SHORT NOTE

AN ANSWER TO A REPORTED APPARENT CONTRADICTION IN THE PREDICTED RELATION BETWEEN THE CONCENTRATION OF ATP AND K IN LIVING CELLS

GILBERT N. LING

Department of Molecular Biology, Pennsylvania Hospital, Eighth and Spruce Streets, Philadelphia, Pennsylvania 19107

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According to the association-induction hypothesis, quantitative correlations should exist between the equilibrium concentrations of **ATP** and of K^+ in living cells.[1] Experimental evidence from the studies of frog sartorius muscles support this theory (see Fig. 1, Inset 1).

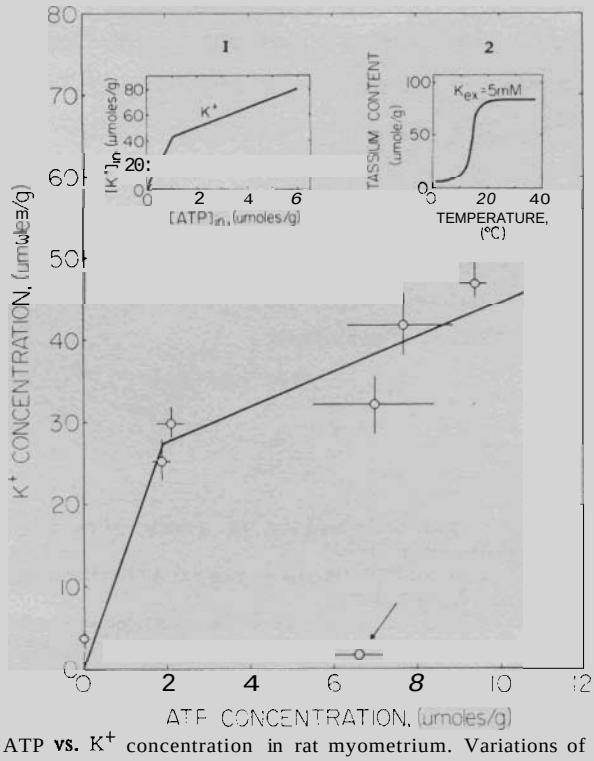

Figure 1. Plot of ATP **vs.** K^+ concentration in rat myometrium. Variations of ATP concentration were brought about by various metabolic poisons and by cooling (marked with arrow). Data from Rangachari et **al.**[2] Inset 1 shows quantitative relation between K^+ and ATP in frog sartorius muscles from Ling and **Ochsenfeld.**[3] (Other similar data are given in Ref. 1, p. 252.) Inset 2 from **Reisin** and Gulati[4] shows temperature transitions from K^+ to the Na^+ state in guinea pig taenia coli.

In 1972, Rangachari, Paton and Daniel, publishing the results of their studies of rat myometrium, concluded that "the linear correlation between ATP and K^+ contents predicted by the association-induction model did not always hold."[2] However, a comparison of their data, reproduced in Figure 1, with the data shown in Inset 1 from studies with frog sartorius muscle shows that, except for one point (marked by an arrow), there is good agreement between the two sets of data. The one departing point resulted from an experiment produced by cooling rat myometrium to O°C, which sharply reduced the concentration of K^+ but not that of ATP.

From the cooperative K^+-Na^+ adsorption isotherm presented in the association-induction hypothesis,[3] another deduction can be made. Under certain conditions a sharp transition from K^+ adsorption to Na^+ adsorption might occur in response to a relative small change in the temperature. This type of phenomenon represents what is known in statistical mechanics as a "temperature transition."

Recently, Reisin and Gulati[4] reported just such a temperature transition in another mammalian smooth muscle, the guinea pig taenia coli. In this case, cooling to 0°C or indeed to another temperature below 14°C produced a "reversible and abrupt shift of K^+ adsorption to Na^+ adsorption" (Inset 2). Thus, taken together with this finding, the data of Rangachari et al. confirm not one but two predictions of the association-induction hypothesis.

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