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# A COMPARATIVE STUDY OF RHODANESE ACTIVITY IN SOME LIZARD SPECIES

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**Abstract**—1. Rhodanese activity has been determined in some organs of three species of lizards, namely: rainbow lizard, wall gecko and skink.

2. While the activity was significantly higher in the livers of all the species compared to that in the kidney, small intestine and the brain, there were significant differences in the enzyme in the livers of the different species. The activity was highest in the liver of the rainbow lizard followed by that of wall gecko and then skink.

3. The order of activity of the enzyme in the organs of the rainbow lizard was liver > kidney > small intestine > brain.

4. The high level of rhodanese in lizard tissues suggests that the enzyme may be involved in roles other than cyanide detoxification.

## INTRODUCTION

Rhodanese (thiosulphate: cyanide sulphur transferase EC 2.8.1.1) catalyses the formation of thiocyanate from thiosulphate or colloidal sulphur and free cyanide (Westley, 1973; Sorbo, 1975). The enzyme has been established to occur in some plants (Chow and Boey, 1972); fungi (Oi, 1973); actinomycetes (Yamamoto and Oi, 1977) and in various bacteria (Tabita *et al.*, 1969). It has also been detected in all phyla of the animal kingdom (Westley, 1981).

The primary function of rhodanese is generally believed to be cyanide detoxification (Oke, 1973; Cerletti, 1986). It has also been shown that the enzyme can detoxify the highly neurotoxic sulphide produced from cysteine by cystathionase (Szczepkowski and Wood, 1967) and reactivate ferredoxin from apoferridoxin (Tomati *et al.*, 1974; Cerletti, 1986).

The present paper deals with a comparative study of rhodanese activity in organs of some lizard species.

## MATERIALS AND METHODS

### *Chemicals*

Analytical grade chemicals were used. Ferric nitrate, sodium thiosulphate and potassium cyanide were products of E. Merck (Darmstadt, F.R.G.) All other chemicals used were purchased from British Drug Houses (BDH) Chemicals Ltd, Dorset, U.K.

### *Animals*

The full names of the lizard species used are shown in Table 1. Adult rainbow lizards, wall geckos and skinks were caught alive in their natural habitats; in the open fields, homes and in moist, wooded areas, respectively.

### *Preparation of homogenates*

Ten lizards of each species were killed by decapitation. The brain, liver, kidney and small intestine were quickly dissected out. Blood on the organs was washed off with ice-cold 0.9% saline (w/v). They were frozen at −15°C for analysis.

Ten percent homogenate (w/v) of all the organs were prepared in cold 0.05 M potassium phosphate buffer (containing 2 drops of Triton X-100) pH 7.0, using a Teflon homogenizer. Triton X-100 was added to solubilise rhodanese which is mainly a mitochondrial enzyme (Volini and Alexander, 1981). The homogenates were centrifuged at 4°C for 15 min at 700 *g*. The supernatant fractions were stored at 4°C until subsequent enzyme assays.

### *Enzyme assay*

The rhodanese activity was measured by the method described by Sorbo (1953). The intensity of the reddish-brown colour produced was estimated spectrophotometrically at 460 nm using a pye-Unicam SP 1800 u.v. spectrophotometer. The enzyme activity was expressed as micromoles of thiocyanate formed/min·g fresh tissue.

## RESULTS AND DISCUSSION

Rhodanese activities in some organs of three species of lizard are summarised in Table 1. All organs investigated showed enzyme activity. Liver rhodanese activity was significantly higher in *Agama agama* than in *Hemidactylus brookeri* or *Eumeces brevilineatus*. Similarly, small intestine and brain rhodanese activities in *A. agama* were significantly higher than the activities in corresponding organs of *H. brookeri* and *E. brevilineatus*.

The order of activity of the enzyme in the tissues of *A. agama* was liver > kidney > small intestine > brain. This result is similar to those obtained by Lang (1933) and Sorbo (1953) who reported highest rhodanese activity in mammalian liver. Moreover, Izokun-Etiobhio and Ugochukwu (1984) have shown that the rhodanese activity in the liver of the albino rat is three times that in the kidney. The reason for the presence of high levels of this enzyme in various organs of the lizard species examined is not certain. However, the primary function of rhodanese is thought to be in detoxification of ingested cyanide

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Table 1. Rhodanese activity (μmol ScN/min·g) tissue in organs of some lizard species*

| Species | Common name | Tissues | | | |
|---|---|---|---|---|---|
| | | Liver | Kidney | Small intestine | Brain |
| *Agama agama* | Rainbow lizard | 2.7300 ± 0.01† | 1.0711 ± 0.02‡ | 0.6200 ± 0.02§ | 0.3850 ± 0.01‖ |
| *Hemidactylus brookeri* | Wall gecko | 1.2513 ± 0.03‡ | ND | 0.44 ± 0.01 | 0.21 ± 0.01 |
| *Eumeces brevilineatus* | Skink | 0.6130 ± 0.02§ | ND | 0.22 ± 0.01 | 0.1200 ± 0.01 |

*Results are expressed as the mean ± SEM of determinations on ten animals per species.
†‡§‖: Values bearing different superscripts differ significantly ($P < 0.05$) using analysis of variance.
ND: Not determined.

(Oke, 1973; Cerletti, 1986). A careful study of the feeding habits of these lizards (Okolie, 1989, unpublished) showed that although lizards are mostly insectivorous (Smith, 1946), the rainbow lizard also feeds on cassava, melon seeds, tomato fruits, beans, red pepper and palm fruits. Beans and cassava are known to contain cyanogens/cyanide (Butler, 1965; Nartey, 1968; Cooke, 1978; Vanderborght, 1979; Okolie and Ugochukwu, 1989). Thus the presence of high levels of rhodanese in *A. agama* may partly be due to its role in the detoxification of ingested cyanide. On the other hand, rhodanese activity in skinks and geckos is not easily explained on the basis of their feeding habits. Thus, in these species, the enzyme may be involved in roles separate from cyanide detoxification. The other roles which have been proposed for the enzyme include involvement in the disposal of the highly neurotoxic cysteine sulphide (Szczepkowski and Wood, 1967) and/or formation of iron-sulphur clusters in iron-sulphur proteins (Finazzi-Agro *et al.*, 1971; Tomati *et al.*, 1972). It may not be unreasonable to suggest that the activity pattern of this enzyme in the various tissues of the lizards has some relevance to the variability of extent of these roles in the different tissues.

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