

Klebsiella pneumoniae

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ABSTRACT

The study tested the effect of the lipopolysaccharide, which was extracted from *Klebsiella pneumoniae*, on immune response of BALB/c mice infected with secondary hydatid disease caused by experimental infection with *Echinococcus granulosus* protoscolices.

The immunopathological changes accompanied with secondary hydatid disease in mice treated with LPS were followed in comparison with the positive and negative control group along 3-5 months period of the experiments. Criteria taken into consideration included the changes in the total and differential count of WBCs, and non-specific (innate) immune response, expressed by the change in the phagocytic index.

Results of the present study revealed an increase in the means of total and differential count of WBCs, expressed by increase in the number of lymphocytes accompanied by a decrease in number of monocytes, neutrophils and eosinophils in treated mice. An increase in the nonspecific immune responses is represented by increase in the mean of phagocytic index.

Therefore, it may be concluded that the lipopolysaccharide extracted from *Klebsiella pneumoniae* can be used as a non-toxic stimulator of non-specific immunity against infection with secondary hydatid disease.

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Lipopolysaccharide

Klebsiella pneumoniae

(LPS)

Echinococcus

.granulosus

5 - 3

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K. pneumoniae

Hydatidosis

.Cosmopolitant

Immunomodulators

.[2,1]

Macrophages

Eosinophils

Monocytes

Mast cells

Neutrophils

.[3]

Myofibroblasts

.[4] T

		[5]	
	. [6]		
	Postencystment		Preencystment
	4-2		
	. [6]		
	Hyperplasia		
	. [8] Leucocytosis		[7]
<i>Klebsiella</i>		<i>K. pneumoniae</i>	
	Dome-like colonies		
	<i>K. pneumoniae</i>	. [9]	
			%95
		LPS	
		Endotoxins	[10]
Tumor Necrosis Factor	IL-6	IL-1	Proinflammatory cytokines
			LPS [11] (TNF- α)
(MHC- II			[12]
B		Major Histocompatibility Complex II)	
	LPS	. [13]	LPS
			LPS [14]
		[15] TLR-4	CD14
			. [21-17, 3, 16]
		<i>K. pneumoniae</i>	LPS
		BALB/c	

/ *K. pneumoniae* /
 [24] Learne *et al.* . [23, 22]
 Leathers *et* . [25] *al.*
 .[26]
 .[27]
 :[28] -
 × _____ = (**100/**)

BALB/c
 / /
 6
 5-4
 .2008 2007

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. [29] Smyth

. [30] Smyth and Baret

2000

5-4

. [31]

500 400 300 200 100

:

20/

	5		25
		72	
	5		6
		5	
9			25
			72
		5	
			5
12			25
			72
		5	
			5

Diethyl ether

[32]

Total count

5 EDTA

.Phagocytic index

Differential count

:[33]

$$100 \times \frac{\text{NBT}}{\text{Total count}} =$$

ANOVA

.[34]

(1)

)

(72

20/ 400

20/ 400

.7538

4718

(p < 0.001)

.(p < 0.01)

2880

20/ 500

85.4

56.75

(p<0.001)

.35.75

(p<0.001)

4.4

20/ 500

20/ 100

8.25

(p<0.01)

(p<0.05)

.12

20/ 500

8.4

(p<0.001)

&

.32 200
 47.75
 .(p<0.01)
 400
 20/ 400 .1.2
 3 (p<0.001)
 .4.5
 :(1)
 (72)

												3 /			20/)
Eosinophils			Neutrophils			Monocytes			Lymphocytes			t	SD		(
t	SD		t	SD		t	SD		t	SD		t	SD		(
*3.00	0.577	1.50	***4.85	5.852	13.25	**1.11	3.651	6.00	**4.58	7.632	79.25	**3.46	259.097	6117	100
1.56	0.500	2.25	0.95	3.741	29.25	0.5	2.986	7.25	0.70	3.403	59.25	**3.27	1196.418	7044	200
*2.61	0.500	1.75	***7.15	3.403	10.25	*3.06	0.957	5.25	***7.27	3.594	82.75	0.48	763.461	4857	300
***4.24	0.447	1.20	***4.60	5.831	15.00	1.91	2.049	5.80	***5.19	6.041	78.00	***5.05	878.088	7538	400
*2.82	0.447	1.80	***8.90	2.881	8.40	*2.50	2.280	4.40	***7.83	4.827	85.40	*2.73	560.944	5922	500
1.96	1.291	4.50	**4.20	5.560	47.75	*2.72	2.160	12.00	***5.37	4.787	35.75	**3.49	720.896	2880	C ⁻
-	0.816	3.00	-	5.033	32.00	-	1.707	8.25	-	6.184	56.75	-	764.737	4718	C ⁺

:* . : C⁺ . : C⁻
 : *** (p<0.01) : ** (p<0.05)
 .(p< 0.001)

(2)

(72)

20/ 400
 400 .10886
 .6715 (p<0.001)
 (p<0.01)
 .5051

.85.4 20/ 400

...

(p<0.001)

63.25

. 32.25 (p<0.001)

20/ 100

3.75

7

.10.25

7.8 20/ 400

20/ 400

26.5 (p<0.01) (p<0.001)

(p<0.001)

.52.5

1 20/ 500

20/ 500

3.25 (p<0.01)

.(p<0.05) 5

:(2)

(72)

												³ /			20/)
Eosinophils			Neutrophils			Monocytes			Lymphocytes			t	SD		
t	SD		t	SD		t	SD		t	SD					
1.98	0.816	2.00	**3.68	2.500	14.00	2.26	1.258	3.75	6.6888	2.217	80.25	*2.59	675.602	7833	100
2.21	0.957	1.75	**4.38	1.414	12.00	1.27	0.957	5.25	***7.20	1.825	81.00	0.72	1425.412	6862	200
*3.13	0.577	1.50	**4.06	2.753	12.25	1.09	2.58	6.00	***3.96	5.377	77.25	2.11	684.980	7632	300
*2.42	0.836	1.80	***5.90	2.774	7.80	1.31	2.000	5.00	***7.33	4.449	85.40	***5.07	1553.564	10886	400
4.07	0.707	1.00	**3.94	3.962	12.80	0.90	2.073	5.60	*5.51	4.774	80.60	1.31	742.444	6732	500
*2.78	0.816	5.00	***7.12	3.415	52.50	1.76	2.630	10.25	***8.84	5.315	32.25	***3.29	882.814	5015	C ⁻
-	0.957	3.25	-	6.455	26.50	-	2.582	7.00	-	4.573	63.25	-	534.730	6715	C ⁺

(3)

(72)

20 / 500 .9764
 20/ 400 (p<0.01) (p<0.001)

20/ 500
 .4482 6683 (p<0.01)

20/ 400 84.5
 57.5 (p<0.001)
 41.5 (p<0.001)

20/ 400 300 .3
 20/ 100 (p<0.01) (p<0.001)

.11.75 8 (p<0.05)

(p<0.001) 20/ 500 9.4
 31.5
 .42.25 (p<0.01)

20/ 400 1.5

...

3
4.5

:(3)

(72)

												3 /			20/)
Eosinophils			Neutrophils			Monocytes			Lymphocytes			t	SD		(
t	SD		t	SD		t	SD		t	SD					
1.32	0.836	1.80	***6.60	2.588	15.80	**3.90	1.140	4.40	***9.59	2.549	78.00	0.58	1310.481	7093	100
0.24	0.957	2.75	***5.86	4.654	12.50	1.99	2.217	5.25	***5.74	6.608	79.50	0.66	1140.138	6865	200
1.32	0.500	1.75	***6.75	2.061	14.75	***5.19	0.577	3.50	***10.5	1.825	80.00	0.45	596.171	6867	300
1.34	1.291	1.50	***7.61	2.943	11.00	***5.47	0.816	3.00	***9.85	3.87	84.50	**2.59	806.166	9574	400
0.51	1.673	2.40	***9.98	1.949	9.40	1.73	1.483	6.20	***10.60	3.082	82.00	***7.03	724.340	9764	500
1.56	0.577	4.50	**4.39	1.893	42.25	*2.85	2.061	11.75	***6.12	3.511	41.50	**4.38	845.742	4482	C-
-	1.825	3.00	-	4.509	31.50	-	1.633	8.00	-	3.873	57.50	-	543.436	6683	C+

(4)

(72)

%77.486 20/ 400
20/ 200 (p<0.001)

.%43.425

(5)

(72)

20/ 400 %74.232
%39.23 (p<0.001)

&

:(4)

(72)

Phagocytic index (%)			20/)
t	SD		(
***5.77	4.398	62.217	100
1.99	5.606	50.792	200
***5.58	4.260	61.352	300
***8.69	6.516	77.486	400
***8.98	4.153	70.208	500
-	4.799	43.425	C ⁺

:(5)

(72)

Phagocytic index (%)			20/)
t	SD		(
***5.90	3.237	57.867	100
***7.26	2.501	60.892	200
***5.27	4.799	58.312	300
***7.92	7.333	74.232	400
***8.04	3.747	63.726	500
-	5.415	39.23	C ⁺

(6)

(72)

. (p<0.001) 20/ 400 %79.76
%38.407

...

:(6)

(72)

Phagocytic index (%)			20/)
t	SD		(
***8.16	3.8321	61.022	100
***8.51	3.587	62.872	200
***8.72	4.9124	67.447	300
***7.79	9.6203	79.76	400
***10.51	3.7728	67.28	500
-	4.4893	38.407	C ⁺

LPS

Monokines

. [35]

K. pneumoniae

[36] Ye *et al.*

CD4+T

IL-17

Granulocyte precursors

[15] Elson *et al.*

.LPS

MD-2 TLR-4

[37] Takeuchi *et al.*

Lipoarabinomannan *Mycobacterium tuberculosis*

[18] Ali and Yousif [38] Ali and Salih

A. pullulans

Pullulan

E. coli

[39] Al-Kannany

[40] Profumo *et al.*

T B 5

[41] Kharebov *et al.*

LPS

LPS

[42] Li *et al.* [2] Al-Grawy

B

T [43] Vogel *et al.*

[44] Kaiser *et al.* LPS IL-2

T

.Tumor antigen

Dendritic cells (DCs)

Ali and Abdull [38] Ali and Salih

[45]

[46] Remick *et al.*

(FCA)

[5] Vuitton *et al.*

.CD8+T

. [47]

IL- TNF- α LPS [12] Mathiak *et al.*
LPS *Salmonella typhosa* *P. aeruginosa*
1 β

Maus *et*

[48] *al.*

Alveolar

Ali

macrophages

[49,45] Ali and Abdulla [38] and Salih

. *E. granulosus*

BALB/c

20/ 400 7.8

(2)

LPS

B

[50] Rigano *et al.*

TNF- α IL-12

B

[51]

Bozza *et al.*

[52]

[53] Penido *et al.*

LPS

LPS

[54] Henriques *et al.*

T

(LPS)

[55]

[7] Hashemitabar *et al.*

whole body antigen

E. granulosus

20/ 400

(6)

%79.76

LPS

C5a C3b

Cortes *et*

Opsonization

[56] *al.*

E. coli

LPS

Candida albicans

Leishmania donovani

[58] Bozinovski *et al.*

[57] *Staphylococcus aureus*

Lps

BALB/c

Ali and [59] Ali and Salih

[17] Yaseen,

[18] Ali and Yousif

Rattus rattus norvegicus

E.coli

[60] Sulaiman

NBT ()

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