

SELENIUM AND GLUTATHIONE PEROXIDASE ACTIVITY IN BLOOD OF THE NUTRIA (*MYOCASTOR COYPUS*): COMPARISON WITH GUINEA-PIG, RAT, RABBIT AND SOME NON-MAMMALIAN VERTEBRATES

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(Received 15 December 1982)

Abstract—1. Plasma selenium and selenium-dependent glutathione peroxidase (GSH-Px) activity in plasma and erythrocytes were measured in the nutria (*Myocastor coypus*) and the alligator (*Alligator mississippiensis*). Plasma and erythrocyte GSH-Px activity only were measured in the rat, rabbit, chicken, quail, turtle (*Chrysemys picta*), snake (*Nerodia fasciata*), bullfrog (*Rana catesbiana*) and catfish (*Ictalurus punctatus*).

2. Plasma GSH-Px activity ranged from a low of 0.021 EU/ml in the bullfrog to a high of 1.97 EU/ml in the alligator.

3. Erythrocyte GSH-Px activity was lower in the nutria (2.8 EU/g Hb) than all other species studied. Whereas the rat had the highest activity (539 EU/g Hb). The variation among the mammalian species studied was greater than between the different orders of vertebrates. There was no relationship between plasma and erythrocyte GSH-Px activity and no phylogenetic pattern in the differences in activity between species.

4. There was a relationship between plasma selenium concentration and enzyme activity: animals with the lowest enzyme activity had lowest selenium levels.

INTRODUCTION

Lawrence and Burk (1978) reported the apparent lack of selenium-dependent glutathione peroxidase (GSH-Px) in the liver of guinea-pig. Tissue selenium and blood GSH-Px activity were not assayed. GSH-Px (E.C. 1.11.1.9; glutathione-peroxidase oxidoreductase) is a seleno-enzyme containing 4 gram atoms of selenium per molecule (Rotruck *et al.*, 1973). Pathologies associated with selenium deficiency have been attributed to a deficiency in this enzyme (Tappel, 1974). In a wide variety of domestic mammals and birds (Van Vleet, 1980), in deer (Brady *et al.*, 1978), and in salmon and trout (Poston *et al.*, 1976; Hilton *et al.*, 1980), selenium has been shown to be an essential trace element associated with GSH-Px activity.

As far as we are aware there have been no further studies on GSH-Px or selenium requirements of guinea-pigs. Guinea-pigs (*Cavia porcellus*) belong to the suborder Hystriomorpha (Anderson and Knox Jones, 1967), a group of rodents with some unusual biochemical characteristics. Hystriomorph insulins differ from those of other mammals in that they do not bind zinc and have very little biological activity with respect to glucose metabolism (King and Kahn, 1981). In a related study (Elsey and Lance, unpublished) we noted that muscle tissue from a related hystriomorph, *Myocastor coypus* (the nutria or coypu), had an extremely low selenium content. On

the basis of this observation and the data of Lawrence and Burk on the guinea-pig, we thought it possible that this group of rodents may lack a selenium-dependent GSH-Px. When the opportunity arose to collect blood samples from freshly trapped nutria, we decided to test for the presence of selenium-dependent GSH-Px in the plasma and erythrocytes of this animal. In addition we assayed for selenium-dependent GSH-Px in plasma and red blood cells from guinea-pigs, rabbits, rats and a number of non-mammalian vertebrates.

MATERIALS AND METHODS

Animals

Rats (Sprague-Dawley, King Animal Labs, Oregon, WI) and guinea-pigs (from the LSU School of Veterinary Medicine) were bled via cardiac puncture under ether anaesthesia. Rabbits (Dutch Belted) were obtained from a local breeder and bled from the heart after being killed by a blow to the head. Nutria (*Myocastor coypus*) were trapped at the Lacassine National Wildlife Refuge, LA, anaesthetized with sodium pentobarbital (60 mg/kg body weight) and bled via cardiac puncture. Chickens (Rhode Island Red, SPAFAS) from the LSU Veterinary Science Research Farm and Japanese quail from the LSU Department of Poultry Science were bled from the wing vein. Alligators (*Alligator mississippiensis*) were trapped at the Rockefeller Wildlife Refuge, LA, and bled from the internal jugular as described by Olson *et al.* (1975). Water snakes (*Nerodia fasciata*) were caught in Pinellas Co., FL, decapitated and bled from the heart. Turtles (*Chrysemys picta*) were purchased from Nasco Biological Supply Co., WI, and bled from the tail. Bullfrogs (*Rana catesbiana*) from the LSU experimental

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