

Zusammenfassung. 73 Ratten wurden hyperventiliert und mit Gasgemischen verschiedener CO_2 -Gehalte (0–12%) während 30–180 min beatmet (arterieller P_{CO_2} 12–107 Torr). Die Versuchstiere wurden *in situ* eingefroren und der CO_2 -Gehalt des Gehirngewebes mit eigener Methode bestimmt. Dissoziationskurve und Pufferkapazität

des Gehirngewebes für CO_2 *in vivo* werden mitgeteilt.

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Pronephric System in Haploid and Diploid Larvae of *Xenopus laevis*

DALCQ¹ suggested that the oedema which develops in about 90% of haploid frog tadpoles is the result of blockage, and consequently malfunction, of the pronephric system. However, in our experience with *Xenopus laevis* such oedematous tadpoles have greatly swollen, but apparently patent pronephric tubules and Wolffian ducts, and it seemed possible that the oedema might be caused rather by increased water uptake than by reduced elimination. If this were so, the occasional haploid embryo developing without oedema might owe its health to an exceptionally active nephric system. If the haploid kidney is having to eliminate more water than a diploid in order to prevent the development of oedema, it might become hypertrophied in the way that the remaining kidney does after unilateral pronephrectomy in diploid *Triturus* (Fox²). We therefore compared the structure of the pronephric systems of five haploid tadpoles showing fairly normal development and no oedema with those of five control diploids. The measurements were made on longitudinal and transverse serial sections, and are summarized in the Table. All the differences between the haploids and diploids there shown are significant.

We agree with FANKHAUSER³ who suggested, as a result of his studies on haploid salamanders, that there is a tendency for haploid organs to compensate for small cell size by an increase in cell number. However, it was found

that the haploid pronephric system in *Xenopus* not only compensated, but over-compensated. Our figures show a 16% superiority in total cell volume in haploids and a corresponding increase of 140% in cell numbers. Comparable figures for hypertrophied and hyperfunctional *Triturus* diploid pronephros² were 34% and 17%.

Thus we feel justified in suggesting that, since the pronephric system of non-oedematous haploid tadpoles is hypertrophied and possibly hyperfunctional, the oedema so often seen in haploids may not, in fact, be caused by kidney dysfunction, but rather by failure to cope with a quite exceptional functional demand.

Zusammenfassung. Eine morphologische Untersuchung des Vornierensystems in haploiden und diploiden *Xenopus*-Larven weist darauf hin, dass das haploide Oedem nicht durch eine Funktionsstörung des Vornierensystems verursacht ist.

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¹ A. DALCQ, Arch. Biol. Liège et Paris 43, 343 (1932).

² H. FOX, J. Embryol. exp. Morph. 4, 139 (1956).

³ G. FANKHAUSER, Quart. Rev. Biol. 20, 20 (1945).

Measurements and calculations of various components of the pronephric system of diploid and haploid larvae of *Xenopus laevis* (five animals in each group)

	Pronephros diploid	haploid	Pronephric duct diploid	haploid
Mean antero-posterior length (mm)	0.243 ± 0.0099	0.279 ± 0.0124	0.562 ± 0.0160	0.436 ± 0.0310
Mean nuclear population	1337 ± 57	3159 ± 257	276 ± 7	793 ± 43
Mean total volume of cells ($\text{mm}^3 \times 10^{-3}$)	3.2 ± 0.21	3.7 ± 0.33	0.37 ± 0.020	0.60 ± 0.044
Mean total volume of lumina ($\text{mm}^3 \times 10^{-3}$)	1.5 ± 0.11	2.5 ± 0.14	0.21 ± 0.011	0.49 ± 0.062
Mean internal surface area of lumina (mm^2)	0.2236 ± 0.01521	0.2450 ± 0.01679	0.0415 ± 0.00117	0.0604 ± 0.00522
Mean volume of individual cell (μ^3)	2419 ± 128	1194 ± 79	1353 ± 76	761 ± 49
Mean anterior-posterior nuclear length from horizontal section (500 pronephros, 200 duct) (μ)	8.87 ± 0.051	6.59 ± 0.047	8.59 ± 0.078	6.35 ± 0.070
Mean nuclear diameter from transverse section (800) (μ)	6.56 ± 0.021	5.18 ± 0.017	6.54 ± 0.023	5.18 ± 0.017
Calculated nuclear volume (μ^3)	300	139	290	134
Calculated nucleo-cytoplasmic volume ratio	0.142	0.132	0.273	0.214
Calculated nuclear surface area (μ^2)	250	149	243	145
Calculated volume (μ^3) of cytoplasm/1 μ^2 nuclear surface	8.5	7.1	4.4	4.3
Calculated length/breadth nuclear index	1.352	1.272	1.313	1.226