Study the relation of catalase enzyme production about the virulance of mycobacteria and brucella spp

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Abstract

This study was investigated the virulence of mycobacterium spp and brucella spp and production of catalase enzyme Mycobacterium and Brucella spp. direct and indirect methods of catalase test were done. The result indicate the tightly relation between the virulent strains and actively production catalase enzyme showed a more potent ($P \leq 0.05$) in comparison with the a virulent strains which gave weak or negative reaction.

Keyword: catalase, mycobacterium, brucella, virulence,
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دراسة علاقة إنتاج إنزيم الكتاليز مع ضراوة جرثومة السل والبروسيلا

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الخلاصة

استهدفت الدراسة التحري عن وجود علاقة بين ضراوة جراثيم السل والبروسيلا ومدى قابليتها على إنتاج إنزيم الكتاليز بصورة فعالة وتم اعتماد عتر ضارية وعتر لقاحية من جراثيم السل والبروسيلا حيث أجريت عليها الفحوصات النوعية والكمية بنوعيها المباشر وغير المباشر وأظهرت النتائج وجود علاقة ترابطية وثيقة نوعية وكمية بين العتر الضارية وقابليتها على إنتاج إنزيم الكتاليز بشكل مؤثر مقارنة بالعتر اللقاحية لجراثيم السل والبروسيلا حيث أعطت جراثيم السل البشري والبروسيلا الضارية تفاعلا نوعيا وكميا مميزا بمقدار إحصائي ($P \leq 0.05$) مقارنة بالعتر غير الضارية ذات التفاعل السالب أو الضعيف.

الكلمات المفتاحية: الكتاليز، البروسلا، السل، ضراوة الجرثومة

Introduction

Tuberculosis and Brucellosis are zoonotic diseases that threating health of human and animals (1, 2). Catalase is enzyme present in animals, plants, bacteria, its protect the cell from damage by oxygen (3). Catalase its contain four iron groups and is used by cell to catalyse the decompostion of H_2O_2 molecule (4, 5). Cells infected with a Virulence pathogen, it used hydrogen peroxide as apotent antibacterial factor (6). Pathogen such mycobacterium can in the host by activity of catalase (7). Most member of genus brucella are positive for catalase(8).

Materials and Methods

The strain of bacteria and vaccine used was taken from the labarotry in zoonosis unit in veterinary medicine in Baghdad. Strain of *Mycobacterium tuberculosi*s. Strain of *Mycobacterium bovis*. BCG (france). Brucella abort us S99. Brucella abort us S19. Brucella melitensis Rev1. Standard bacteria

- **Quantitative test:** According to (8).

- **Direct test**: Take a drop from broth bacterial culture for virulent and vaccine. Sample put it on clean sterial slide with a drop from H_2O_2 (3%) puples indicate the positive result (8).

- **Indirect test**: Brucella growth in broth and add a drop of H_2O_2 (3%) the formation of coloum of gas puples indicate the positive result. Mycobacterial growth in broth and adding (0.5) cc from Tween80-peroxidase the formation of gas puples Coloum indicate a positive result (8).

- **Qualitative test:** This test doing for brucella and messuring the ability of microorganism to produce catalase enzyme according to Length of gas column (mm) X 100 O_2%.

- Length of bacterial culture column (mm): For mycobacteria the test done after inoculation mycobacteria on middle brooke 7H10 agar in (37) and after growth adding the indicator of tween 80 (10%) and 3% H_2O_2 then measuring the lenghth of gas O_2 coloum within five min. above 45mm was indicator for good result and low of this result indicator for low effectivity(8).

Results

Table (1) The result of Quantitative test for messuring the activity of catalase Enzyme (mycobacterium and brucella)

Strain	Direct test	In direct test
M.tuberculosis	++	++
M.bovis	-	-
BCG (japan)	-	-
BCG (france)	-	-
B.abortus S99	+++	+++
B.abortus S19	+	+
B.melitensis Rev1	+	+

(+) mean positive result strong activity, (-) mean negative result or weak activity.

Table (2) O_2 production as result to catalase enzyme production in brucella

Strain	O2%
B.abortus S 99	**13.34**
B.abortus S19	**2.22**
B. meletensis Rev1	**0.55**

>5%---low activity, 5-10%---active, <10%----strong activity

Table (3) The length of O_2 gas production and the relation to catalase enzyme in mycobacteria

Strain	activity	Mm (length of gas)
M.tuberculosis	**strong**	**45**
M.bovis	**weak**	**2**
BCG (japan)	**nil**	**-**
BCG (france)	**nil**	**-**

Discussion

Catalase is classified as xoidoreductase enzymes and one of protective factor for cells. The results of this study indicate that there is strong quantitative and quantitative relationship between the virulence strain and their ability to produce catalase enzyme in active form in compares with a virulent strain, and this due to ability of organism that live inside cell and facultative in production of virulence factor for protect it self from cellular killing inside and outside phagocytic cell as result for metabolic action for this cell and defense mechanism in production the killing factor and one of this mechanism is production of H_2O_2, noticed that the cell wall of vaccinated strain preparing from brucella S19 is lost the protein in lipopolysaccharide which is important in increase the virulence of brucella(9). Also the degree of compelex chemical cell wall of mycobacterium from mycolic acid and was for *M. tuberculosis* was more in compares to other with other type of mycobacterium because the complex degree and the range of complete cell wall competed in natural infection increase the virulence of microorganism and its ability to product the self protecting factor (10), (11) in his study find that the effect of at on isoniazid resistant and virulent of *M. bovis* found that is a virulence factor. M.bovis and when loss this the catalase activity and become more resistant to in for and it's the parent in sensitive stain virulent for guina pigs (12). Found that *M. tuberculosis* have virulence differences and this related to defend culet

Mechanisms against tuberculosis (13). His result demonstrate that the compared the catalytic properties the wild type of enzyme to kat g mutant which have associated with isonaizid resistance in clinical *M.tuberculosis* isolate (14). The study indicate that *M. tuberculosis* producing catalase were more virulent for mice. The link between Catalase and virulence was first recognized by Middle brook, who showed that in (INHr) (15). Mycobacteria with defective gene lack virulence in a variety of strains (16), whereas (17) have observed no correlation between loss of *katG* gene activity. In agreement, several evidences suggest that resistance to treatment in tuberculosis had relationship to catalase production (18). Other study ensure the virulence and the availability of Kat G a brucella (19, 20). Brucella showed very strong immunogenicity, which might be associated with the survival of Brucella in macrophages (21). While in other study H_2O_2 a catalase of Brucella meletensis function as antioxidant and this enzyme not play in virulent in the natural host and this result agree with our study(15).

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