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An approach towards bacterial pathogens of zoonotic importance harbored by commensal rodents prevalent in Beni-Suef Governorate

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This study was conducted in the period July 2009 through June 2010 to determine the role of commensal rodents in transmitting bacterial pathogens to man in Beni-Suef Governorate, Egypt. A total of 50 rats of various species were selected from both urban and rural areas at different localities. In the laboratory, rodent species were identified and bacteriological examination was performed. Seven types of samples were cultured from external and internal body parts of each rat. The identified rodent spp. included *Rattus norvegicus* (16%), *Rattus rattus rattus* (42%) and *Rattus rattus frugivorus* (42%). The results demonstrated that *S. aureus*, *S. lentus*, *S. sciuri* and *S. xylosus* were isolated from the examined rats at percentages of 8, 2, 6 and 6 %, respectively. Moreover, *E. durans* (2%), *E. faecalis* (12%), *E. faecium* (24%), *E. gallinarum* (4%), *Aerococcus viridans* (12%) and *S. porcinus* (2%) in addition to *Lc. lactis lactis* (4%), *Leuconostoc* sp. (2%) and *Corynebacterium kutscheri* (8%) were also harbored by the screened rodents. On the other hand, *S. arizonae, E. coli, E. cloacae and E. sakazakii* were isolated from the examined rats at percentages of 4, 8, 4 and 6 %, respectively. Besides, *Proteus mirabilis* (6%), *Proteus vulgaris* (2%), *Providencia rettgeri* (6%), *P. aeruginosa* (4%), *Burkholderia cepacia* (2%) and *V. fluvialis* (2%) were also recovered from the investigated rodents. It was concluded that considerable bacterial pathogens could be harbored in/on different body parts of the examined rodents and that commensal rodents prevalent in Beni-Suef Governorate supply multiple potentials through which they may act as sources of infection and occasionally represent a serious threat to the public health.

Rodents, particularly rats and mice, represent important reservoirs of a large category of bacterial zoonoses worldwide. The risk of rodent-borne zoonoses to the public health elevates to a topic of concern when it is considered that they are, in most instances, asymptomatic carriers. Although wild rodent populations constitute natural foci of several disease causing agents, commensal rodents pose the greatest concern. The term "commensal" means "living with or in close association to humans." Although many species of rodents occasionally may be found around humans, the term commensal rodents refers specifically to rats and mice.

Rats and mice are very common pest animals in cities, villages and agricultural fields of almost all Egyptian Governorates (Morsy *et al.,* 1986; Shoukry *et al.*, 1986). They find their ways into homes and storehouse feeding on almost any human and/or animal food materials. They also feed on human garbage, manure piles, sewers and other accumulations. Both mice and rats will eat virtually anything that is edible, but are strongly attracted to human dwellings because of the large source of food in the form of garbage. In fact, hungry rats sometimes will bite children and adults during sleep (Jackson, 1990). The ability of rodents for survival, multiplication, reproduction and adaptation to varieties of different environmental conditions allow them to occur in large populations and increase their possibility for transmission of several zoonoses (Morsy *et al.,* 1981). Rodent-borne bacterial zoonoses include such diseases caused by *Escherichia coli*, *Campylobacter jejuni*, *Leptospira interrogans*, *Listeria monocytogenes*, *Yersinia pestis*, *Streptobacillus moniliformis*, *spirillum minus*, *Salmonella spp.*, *Yersinia enterocolitica* and others (Romich, 2008). The close association of commensal rodents with humans and domestic animals is a risk factor for transmission of these diseases (Kia *et al.,* 2009).

Bacterial pathogens may be harbored by rodents in/on their mouth, nose, whiskers, paws, body, tail, urine, droppings, blood and internal organs that represent multiple potentials through which rodents may act as sources of infection for human beings. This, in addition to the observation that little information is available on

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rat-borne bacterial diseases in Egypt, increase the interest for choosing bacterial pathogens harbored by commensal rodents as a subject of study in Beni-Suef Governorate and to throw lights on their possible public health hazards.

Materials and methods

This study was carried out in Beni-Suef Governorate, Egypt, in the period July 2009 through June 2010 including a total of 50 commensal rats of different species.

Rodent trapping. Live traps were used to collect rodents alive. The sampling habitat was selected from both urban and rural areas at different localities. Ten wire-cage traps were used to catch rodents. Traps were pre-cleaned with hot water and soap before each use, then baited with favorite foods of rodents and distributed in the selected locations at sunset. Traps were placed near runways, feeding areas, and shelter where there were clear signs of rat activity (droppings, gnawing, tracks, rub marks …etc), then collected next morning, put in separate bags and transported to the laboratory. The method of capture and transport of rodents described by Abdel-Gawad *et al.,* (1982) was followed throughout the present investigation.

Inspection of rodents. Cotton wool soaked in ether-chloroform-alcohol mixture was used for induction of anesthesia followed by euthanasia of the trapped rodents in a glass box. The sex was determined by visual inspection of external sexual organs. The identification of rodent species was then performed according to Ghoneim (1972); Mahmoud *et al.,* (2008). Wearing of protective gloves was considered during removing from traps, identification and examination of the trapped rats.

Bacteriological examination (Cruickshank, *et al.,* 1975; Collee, *et al.,* 1996). Seven types of samples were cultured from external and internal body parts of each rat. The external samples included naso-oral (mouth, nostrils and whiskers) and paws/tail swabs. Rats were then skinned and the peritoneum and thorax were opened using sterile toothed forceps and scissor for collecting internal samples. The latter included heart blood, liver, kidney, urine (form the bladder) and intestinal content. All samples were inoculated into tryptone soya broth (Oxoid) tubes and incubated at 37°C for 24-48h. Liver and kidney samples were macerated before inoculation in the broth tubes. Loopfuls from each broth culture were streaked onto tryptone soya agar plates (Oxoid®), and then incubated at 37°C for 24h. Smooth colonies were picked up and further subcultured onto tryptone soya agar plates for purification. Characterization of the colonial morphology was conducted. Each isolate was preserved in semi-solid agar and kept in the refrigerator for further identification**.**

Biochemical identification was performed using different API systems (Analytical Profile Index, bioMerieux Marcy-l'Etoile, France) according to the morphological characterization using Gram's staining technique:

API Staph: for identification of Staphylococci.

API 20 Strept: for identification of Streptococi and related genera.

API Coryne: for identification of Coryneform bacteria.

API 20E: for identification of Enterobacteriaceae and other Gram negative bacilli.

Results and discussion

The results of identification of the trapped rodents as illustrated in Table (1) revealed that *Rattus norvegicus* (Norway rat or sewer rat) was detected at a rate of 16%. *Rattus rattus* (roof rat) was recorded including two subspecies; *Rattus rattus rattus* (black with a gray belly) and the fruit rat, *Rattus rattus frugivorus*, (brownish streaked with gray back and white belly) that accounted for 42% for each. The same domestic rodent species were previously reported by Allam *et al.,* (2002); Salit *et al.,* (1982) who showed that the common domestic rodents identified in Damietta and Qualybia Governorates were *Rattus norvegicus* and *Rattus rattus frugivorus* beside *Rattus rattus alexandrinus.* In a study made by Mahdi *et al.,* (1970) at Suez area, *Rattus norvegicus* was the most dominant species in contrast to the present study which evidenced that the roof rat accounted for the highest rates among all rodent spp. despite the application of traps at various rodent habitats. Roof rats are often found living on the second floor of a warehouse in which Norway rats occupy the first or basement floor. Once established, they readily breed and thrive within buildings, just as Norway rats do. However, they are sometimes found living in rice fields or around poultry or other farm buildings as well as in industrial sites where food and shelter are available and, therefore, they might be seen in the habitat of other rodent spp. (Frantz and Davis, 1991). On the other hand, the Alexandrine rat *(Rattus rattus alexandrinus)*, the Cairo spiny mouse (*Acomys cahirinus)* and the house mouse (*Mus musculus)* were not recorded along the course of this study

in contrast to that demonstrated by Mahmoud *et al.,* (2008) who added that the house mouse was the highest species detected in Beni-Suef Governorate (33.7 %).

The results illustrated in Table (2) demonstrated that *S. aureus, S. lentus, S. sciuri* and *S. xylosus* were isolated from the examined rats at percentages of 8, 2, 6 and 6 %, respectively. Moreover, *E. durans* (2%), *E. faecalis* (12%), *E. faecium* (24%), *E. gallinarum* (4%), *Aerococcus viridans* (12%) and *S. porcinus* (2%) in addition to *Lc. Lactis lactis* (4%), *Leuconostoc* sp. (2%) and *Corynebacterium kutscheri* (8%) were also harbored by the sampled rodents. The distribution of these pathogens according to different samples of the examined rodents regardless of the rodent species clarified that naso-oral swabs carried *S. lentus, S. sciuri, S. xylosus, E. faecium, E. gallinarum, Aerococcus viridans* and *Corynebacterium kutscheri* while paws/tail swabs yielded *E. faecalis, E. faecium, Aerococcus viridans, S. porcinus,* and *Corynebacterium kutscheri*. *S. aureus, S. xylosus, E. durans, E. faecalis, Aerococcus viridans,* and *Corynebacterium kutscheri* were recovered from heart blood, whereas *S. aureus, S. sciuri, S. xylosus, E. faecalis, E. faecium* and *Leuconostic* sp. were detected in liver samples. Approximately similar microbial loads were recorded in kidney and urine samples (*E. faecalis, E. faecium and Lc. Lactis lactis, Leuconostic* spp.). With regard to intestinal samples only *S. sciuri, S. xylosus, E. faecalis, E. faecium* and *E. gallinarum* were reported (Table 3).

A variety of clinical syndromes in rats have been attributed to *Staphylococcus aureus,* including facial abscesses and ulcerative dermatitis. Lesions appear to be initiated or aggravated by scratching with the ipsilateral rear foot (Russell *et al.,* 1991). The close association of different *Staphylococcus* spp. with human diseases is well documented. *S. aureus* is predominantly associated with skin and soft tissue infections (Eady and Cove, 2003) beside cutaneous abscesses and cellulites that are particularly common (Iyer and Jones, 2004). *S. aureus* bacteria are commonly isolated from nonpurulent wounds as a result of animal bites, principally dogs, cats, horses, camels, pigs and rodents (Romich, 2008).

Table (1): Results of identification of the trapped rodents.

Rodent species / subspecies	Male	Female	Total
Rattus norvegicus	6	2	8 (16%)
Rattus rattus rattus	14	7	21 (42%)
Rattus rattus frugivorus	11	10	21 (42%)
Total	31	19	50

The percentages were calculated in relation to the total number of rodents.

Table (2): Occurrence of Gram positive bacterial pathogens in the examined rodents.

Isolated Bacteria	Rodents			
	Rattus norvegicus (n = 8)	*Rattus rattus rattus (n = 21)*	*Rattus rattus frugivorus (n = 21)*	Total *(n = 50)*
S. aureus	-	-	4 (19%)	4 (8%)
S. lentus	-	-	1 (4.8%)	1 (2%)
S. sciuri	-	1 (4.8%)	2 (9.5%)	3 (6%)
S. xylosus	-	1 (4.8%)	2 (9.5%)	3 (6%)
E. durans	-	-	1 (4.8%)	1 (2%)
E. faecalis	1 (12.5%)	5 (23.8%)	-	6 (12%)
E. faecium	1 (12.5%)	3 (14.3%)	8 (38%)	12 (24%)
E. gallinarum	-	2 (9.5%)	-	2 (4%)
Aerococcus viridans	3 (37.5%)	1 (4.8%)	2 (9.5%)	6 (12%)
S. porcinus	-	-	1 (4.8%)	1 (2%)
Lc. Lactis lactis	-	-	2 (9.5%)	2 (4%)
***Leuconostoc* sp.**	1 (12.5%)	-	-	1 (2%)
Corynebacterium kutscheri	1 (12.5%)	1 (4.8%)	2 (9.5%)	4 (8%)
Total No. of isolates	7	14	25	46

Table (3): Gram positive bacterial pathogens isolated from different samples of the examined rodents.

Isolated Bacteria	Samples*						
	Naso-oral swab	Paws/tail swab	Heart blood	Liver	Kidney	Urine	Intestinal content
S. aureus	-	-	3 (6%)	1 (2%)	-	-	-
S. lentus	1 (2%)	-	-	-	-	-	-
S. sciuri	1 (2%)	-	-	2 (4%)	-	-	1 (2%)
S. xylosus	1 (2%)	-	1 (2%)	1 (2%)	-	-	1 (2%)
E. durans	-	-	1 (2%)	-	-	-	-
E. faecalis	-	2 (4%)	1 (2%)	1 (2%)	1 (2%)	3 (6%)	1 (2%)
E. faecium	4 (8%)	2 (4%)	-	3 (6%)	5 (10%)	1 (2%)	3 (6%)
E. gallinarum	1 (2%)	-	-	-	-	1 (2%)	1 (2%)
Aerococcus viridans	1 (2%)	3 (6%)	1 (2%)	-	1 (2%)	-	-
S. porcinus	-	1 (2%)	-	-	-	-	-
Lc. Lactis lactis	-	-	-	-	1 (2%)	1 (2%)	-
***Leuconostic* sp.**	-	-	-	1 (2%)	-	-	-
Corynebacterium kutscheri	1 (2%)	1 (2%)	2 (4%)	-	-	-	-
Total No. of isolates	10	9	9	9	8	5	7

* The number of samples examined in each category was 50. The same bacterial species might be isolated from more than one sample type of the same rat.

Table (4): Occurrence of Gram negative bacterial pathogens in the examined rodents.

Isolated Bacteria	Rodents			
	***Rattus norvegicus* (n = 8)**	***Rattus rattus rattus* (n = 21)**	***Rattus rattus frugivorus* (n = 21)**	**Total (n = 50)**
***S.* Arizonae**	-	1 (4.8%)	1 (4.8%)	2 (4%)
E. coli	-	1 (4.8%)	3 (14.3%)	4 (8%)
E. cloacae	-	1 (4.8%)	1 (4.8%)	2 (4%)
E. sakazakii	1(12.5%)	-	2 (9.5%)	3 (6%)
Proteus mirabilis	-	2 (9.5%)	1 (4.8%)	3 (6%)
Proteus vulgaris	-	-	1 (4.8%)	1 (2%)
Providencia rettgeri	-	1 (4.8%)	2 (9.5%)	3 (6%)
P. aeruginosa	-	1 (4.8%)	1 (4.8%)	2 (4%)
Burkholderia cepacia	-	-	1 (4.8%)	1 (2%)
V. fluvialis	-	-	1 (4.8%)	1 (2%)
Total No. of isolates	-	7	14	22

Table (5): Gram negative bacterial pathogens isolated from different samples of the examined rodents.

Isolated Bacteria	Samples*						
	Naso-oral swab	Paws/tail swab	Heart blood	Liver	Kidney	Urine	Intestinal content
***S.* Arizonae**	-	-	-	2 (4%)	-	-	-
E. coli	-	-	1 (2%)	-	-	3 (6%)	1 (2%)
E. cloacae	-	-	-	-	-	-	2 (4%)
E. sakazakii	2 (4%)	2 (4%)	-	-	1 (2%)	-	1 (2%)
Proteus mirabilis	-	-	-	1 (2%)	-	-	3 (6%)
Proteus vulgaris	-	-	1 (2%)	-	-	1 (2%)	1 (2%)
Providencia rettgeri	1 (2%)	2 (4%)	-	-	-	2 (4%)	1 (2%)
P. aeruginosa	1 (2%)	-	-	-	1 (2%)	-	-
Burkholderia cepacia	-	-	-	1 (2%)	-	-	-
V. fluvialis	-	-	-	-	-	-	1 (2%)
Total No. of isolates	4	4	2	4	2	5	10

* The number of samples examined in each category was 50. The same bacterial species might be isolated from more than one sample type of the same rat.

Invasive strains of *S. aureus* have been associated with necrotizing pneumonia, sepsis and necrotizing fasciitis in previously healthy persons and in companion animals (Rabinowitz and Conti, 2010). *Staphylococcus sciuri* and *S. lentus* were previously isolated from healthy and sick human beings, goats, sheep, antelope and other animals. *S. sciuri* was recovered from humans with boils and wounds, goats with pestes des petits ruminants and dogs with nasal discharge (**Adegoke**, 1986). *Staphylococcus xylosus* has been associated with some conditions as nasal dermatitis in gerbils, pyelonephritis in humans, avian staphylococcosis and bovine interamammary infection. It could also be found in milk, cheese and sausages and on skin of many animals (Schleifer and Kloos, 1975).

A notable finding in this study was that Streptococi and related bacterial genera constituted a significant proportion from the total bacterial load in the examined rodents; *E. durans* (2%), *E. faecalis* (12%), *E. faecium* (24%), *E. gallinarum* (4%), *Aerococcus viridans* (12%), *S. porcinus* (2%) and *Lc. Lactis lactis* (4%). Despite their commensal occurrence, members of the genus *Enterococcus* can occasionally cause several disease entities in humans. *Enterococcus faecium* can be a commensal, in the human intestine, but it may also be a pathogen causing diseases like neonatal meningitis. Likewise, *Enterococcus faecalis*, formerly classified as part of the Group D *Streptococcus* system, is a commensal bacterium inhabiting the gastrointestinal tracts of humans and other mammals and is one of the main constituents of some probiotic animal food supplements, yet it can cause life-threatening infections in humans, especially in the nosocomial environment, where the naturally high levels of antibiotic resistance found in *E. faecalis* contribute to its pathogenicity (Ryan and Ray, 2004). Strains identified as *E. durans* are infrequently isolated from humans and have associated with enteropathies in infant rats, foals, dogs, calves, chickens and piglets before weaning (Devirese *et al.,* 2002). In addition, clinically significant bacteremia caused by *E. gallinarum* and other *Enterococcus* spp. with one case of *E. gallinarum* endocarditis was previously reported by Reid *et al.,* (1999).

As regards to *Aerococcus viridans*, it has been reported as a rare pathogen in humans. In a study made by Meryem *et al.,* (2007), Aerococcus *viridans* was confirmed as a causative agent of urinary tract infection in pregnant women. Similarly, Romich, (2008) stated that *S. porcinus* is a beta-haemolytic bacterium that has been isolated from swine as well as from the urogenital tract of women but its zoonotic potential is uncertain. *Lactococcus lactis*, formerly *Streptococcus lactis* (Chopin *et al.,* 1989), is one of the most important microorganisms in the dairy industry. Nevertheless, it has been considered as an opportunistic pathogen, though the number of clinical cases associated with infections by these microorganisms has increased in the last decade in both humans and animals (Facklam *et al.,* 1990; Mannion and Rothburn, 1990). *Leuconostoc* spp. are *Streptococcus*-like isolates recovered in some instances from clinical origin although they are formerly thought to be only of dairy origin (Barreau and Wagener, 1990). This is supported by Kulwichit *et al.,* (2007) who assumed that some *Leuconostoc* spp. are capable of causing human infection. *Corynebacterium kutscheri* is a common bacterium isolated from the oral cavity of healthy mice and rats. Its isolation from naso-oral and paws/tail swabs as well as heart blood of the investigated rodents acquires a great significance when its public health importance is taken into account. This can be explained in light of the published report of Holmes and Korman (2007) who recorded the first well-documented case of *C. kutscheri* human infection in a 7-month-old infant which followed a rat bite.

The obtained results in Table (4) indicated that *S. arizonae, E. coli, E. cloacae and E. sakazakii* were isolated from the examined rats at percentages of 4, 8, 4 and 6 %, respectively. Additionally, *Proteus mirabilis* (6%), *Proteus vulgaris* (2%), *Providencia rettgeri* (6%), *P. aeruginosa* (4%), *Burkholderia cepacia* (2%) and *V. fluvialis* (2%) were also recovered from the investigated rodents. The distribution of these pathogens in relation to different samples of the examined rodents apart of the rodent species pointed out that *E. sakazakii* and *Providencia rettgeri* were detected in each of naso-oral and paws/tail swabs. Besides, naso-oral carriage of *P. aeruginosa* could be reported. *E. coli* and *Proteus vulgaris* were recorded in heart blood, whereas *S. arizonae*, *Proteus mirabilis* and *Burkholderia cepacia* were confirmed in liver samples. Kidney samples yielded *E. sakazakii* and *P. aeruginosa* in contrast to urine samples that harbored *E. coli, Proteus vulgaris* and *Providencia rettgeri*.

Higher levels of bacterial carriage were detectable in intestinal samples including *E. coli, E. cloacae, E. sakazakii, Proteus mirabilis, Proteus vulgaris, Providencia rettgeri* and *V. fluvialis* (Table 5).

Several animal species have been implicated in human infection with *S. arizonae*, including reptiles, poultry, sheep, rats, dogs, and cats as declared by Hoag and Sessler (2005) who pointed out that serious human infections have been reported in hosts with impaired immune systems. They presented a case of pericardial infection associated with disseminated *S. arizonae* infection. The isolation of *E. coli* from heart blood and urine of the examined rodents acquires a great significance when their close contact with farm animals and humans is considered. In a study made by Nielsen *et al.*, (2004) Norway rats (*Rattus norvegicus*) carriage of Shiga toxin-producing *E. coli*, identical to cattle isolates from the corresponding farms, was confirmed. They showed that rodents may become infected from farm animals or vice versa, suggesting a possible role in transmission. In addition, spread of *E. coli* infection from rodents to other ruminant species, other domestic animals and humans is another possible hazard (Beutin *et al.*, 1993; Wallace *et al.*, 1997).

E. sakazakii, isolated from naso-oral and paws/tail swabs and kidney samples, is a rare cause of invasive infection with historically high case fatality rates (40–80%) in infants (CDC, 2002). It can cause bacteraemia, meningitis and necrotising enterocolitis. Its infection has been associated with the use of powdered infant formula (CDC, 2002; Bowen and Braden 2006). Consequently naso-oral, paws/tail and kidney carriage of this pathogen by rodents, as recorded in the current study, represents an extreme threat to the public health, particularly in shops and dwellings infested by roof rats (*Rattus rattus*). In the same concept *B. cepacia*, recovered from liver specimens of the roof rat *Rattus rattus frugivorus***,** is an important human pathogen that is found naturally in wet soil and decaying plants. Evidence that *B. cepacia* is an important human pathogen that causes pneumonia and cystic fibrosis in immunocompromised individuals has been reported (Isles *et al.*, 1984; Mahenthiralingam *et al.*, 2005).

Enterobacter cloacae has been increasingly considered as causing infections in hospitalized patients (Davin-Regli *et al.*, 1997). In the same context, *Proteus* spp. are the causative agent of a variety of opportunistic nosocomial infections including those of the respiratory and gastrointestinal tracts, eye, ear, nose, skin, burns, throat, and wounds (Penner, 1992; Rozalski *et al.*, 1997). *Proteus mirabilis*, one of the most common uropathogens, is frequently isolated from the urine of elderly long-term catheterized patients (Mobley and Hausinger, 1989) that can result in acute pyelonephritis and other serious complications in hospitalized patients (Rubin *et al.*, 1986). The occurrence of *Proteus* spp. in liver, heart blood, urine and intestinal content of the examined rats (*Rattus rattus rattus* and *Rattus rattus frugivorus*) draws attention strongly to the importance of eradicating roof rat, in particular, in the nosocomial environments. Having a parallel significance, *Pseudomonas aeruginosa* is an increasingly prevalent opportunistic human pathogen considered as the most common Gram-negative bacterium in nosocomial infections. It is commonly responsible for a large category of hospital-acquired health hazards; pneumonia (Wiblin, 1997) and infections of the urinary tract (Pollack, 1995), surgical wounds (Kluytmans, 1997), and bloodstream (Gordon *et al.*, 1998) especially in the immunocompromised.

Providencia species have been isolated from urine (most common), stool, and blood, as well as from sputum, skin, and wound cultures as demonstrated by Koreishi *et al.*, (2006) who provided evidence that *P. rettgeri* is a cause of ocular infections, including keratitis, conjunctivitis, and endophthalmitis. *V. fluvialis* was incriminated as the causative agent of a large clinical series of cases in the United States, from 1982 through 1988, in which patients presented clinically with gastroenteritis (Klontz and Desenclos, 1990). In 2002, 36 isolates of *V. fluvialis* were reported to the CDC of which, 29 were isolated from stool samples (CDC, 2005).

A prominent observation is that some of well-known bacterial pathogens previously described to be of rodent origin failed detection in this study (*Leptospira* spp., *Listeria* spp., *Yersinia* spp., *Streptobacillus moniliformis* and *spirillum minus*). The use of non-selective procedure in culturing of different specimens might, in part, have shared in producing some false negative isolations. Hence, the possibility that some of these pathogens could be sometimes outgrown by contaminant microflora present at high levels in samples should be considered (Garayzabal *et al.*, 1987). This clarification becomes more objective when the

poor sanitary condition of rodent environments is taken into consideration. The task becomes more difficult when isolation of bacterial pathogens is from fecal samples, where an extremely high microbial load is found. Nevertheless, the aim of this work was to provide a comprehensive overview of rodent-borne bacterial pathogens and to give an indication about individual pathogens have to be allocated to study subsequently.

As a result of the above findings, it can be concluded that considerable bacterial pathogens could be harbored in/on the mouth, nose, whiskers, paws, body, tail, urine, droppings, blood and internal organs of commensal rodents prevalent in Beni-Suef Governorate. Accordingly, such pests living in close association to humans and farm animals supply multiple potentials through which they may act as sources of infection and occasionally represent a serious threat to the public health. Therefore, proper control programs as well as intensive public education should be adopted to achieve effective reduction of rodent population and thereby diminish their related pathogens.

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إطلالة على البكتيريا الممرضة ذات الأهمية للصحة العامة المعزولة من الفئران المحلية السائدة في محافظة بني سويف

أجريت هذه الدراسة في الفترة من يوليو ٢٠٠٩ إلى يونيو ٢٠١٠ بهدف تحديد دور القوارض المحلية في نقل مسببات الأمراض البكتيرية للإنسان في محافظة بني سويف بمصر. وقد تم اختيار ٥٠ من الفئران من مختلف الأنواع من كل من المناطق الحضرية والريفية في مناطق مختلفة. في المختبر، تم تحديد فصائل القوارض وأجري الفحص البكتريولوجي لسبعة أنواع من العينات من أجزاء الجسم الداخلية والخارجية من كل فأر. وقد شملت فصائل القوارض التي تم تحديدها الفأر النرويجي راتس نورفيجيكس (١٦ ٪)، والفأر المنزلي الأسود (٤٢ ٪) والفأر المنزلي فروجيفورس (٤٢ ٪). هذا، وقد أظهرت النتائج أن المكورات العنقودية المذهبة، و لينتوس، وسكويري، وزيلوزس قد عزلت بنسب ٨ و ٦ و ٢ و ٦ ٪ على التوالي. علاوة على ذلك، فقد رصدت ميكروبات الإنتيروكوكس ديورانس (٢%)، والإنتيروكوكس فيكاليس (١٢%)، والإنتيروكوكس فاشيم (٢٤%)، والإنتيروكوكس جالينيرم (٤%)، والإيروكوكس فيريدانز (١٢%)، والمكورات السبحية الخنزيرية (٢ ٪)، إضافة إلى اللاكتوكوكس لاكتيس (٤%)، واللوكونوستيك (٢%)، والكورينيباكتريم كوتشيري (٨%). ومن ناحية أخرى فقد عزل كل من السالمونيلا أريزوني، والإيشيريشيا كولي، والإنتيروباكتر كولواكي، والإنتيروباكتر ساكازاكي بمعدلات ٤ و ٨ و ٤ و ٦ ٪ على التوالي. الى جانب ذلك ، أبرزت الدراسة وجود كل من البروتيس ميرابليس (٦ ٪)، والبروتيس فلجاريس (٢ ٪)، وبروفيدينسيا الرتغرية (٦ ٪)، والسودوموناس إيروجينوزا (٤ ٪)، وبيركولديريا سيبيشيا (٢ ٪)، وفيبريو فلوفياليس (٢ ٪). وخلصت الدراسة إلى أن القوارض المحلية المنتشرة ببني سويف لديها إمكانات متعددة قد تكون بمثابة مصادر للعدوى يمكنها إيواء العديد من مسببات الأمراض البكتيرية بأجزاء الجسم المختلفة الداخلية والخارجية، وأنها تمثل تهديدا خطيرا للصحة العامة بما تحتويه من مسببات مرضية مشتركة.