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Abnormal Serum Lactate Dehydrogenase Isoenzyme Due to Complex of Lactate Dehydrogenase and Immunoglobulin G (Kappa Type)*)

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ABSTRACT

Abnormal electrophoretic pattern of serum lactate dehydrogenase isoenzyme is shown. In this case electrophoretic pattern showed a sharp single band between lactate dehydrogenase 4 and lactate dehydrogenase 5 and broad band between lactate dehydrogenase 2 and lactate dehydrogenase 4. This abnormality was suggested to be caused by the presence of lactate dehydrogenase and immunoglobulin G (kappa type) complex at least in part. There were no abnormalities of other laboratory data in this case.

INTRODUCTION

Several papers have been published on abnormal electrophoretic patterns of serum lactate dehydrogenase isoenzymes[1-14]. In some of the cases, the occurence of complexes of lactate dehydrogenase and immunoglobulin was reported, in which complexes of lactate dehydrogenase and immunoglobulin A or immunoglobulin G were described[1-3,6,7,11-13].

In this report we described a patient whose serum lactate dehydrogenase activity was increased and whose serum lactate dehydrogenase showed an abnormal electrophoretic pattern. In this case, the abnormality was suggested to be caused by the interaction between lactate dehydrogenase and immunoglobulin G (kappa type). There were no abnormalities of other laboratory data except LDH abnormality in this patient.

MATERIALS AND METHODS

Lactate dehydrogenase activity was assayed according to Wróblewski et al.[15]. Lactate dehydrogenase isoenzymes were separated by electrophoresis with a Corning ACI system (Corning Medical, Medfield, MA 02052) with 0.07 M barbiturate buffer (pH 8.6) and 60 min of electrophoretic time, and stained for lactate dehydrogenase activity with lactate-NAD-nitrotetrazolium blue method. The bands of lactate dehydrogenase activity were named as LDH 1, LDH 2, LDH 3, LDH 4 and LDH 5 from possitive pole side. The immunoelectrophoresis was carried out with anti-IgG, IgA, IgM, IgD and light chains (kappa and lambda types) antibodies at room temparature for 12 hours after the electrophoresis of serum with a Corn-

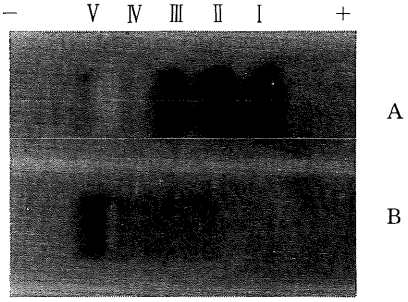
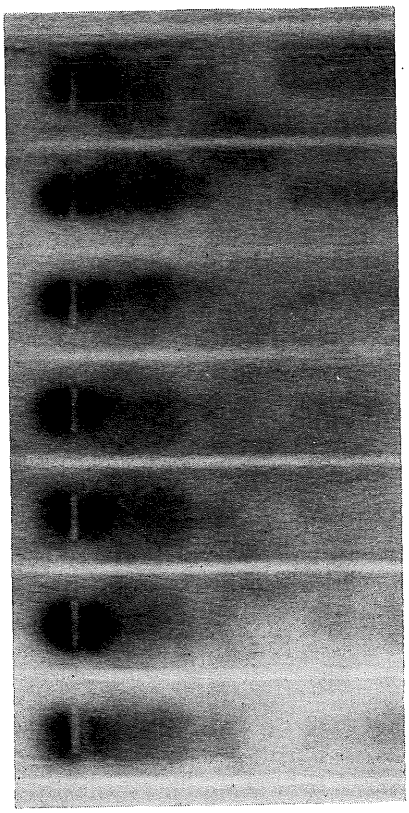


Fig. 1. Lactate dehydrogenase isoenzyme patterns of serum on agarose gel electrophoresis.
Normal serum (A) and patient's serum (B) were used about 5 μl. Electrophoresis and staining for lactate dehydrogenase activity were carried out as described in Materials and Methods.

*) 林　幸三，土橋敬弘，三重野寛，伊藤和朗，小園　昇：乳酸脱水素酵素と免疫グロブリンG（K型）の複合体に起因する異常血清乳酸脱水素酵素アイソエンザイム



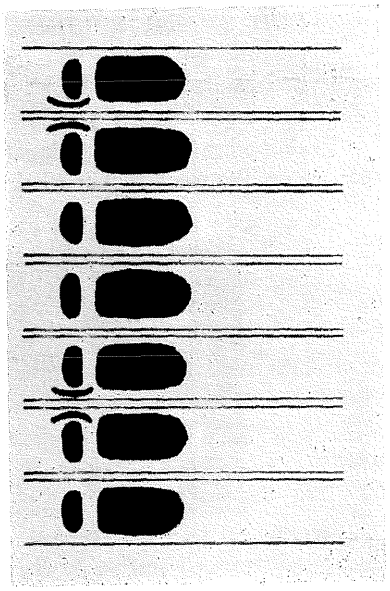


Fig. 2. Lactate dehydrogenase activities on the precipitation lines by agarose gel immunoelectrophoresis.
About 5 μl of patient's serum was used for immunoelectrophoresis with anti-IgG, IgA, IgM, IgD and light chains (kappa and lambda types) antibodies as described in Materials and Methods.

ing ACI system described above. The staining was carried out as described above. Anti-IgG, IgA, IgM, IgD and light chains (kappa and lambda types) antibodies were purchased from Hoechst Behring Institute.

RESULTS

Lactate dehydrogenase isoenzyme pattern of serum.

Lactate dehydrogenase isoenzyme pattern of normal serum showed five fine bands (LDH 1, 2, 3, 4 and 5) as shown in Fig. 1A. However, lactate dehydrogenase isoenzyme pattern of patient's serum showed a sharp single band between LDH 4 and LDH 5 and broad band between LDH 2 and LDH 4 (Fig. 1B). The lactate dehydrogenase activity of patient's serum was 1073 unit and this activity was high in comparison with normal value (200-500 unit).

Immunoelectrophoresis and staining for lactate dehydrogenase activity.

Several reports have been published on the occurence of lactate dehydrogenase and immunoglobulin complexes[1-3,6,7,11-13]. Therefore, immunoelectrophoresis and lactate dehydrogenase activity staining were carried out with anti-IgG, IgA, IgM, IgD and light chains (kappa and lambda types) antibodies in order to identify the binding protein for lactate dehydrogenase. As shown in Fig. 2, lactate dehydrogenase activity was shown on precipitation line between sharp single band and anti-IgG antibody. The same result was shown when anti-light chain (kappa type) antibody was used.

These results suggest that lactate dehydrogenase and immunoglobulin G (kappa type) complex was present in this patient's serum. However, a precipitation line which had lactate dehydrogenase activity was not present between broad band and anti-IgG antibody or anti-light chain (kappa type) antibody.

DISCUSSION

Abnormal electrophoretic patterns of serum lactate dehydrogenase isoenzymes were reported[1-14]. The cases reported by Kitamura et al. and Peel showed the congenital defect of H subunit and the presence of a factor which inactivated H subunit[8,14]. The occurence of complexes of lactate dehydrogenase and immunoglobulins in human serum has been reported previously[1-3,6,7,11-13]. The complexes reported were lactate dehydrogenase and IgA or IgG, and the electrophoretic patterns of these cases showed several bands. It has been reported that light chains of immunoglobulin which associated with complexes of lactate dehydrogenase and immunoglobulin were kappa or lambda type previously.

In our case, the electrophoretic pattern of serum lactate dehydrogenase showed a sharp single band and broad band, and the immunoelectrophoretic pattern showed a short precipitation line between lactate dehydrogenase and anti-IgG antibody and anti-light chain (kappa type) antibody. These results suggest that an interaction between lactate dehydrogenase and IgG (kappa type) causes an atypical isoenzyme pattern. However, a precipitation line which had LDH activity was not shown between broad band and anti-IgG antibody. The reason why a precipitation line does not appear between broad band and anti-IgG antibody is not clear. The mechanism for the formation of a broad band also is not clear. One possible speculation is that antibody is produced against a paticular LDH isoenzyme and that a broad band is produced by another mechanism which is not examined. The mechanism or physiological role for the formation of lactate dehydrogenase and immunoglobulin complex has not been explained yet. Two possible speculations are suggested for the mechanism. One is an abnormality in the patient's lactate dehydrogenase and the other is an immunologic abnormality, that is, an autoimmune mechanism which was suggested by Ganrot[6]. If normal lactate dehydrogenase isoenzyme pattern is influenced by the addition of patient's serum, a possibility that immunoglobulin G (kappa type) which forms the complex of lactate dehydrogenase and IgG in patient's serum will reacts with normal lactate dehydrogenase is suspected. However, this conception was not proved in this experiment.

As shown in previous reports, the autoimmune mechanism is suggested for the formation of the lactate dehydrogenase and immunoglobulin complex. However, we could not investigate the mechanism for the formation of lactate dehydrogenase and immunoglobulin complex more precisely. Furthermore, the physiological role for the formation of complex

and the mechanism of the increase in lactate dehydrogenase activity of the complex have not been investigated, so it is important to study these problems biochemically.

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