*G.U. Journal of Science*
*21(4): 113-115 (2008)*

IN PRESS

GUJS
*www.gujs.org*

# Comparative Analysis of Human and Porcupine (Hystrix Cristata L., 1758) Haemoglobins

Yılmaz ÇİĞREMİŞ [1♠], Ömer ATALAR [2], Kenan ERDOĞAN [3], Muhammet GAFFAROĞLU [4], Yusuf TÜRKÖZ [5], Sadık YILMAZ [6]

[1] *Kafkas University, Faculty of Arts & Sciences, Department of Biology, Kars, Turkey*
[2] *Fırat University, Faculty of Veterinary Medicine, Department of Anatomy, Elazığ, Turkey*
[3] *Aksaray University, Faculty of Arts & Sciences, Department of Biology, Aksaray, Turkey*
[4] *Ahi Evran University, Faculty of Arts & Sciences, Department of Biology, Kırşehir, Turkey*
[5] *Inonu University, School of Medicine, Department of Medical Biochemistry, Malatya, Turkey*
[6] *Fırat University, Faculty of Veterinary Medicine, Department of Anatomy, Elazığ, Turkey*

*Received: 08.03.2006 Revised: 02.06.2008 Accepted: 23.09.2008*

**ABSTRACT**

Agarose gel electrophoresis was used to determine the electrophoretic pattern of the haemoglobin of *Hystrix cristata* (*H. cristata*), and that of a healthy human. Alkaline agarose gel electrophoresis of the haemoglobin of *H. cristata* revealed that the mobility of the *H. cristata* haemoglobin was considerably faster than that of human haemoglobin. These comparisons showed obvious differences between the haemoglobin of the two species.

**Key Words**: *Hystrix cristata, Haemoglobin, Electrophoresis*.

## 1. INTRODUCTION

Porcupine (*H. cristata*), a member of the Hystricidae family, constitutes a small group of the order Rodentia [1, 2]. Most of the world's porcupines are widely distributed in the warm regions of Asia and Africa; only one species, the common or crested porcupine, is found in Europe, in southern Italy and Sicily. A survey of the literature has shown that *H. cristata* has extensively been focused on in macro-anatomical investigations [3-5]. However, there have been few reports on the biochemical parameters of *H. cristata*. In a study, *H. cristata* insulin was investigated, and a change in the primary structure of *H. cristata* insulin was reported [6]. In addition, Felicoli *et al.* [7] investigated the eight new proteins of the nasal tissue of the old-world porcupine. Recently, a clinical disease associated with *T. gondii* infestation was reported in an African crested porcupine (*H. cristata*) [8].

Haemoglobin is one of the most investigated proteins in various species, including monkeys and chimpanzees, cattle, pigs, sheep, deer, goats, cats, rats, and mice. However, we have not found any reference concerning the electrophoretic patterns of the haemoglobin of the *H. cristata* found in the wild. The objective of the present study is to determine haemoglobins of *H. cristata* and humans and then to carry out a comparative evaluation of their likenesses and differences using agarose gel electrophoresis.

## 2. MATERIALS AND METHODS

Six adult porcupines were trapped in Eastern Anatolia (Turkey). Animals were initially anaesthesized with Pentothal (6 ml/kg), and then the blood samples were drawn from the jugular vein and collected in tubes containing EDTA. Haemoglobin analyses of the specimens were carried out with a Paragon Haemoglobin Electrophoresis Kit (alkaline agarose haemoglobin electrophoresis, Beckman Coulter, Inc., USA). Anticoagulated blood was centrifuged at 850xg for 15 minutes to separate cells from plasma. Packed red cells were washed at least three times with 0.9% NaCl (w/v) solution. Following the final wash, the packed cells were lysed with Paragon Haemolysing Reagent. Haemolysates were then used for electrophoresis.

♠Corresponding author, e-mail: yilmazcigremis@hotmail.com

## 3. RESULTS

As can be seen in Figure 1, alkaline agarose gel electrophoresis of the haemoglobin of *H. cristata* revealed that the mobility of the *H. cristata* haemoglobin was considerably faster than that of healthy human haemoglobin.

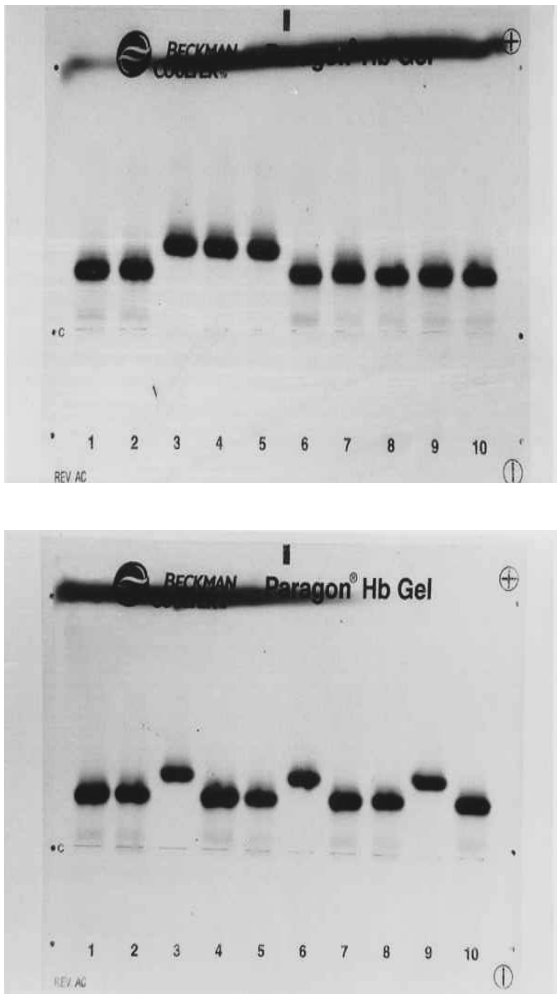


Figure 1. Comparison of healthy human and *H. cristata* haemoglobins. Agarose gel showing haemoglobins of human (lanes 1,2,6,7,8,9,10 on the above gel and 1,2,4,5,7,8,10 on the below gel) and *H. cristata* (lanes 3,4,5 on the above gel and 3,6,9 on the below gel).

## 4. DISCUSSION

Mammalian haemoglobins are generally composed of four subunits, consisting of four peptide chains, to each of which is attached one heme group. Most mammalian haemoglobins have a molecular weight of approximately 67,000. Although various forms of haemoglobin are structurally similar, there is a great variation in the functional properties of haemoglobin from various species. Electrophoresis is generally considered the best method for separating and identifying haemoglobins; it uses an electrical current to separate the different types of haemoglobin in the blood. The different types of haemoglobin move at different rates in the electrical field because they possess different electrical charges.

Maiser [9] compared human and hedgehog (*Erinaceus romanicus)* haemoglobin in starch-gel electrophoresis. It was found that hedgehog haemoglobin has a low solubility and lower mobility compared to human haemoglobin. Ground squirrel haemoglobin was studied by Duffy *et al*. [10]. They reported that the haemoglobin of the ground squirrel in the alkaline agarose gel electrophoresis moved slightly faster than the human haemoglobin does. In addition, they also found that ground squirrel haemoglobin had only single band which migrated more slowly toward the cathode than fetal human haemoglobin does in citrate agar electrophoresis.

The present study revealed that the electrophoretic pattern of the *H. cristata* haemoglobin was different from that of human haemoglobin. In conclusion, further investigations are necessary to establish the structure composition and functionality of *H. cristata* haemoglobin.

## REFERENCES

[1] Kuru, M., "Rodentia, Omurgalı Hayvanlar", ***Atatürk Üniv. Basımevi,*** Erzurum, 551-564 (1987).

[2] Weichert, C.K., "Rodentia, Anatomy of the cordates", ***McGraw-Hill,*** London, 500-738 (1970).

[3] Yilmaz, S., "Macro-anatomical investigations on the skeletons of porcupine (*Hystrix cristata*). Part III: Skeleton axiale", ***Anat. Histol. Embryol.,*** 27: 293-296 (1998).

[4] Yilmaz, S., Karan, M., "The anatomy of the arterial supply of the pelvic limb of the porcupine (*Hystrix cristata*)", ***Acta Vet. (Beogr).,*** 51: 261-268 (2001).

[5] Yilmaz, S., Aydın, A., Dinc, G., "The anatomy of the arterial supply of the thoracic limb of the porcupine (*Hystrix cristata)",* ***Anat. Histol. Embryol.,*** 30: 273-275 (2001).

[6] Horuk, R., Blundell, T.L., Lazarus, N.R., Neville, R.W.J., Stone, D., Wollmer, A., "A monomeric insulin from the porcupine (*Hystrix cristata),* an Old World hystricomorph", ***Nature***, 286: 822-824 (1980).

[7] Felicoli, A., Ganni, M., Garibotti, M., Pelosi, P., "Multiple types and forms of odorant-binding proteins in the old-world porcupine *Hystrix cristata*", ***Comp. Biochem. Physiol.,*** 105: 775-784 (1993).

[8] Harrison, T.M., Moorman, J.B., Bolin, S.R., Grosjean, N.L., Lim, A., and Fitzgerald S.D.J,. "Toxoplasma gondii in an African crested porcupine (*Hystrix cristata*)", ***J Vet. Diagn. Invest.,*** 19(2): 191-4 (2007).

[9] Maiser, P., "On hemoglobin-XXVI. Hemoglobin of hedgehog (*Erinaceus romanicus*), I", ***Comp. Biochem. Physiol.,*** 33: 697-703 (1970).

[10] Duffy, L.K., Genaux, C.T., Florant, G.L., "A reinvestigation of haemoglobin alterations in ground squirrels while in various hibernation activity states", ***Comp. Biochem. Physiol.,*** 83: 797-800 (1986).