Starting from the moving boundary or frontal electrophoresis the technique has seen many improved modifications resulting in providing more accurate and important information to the clinicians. For many years cellulose acetate membrane[1] (CAM) and agarose gel[2] electrophore sis have dominated the clinical laboratories because of easy use, low cost and commercial availability. In early descriptions, both agarose gel and CAM electrophoresis resolved the proteins in five major zones[3] namely albumin, alpha-i, alpha-2, beta and gamma globulins and the two systems were comparable[4]. These five fractions gave a good information regarding diagnosis and prognosis of the disease but was still limited and sometimes confusing, the reason being that each of these major fractions composed of many individual proteins[5]. Each of these proteins has its own importance towards the disease precess[6-8]. Albumin shows the maximum electrophoretic mobility, prealbumin, however, moves ahead of albumin. It is a better indicator of malnutrition than albumin and has a much shorter half-life than albumin[9]. At the sametime, prealbumin binds with it the ratinol-binding protein which in turn complexes with the vitamin A. Thus prealbumin also plays an important role in the transport and metabolism of vitamin A. Alpha-i-globulin fraction carries with it the alpha-i-antitrypsin and alpha lipoproteins. The level of alpha-i- antitrypsin is diminished in serum in acute hepatocellular necrosis, chronic liver disease or in genetically controlled production of the aberrant types of proteins inhibitor[10,11]. The importance of lipoproteins is well known. A long with the alpha-2-globulin fraction also migrate haptoglobin[12] and beta lipoproteins[13]. Haptoglobin has the function of combining with haemoglo bin (forming haemoglobin - haptoglobin complexes) released by the lysis of the red cells. The haemoglobin haptoglobin complexes are then taken up by the reticuloendothelial system, where the haemoglobin is broken down into globin and hence gets further degraded to iron and bilirubin. Free haptoglobin then combines with iron and preserves it for future use. Transferrin[14,15] moves alongwith the beta-globulin fractioa whereas fibrinogen and the C. reactive protein are carried by the gamma globulin fraction. Each of these fractions has its own clinical importance. Thus, in addition to five major bands, the importance of sub-fractions cannot be denied. Inspite of the immense clinical significance of these protein fractions, no attempt has been made to obtain such information collectively. Different modifications in the standard electrophoretic procedures may result in a single step resolution of these protein fractions which will not only be cost effective and less time consuming but also give more elaborate information about the disease process. As mentioned earlier, the cellulose acetate membrane (CAM) and agarose gel electrophoresis both resolve proteins in five major fractions. However, agarose gel electrophoresis gives more bands at a high voltage[11] but the resolution of proteins at a high voltage is not practicable as overheating may result in the denaturation of proteins or deformation of their molecular struc ture. In CAM electrophoresis, the conventional electrophoretic procedures have been modified by some workers and certain improvements have been achieved[11,16]. However, no information is available regarding any such improvements in Pakistan. In our country, where highly sophisticated and equipped laboratories are few in number, the need for such improvement has become urgent. If for clinical practice such modifications/improvements can be achieved with CAM electrophoresis, this will provide the clinicians a more compact picture of the patient by performing just one laboratory test. At the same time, another important aspect be kept in

mind that, in the coming years, working on the conventional 5-band electrophoresis will need to be replaced by some modified electrophoretic procedures. Due attention should be given to this important technique for the diagnosis and prognosis of disease.

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