

the rat kidney (Saikia, 1965). The concentration and amount of sodium however, are greater in the kidney of *Psammomys* than in the rat.

$\text{Na}^+$  -  $\text{K}^+$  activated ATPase was determined in the kidneys of 5 *Psammomys* and 5 white rats. Kidneys were removed under ether anesthesia and the center part immediately frozen in dry ice and acetone. While still frozen the kidney was divided into zones as shown in Table 1. Care was taken to separate the zones as completely as possible. Assay for ATPase activity were carried out as described by Epstein. Protein was estimated by the method by Lowry et al (1951).

The results show that the ATPase activity is twice as high in the outer zone as in the cortex in both *Psammomys* and white rat. The activity is higher in the cortex and outer zone of the *Psammomys* than in the white rat. In the inner zone it was only 1/10 of that of the outer zone. In contrast the inner zone of white rat had about 3 times the ATPase activity as that of the *Psammomys* (Table 2).

Table 2  
 $\text{Na}^+$  -  $\text{K}^+$  ACTIVATED ATPase ACTIVITY  
 MEAN VALUES

( $\mu$  Moles of inorganic phosphate released per mg protein per hr)

Psammomys (10 kidneys)	
Cortex	24.8
Outer zone	47.4
Inner zone 1	4.6
Inner zone 2	3.8
Rat (10 kidneys)	
Cortex	16.2
Outer zone	31.4
Inner zone	12.2

For these determinations the inner zone was only divided in two portions.

If the  $\text{Na}^+$  gradient in the inner zone were caused by  $\text{Na}^+$  reabsorption by the ascending thin limb of the loop of Henle, we would expect higher ATPase concentrations in the inner zone of the *Psammomys*, and we would not expect the value to be lower than that in the white rat. Other explanations for the low ATPase activity in the inner zone are being considered.

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#### ATP-2,3 DIPHOSPHOGLYCERIC ACID RATIOS IN SEAL ERYTHROCYTES

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Substantial concentrations of 2,3 diphosphoglyceric acid (2,3 DPGA) are found almost exclusively in certain mammalian erythrocytes. The precise role of this phosphate in energy me-

tabolism and in cellular function is not clear. Theoretically this compound might act as an energy sump. If during anaerobic glycolysis no 2,3 DPGA is formed a net gain of 2 moles of ATP will occur for each mole of glucose converted to lactic acid. The formation of 2,3 DPGA from 1,3 DPGA will cause a proportional decrease in net yield of ATP. In addition recent work has suggested that 2,3 DPGA may play an important role in the regulation of oxygen transport in red cells. Since seal red cells have a relatively low energy requirement for cation transport but have an overall glycolytic rate equal to that found in high energy requiring cells (this Bulletin, abstract #33) it seemed of interest to measure ATP and 2,3 DPGA concentrations in these cells.

Measurements of ATP and 2,3 DPGA were performed on fresh blood obtained from the extradural vein of four seals, Phoca vitulina. The sum of ATP and 2,3 DPGA was determined using the technique of Bartlett. ATP concentrations were determined by a firefly tail method. The difference between sum and ATP gave calculated 2,3 DPGA. For comparison, similar measurements were performed on fresh human erythrocytes.

In the seal red cells the mean concentration of ATP was 0.43 mM/5.25 mM Hgb and of 2,3 DPGA was 6.80 mM/5.25 mM Hgb giving a 2,3 DPGA to ATP ratio of 15:8. In human red cells the mean concentration of ATP was 1.47 mM/5.0 mM Hgb and of 2,3 DPGA was 6.30 mM/5.0 mM Hgb with a ratio of 4.3.

Thus the ratio of 2,3 DPGA to ATP is substantially greater in the low energy requiring seal red cell than in the high energy requiring human red cell. This increased ratio, however, is produced by a lower ATP concentration rather than a higher 2,3 DPGA concentration. Studies of the stoichiometry of glucose to lactate conversion in the 2 cells reveal no essential difference (this Bulletin, abstract #33). A survey of existing values reported in the literature shows no consistent trend with respect to this ratio in high  $\text{Na}^+$  versus low  $\text{Na}^+$  cells. It is concluded that:

- a. ATP is present in both types of cells and is presumably involved in energy delivery for cation transport.
- b. 2,3 DPGA is present in seal red cells and may represent an energy sump.
- c. The quantitative relationship between the 2 forms does not explain the difference in energetics between the 2 types of cells.

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#### OUABAIN AND IODOACETATE INSENSITIVE, ETHACRYNIC ACID STIMULATED, ETHANOL INHIBITED UNIVALENT CATION TRANSPORT IN SEAL ERYTHROCYTES

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Mammalian erythrocytes show 2 different cation patterns. One pattern, like that in man, consists of relatively low  $\text{Na}^+$  and relatively high  $\text{K}^+$  concentrations. The other pattern, like cat and seal, consists of relatively high  $\text{Na}^+$  and relatively low  $\text{K}^+$  concentrations. Studies of the transport mechanisms involved in the high  $\text{Na}^+$  group might be anticipated to deepen understanding of cation transport generally.

In this study, the effects of various inhibitors on  $\text{Na}^+$  efflux and  $\text{K}^+$  influx in the erythrocyte of the harbor seal, Phoca vitulina, were determined using isotopic  $^{22}\text{Na}$  and  $^{22}\text{Na}$  efflux was de-