

Klebsiella pneumoniae

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ABSTRACT

The study investigated the effect of the lipopolysaccharide, (LPS) extracted from *Klebsiella pneumoniae*, on immune response of BALB/c mice infected with secondary hydatid disease caused by *Echinococcus granulosus* protoscoleces.

The immunopathological changes accompanied with secondary hydatid disease in mice treated with LPS were followed in comparison with the positive control group (mice infected with hydatid disease but not treated with LPS before infection) along - months period of the experiments.

Criteria taken into consideration included the specific cellular immune response, expressed by the change in the delayed-type hypersensitivity (footpad thickness) and humoral immune response expressed by antibody titer, were also considered.

Results of the present study revealed an increase in the specific cellular and humoral immune response, expressed by an increase in the delayed type hypersensitivity (footpad thickness) and the titer of the antibody, respectively, in treated mice.

Therefore, it may be concluded that the lipopolysaccharide extracted from *Klebsiella pneumoniae* may possess some stimulating effect on both specific cellular and humoral immune response against infection with hydatid disease.

Lipopolysaccharide (LPS)

Echinococcus () *Klebsiella pneumoniae*
.granulosus

)
- (LPS
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()

K.
pneumoniae

Hydatid disease

Echinococcus
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3 []
.[2]

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.[]

Albendazole

[7] Oxfendazole

Benzimidazole

Mebendazole

Immunomodulators

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[12] Aceti *et al.* [11]Afferini [10]

IgE IgG4

IgE

T IL-4

macrophages

B

[13]

[14] Aceti *et al.*

IgG

B

IgM

[15]

[]

Hyperplasia

[18] Leucocytosis

[17]

Klebsiella

K. pneumoniae

Dome-like colonies

K. pneumoniae [19]

%

%

% -

[20]

septicemia

. [21] meningitis

Lipopolysaccharide

LPS []

(MHC- II

[3]

B

Major Histocompatibility Complex II)

. []

[5]

[] TLR-4 CD14

Reticulo endothelial cells

. [- 2]

(IL-6 IL-1 TNF- α)

LPS-

Lipopolysaccharide Binding Protein (LBP)

CD₁₄

Lipopolysaccharide Binding Protein

. [-] TLR₄

K. pneumoniae

BALB/c

LPS

/

K. pneumoniae

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. [36,35]

[37] Learne *et al.*

[38] Leathers *et al.*

[39]

[] Dubois *et al.*

: [41]

$$\times \text{—————} = (\quad / \quad)$$

BALB/c

/ /

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[42] Smyth

[43] Smyth and Barrett

[44]

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/

.Delayed-type hypersensitivity

. [45] Dottorini *et al.*

[46] Schacterle and Pollack



[47] Ali-Khan

/ %

.25G

Vernier

Indirect Haemagglutination Test (IHA)

[48] Varela-Diaz *et al.*

: : :

Microtiter plates (U)

%

t

ANOVA

[49]

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(p < 0.001)

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48 hr.			24 hr.			3 hr.			
t	SD		t	SD		t	SD		(
/	/	/	/	/	/	**	/	/	
*	/	/	*	/	/	*	/	/	
/	/	/	*	/	/	/	/	/	
*	/	/	***	/	/	**	/	/	
**	/	/	*	/	/	*	/	/	
-	/	/	-	/	/	-	/	/	C ⁺

: ** (p < 0.05)

: * .

: C⁺

.(p < 0.001)

: *** (p < 0.01)

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48 hr.			24 hr.			3 hr.			
t	SD		t	SD		t	SD		
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(p < 0.01)

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48 hr.			24 hr.			3 hr.			
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(4)

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(p < 0.001)

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(p<0.001)

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Titer of antibodies			(/)
t	SD		()
**	,	,	
***	,	,	
***	,	,	
***	,	,	
***	,	,	
-	,	,	C ⁺

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Titer of antibodies			(/)
t	SD		()
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-			C ⁺

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(p < 0.001)

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Titer of antibodies			(/)
t	SD		()
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-			C ⁺

[50]

K. pneumoniae

TNF- α IL-6 IL-1 Chemkines
.[52,51]
.[53] Alternative pathway

[54]
IL-6 [56,55] T B
[57] B
.[58] T
/
.() ,

Allergic inflammation
[60] Teixeira et al. [59]

(BCG) Th2
Schistosoma mansoni

Reticulo endothelial cells
Anti-IFN- Th2
IFN- Th2
mast cells
(T – dependent neutrophil accumulation) T
TNF

[61] Macrophage inflammatory protein-2(MIP-2)

TNF- IFN- IL-2 [56] Willey et al. TNF- IFN-
Th1

[62] Asherson and Ptak
(FCA)

[63] Ryu and Kim
Lipopolysaccharide- -
Pasteurella multocida (P - 2383) protein complex
) (((P-2383-1)
(P-2383-1-PRO) (P-2383-1-LPS) (P-2383-1)
(P-2383-1)

[28] Ali and Yaseen [65,64] Ali and Abdullah

[30] Ali and Yuosif

E. coli

E. multilocularis [47] Ali – Khan
[66] Ali and Salih; [30] Ali and Yousif; [28] Ali and Yaseen

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Rhizobium

[67] Fattah

Immobilization

. [68]

ADCC

[11] Al-Grawy

. [69]

B

[70] Ali and Salih

IgM

Pullulan

[71] Al-Qaoud and Abdel-Hafez

B

IgG3

IgG2 IgG1

IgG

MHC-II

[24] Rodo *et al.*

LPS

B

MHC

TLR-4 RP105 (CD180)

LPS

B

MHC-II

B

[72] Araj *et al.*

[73] AL-Awady

.IHA

IHA

E. granulosus

[74]

[75]

Mopping effect

T

T

[76] Th2 Th1

Autocytotoxicity

Echinococcus spp.

[77] Persat *et al.*

IgG,

E-multilocularis

1/128

[78] Ray *et al*

.IgA, IgM

IHA

1/100

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