# The immune functions and immune profiles of human bacterial persistent pyuria

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## Abstract

One hundred twenty five uropathy patients were with clinically proven persistent pyuria (PP). Bacterial culture studies for their clean catch midstream urine samples showed that they were of bacterial causes (BPP). Mucosal and serum globulin concentrations, specific agglutinins and mucosal as well as peripheral leucocytes inhibition index were made to these patients. Results of these immunologic investigations have shown, that the associated bacterial uropathogens (ABUs) were of both gram negative and gram positive types. These ABUs may have one or more than one of the antigenic epitopes. The patient immune responses were dependent on the nature of the immunodominant epitope of the antigen. Thus antibody responses may be scored alone or antibody and cell mediated responses can be scored among these patients. Immunocompromy, no matter of its origin reduce the outcome of the immune function . Five immunoprofiles were deduced as;

Profile I: The infection stimulate mucosal and systemic humoral and cellular immune responses.

Profile II: The infection stimulate mucosal and systemic humoral immune rcsponses.

**Profile III:** The infection stimulate reduced mucosal and systemic humoral and cellular immune respones.

**Profile IV:** The infection stimulate low grade mucosal and systemic humoral immune responses.

**Profile V:** The aetiogen nonrecoverable with low globulin levels.

**طبيعة الوظائف المناعية وهينة المناعة في حالات البيلة القيحية المستديمة البشرية**

## الخلاصة

جرى التشخيص السريري المثبت إلى ١٢٥ مريض بالبيلة القيحية المستديمة. وقد بينت دراسة الزرع البكتيري لعينات من بول هؤلاء المرضى بان البيلة القيحية متاتية من مسبب بكتيري. وتمت دراسة تراكيز الكلوبيولين المناعي المخاطي والمصلي ومستوى الأضداد المتخصصة بالمسبب في كل من المصل والمخاط واختبار تثبيط هجرة الخلايا البيض من المخاط والدم المحيطي. وبينت النتائج بان المسبب المشارك كان من سلبية الكرام وايجابية الكرام. وهذه المسببات قد تحتوي على ذرى مستضدية واحدة أو أكثر. وتعتمد طبيعة

الاستجابة المناعية في المريض على طبيعة الذرى المستضدية ذات السيادة المناعية في المسبب. وبذلك فان الحالة المناعية للمرضى قد تتلخص باستجابة ضدية فقط أو استجابة ضدية واستجابة خلوية، هذا وان الخفض المناعي الذي يعاني منه المريض بغض النظر عن سببه فانه يؤدي لاختزال في قيم الاختبارات الوظيفية المناعية وأمكن استنباط خمس هيئات مناعية مختلفة لهؤلاء المرضى وهي كالأتي:
الهيئة الأولى: الخمج يحفز استجابة مناعية خلطيه وخلوية مخاطية وبدنية.
الهيئة الثانية : الخمج يحفز استجابة مناعية خلطيه مخاطية وبدنية فقط .
الهيئة الثالثة : الخمج يحفز استجابة مناعية خلطيه وخلوية مخاطية وبدنية مختزلة.
الهيئة الرابعة : الخمج يحفز استجابة مناعية خلطيه مخاطية وبدنية مختزلة .
الهيئة الخامسة : المسبب لم يتمكن من الحصول عليه ولكن هناك تراكيز من الكلوبيون المناعي واطئة.

## Introduction

- Uropathy are the disease conditions of urinary tract. They can be of; viral, chiamydial, bacterial, fungal, protozoal, obstructive, neoplastic and / or of ideopthic a etiologies (1, 2, 3). Several studies have been conducted to documented one or more of these aetiogens (4). Few studies, however, were made on the immunology of urinary tract infection(5,6). The objectives of the present work were to document:

1. Mucosal humoral and cellular immune function in bacterial persistent pyuria (BPP).
2. Systemic humoral and cellular immune functions in BPP.
3. A suggestion for five immune profiles BPP.

## Materials and Methods

I. Patients:

The study patients were with persistent pyuria. The number of these patients were 125 (table 1)

II. Controls

Ten normal subject were serving as controls (table 1)

Table 1: The study patients and controls

| Diagnosis | Number |
|---|---|
| Persistent pyuria (pp) | 105 |
| Persistent pyuria with D. meletus | 6 |
| Persistent pyuria with senescence | 9 |
| Persistent pyuria with pregnancy | 5 |
| Normal subject as control | 10 |
| **Total** | 135 |

III. Samplings:

From each of the patients and controls (table 1) clean catch midstream urine sample and blood with and with out anticoagulant were collected using standard collection techniques (2).

IV- Bacteriology and immunology:

The bacteriology and immunology procedures are briefly mentioned in the heading I-III, of the table 2.

Table 2: The naturel of assay (A), short account a bout the method

(B) as well as the references (C)

| | (A) | (B) | (C) |
|---|---|---|---|
| .I | **Bacteriology** | | |
| | **urine culture -١** | **Direct Quadrate culture Indirect** | 7 |
| | **Biochemical properties -٢** | **Enrichment Conventional to species level** | 8 |
| | | | 9 |
| II. | **Antigens & immune sensitizer** | | |
| A- | **Particulate** | **Heat killed whole cell antigen** | 10 |
| | | **Benzelchonium chloride** | |
| | | **Treated whole cell antigen** | 11 |
| B- | **Soluble immune sensitizer** | **Cell free culture filtrate** | 12 |
| II. | | | Mucosal immune response |
| | **A- Mucosal** | **Mucosal globulin separation using** | 6 |
| | | **6% PEG 6000 After filter paper filtration** | 13 |
| | | **Mucosal leukocyte (LIF)** | 14 |
| | | **Mucosal agglutination test** | 15 |
| | **Systemic immune response** | **Collection for sera** | 16 |
| | **Blood** | | |
| | | **Collection for cells** | 17 |
| | **Serology** | **agglutination** | 18 |
| | Leukocyte function | Leucocytes inhibition factor (LIF) | 14 |

## Results

**I - Bacteriology:**

Both culture negative and culture positive pyuria were noted. The associated uropthogens were belongs to both gram negative and gram positive species. Among which: Eschrichia coli, Staphylococcus aurcus, Pseudomonas aeruginosa, Klebseiella pneumoniae and Proteus vulgaris and Proteus mirabilis.

**II - Immunology**

Neither sole cell mediated nor sole mucosal responses can be matched among those BPP patients. These patients were assorted in to five (I-V) groups in accordance with the nature of their immune function tests (table 3)

***1. Globulins***

The medians of serum globulin concentrations were 43.02, 42.28, 39.85, 38.28, 36.39&34.93 gm/L to the groups l, II, III, IV, V&control(C) while the median of mucosal globulin concentration where 0.72 , 0.72 0.55,0.57,O.3&0.2 gm/L to the groups l,II,III,IV,V&control( C ) than other study groups and controls (tables 3)

***2. Specific Agglutinin titers;***

The medians of the specific serum bacterial agglutinin titers were : 400

,360 , 240 ,200, 0 and 0 to the groups I , II, III, IV , V and Control. . While the specific mucosal agglutinin titers were 40, 36, 40, 40, 0 and 0. to the groups I ,II , III , IV , V & Control( C ) respectively
(Table 3)
respectively . (Table 3)

**III - The major immune feature of BPP:**

The major immune features for the five groups of the tested patients were presented In tables 4 In groups I; the

| II | III | IV | CONTROL (C) |
|---|---|---|---|
| ella | Escherichia coli | Kiebsiella | No |
| .02 | 42.28 | 39.85 | 34.93 |
| .72 | 0.55 | 0.57 | 0.2 |
| | | | |
| | 0.87 | | 0.96 |

**Tables 3 : The Immunology Of BPP Patients**

***3. Leucocytes inhibition factor (LIF)***

The medians of systemic LIF were 0.55, 0, 0.87, 0, 0, and 0.96 to the groups I ,II , III , IV , V & C . While the median of mucosal (LIF) were 0.45, 0, 0.80, 0, 0, 0.98 to the groups I ,II , III , IV , V & C immunogen of the associated pathogen were from both gram positive and

gram negative bacteria may contain both T cell and B cell epitopes and rising up mucosal and serum globulin as well as inhibited migration of leucocyte invitro Groups III

**Table 4: The Immune Features and Immune Profiles Of BPP Patients**

| Sp | Immune features | Immune Profile | Associated Uropathogens |
|---|---|---|---|
| I | **١- The immunodominant epitopes are T dependent and T independent type**<br>**٢- Rise of mucosal and systemic globulins and rise of specific agglutinins, significant LIF**<br>**٣- Aetiogen bacteria gram negative and gram positive** | **The infection stimulate mucosal and systemic humoral as well as cellular immune responses** | Escherichia coli<br>Staphylococcus aureus<br>Pseudomonas aeruginosa |
| II | **١- the immunodominant epitope are T independent.**<br>**٢- Riase of mucosal and globulins and specific agglutinins.**<br>**٣- The aetiogen are gram negative.** | **The infection stimulate mucosal and systemic humoral immune responses.** | Kiebsiella pneumoniae &<br>Proteus vulgaris,<br>P. mirabilis |
| III | **١- The immunodominant epitopes are T dependent and T independent**<br>**٢- Rise low grade globulin and specific agglutinins at serum and mucosal. Non significant LIF**<br>**٣- Aetiogens are gram negative and positive** | **The infection stimulate low grade mucosal and systemic humoral and cellular immune responses.** | Escherichia coli<br>Staphylococcus aureus<br>Pseudomonas aeruginosa |
| IV | **١- The immunodominat epitope are T independent**<br>**٢- Rise of low grade mucosal globulin and serum globulin and specific agglutinin**<br>**٣- Aetiogen are gram negative** | **The infection stimulate low grade mucosal and systemic humoral immune responses** | Kiebsiella neumoniae<br>Proteus vulgaris,<br>P. mirabilis |
| **V** | ١- The aetiogen are non recoverable<br>٢- Low grade globulin increase at mucosa and serum. | The non recoverable aetiogen stimulate low grade globulins at mucosa and serum | No growth |

However, include same aetiogen but in metabolic defective condition like D.

meletus, pregnancy and Senescence und**e**rlying the BPP. Meantime, I group

II presented major immune feature as; the immunogen of the associated infectious agent were found to be of; K. pneumonae , Pr. vulgaris and Pr , mirabilis , leading to rise of serum and mucosal gama globulins and rising of specific agglutinin titres mean while gzoup IV showing same features but with immunocompromy state.

IV. immune profiles;

Each of the patients groups I -V presented in the tables 3, 4, 5, were being of five different immune profiles which can be suggested as five immunological classes of BPP.

## Discussion

Uropathy may be infectious and/or non-infectious types. The infectious type could be associated with an array of microbes including bacteria Among which is bacterial persistent pyuria (BPP). The susceptibility of human to infection may be expressed as sever or moderate and mild , in immunological sense, however , they are parallel to highly responder modrately responder and non-responders (19,20) as in the case of this study patient (table 3 ) The host parasite relationships between the associated uropathic bacterial pathogens and human being as host may be started with the port of entery which is in this case either exogenous, ascending or endogenous, haematogenous or lymphogenous descending rout (3) . mounting immune responses as indicated in table 3 means that in the mucosal infection, the immunogens have been succeeded to avoid the local as well as systemic immune defence mechanisms and their immunodominant epitopes (19,21) directly induce the proliferation and expansion of B lymphocyte system T independent 1 (21) or indirectly through helper effect of T lymphocyte effect which activate B lymphocyte system to proliferate and expand as well as synthesize and secret specific antibodies T cell epitope may also activate the cytotoxic T lymphocyte with cytokine production T dependant , (21) profile 1 and 111 the immunodominat epitopes may be both T and B epitopes. While the profiles, 11 and 1V the immumodominant epitopes may activate B cells directely or indiredtly through T helper effect (19, 21, 22).

In other word the epitope portion of the TC appears to be non potent activator, or only the opportunity available on macrophage surface for those of Th2 activation (19)

Finally, Drutz and Graybill (23) had been put forward an immunologic classification system to the human infectious diseases. Such system stayed acceptable till 1987, Dratz and Graybill (24) this classification system depends on responses of specific and non specific humoral and cellular immune response of the immune system. Then such classification has been shifted to parasite nature dependent classification mainly (19, 25). In the present work it was an attempt to put forward an immunologic classification of ***BPP*** patients deduced on an analogy to Drutz and Graybill (23, 24, 25) classification. It seams that, such classification system is being reported for first time. Thus on conclusion one may state:

1. The aetiogen for BPP were of; gram negative and gram positive types. And they may have one or more type of antigenic epitopes.
2. The patients immune responses were dependent on nature of the immunogens of bacterial agent.
3. Antibody responses alone or antibody and cell mediated responses were matched, in these BPP cases.
4. Immunocompromy on matter of its origin reduce the outcome of the immune function tests.
5. Five immunoprofiles were deduced in human BPP.

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Cholera in Diwanyia, an epidemiological study

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