

## Blood-Serum Proteins of *Rattus rattus* and *Rattus norvegicus* (Mammalia: Rodentia) in Turkey

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**Abstract:** The blood serum proteins of 35 live specimens of *Rattus rattus* and *Rattus norvegicus* collected from ten localities in Turkey were examined by SDS-PAGE (sodium dodecyl sulphate - polyacrylamide gel electrophoresis). Globulin, albumin, postalbumin, and prealbumin proteins in blood serum showed different electrophoretic patterns in populations of *R. rattus* and *R. norvegicus*. Because of the variations in electrophoretic patterns of both species, these patterns do not seem to be diagnostic characters in distinguishing *R. rattus* from *R. norvegicus*.

**Key Words:** *Rattus rattus*, *Rattus norvegicus*, Serum proteins, SDS-PAGE, Turkey.

### Introduction

The genus *Rattus* has been defined as the widely distributed and taxonomically confusing group including many species and subspecies throughout the world (1-4). In the Palaearctic region, Ellerman and Morrison-Scott (1) identified three subspecies for *R. norvegicus* (Berkenhout, 1769) and 52 subspecies for *R. rattus* (Linn., 1758). Vinogradov and Argyropulo (2) stated that three species belonging to this genus, *R. norvegicus*, *R. rattus* and *R. turkestanicus* Satunin, 1902, range across Caucasia. In addition, according to Harrison and Bates (4), the only rats occupying Arabia are *R. norvegicus* and *R. rattus*. Only a few distribution records from Turkey exist, by Aharoni (5), Neuhauser (6), and Lehmann (7). Furthermore, the distribution records on *R. norvegicus* and *R. rattus* recorded from areas neighboring Turkey have been provided by Misonne (8), Bodenheimer (9), Hatt (10), Ondrias (11), and Lay (12). Apart from these reviews, taxonomic studies conducted on this genus in eastern, southeastern Asia and Europe have focused on karyology (13-24). Recently, the karyotypes of *R. rattus* and *R. norvegicus* were described by Yiğit et al. (25) from Turkey. The aim of this study was to examine blood-serum proteins of *R. norvegicus* and *R. rattus*, and to assay if electrophoretic aspects of blood serum proteins are a taxonomic character of the genus *Rattus*.

## Materials and Methods

Electrophoretic analysis was performed on 35 live specimens collected from ten localities in the distribution areas of *Rattus rattus* and *Rattus norvegicus* in Turkey (Fig. 1). Blood was taken by cardiac puncture from the animals anaesthetized with ether. After blood clotting the separated sera were centrifuged at 12000 rpm for 3 min. The sera were mixed with a sample buffer containing 0.0625 M Tris Cl, pH 6.8, 2 % SDS, 10 % Glycerol, 5% 2-Mercaptoethanol and 0.01% bromphenol blue (26). The final concentration of sera was adjusted to 5 %. Samples were boiled for 3 min and stored at -70° C until electrophoresis. Electrophoresis was carried out using a Consort E 863 model vertical slab gel electrophoresis apparatus. SDS-polyacrylamide denaturing gels, separating gels (7.5 %) and stacking gels (4 %) were prepared as described by Sambrook et al. (27). Electrode buffer solution contained 0.025 M Tris, 0.192 M Glycine, 0.1 % SDS at pH 8.3 (26). Samples of 10 to 15 µl were applied to gels in different experiments. Molecular Weight Marker (Sigma MW-SDS-200) consisted of carbonic anhydrase (29,000), egg albumin (45,000), bovine albumin (66,000), phosphorylase B (97,400), β-galactosidase (116,000), and myosin (205,000).

Constant voltage (8 V/cm) was applied to the stacking gel. After tracing the dye attained from the separating gel, the voltage was adjusted to 15 V/cm. After electrophoresis, gels were stained with 0.25 % Coomassie Brilliant Blue R250 in 90 ml of methanol: water (1: 1 v/v) and 10 ml glacial acetic acid and destained in methanol: water: acetic acid (45: 45: 10) (26).

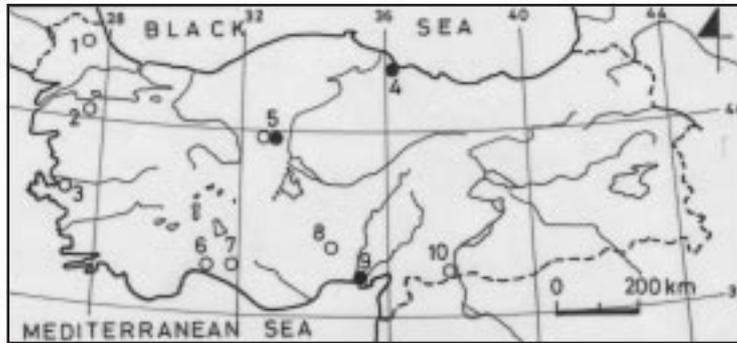


Figure 1. Map showing recorded localities of *Rattus rattus* (○) and *Rattus norvegicus* (●)  
1. Velikaköprüsü, 2. Gönen, 3. Kemalpaşa, 4. Samsun, 5. Ankara, 6. Belek, 7. Akseki, 8. Pozanti, 9. Karataş, 10. Karkamış.

## Results and Discussion

Blood serum proteins of 23 specimens of *Rattus rattus* collected from nine localities were examined by SDS-PAGE (Fig. 1). There is considerable variation in populations of *R. rattus*. In

three specimens from Kemalpaşa (İzmir) of *R. rattus*, 11-12 bands appeared in the globulin region, and the first bands were weaker than the other ones. The albumin region was subdivided into postalbumin, albumin and prealbumin zones. The postalbumin and prealbumin zones were polymorphic, the postalbumin zone had 1-2 bands, and the prealbumin 1-4 bands (Fig. 2). The first bands were weaker than the other ones. Nagase and Shimamune (28) stated

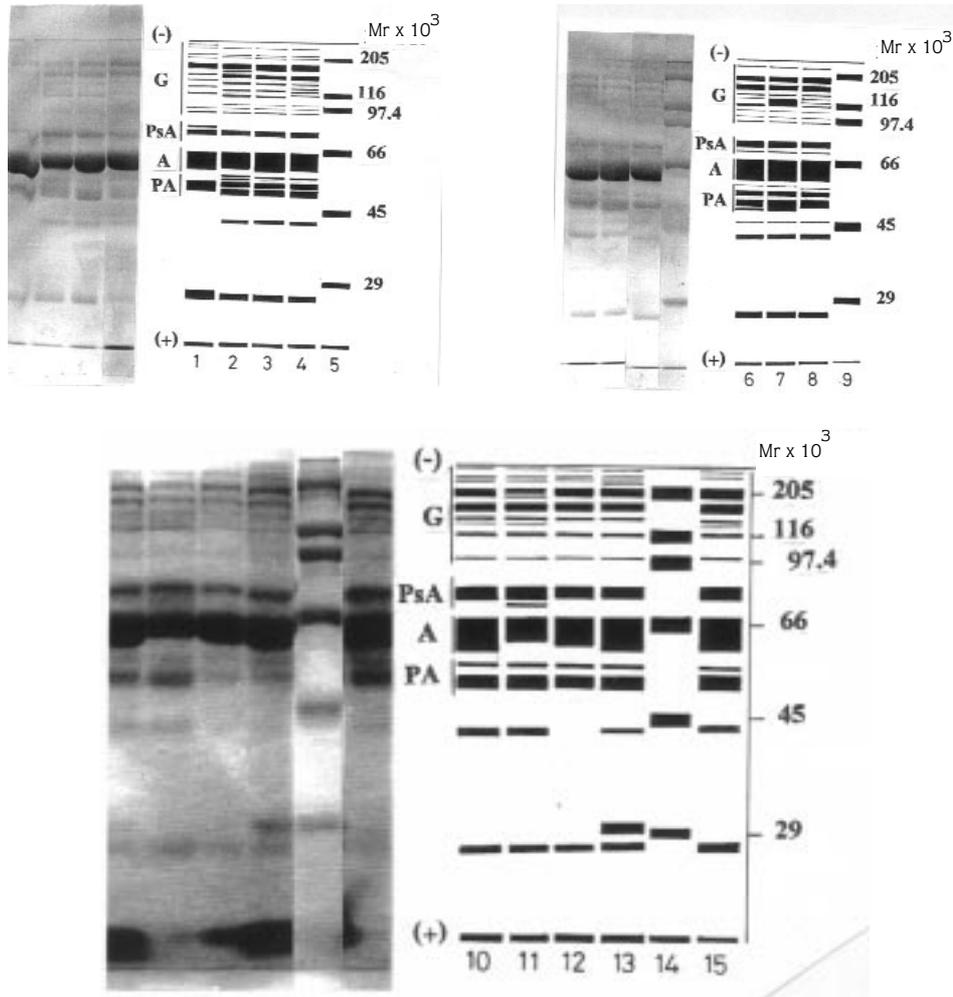


Fig. 2. Variations in blood serum proteins of specimens from various localities of *Rattus rattus*  
 G: Globulin, PsA: Postalbumin, A: Albumin, PA: Prealbumin, Mr: Marker  
 1. Kemalpaşa, 2. Kemalpaşa, 3. Kemalpaşa, 4. Pozantı, 5. Marker, 6. Velikaköprüsü, 7. Gönen, 8. Karkamış, 9. Marker, 10. Velikaköprüsü, 11. Gönen, 12. Akseki, 13. Akseki, 14. Marker, 15. Akseki

that the postalbumine zone has one band in normal and analbuminemic Sprague - Dawley rats. They also showed that normal Sprague-Dawley rats have one albumin band but it is absent in analbuminemic Sprague-Dawley rats. In specimens from Pozantı (Adana), the globulin region consisted of 12 bands of which the first, the second, and third bands were weaker, the postalbumin zone had one band, and the prealbumin zone three bands (Fig. 2). There were 8-9 bands in the globulin region and two in the prealbumin zone in three specimens from Akseki (Antalya) (Fig. 2). 8-10 bands in the globulin region, two bands in the postalbumin zone, and 2-3 bands in the prealbumin zone in two specimens from Gönen (Balıkesir) were determined (Fig. 2). In two specimens from Velikaköprüsü (Kırklareli), there were 9 bands in the globulin region, 1-2 bands in the postalbumin zone, 2-4 bands in the prealbumin zone (Fig. 2).

Blood serum proteins of nine specimens of *Rattus norvegicus* collected from Adana, Ankara and Samsun (Fig. 1) were examined. There were 9-11 bands in the globulin region in five specimens from Ankara, one band in the postalbumin zone, and three bands in the prealbumin zone (Fig. 3). In three specimens from Samsun, the globulin region contained 10 bands with two different electrophoretic patterns, the postalbumin zone two bands, and the prealbumin zone three bands (Fig. 3). In two specimens from Karataş (Adana), 8-10 bands in the globulin region 1-2 bands in the postalbumin and 3-4 bands in the prealbumin zone were observed (Fig. 3). Both male and female specimens were evaluated together as no differences exist between sexes.

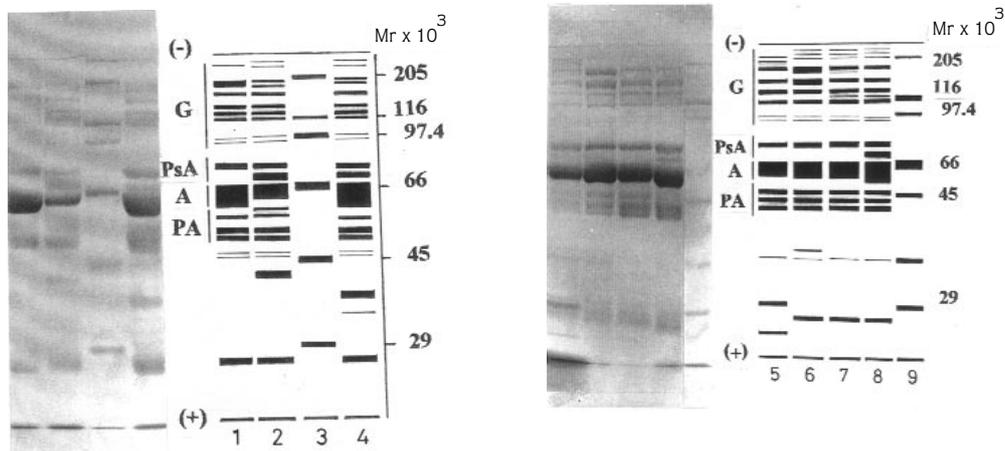


Fig. 3. Variations in blood serum proteins of specimens from various localities of *Rattus norvegicus*  
 G: Globulin, PsA: Postalbumin, A: Albumin, PA: Prealbumin, Mr: Marker  
 1. Karataş, 2. Karataş, 3. Marker, 4. Samsun, 5. Ankara, 6. Ankara, 7. Ankara, 8. Samsun, 9. Marker

Globulin, albumin, postalbumin, and prealbumin showed different electrophoretic patterns in populations of *R. rattus* and *R. norvegicus*. Because of variations in the electrophoretic patterns of both species, these patterns do not seem to be possible diagnostic characters in distinguishing *R. rattus* from *R. norvegicus*.

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