liali dei vasi, cellule che estemporaneamente partecipano delle funzioni del S. R. I.

Uno di noi, ZACCO[1], ha riscontrato, in rapporto a diverse condizioni sperimentali: iniezione locale di istamina, di papaina, di un antigene (previa sensibilizzazione locale mediante trasporto passivo), imponente reazione istiocitaria del polmone di cavia; l'uso preventivo di un prodotto antiistaminico di sintesi inibisce in maniera apprezzabile la reazione mesenchimale da papaina.

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Istituto di Clinica Medica dell'Università di Bari, il 18 giugno 1949.

Zusammenfassung

Die Autoren bestimmen den Histamingehalt von Meerschweinchenlungen nach Anlegung eines Pneumothorax, nach lokaler Reizung mit Papain und bei normalen Kontrolltieren.

Der Histamingehalt sinkt zunächst sofort nach Herstellung eines Pneumothorax, steigt aber nach einigen Stunden wieder an und bleibt während mehrerer Tage über den Normalwert erhöht.

Die Reizung der Lunge durch eine lokale Injektion von Papain gibt, ähnlich wie der Pneumothorax, eine nach einiger Zeit auftretende Erhöhung des Histamingehalts.

[1] M. ZACCO, Fisiologia e Medicina 10, in corso di stampa (1949).

Antihistaminic Substances and Epinephrine Action on Blood Pressure

At present there is no generally accepted opinion as regards the influence of antihistaminic drugs on the action of epinephrine on blood-pressure (cf. for instance LOEW[1]. Recently GRAHAM[2] has shown that in the spinal cat high doses of Neoantergan inhibit the pressor response to epinephrine. The author has studied the blood-pressure of unanæsthetized rats with the technique developed by KERSTEN[3] and coworkers. It was possible to demonstrate that Neoantergan in doses of 10 mg/kg body-weight enhanced the pressor response to epinephrine, whereas doses of 50 mg/kg entirely abolished it. In additional experiments it was shown that Antastene in doses of 50 mg/kg inhibited the pressor response to epinephrine in unanæsthetized rats and guinea-pigs. Further work on this subject is in progress with the possibility in mind that the effect could be explained as a competitive inhibition between inhibitors.

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Zusammenfassung

Bei nichtnarkotisierten Ratten verstärken kleine Dosen von Neoantergan die Adrenalinwirkung auf den Blutdruck. Anderseits sieht man, daß große Neoantergandosen diese Blutdrucksteigerung ganz verhindern. Bei nichtnarkotisierten Ratten und Meerschweinchen eliminieren große Dosen von Antastene die Adrenalinwirkung auf den Blutdruck. Die Beobachtung wird an anderer Stelle ausführlicher geschildert werden.

[1] E. R. LOEW, Physiol. Rev. *27*, 542 (1947).
[2] J. D. P. GRAHAM, J. Pharmacy Pharmacol. *1*, 17 (1949).
[3] H. KERSTEN, W. G. BROSENE, Jr., F. ABLONDI, and Y. SUBBA-ROW, J. Lab. Clin. Med. *32*, 1090 (1947).

On the Influence of Temperature on the HCl-formation and the Oxygen Consumption of the Stomach

Experimental determinations of the hydrochloric acid secretion rate of the stomach and the accompanying oxygen consumption have received considerable attention in recent years in connexion with discussions on the mechanism of the HCl production[1–5]. So far no conclusive results have been obtained as to a possible quantitative relationship: TEORELL[1] (cat's stomach) anticipates one, but points out that under his conditions the thermodynamic "efficiency" was too low, a fact which tends to obscure a possible relation. DAVIES[5] (isolated frog's stomach) finds an increase in Q_{O_2} after histamine stimulation (l. c. Fig. 3) but records only two cases with concomitant HCl determinations (l. c. Table 4). The present note intends to contribute to these problems by measurements of the temperature influence upon the factors in question, i. e. the rate of HCl production and the related O_2 consumption.

Isolated frog's stomach mucosa was used and the technique was in principle the same as described previously[3, 5, 6], with provisions added for good temperature control. The HCl secretion was received in a small volume of 0·1 *N* NaCl and the rate of H^+ ion secretion measured from continuous p_H-time records (glass electrode). The conventional gasometric procedure for oxygen consumption (Q_{O_2}) was employed: immediately after a well-established, constant secretion period (induced with histamine) the mucosa piece (c. 10 mg) was transferred to the Warburg apparatus in frog's phosphate-saline + 100% O_2. Secretion tests and gasometric analyses were performed on each of a total of 25 mucosa membranes in groups of four to six experiments at 15°, 20°, 25°, 28° and 33°C[7], respectively.

The temperature influence on the HCl secretory rate, respectively the Q_{O_2}, was expressed in terms of the customary Arrhenius-van't Hoff equation[8]

$$\log K_T = -\Delta E/(4{\cdot}575\ T) + C \text{ (a constant)}$$

derived from a plot of log K_T against $10^3/T$. K_T is $|H^+|$ or $|Q_{O_2}|$ and $T = (273 + C°)$. The best fit of the experimental point groups was calculated as a straight "regression line" according to usual statistical methods[9]. The temperature effect on the respective rate is here determined by $-\Delta E$ calories/mole, the "energy of activation".

The results are summarized in the following table.

The Temperature Coefficient: A common way of expressing the influence of temperature is the use of the "temperature coefficient", Q_{10}. It can, for the temperature interval 15°–25°C, be rather exactly calculated as antilog[10] $(25{\cdot}3 \times 10^{-6} \cdot \Delta E)$. Hence Q_{10} *for the* H^+ *secretion is 3·2* (probable variation limits 2·8–3·8) and Q_{10} *for the* O_2*-consumption is 2·2* (limits 2·0–2·4). The ΔE*:s*, respectively the Q_{10}*:s*, found are of the order generally found for chemical processes[1], but the exact significance

[1] T. TEORELL, Skand. Arch. Physiol. *66*, 225 (270) (1933).
[2] C. LUTWAK-MANN, Biochem. J. *19*, 19 (1947).
[3] R. E. DAVIES, N. M. LONGMUIR, and E. E. CRANE, Nature *159*, 468 (1947).
[4] E. E. CRANE and R. E. DAVIES, Proc. Biochem. Soc. (24 Sept. 1948).
[5] R. E. DAVIES, Biochem. J. *42*, 609 (1948).
[6] T. TEORELL and R. WERSÄLL, Acta physiol. Scand. *10*, 243 (1945).
[7] Above 33°C heat damage starts.
[8] See for instance: H. BULL, *Physical Biochemistry*, p. 23 (New York, 1943). – A. KANITZ, *Temperatur und Lebensvorgänge* (Berlin 1915). – Y. BELEHRÀDEK, *Temperature and Living Matter* (Berlin, 1935).
[9] A. C. WORTHING and J. GEFFNER, *Treatment of Experimental Data*, Chap. XI, XII (New York, 1943).

Acid Secretion (μ eq./mg dry wt./hr) (24 experiments)	
Regression equation	$\log H = -(4{\cdot}418 \pm 0{\cdot}576) \cdot 10^3/T + 14{,}037 \pm 0{\cdot}204$
Standard error of estimate of log H	0·85
Correlation coefficient (log H vs. $1/T$)	22,000 ± 2,600 cal./mole
Energy of activation ($-\Delta E$)	3·2 (2·8 – 3·8)
Temperature coefficient (Q_{10})	
Oxygen Consumption (μl/mg dry wt./hr) (25 experiments)	
Regression equation	$\log\lvert Q_{O_2}\rvert = -(3{\cdot}005 \pm 0{\cdot}321) \cdot 10^3/T + 10{\cdot}466 \pm 0{\cdot}113$
Standard error of estimate of $\log\lvert Q_{O_2}\rvert$	0·89
Correlation coefficient ($\log_2\lvert Q_{O_2}\rvert$ vs. $1/T$)	13,700 ± 1,470 cal./mole
Energy of activation ($-\Delta E$)	2·2 (2·0 – 2·4)
Temperature coefficient (Q_{10})	

of these parameters must be judged with caution[1]. The high order of c. 2·5 for Q_{10} means that there is about $10\,\%$ ($=\sqrt[10]{2{\cdot}5}$) increase in secretion rate (and O_2 uptake) per degree temperature increase.

The relation between HCl *production rate* (K^H) *and* O_2 *consumption rate* (K^{O_2}) at any one temperature can be written in logarithmic form (cf.the Arrhenius equation above) as

$$\log \frac{(K^H)}{(K^{O_2})} = (A^H - A^{O_2}) \cdot \frac{1}{T} + (C^H - C^{O_2})$$

where A is an abbreviation for $(-\Delta E/4{\cdot}575)$. As $1/T$ varies very little over the middle range of the temperature interval—the "physiological" one—it may be justified to approximate the right hand member to a constant, B. Hence, one can write $(K^H)/(K^{O_2}) = 10^B$, i.e. there is *approximately linear relation between the acid output and oxygen consumption rate.* The constant 10^B is of the order 0·1 (with a probable variation 0·05–0·2), in other words, *1 µl* O_2*-uptake corresponds to 0·1 µeq.* H^+ *ions (approximately).*

Energy considerations:—It has been calculated (cf. for instance[1]) that the production of 1 liter of gastric juice (being 0·1 normal in HCl) requires at minimum c. 900 cal., i.e. $9{\cdot}10^3$ cal./eq. Furthermore, it is generally assumed that 1 ml O_2-uptake corresponds to 5 cal., hence it is possible to calculate the *thermodynamic efficiency to approximately 20 per cent* (i.e. $0{\cdot}1 \cdot (9{\cdot}10^3 \cdot 10^{-6}/5{\cdot}10^{-3}) = 0{\cdot}18$). This figure is amazingly high especially when considering the fact that the HCl producing cells are only a fraction of all O_2 consuming mucosa cells (cf. CRANE and DAVIES[2] and DAVIES[3] p. 616. TEORELL[4] found for the cat's stomach only 6 to 9 per cent).

Finally it is of interest to express the relation (H^+ *output*) : (O_2 *uptake*) in terms of Q_{HCl} and Q_{O_2} as done by DAVIES and collaborators. As Q_{HCl} at N.T.P. is equal to 22·4 (μ eq. H^+/mg dry wt./hr) one finds for our material of frog gastric mucosa experiments that $Q_{HCl}/\lvert Q_{O_2}\rvert$ *is of the order 2·2* (probable variation 1·1 to 4·4). Although this ratio falls somewhat lower than the majority of those reported by CRANE and DAVIES, it is nevertheless high and being > 1 one may perhaps say that our results seem to confirm DAVIES' statement, that the H^+ ions can not directly originate from oxidative degradation of a substrate known to take part in intermediate metabolism (l. c., p. 617).

The mean Q_{HCl} at 25°C of 3·5 (probable variation 2·2–5·6) is also in good agreement with values published by DAVIES and collaborators.

The mucosa potential has been measured in all cases reported here, it ranged from a few mV to c. 30 mV at maximum (the serosa side positive in the external circuit). Although a covariation between secretion rate and potential could be traced in some single experiments, it was not possible, in our material, to find such a pronounced general relationship between potential and H^+ production, as has recently been argued by REHM[1] and CRANE, DAVIES and LONGMUIR[2].

More complete reports and discussions will be published elsewhere.

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Zusammenfassung

Die Geschwindigkeit der HCl-Bildung und des O_2-Verbrauchs der isolierten Magenschleimhaut des Frosches sind als Funktionen der Temperatur bestimmt worden. Der Temperaturkoeffizient Q_{10} bewegte sich für die HCl-Bildung in der Größenordnung um 3,2, für den O_2-Verbrauch um 2,2, was einer «Aktivierungsenergie» von ca. 22000 bzw. 14000 Kal./Mol entspricht. Der thermodynamische «Nutzeffekt» der Säuresekretion betrug ≧ 20 v. H. Die Beziehungen zwischen Säurebildung und O_2-Verbrauch werden in bezug auf die Energiequellen und auf die Quellen für die Wasserstoffionenbildung besprochen. Einige Ergebnisse der Potentialmessung an der Schleimhaut werden erwähnt.

[1] See for instance: H. BULL, *Physical Biochemistry*, p. 23, (New York, 1943). A. KANITZ, *Temperatur und Lebensvorgänge* (Berlin 1915). – Y. BELEHRADEK, *Temperature and Living Matter* (Berlin, 1935).

[2] E.E. CRANE and R. E. DAVIES, Proc. Biochem. Soc. (24 Sept. 1948).

[3] R.E. DAVIES, Biochem. J. *42*, 609 (1948).

[4] T. TEORELL, Skand. Arch. Physiol. *66*, 225 (270) (1933).

[1] W.S. REHM, Amer. J. Physiol. *141*, 537 (1944); *144*, 115 (1945).

[2] E.E. CRANE, R.E. DAVIES, and N.M. LONGMUIR, Biochem. J. *43*, 321 (1948).

Effect of ultrasonic vibration on muscle fibres *in vitro*

SZENT-GYÖRGYI[1] and his coworkers[2] have accumulated evidence that the muscle's contractile substance is composed of two protein components, myosin and actin.

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[2] F. B. STRAUB, Stud. Inst. Med. Chem. Univ. Szeged. *2*, 3 (1942).