

! > 2 < 5 A B = K 9 on-line A 5 < 8 = 0 @ - : > = D 5 @ 5 = F 8 O

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11 8 N = O 2019 3. = 0 1 0 7 5 8 = A B 8 B C B 0 ? @ > 2 5 4 5 = A > 2 < 5 A B = K 9  
on-line A 5 < 8 = 0 @ - : > = D 5 @ 5 = F 8 O « 5 @ A ? 5 : B 8 2 = K 5 = 0 ? @ 0 2 ; 5 = 8 O  
= 0 C G = K E 8 A A ; 5 4 > 2 0 = 8 9 2 > 1 ; 0 A B 8 M ? 8 4 5 < 8 > ; > 3 8 8,  
@ 0 7 @ 0 1 > B : 8 8 A > 2 5 @ H 5 = A B 2 > 2 0 = 8 O < 5 B > 4 > 2 4 8 0 3 => A B 8 : 8  
> ? 0 A = K E 8 = D 5 : F 8 9, 0 = 0 ; 8 7 0 3 5 => < 0, ? @ > B 5 > < 0 8 E  
2 > 7 1 C 4 8 B 5 ; 5 9 ». @ 3 0 = 8 7 0 B > @ K A 5 < 8 = 0 @ 0 ! > 2 5 B K  
< > ; > 4 K E C G 5 = K E \$ # ! B 0 2 @ > ? > ; L A : 8 9 ? @ > B 8 2 > G C < = K 9  
8 = A B 8 B C B > A ? > B @ 5 1 = 0 4 7 > @ 0, \$ # > ; 3 > 3 @ 0 4 A : 8 9  
? @ > B 8 2 > G C < = K 9 8 = A B 8 B C B > A ? > B @ 5 1 = 0 7 4 > @ 0  
(3. > ; 3 > 3 @ 0 4) 8 \$ # > A ' « 8 : @ > 1 »  
> A ? > B @ 5 1 = 0 4 7 > @ 0 (3. ! 0 @ 0 B > 2). ! > 3 ; 0 A => ? > 2 5 A B : 5  
4 = 0 = 0 A 5 < 8 = 0 @ 5 1 K ; 8 @ 0 A A < > B @ 5 = K 8 > 1 A C 6 4 5 = K 1 2  
= 0 C G = K E 4 > : ; 0 4 > 2, ? > A 2 O 1 5 == K 5 > A => 2 = K <  
@ 5 7 C ; L B 0 B 0 < 8 A A ; 5 4 > 2 0 = 8 9 ? > A ; 5 4 C N 1 8 <  
= 0 ? @ 0 2 ; 5 = 8 O < - ? @ 8 < 5 = 5 = 8 5 A > 2 @ 5 < 5 == K E  
8 = D > @ < 0 F 8 > == K E B 5 E => ; > 3 8 9 ( !, 4 8 A B 0 = F 8 > == > 3 >  
7 > = 4 8 @ > 2 0 = 8 O 7 5 < ; 8 8 1 5 A ? 8 ; > B = K E ; 5 B 0 B 5 ; L = K E  
0 ? ? 0 @ 0 B > 2) 4 ; O < > = 8 B > @ 8 = 3 0 ? @ 8 @ > 4 = K E > G 0 3 > 2 G C < K 8  
4 @ C 3 8 E > ? 0 A = K E 8 = D 5 : F 8 9; - 0 = 0 ; 8 7 @ 8 A : > 2  
M ? 8 4 5 < 8 G 5 A : > 3 > @ 0 A ? @ > A B @ 0 = 5 = 8 O 1 > ; 5 7 = 8, 2 K 7 2 0 == > 9  
2 8 @ C A > < - 1 > ; 0 ( - ), 2 F 5 = B @ 0 ; L = > 9 D @ 8 : 5;  
3 5 = > B 8 ? 8 @ > 2 0 = 8 5 - 8 7 > ; O B > 2 2 8 @ C A 0 0 ? 0 4 => 3 > 8 ; 0  
( ), F 8 @ : C ; 8 @ > 2 0 2 H 8 E = 0 N 3 5 > A A 8 8 2 2 0 1 8 3, H B 0 < < > 2 Bacillus  
anthracis 2 K 4 5 ; 5 == K E = 0 B 5 @ @ 8 B > @ 8 8 0 ? 0 4 => 9 ! 8 1 8 @ 8, 8  
3 5 = 5 B 8 G 5 A : > 3 > ? @ > D 8 ; 8 @ > 2 0 = 8 O ? 0 B > 3 5 == K E  
1 8 > ; > 3 8 G 5 A : 8 E > 1 J 5 : B > 2 B 5 @ @ 8 B > @ 8 9 (= 0 ? @ 8 < 5 @ 5 0 4 <.  
B 5 @ @ 8 B > @ 8 9 . 3 0 > A A 8 9 A : > 9 \$ 5 4 5 @ 0 F 8 8);  
3 5 == > - 8 = 6 5 = 5 @ = K 5 8 A A ; 5 4 > 2 0 = 8 O in silico 2 A > 7 4 0 = 8 8  
@ 5 : > < 1 8 = 0 = B = K E G C < = K E 2 0 : F 8 = 8 < 5 B > 4 > 2 in vitro 2  
? @ > 8 7 2 > 4 A B 2 5 3 5 B 5 @ > ; > 3 8 G => 3 > 0 = B 8 @ 0 1 8 G 5 A : > 3 >  
8 < < C = > 3 ; > 1 C ; 8 = 0; - 8 7 C G 5 = 8 5 < > ; 5 : C ; O @ = K E  
< 5 E 0 = 8 7 < > 2 D > @ < 8 @ > 2 0 = 8 O @ 5 7 8 A B 5 = B => A B 8 : 2 - ; 0 : B 0 < 0 <

C ?> G 2 5 == K E H B 0 <<> 2                           *B. pseudomallei*, 8 7 = 0 G 0 ; L => @ 5 7 8 A B 5 = B = K E  
: F 5 D B 0 7 8 4 8 < C 8 ?>; C G 5 = 8 O H B 0 << 0                           *Yersinia pestis*,  
? @> 4 C F 8 @ C N I 5 3 > D; C > @ 5 A F 5 = B = K 9 1 5 ;> : GFP.                           0  
> A => 2 0 = 8 8 0 = 0 ; 8 7 0 ? @ 5 4 A B 0 2 ; 5 == K E @ 5 7 C ; L B 0 B > 2  
8 A A ; 5 4 > 2 0 = 8 9 C G 0 A B = 8 : 8 D > @ C < 0 A G 8 B 0 N B = 5 > 1 E > 4 8 < K <  
0 : B 8 2 8 7 8 @ > 2 0 B L = 0 C G = C N 8 ? @ 0 : B 8 G 5 A : C N 4 5 O B 5 ; L => A B L  
<>; > 4 K E C G 5 = K E 8 A ? 5 F 8 0 ; 8 A B > 2 ? > 2 > ? @ > A 0 <  
A > 2 5 @ H 5 = A B 2 > 2 0 = 8 O A B @ 0 B 5 3 8 8 8 B 0 : B 8 : 8  
M ? 8 7 >> B >; > 3 >- M ? 8 4 5 < 8 >; > 3 8 G 5 A : > 3 > <> = 8 B > @ 8 = 3 0 7 0  
> A > 1 > > ? 0 A = K < 8 8 = D 5 : F 8 0 < 8 8 < 5 N 1 8 < 8 2 K A > : 8 9  
? > B 5 = F 8 0 ; : @ 0 A ? @ > A B @ 0 = 5 = 8 N 2 ? > ? C ; O F 8 8 6 8 2 > B = K E 8  
; N 4 5 9 , = 0 > A => 2 5 2 = 5 4 @ 5 = 8 O A > 2 @ 5 < 5 == K E  
@ 8 A :-> @ 8 5 = B 8 @ > 2 0 == K E B 5 E =>; > 3 8 9; @ 0 7 @ 0 1 > B : 8  
0 ; 3 > @ 8 B < 0 > F 5 = : 8 8 8 7 C G 5 = 8 O 8 << C => 3 5 == K E A 2 > 9 A B 2  
> < ? ; 5 : A > 2 0 = B 8 3 5 => 2       8 : 0 = 4 8 4 0 B = K E 2 0 : F 8 = ? @ > B 8 2  
, > A => 2 0 == K E = 0 0 = B 8 3 5 = A ? 5 F 8 D 8 G 5 A : 8 E : ; 5 B > G = K E  
B 5 A B 0 E ; 2 = 5 4 @ 5 = 8 O A > 2 @ 5 < 5 == K E in vitro B 5 E =>; > 3 8 9 2  
? @ > 8 7 2 > 4 A B 2 >       4 ; O ? @ > D 8 ; 0 : B 8 : 8 8 ; 5 G 5 = 8 O  
8 = D 5 : F 8 > == K E 1 >; 5 7 = 5 9; @ 0 7 @ 0 1 > B : 8 C = 8 D 8 F 8 @ > 2 0 == > 9  
< 5 B > 4 >; > 3 8 8 ? 0 A ? > @ B 8 7 0 F 8 8 3 5 => <= K E 8 ? @ > B 5 > <= K E  
? > @ B @ 5 B > 2 H B 0 <<> 2 2 > 7 1 C 4 8 B 5 ; 5 9 > A > 1 > > ? 0 A = K E  
8 = D 5 : F 8 > == K E 1 >; 5 7 = 5 9; 8 7 C G 5 = 8 O A 2 > 9 A B 2       ,  
0 A A > F 8 8 @ > 2 0 == K E A 8 E ? 0 B > 3 5 == > A B L N, ? > 2 K O 2 ; 5 = 8 N  
7 0 : > == < 5 @ == > A B 5 9 2 7 0 8 <> 4 5 9 A B 2 8 O < 8 : @ >- 8  
< 0 : @ > > @ 3 0 = 8 7 < 0.

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