Concanavalin A Administration Disrupts the Morphology of C3H/HeN Mouse Intestinal Barrier Epithelium

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Abstract

Concanavalin A (Con A) is a lectin that derived from jack bean plant. Intravenous administration of Con A causes a dose dependent acute liver injury. In addition, following treatment, there is an increase in gut permeability. Stereological and ultrastructural studies showed that intestinal wall morphology alteration leading to disruption of intestinal barrier. Increase in gut permeability might be one of the mechanisms by which Con A induces liver injury, and this mechanism might be dependent on the LPS/TLR4 signalling pathway.

1. Introduction

Con A is a lectin that derived from jack bean plant (*Canavalia ensiformis*). Con A had been widely used as a potent stimulator of the release of a broad range of cytokines from lymphocytes and mononuclear cells. It is known for its ability to agglutinate cells in vitro. In addition, it induces T cell activation. In vivo (intravenous) administration of Con A causes a dose dependent acute liver injury, which is self-limiting 72 hours after the treatment. Toll-like receptor-4 (TLR4) is a component of innate immune system. It is a lipopolysaccharide (LPS) receptor and in the liver that expressed by both T cells and Kupffer cells. LPS is a major component of the outer membrane of the Gram-negative bacteria. The signalling pathway of LPS/TLR4 initiates the signalling of inflammatory process. Following Con A administration, there is an increase in gut permeability after the treatment. Increase in gut permeability might be one of the mechanisms by which Con A induces liver injury, and this mechanism might be dependent on the LPS/TLR4 signalling pathway.

2. Materials and Methods

C3H/HeN (LPS-sensitive) mice was used to establish the action of Con A in LPS/TLR4 signalling pathway might be involved in Con A induced liver injury with alteration of gut permeability. The intestinal tracts of 20 mice were collected after euthanasia at 1,2,4 and 24-hour after Con A administration. Gut wall components of muscularis, lamina propia and microvilli of mucosa were stereologically quantified to assess any morphological changes after Con A treatment in the present study. Histological sections from jejunum, ileum, caecum and colon-rectum were made according to common stereological principles. Using these sections, the volumes and surface areas of each intestinal segment was estimated applying stereological counting procedures. In the other 20 animals, the conditions of microvilli present in each intestinal segment were determined by means of transmission electron microscopy (TEM).

3. Results

Stereological studies showed that estimation of mucosa volume and villi volume in the jejunum were significantly decreased ($p<0.05$) at 1 hour after Con A treatment. The volumes return towards basal volumes at 4 hours. TEM micrographs showed a distortion and disorganised arrangement of the microvilli after 4 hours exposure to Con A.

4. Discussion

Increased intestinal permeability in Con A induced acute liver injury is dependent on the LPS/TLR4 signalling pathway that might be due to the disruption in gut barrier lining morphology and integrity. The data concerning the gut wall components and microvilli shown in the present study might be very valuable since very few morphometric studies on murine microvilli have been performed.

5. References

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