Cumhuriyet University Faculty of Science
Science Journal (CSJ), Vol.34, No.2 (2013)
ISSN: 1300-1949

Intestine Bacterial Composition of the Chromosomal forms of genus *Nannospalax* and Comparison of Some Rodent Species

Ausama MS El-Namee[1], Yüksel COŞKUN[2*], Alaettin KAYA[3]

[1] *Mosul University, Science Collage, Biology Department, Mosul, IRAQ*

[2,3] *Dicle University, Science Faculty, Biology Department, Diyarbakır, TURKEY*

Received: 19.02.2013; Accepted: 11.04.2013

Abstract. In this study, five selected different rodent species, *Meriones tristrami* (karyotype 2n=72 from Mardin/Turkey), *Nannospalax ehrenbergi* (karyotype 2n=52 from Diyarbakır/Turkey and Mosul/Iraq), *Nannospalax nehringi* (karyotype 2n = 60 from Sivas/Turkey), *Rattus rattus* (karyotype 2n=42 from Diyarbakır/Turkey), *Sciurus anomalus* (karyotype 2n=40 from Bingöl/Turkey) were studied in respect to bacterial species.

The results showed the presence of two types of bacteria *Pantoea agglomerans* and *Serratia liquefaciens* in intestine *Nannospalax ehrenbergi* and *N. nehringi;* as bacterial species isolated *Aeromonas hydrophila* and *Klebsiella oxytoca* from intestine *Meriones tristrami* and *Rattus rattus. Salmonella choleraesuis* is also found in *R. rattus*. The bacterial species isolated *Klebsiella oxytoca* and *Salmonella choleraesuis* from intestine *Sciurus anomalus*. It is the first study of its kind in the detection of bacterial species present in specific types of rodents.

KeyWords: *Nannospalax, Pantoea agglomerans*, *Serratia liquefaciens, Aeromonas hydrophila, Klebsiella oxytoca, Salmonella choleraesuis, Meriones tristrami.*

---

1. INTRODUCTION

The genus *Nannospalax*, mole rats belong to the family Spalacidae is a subterranean rodents, which adapted underground life, at present distributed in the Palearctic regions, the area (range of distribution) of the genus includes a number of regions in North Africa, Asia Minor, Caucasia, from the Balkans and the Middle East [1,2]. Recent karyological studies show that *Nannospalax* consisting of several chromosomal forms [3-6] and references therein. For example, *Nannospalax ehrenbergi* [7] has different chromosomal forms, 2n = 52) in southeastern Anatolia / Turkey and conducted a single study in northern Iraq, including Mosul, and 2n=56 in Kurtalan-Turkey [6, 8].

---

* Corresponding author. *Email address*: yukselc@dicle.edu.tr

It is well known that a number of wild rodents can be reservoirs and vectors of a number of agents that cause disease in food, animals and humans. But informations on the species composition of bacteria is very scanty in member of the genus *Nannospalax,* and other rodent species which are mentioned here.

The epidemiological significance of mole rats has not been sufficiently studied. It has been suggested that they could be the carriers of the infectious rabbit fever [1].

The researchers pointed out that there are many bacteria live in rodents intestine, such as *Salmonella choleraesuis* which is distinguished by being flagella bacilli Gram negative stain and infect cattle, cats and all kinds of rodents, studies indicated the possibility of isolated from intesine young rats and food and animals also occur injury in humans [9-12]. *Serratia liquefaciens,* bacillus and Gram negative stain and animation peripheral flagella, and it is found in agricultural soils and around sweet potato roots and infect rodents, insects and fish also isolated from clinical infections in hospitals from wounds infected patients impaired immune [13-15]. *Aeromonas hydrophila,* bacillus anaerobic and Gram negative stain and her ability to digest certain substances, such as gelatin and hemoglobin, isolated from food and agricultural soil and feces of some animals also isolated from wounds caused by bites snakes and animals like Asian tiger trout, noted researchers possibility isolated from infected blood septicemia in infant children [16-20]. *Klebsiella oxytoca,* bacillus shape and Gram negative stain and their ability to grow on sugar triple Malizaam and which is produced by many plants across her steam and roots as an accidental by-product feed upon insects and used by rodents, and these bacteria isolated from the hands of hospital staff and wounds with weakened immune systems too, as isolated from the feces of some animals and rodents [21-24]. And, *Pantoea agglomerans*, bacillus shape and Gram negative stain and characterized by its inability to take advantage of amino acids, researchers isolate it from the seeds of plants and surface and timber and all kinds of sweet potatoes and fruit, such as oranges Mandarin as well as isolated from human feces and from rodents also isolated from locusts intestine [25-27].

The aim of this study was to conduct a survey bacteriological species present in the gut of some rodents and comparing chromosomal forms of the genus *Nannospalax,* and we chose these rodents because of the uniqueness of living underground and the scarcity of leaving on the surface and the absence of any study in Iraq or Turkey indicate bacterial species in intestine this rodent.

2. MATERIALS AND METHODS

Samples of animals (5 different species) obtained and diagnosed by karyotype at the University of the Dicle / Diyarbakır / Turkey: *Meriones tristrami*, 2n = 72, samples (3) from

Mardin; *Nannospalax* ***ehrenbergi***, 2n = 52, samples (4) from Diyarbakır; *Nannospalax* ***nehringi,*** 2n = 60, samples (3) from Sivas in Turkey; *Nannospalax* ***ehrenbergi,*** 2n = 52, samples (3) from Mosul in Iraq, have been identified karyotype for each model depending on the study [6, 8, 28].

Samples were cultured of content intestine by (0.1 grams) of each sample of rodent samples elected in sterile tubes container (10 cm^3) of the nutrient broth (Figure 1a), (from company MERCK), the tubes and six plates of Eosin Methylene Blue agar (EMB), were sterilized by autoclave at 121° C for 15 minutes. Tubes were incubated at a temperature 37 °C for 24 hours. A loop amount cultured of each incubated tube in EMB plates. Plates were incubated at a temperature 37°C for 24 hours.

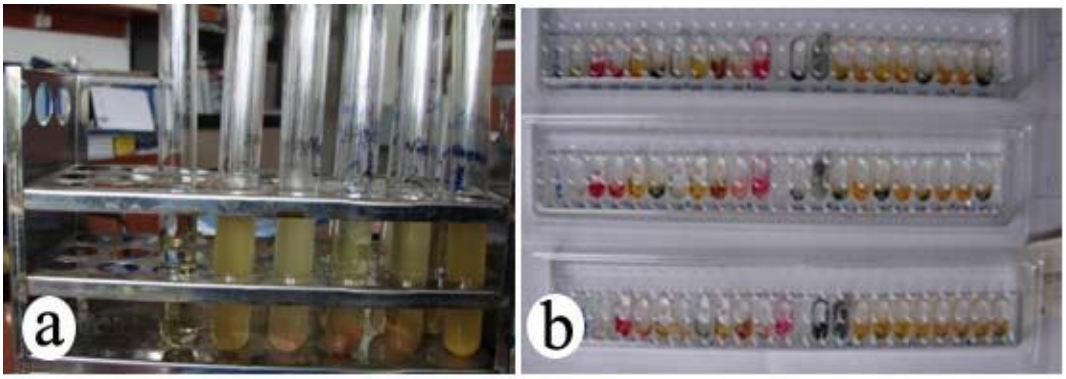

Figure 1. Sample cultures (a), strips (b).

The colonies diagnosed phenotypic, and attended the swabs from colonies on glass slides and stained by Gram stain for examination under a microscope. The Bacterial species diagnosed by using strips api 20 ETM (Fig. 1b). The work carried out by the company processed tapes University Dicle / Diyarbakır / Turkey (Diyarbakır Çocuk Hastalıkları Hastanesi, Laboratuvar Raporu, bioMerieux).

RESULTS and DISCUSSION

Bacteria *A. hydrophila* (Fig. 2a) Gram negative stain, from colonies EMB media, and isolated from the gut of the following animals, *Meriones tristrami* from Mardin and *Rattus rattus* from Diyarbakır, compared with the same species of bacterial mentioned in the (http://cdn.c.photoshelter.com).

Bacteria *K. oxytoca* (Fig. 2b) Gram negative stain, from colonies EMB media, and isolated from the gut all of the following animals *Meriones tristrami* from Mardin and *Rattus rattus* from Diyarbakır, *Nannospalax ehrenbergi* from Mosul,and *Sciurus anomalus* from

Bingöl, compared with the same type of bacterial mentioned in the (http://www. sciencephoto.com).

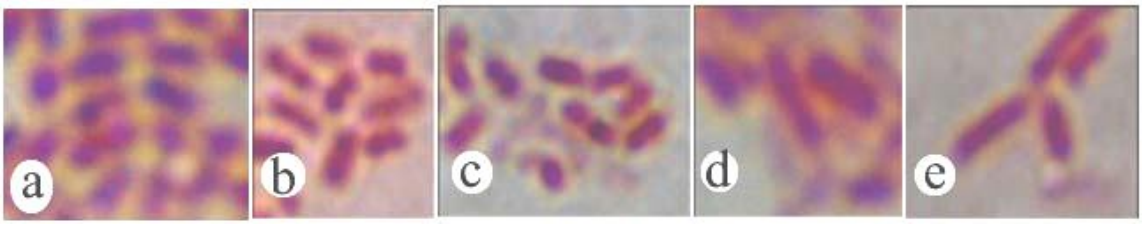

Figure 2. *A. hydrophila* (a), *K. oxytoca* (b), *P. agglomerans* (c), *S. choleraesuis* (d), *S. liquefaciens* (e). (Photos were taken under Nikon E 400 microscope).

Bacteria P. *agglomerans* (Fig. 2c) and *S. liquefaciens* (Fig. 2e) Gram negative stain, colonies diagnosed from EMB media and isolated from the intestines of the species of genus *Nannospalax*; *Nannospalax nehringi* from Sivas and *Nannospalax ehrenbergi* from Diyarbakır and Mosul, compared with the same type of bacterial in the picture mentioned in the (http://www.bode-science-center.com) and (http://images.photoresearchers.com), respectively.

Bacteria *S. choleraesuis* (Fig. 2d) Gram negative stain, colonies diagnosed from EMB media and isolated from the gut of animals (Rat from Diyarbakır, Squirrel / City Bingöl) compared with the same bacterial type in the picture mentioned in the (http://4.bp.blogspot.com).

Table note the similarity of bacteria, *A. hydrophila* and *K. oxytoca* in terms of their presence in the gut of the *Meriones tristrami* with karyotype (2n = 72) and *Rattus rattus* with karyotype (2n = 42). The presence of bacteria, *S. choleraesuis* in *Rattus rattus* has indicated the possibility of bacterial isolate these types of human and animal feces and different types of soils, particularly agricultural and insect, and rodents.

We also note the presence of bacteria *K. oxytoca* and *S.choleraesuis* in the small intestine of the *Sciurus anomalus* with karyotype (2n = 40), where we note that bacteria *S. choleraesuis* isolated from *Rattus rattus* are living in different environmental witnessed by both rodents where different geographical locations. The table also shows the presence of both bacterial species *P. agglomerans* and *S. liquefaciens* in *Nannospalax ehrenbergi* from the Mosul in Iraq and Diyarbakır in Turkey with karotype (2n = 52). This is the first study of its kind in the diagnosis of bacterial species present in *N. ehrenbergi* in Turkey and Iraq.

Presence of specific types of bacteria in intestine of these rodents, despite they spread in distinct geographic areas, has been confirmed by the lack of effect of environmental variations.

The same content of bacteria in different chromosomal forms intestine may be the presence of these species based on the type of food consumed in distributed area, and also did not affect the different karyotype in bacterial composition.

Table. Bacterial composition isolated from the intestine and gut of chromosomal forms of the genus *Nannospalax* and some rodent species.

No	Sample size	Rodent species	2n	*A. hydrophila*	*K. oxytoca*	*P. agglomerans*	*S. choleraesuis*	*S. liquefaciens*
1	3	*Meriones tristrami* Mardin/Turkey	72	2	2	0	0	0
2	2	*Rattus rattus* Diyarbakır/Turkey	42	1	2	0	2	0
3	3	*Nannospalax nehringi* Sivas/Turkey	60	0	0	3	0	3
4	3	*Nannospalax ehrenbergi* Mosul/Iraq	52	0	2	3	0	2
5	4	*Nanonspalax ehrenbergi* Diyarbakır/Turkey	52	0	0	3	0	2
6	2	*Sciurus anomalus* Bingöl/Turkey	40	0	2	0	2	0

(2n): Diploid chromosome number.

In conclusion, there is not differentions of intestine bacterial composition between chromosomal forms of the genus *Nannospalax* and *P. agglomerans* and *S. liquefaciens* specific for *Nannospalax* populations.

REFERENCES

[1] Topachevskii, V.A., 1969. Fauna of the USSR: Mammals Mole-Rats, Spalacidae. Vol.3 No.3, 1-308.

[2] Musser, G. and Carleton, M., 2005. Superfamily Muroidea. In: Wilson D.E. & Reeder D.M. (eds.), Mammal Species of the world: A taxonomic and geographic reference, 3rd edition. Baltimore, The Johns Hopkins Univ. Press, 894–1531.

[3] Lay, D.M. and Nadler, C.F., 1972. Cytogenetics and origin of North African *Spalax* (Rodentia: Spalacidae). Cytogenetics 11, 279-285.

[4] Savic, I. and Nevo, E., 1990. *The Spalacidae:* Evolutionary history, speciation and population biology. [In: Evolution of subterranean mammals at the organismal and molecular levels. Nevo E. and Reig O. A., eds.] New York, 129-153.

[5] Nevo, E., Filippucci, M.G., Redi, C., Simson, S., Heth, G. and Beiles, A., 1995. Karyotype and genetic evolution in speciation of subterranean mole rats of the genus *Spalax* in Turkey. - Biological Journal of the Linnean Society 54, 203-229.

[6] Coşkun, Y., Ulutürk, S. and Yürümez, G., 2006. Chromosomal diversity in mole-rats of the species *Nannospalax ehrenbergi* (Rodentia: Spalacidae) from South Anatolia, Turkey. Mammalian Biology - Zeitschrift fur Saugetierkunde 71 (4), 244–250.

[7] Nehring, A., 1898. Über mehrere neue *Spalax* Arten. Sitzungsber der Gesellsch. Naturforsch., Freunde z. Berlin. 10, 171-183.

[8] Coşkun, Y., Ausama, E., Alaettin, K. and Zohair, I.F.R., 2012. Karyotypes of *Nannospalax ehrenbergi* (Nehring 1898) (Rodentia: Spalacidae) in the Mosul Province, Iraq. Hystrix, It. J. Mamm. 23 (2), 72-75.

[9] Saphra, I. and Wassermann, M., 1954. *Salmonella choleraesuis*. A clinical and epidemiological evaluation of 329 infections identified between 1940 and 1954 in the New York Salmonella Center. Am. J. Med. Sci. 228, 525-533.

[10] Barrel, R.A., 1987. Isolations of salmonellas from humans and foods in the Manchester area: 1981-1985. Epidemiol. Infect. 3, 277-284.

[11] Bäumler, A.J., Tsolis, R.M., Bowe, F.A., Kusters, J.G., Hoffmann, S. and Heffron, F., 1996. The pef fimbrial operon of *Salmonella typhimurium* mediates adhesion to murine small intestine and is necessary for fluid accumulation in the infant mouse. Infect. Immun. 64, 61-68.

[12] Barza, M., 2002. Potential mechanisms of increased disease in humans from antimicrobial resistance in food animals. Clin. Infect. Dis. 34 (Suppl. 3), 123—125.

[13] Alonso, F.R. and Baquero, M.F., 1994. [The genus *Serratia*: its biology, clinical effects and epidemiology]. Rev Clin Esp. 194(4), 294-299.

[14] Haddy, R.I., Mann, B.L. and Nadkarni, D. D., 1996. Nosocomial infection in the community hospital: severe infection due to *Serratia* species. J Fam Pract. 42 (3), 273-277.

[15] Grohskopf, L.A., Roth, V.R., and Feikin, D.R, 2001. *Serratia liquefaciens* bloodstream infections from contamination of epoetin alfa at a hemodialysis center. N Engl. J. Med. 344 (20), 1491-1497.

[16] Robinson, J., Beaman, J., Wagener, L. and Burke, V., 1986. Comparison of direct plating with the use of enrichment culture for isolation of *Aeromonas* sp. from faeces. J. Med. Microbiol. 22, 315-317.

[17] Krovacek, K., Dumontet, S., Eriksson, E. and Baloda, S.B., 1995. Isolation, and virulence profiles, of *Aeromonas hydrophila* implicated in an outbreak of food poisoning in Sweden. Microbiol. Immunol. 39, 655-661.

[18] Abuhammour, W., Hasan, R.A. and Rodgers, D., 2006. Necrotizing fasciitis caused by *Aeromonas hydrophila* in an immunocompetent child. Pediatr. Emerg. Care 22, 48-51.

[19] Adamski, J., Koivuranta, M. and Leppänen, E., 2006. Fatal case of myonecrosis and septicaemia caused by *Aeromonas hydrophila* in Finland. Scand. J. Infect. Dis. 38, 117-199.

[20] Easow, J.M. and Tuladhar, R., 2007. *Aeromonas hydrophila* wound infection following a tiger bite in Nepal. Southeast Asian J. Trop. Med. Public Health 38, 867-870.

[21] Baker, D.G., 1998. Natural pathogens of laboratory mice, rats, and rabbits and their effects on research. Clinical Microbiology Reviews 11, 231–66.

[22] Ishida, T, Hashimoto, T, Arita, M, Ito, I. and Osawa, M., 1998. Etiology of community - acquired pneumonia in hospitalized patients: a 3-year prospective study in Japan. Chest 114, 1588–1593.

[23] Podschun, R., and Ullmann, U., 1998. *Klebsiella* spp. asnosocomial pathogens: epidemiology, taxonomy, typing methods, and pathogenicity factors. Clinical Microbiology Reviews 11, 589–603.

[24] Sahly, H., Podschun, R. and Ullmann. U,, 2000. *Klebsiella* infections in the immunocompromised host. Advances in Experimental Medicine and Biology 479, 237–49.

[25] De Champs, C., Le Seaux, S., Dubost, J.J., Boisgard, S., Sauvezie, B. and Sirot J., 2000. Isolation of *Pantoea agglomerans* in two cases of septic monoarthritis after plant thorn and wood sliver injuries. J. Clin. Microbiol. 38, 460-461.

[26] Asis, C.A. and Adachi, K., 2004. Olation of endophytic diazotroph P*antoea agglomerans* and nondiazotroph *Enterobacter asburiae* from sweetpotato stem in Japan. Lett Appl Microbiol. 38 (1), 19-23.

[27] Cruz, A.T., Cazacu, A.C. and Allen, C.H., 2007 *Pantoea agglomerans*, a Plant Pathogen Causing Human Disease Clin Microbiol. 45 (6), 1989-1992.

[28] Coşkun, Y., 1999. Diyarbakır *Meriones tristrami* Thomas, 1892 (Rodentia Gerbillidae) örneklerinin morfolojik özellikleri. Turkish Journal of Zoology 23 (2), 345-355.