Effect of K and Mg Aspartate on Cellular Metabolism

The beneficial effects of the K and Mg salts of D,L-aspartic acid in some circulatory disturbances have been attributed to their cation-carrier functions[1-4]. On the other hand, there is a possibility of a metabolic stimulus exerted by the aspartate (the monoaminodicarboxylic acid salt) as well, which could enhance some metabolic cellular processes[5]. Thus, for instance, aspartic acid may act as an anaerobic furnisher of CO_2 by decarboxylation, or may stimulate, after a previous deamination, the tricarboxylic cycle.

We wished to study the effect of the K and Mg aspartate on the oxygen consumption and respiratory CO_2 production in a tissue preparation consisting of isolated nephrons, in vitro.

Materials and methods. Experiments were carried out in a preparation of isolated rat nephrons, by tripsinization. The homogenate of nephrons (cytocrit 2–3%) in isotonic saline, containing 5% calf serum[6], with 5 μM glucose per ml and 2 μM lactate per ml, was subjected to manometrical measurements of gas exchanges by a procedure based on the DICKENS-SIMMER II method[7]. O_2 consumption, respiratory and glycolytic CO_2 production and the respiratory quotient were determined. Two series of experiments were carried out: one control series and the other in the presence of aspartate (5 μM per ml). The rate of K and Mg aspartate was 1:1. Results were worked out statistically.

Results and discussion. The results are presented in the Table (mean values). Aspartate addition leads to intensification of gas exchanges with no modification of the respiratory quotient. The increase of O_2 consumption and CO_2 production are statistically significant ($p < 0.01$).

It is known that the renal tissue takes up and utilizes preferentially free fatty acids[8-10] and lactate[8,11]; under certain conditions, it can oxidize glucose[12,13]; it seems that there is no renal uptake of aminoacids[8]. Our findings agree with these data. In the presence of aspartate, the oxidized substrate remains the same (lactate, possibly glucose), the respiratory quotient being unmodified. So we can also assume that aspartate does not act as an anaerobic generator of CO_2, as this would lead to an increase of the respiratory coefficient. On the other hand, the significant increase of O_2 consumption supports the hypothesis of the intervention of aspartate in the stimulation of the KREBS cycle. This effect finds its explanation in the simplest way by the oxalacetate-producing role of aspartate, the more so as the oxalacetate may be one of the limiting factors of the tricarboxylic acid cycle[14].

Thus the therapeutic effects of the aspartate are more complex than those explained only by their cation-carrier (K and Mg) action, and must also be considered as a cellular metabolic effect, as the result of oxalacetate production, which could stimulate the KREBS cycle. We mention that recently a vasodilating effect, of oxalacetate especially upon small vessels, has been demonstrated[15], so we can consider a vascular action too.

Q_{O_2} (μl oxygen/mg dry weight tissue/h), Q_{CO_2} (μl co_2/mg dry weight tissue/h) and QR(respiratory quotient) of the isolated rat nephrons preparation

Experiment series	Q_{O_2}	Q_{CO_2}	QR	No. of experiments
Control	32.7 ± 1.4	33.1 ± 1.0	1.01	15
Aspartate	40.3 ± 1.9	41.1 ± 1.5	1.02	20

Zusammenfassung. Gasstoffwechselbestimmungen von unter K- und Mg-Asparaginat stehenden Zellenpräparaten isolierter Nephronen zeigen vermehrten Sauerstoffverbrauch. Der dabei unveränderte Atmungskoeffizient beweist, dass das oxydierte Substrat offenbar dasselbe bleibt.

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Constituants amers de *Brucea amarissima*[1], structures des brucéines A, B et C

Un certain nombre de composés cristallisés isolés de plusieurs espèces du genre *Brucea* (Simarubacées) ont été décrits dans la littérature[3,4]. Cependant, leur formule brute et les résultats préliminaires rapportés restent sujets à caution.

Nous avons étudié les fruits de *Brucea amarissima* dont nous avons isolé jusqu'à présent quatre composés cristallisés que nous proposons d'appeler brucéines A, B, C et D.

Nous désirons exposer les principaux arguments qui conduisent à attribuer les structures (II a[5]), (II b) et (II c), respectivement à la brucéine A, $C_{26}H_{34}O_{11}$, $[\alpha]_D$[6] $-86,3°$, à la brucéine B, $C_{23}H_{28}O_{11}$, $[\alpha]_D$ $-77,2°$ et à la brucéine C, $C_{28}H_{36}O_{12}$, $[\alpha]_D$ $-34,2°$.