

SEROSAL. Call instructor to obtain 1-ml *hot* aliquots for counting. (Dilution of *hot* samples is necessary for optimal counting conditions on a gamma counter, generally  $< 10^6$  dpm;  $1 \mu\text{Ci} = 2.2 \times 10^8$  dpm.)

- All samples are taken to a gamma counter for radioactivity determinations. From a  $^{22}\text{Na}$  standard of  $0.3 \mu\text{Ci}$ , the ratio  $\text{cpm}/\text{dpm} \times 100$  represents the percent counting efficiency of the system. Determine the efficiency. Standard and *hot* samples are counted for 1 min each and *weak* samples, for 10 min each. Counting errors (possibly  $\pm 1\%$ ) are proportional to the square root ( $10^2$ ) of the total counts ( $10^4$ ); therefore *weak* samples need more counting time for accuracy.

### CALCULATIONS

- Frog skin behaves as a linear ohmic resistor over a considerable range of voltage. Thus the electrical resistance ( $R$ ) can be calculated from the ratio  $\text{PD}/I_{\text{SC}}$  for each time and treatment period. (Convert  $\mu\text{A}$  to  $\text{mA}$  and use  $\text{mV}$  to get  $R$  in  $\Omega \cdot \text{cm}^2$ .) Prepare a table showing time, treatment,  $\text{PD}$ ,  $I_{\text{SC}}$ , and  $R$ . How would the electrical parameters be expected to change with stimulation and inhibition of active sodium transport?
- Calculate sodium fluxes from the radioactivities of the collected samples. First subtract the background  $\text{cpm}$  from both *weak* and *hot* samples. Then, to convert  $\text{cpm}$  to flux units ( $\mu\text{eq} \cdot \text{cm}^{-2} \cdot \text{h}^{-1}$ ):

$$\text{Flux (m} \rightarrow \text{s)} = \frac{\text{corrected weak S cpm}}{\text{corrected hot M cpm} \times 10} \times \frac{84.6 \mu\text{eq/ml} \times 10 \text{ ml}}{1 \text{ cm}^2 \times 0.25 \text{ h}} \quad (\text{one flux chamber})$$

$$\text{Flux (s} \rightarrow \text{m)} = \frac{\text{corrected weak M cpm}}{\text{corrected hot S cpm} \times 10} \times \frac{84.6 \mu\text{eq/ml} \times 10 \text{ ml}}{1 \text{ cm}^2 \times 0.25 \text{ h}} \quad (\text{paired flux chamber})$$

$$\text{Net flux (m} \rightarrow \text{s)} = \text{flux (m} \rightarrow \text{s)} - \text{flux (s} \rightarrow \text{m)}$$

Prepare a table showing time, treatment, mucosal-to-serosal flux, serosal-to-mucosal flux, and net flux. How would flux values be expected to change with stimulation and inhibition of active sodium transport?

- Active sodium transport across the frog skin is the principal source of the  $I_{\text{SC}}$ . Convert the  $I_{\text{SC}}$  to flux values using the identity,  $1 \mu\text{A} \equiv 0.0373 \mu\text{eq}/\text{h}$ . Calculate the fraction, net flux (mucosal-to-serosal)/ $I_{\text{SC}}$ , for each time and treatment period. How would this fraction be expected to change, if at all, with stimulation and inhibition of active sodium transport?

### RESULTS

A class of first-year graduate students obtained the results shown in Table 1. The unidirectional flux of sodium from mucosa to serosa exceeded the opposite unidirectional flux by a factor of 20 as was found originally by Ussing and Zerahn (2). The net flux of sodium was increased (73%) by a stimulant, vasopressin, and decreased (56%) by an inhibitor, ouabain. Changes were relatively large and rapid for this type of study.

TABLE 1. Sodium Fluxes in Frog Skin

	Time Period, min	Fluxes, $\mu\text{eq} \cdot \text{cm}^{-2} \cdot \text{h}^{-1}$		
		m $\rightarrow$ s	s $\rightarrow$ m	Net m $\rightarrow$ s
Control	0-15	1.66	0.06	1.60
Control	15-30	2.02	0.12	1.90
Control	30-45	2.19	0.11	2.08
Vasopressin	45-60	2.31	0.15	2.16
Vasopressin	60-75	2.95	0.16	2.79
Vasopressin	75-90	3.74	0.15	3.59
Ouabain	90-105	2.72	0.15	2.57
Ouabain	105-120	1.33	0.14	1.19
Ouabain	120-135	1.07	0.15	0.92

Fluxes: m  $\rightarrow$  s, mucosal-to-serosal; s  $\rightarrow$  m, serosal-to-mucosal.

### REFERENCES

- Sernka, T.J., and H.B. Battarbee. Painless pithing. *Bioscience* 26: 596, 1976.
- Ussing, H., and K. Zerahn. Active transport of sodium as the source of electric current in the short-circuited isolated frog skin. *Acta Physiol. Scand.* 23: 110-127, 1951.

### FROM THE EDITOR

The continuing appearance of new journals, most of which are dedicated to progressively narrowing fields, is an expression of intensifying scientific specialization. Not all new journals are focused on a very limited area. The first issue of one, which came to me, is *Clinical Physiology* (vol. 1, no. 1, Feb. 1981). The brief introduction by John Wahren (Stockholm), the Editor, warrants being brought to your attention.

Clinical physiology is a new clinical discipline which has gradually emerged in the Scandinavian countries during the last 25 years. It is concerned primarily with physiology applied to clinical problems in cardiology, pulmonary medicine, nephrology, gastroenterology, endocrinology and metabolism, angiology and intensive care medicine. Clinical physiology also deals with physiological aspects of occupational medicine, sports medicine and rehabilitation. Because of the increasing scientific activities in the field of clinical physiology in Scandinavia, a need has been felt to represent these activities in an independent scientific journal. The sponsor of this new publication, the Scandinavian Society of Clinical Physiology, wishes to encourage a scientific approach to clinical research by providing a forum for scientific reports and debate pertinent to human physiology and disease.

The new journal will not be limited to contributions from Scandinavia alone but invites scientists from all over the world, interested in physiological and pathophysiological aspects of medicine to contribute original papers. The scientific standard and quality of the journal will be guaranteed by the international group of renowned scientists who have agreed to serve on the editorial board. The initial responses to the new journal have been very positive and promising and we are hopeful that this attitude will be reflected in the quality of the papers submitted to the journal and in an increasing circulation.

Stockholm, February 1981

JOHN WAHREN  
Editor