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CLINICAL AND PATHOGENESIS OVERVIEW OF MYROIDES SPP. INFECTION

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Abstract

The genus Myroides classified as Flavobacterium odoratum comprises non- motile ,aerobic, yellow -pigmented .They are non hemolytic on blood agar while it show a good growth on MacConkey and nutrient agar with salt tolerant up to 5% of NaCl also non fermented gram-negative rods .Members of the genus are cause many infectious disease in severely immunocompromised patient includes endocarditics urinary tract infection ,cuteneous infection ,and ventriculitis that behave as low grade opportunistic pathogens and widely distributed in the environment specially in water. Myroides spp. should be attribute among pathogens in hospitalized ,catheterized patients with wide resistant to antibiotic specially Minocycline is useful treating UTI caused by the genus . 16S ribosomal RNA(rRNA) sequencing can identified accurately the species level .In this reviews which description of dangerous infection duo to by Myroides in an immunocompromise host .moreover reviewed the antibiotic resistance and pathogenesis. Many species of the genus Myroides were primarily taking from intestine of human. The genus Myroides includes five species : M. odoratus. , M. pelagicus, M. profundi, M. odoratimimus and M. marinus, by susceptibility to desferrioxamine. M. profundi has produced a protease Myroilysin ,with characterized as playing a role in hydrolysis of collagen through collagenase production and elastinolytic activity displaying by metalloprotease and playing important role with collagenase for hydrolysis of collagen that proven virulence of genus.

Keywords: Aerobic, Immunocompromise Host *,Flavobacterium Odoratum*, Endocarditics,Pathogen.

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Introduction

The first isolation of the genus in 1923⁽¹⁾after that organisms classified as genus Flavobacterium ,belongs to family Bacteriaceae ,tribe Chromobacteriaceae involoved non-motile , yellow pigmented on culture due to colonies secreted of flexirubin pigment ,aerobic , non-fermenting gram-negative rods and cells are middle sized,thin (0.5µm in diameter ,and 1-2 µm long),in broth medium may occur longer rods and long chain. They are non hemolytic on blood agar while it show a good growth on MacConkey and nutrient agar with salt tolerant up to 5% of NaCI .This colonies similar to *Alcaligenes faecalis* that represent a characteristic fruity odour .So ,we can differentiation between *Myroides* and *Alcaligenes faecalis* through absence of nitrate reductase and colistin resistance in *Myroides*⁽²⁾.

The name *Myroides* gets from Greek word Myron ,which are found in environmental specially in water ⁽³⁾. In the past, the organism were not considered pathogen ,but now a days when increased number of cases its considered a risk factor specially in immunocompromised patients includes pneumonia⁽⁴⁾ ,endocarditis⁽⁵⁾, urinary tract infection⁽⁶⁾, cutaneous infections⁽⁷⁾, cathere-associated bacteraemia⁽⁸⁾ , ventriculitis,and soft tissue infections⁽⁹⁾.

Isolation:

Many species of the genus *Myroides* were primarly taking from intestine of human in 1923 as named *Bacterium faecale aromaticum* by Stutzer ⁽¹⁰⁾.Later they were named as as *Flavobacterium odoratum* in 1929 ⁽¹¹⁾.There are 19 strains of *Flavobacterium odoratum* by an extensive polyphasic taxonomic analysis, in 1996 that led to the establishment of *Myroides* which includes species *M. odoratimimus* and *M. odoratus. Myroides* differ from Flavobacterium species by its ability to grow well at 37C⁰,its lack of gliding motility ,its salt tolerance ,and differences in its fatty acid composition . *M. odoratus* differ from *Elizabethkingia meningosepticum* and other organisms medically important by characteristics of being nonsaccharolytic and indol-negative .⁽¹²⁾.In recent year ,a number of studies have indicated there are three novel species were isolated from seawater (*M.profundi, M. marinus ,and M.pelagicus*).

Type of species

The genus *Myroides* includes five species : *M. odoratus.*, *M. pelagicus, M. profundi*, *M. odoratimimus* and *M. marinus*, by susceptibility to desferrioxamine the *M.odoratus* can be differentiated from *M.odoratimimus*⁽¹³⁾. Many recent case reports, showed that *Myroides spp.* cause infections at higher risk in immunocompromised patients includes Catheterized, diabetes and ICU stay may increase the chances of acquiring *Myroides* infection Which considered as secondary pathogens and all infections have been showed in patients with low immunity⁽¹⁴⁾.

The genus consist different species have been found to release deoxycholic acid, cholic acid, and their conjugates with glycineas surface-active compounds using a biosynthetic conversion from cholesterol⁽¹⁵⁾.

Virulence of genus:

M. profundi has produced a protease Myroilysin ,with characterized as playing a role in hydrolysis of collagen through collagenase production and elastinolytic activity displaying by metalloprotease and playing important role with collagenase for hydrolysis of collagen that proven virulence of genus ⁽¹⁶⁾. The biofilms of mixed spp. has also presence clinical *Myroides spp*.⁽¹⁷⁾ and *M.odoratus* can observed in food setting contributed to the contact of *Listeria monocytogenes* to the resistance and stainless steel food surface of this organisms o eradication by chlorine⁽¹⁸⁾, the cells of *M. odoratus* showed in microscopical level like coated rug ,the chain of *Listeria monocytogenes* cells contact to the surface that considered a physical barrier to exposure of chlorine and the isolates showed strong adherence profile at lower temperature(21C)and increase

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forces that showed a hydrodynamic in nutrient rich environment it might be through suggested the coaggregate and autoaggregate ability to biofilms form .its could be explain the ability to increase infection in immmunocompromised host by organisms through nosocomial transmission or with environment strains in the hospital environment suspected the water is carrying.

Diagnosis:

The auto analyzer system (VITEK 2 Compact[™],BioMerieux,france) which used to identification of the bacteria at the genus level, while VITEK N364 card (BioMerieux,france)is suitabl to identify antimicrobial susceptibility on a single card. As CLSI does not any direct slandered for *Myroides*, we used for non-enterobacteriaceae, glucose –nonfermenting ,non-fastidious and Gram-negative bacilli criteria suggested by CLSI.⁽¹⁹⁾

Antibiotic resistance:

Myroides spp. are very difficult to treatment due to resistance to wide range of antibiotic, they have been reported resistance to sulphamethoxazole ,fluroquinolones,and aminoglycosides ⁽²⁰⁾ .Produce a chromosomally mediated non-inducible metallo-lactamase from *M.odoratum* which is ability of hydrolyzing penicillins, azetreonam, cephamycins, cephalosporins ,meropenem and imipenem.⁽²¹⁾.There are many susceptibility patterns show in various studies because to the lack of slandered improved by CLSI. There are various studies which done antimicrobial susceptibility testing through disk diffusion also which is not recommended ^(22,23) .Minocycline considered most effective agent and only antibiotic which present 100% sensitivity while all other tested antibiotics were isolates resistant also Licker etal reported ⁽²⁴⁾.

For example there are reports infections by members of Myroides genus(Flavobacterium odoratum) when tacking five cases with comorbidity not known and clinical settings are ischemic lower limb disease ,foot gangrene, bladder carcinoma, syringomyelia , and chronic renal impairment, showed the results N/A (25). One case with comorbidity malnutrition, left foot gangrene and alcoholism with amputation stump of infection the patients cured from infection⁽²⁶⁾.While another case with comorbidity malnutrition ,prematurity,and hydrocephalus with bacteremia and ventriculitis, the patient survived with sequelae⁽²⁷⁾. Case with comorbidity diabetes, acute cardiac failure and clinical settings cellulitis with bacteremia patient cured from infection (28) and another one suffering from HBV -related cirrhosis with necrotizing fasciitis the patient cured after amputation ⁽²⁹⁾. Moreover, case with clinical settings graft infection and endocarditis with comorbidity end -stage renal disease the patient cured from infection with organism (30), also another case cured from infection with COPD and chronic steroids so clinical settings are recurrent cellutitis and bacteremia (31). Four cases suffering from gastric cancer, acute myeloid leukemia and non-Hodgkin's lymphoma with clinical settings bacteremia and infected central venous catheter also patient cured⁽³²⁾. The reports with infected by *M. odoratimimus* which thirteen cases with comorbidity urinary neoplasma (4 patients) and urinary stone (9 patients) and clinical setting is pyuria the resute N/A⁽³³⁾. Tow cases infected by species *M. odoratus* the patient suffering from ischemic heart disease and another one with diabetes complicated by peripheral vascular disease and clinical settings are bacteremia and cellulitis in both cases the patient will cured (34,35). The patient infected by M. odoratimimus with clinical setting bacteremia and cellulitis suffer from alcoholic cirrhosis and another one with septic shock, soft tissue infection and pneumonia with no comorbidity, so the patient cured in both cases (36).

As key words using in *Myroides* or *Flavobacterium odoratum* by searching the database of English literature ,only afew reports could be detected in immunocompromised patients. Primary infection by *M. odoratimimus* in a patient with cellulitis have been reported due to from a big sermon in a child with low immunity ⁽³⁷⁾. However, post catheterization considered secondary

infection which increase⁽³⁸⁾ in patients with cancer or diabetes mellitus⁽⁴⁰⁾ and in neonates⁽⁴¹⁾ .We conclude that *Myroides* species are resistant to a wide rang of antibiotics . We observed a case infected by *M. odoratimimus* strain PR3039 with a post –injury urinary tract infection in July 2009 was found to be resistant to antibiotics by using antibiotic sensitivity testing (AST)includes : amikasin ,ampicillin ,aztreonam, amoxicillin ,levofloxacin, ciprofloxacin, cephalosporin, gentamycin, tetracycline , chloramphenicol, imipenem , shubatan,and tazobactam .For example antibiotic susceptibility of 23 strains of *Myroides sp*.will be tested by using the Kirby-Baure disk diffusion method (K-B method) in 6 samples of urine ,8 for sputum,4blood,3CSF,and2Bile exhibits only 5 isolates resistant to Amikacin , 11 isolates resistant to Cefazolin ,9 for Cefoperazone ,4 to Sulfamethoxazole , 5 resistant to Sulfadiazine , 10 for Ceftazidime , 3 for Erythromycin and 4 for Azithrromycin ^{(42).}

While 9 males and 2 females patients in age from 2-76 years old suffered from urinary tract stone or urinary retention without any symptoms of urinary tract infection. So ,only 9 patients showed no WBC in the urine while 3 patients appears WBC only in them ,when culture the urine in urinarily catheterized patients. The antibiotic susceptibility testing in 11 strains of *Myroides sp.* In urine(Table1)⁽⁴²⁾

Table 1: Oxoid culture medium using for isolation 11 strains of *Myroides sp.* from urine for antimicrobial susceptibility testing.⁽⁴²⁾

Antibiotic	R	Ι	S
Cefuroxime	11	0	0
Piperacillin	11	0	0
Ampicillin	11	0	0
Cefoperazone	11	0	0
Sulbactam	10	1	0
Cefepime	10	1	0
Ceftazidine	11	0	0
Aztreonam	11	0	0
Imipenem	9	2	0
Ciprofloxacin	8	3	0
Levofloxacin	11	0	0
Amikacin	0	0	11
Trimethoprim- sulphamethoxazole	0	0	11

Among strains of *Myroides spp.* that isolated from different source showed differences to antibiotic resistance. For example ,the strain was sensitive to norfloxacin which isolate from patient infected with hydatid cyst of the live⁽⁴³⁾ but another strain was resistant to same antibiotic that isolated from pulmonary infection patient ⁽⁴⁴⁾,While two strains isolated from a leg amputation and cellulitis patients were reported to be resistant to ciprofloxacin ⁽⁴⁵⁾ and another two were sensitive to ciprofloxacin which isolated from trauma and septicemia patients respectivly⁽⁴⁶⁾

Therefore we should know more information on strain subtype and genotype from biochemical characteristic and 16 RNA ribosomal RNA gene sequencing. So there is no reports about antibiotic resistance mechanisms of *Myroides spp.* in China . The decrease susceptibility to the carbapenems and the β lactam antibiotics resistance of various *Myroides spp* which responsible that β lactamase gene described by Hummel et al ⁽⁴⁷⁾. The β lactam resistance was caused by the release of the chromosomal-encoded β lactamase MUS-1 and TUS-1 in *M. odoratimimus M.odoratus* when a study investigation many of clinical cases ⁽⁴⁸⁾.

Another investigated:

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By Suganthi et al that plasmid-containing *M. odoratimimus* SKS05-GRD for antibiotic sensitivity related to chromosomal-mediated or the plasmid and that showed resistance to amikacin, kanamycin, gentamycin was plasmid- mediated and ceftazidin, cefadroxil, netillin, cefoperazon, and ampicillin resistance to was chromosomal-mediated. Carbapenem resistant is only related to the *Klebsiella pneumonia* carbapenemase (KPC)family ,so the gene (KPC) is presence in a plasmid. Therefor *Myroides spp.* isolated from abscess of abdominal have KPS-2 carbapenemase but not be located on plasmid, this really needs more investigation.^(49,50)

F. indologenes ,now name *Chryserobacterium indologenes* from the same family of *Myroides* ⁽⁵¹⁾, R-factors found In the cytoplasm indicate the antibiotics resistance in this bacteria. Plasmids of R-factor bearing and transport between bacteria a different of resistance gene . Moreover ,low permeability, the thick outer membrane ,and the cell membrane of bacteria active discharge system,and resulting from multidirectional mutation. Also the bacteria release enzyme of β lactamase with hydrolytic activity of β lactam^{(52).}

Conclusion:

Myroides spp. are opportunistic pathogen cause multiple infections in compromised patients. organisms classified as genus Flavobacterium ,belongs to family Bacteriaceae ,tribe Chromobacteriaceae involoved non-motile , yellow pigmented on culture due to colonies secreted of flexirubin pigment ,aerobic , non-fermenting gram-negative rods and cells. *Myroides spp* cause infections at higher risk in immunocompromised patients includes Catheterized ,diabetes and ICU stay .Therefor, which are inffective because the multiple drug resistance found in the genus and usually Minocycline for example can be benefit treatment in UTI patients. Among strains of *Myroides spp*. that isolated from different source showed differences to antibiotic resistance .Therefore we should know more information on strain subtype and genotype from biochemical characteristic and 16 RNA ribosomal RNA gene sequencing.

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