297P MONOCULAR DEPRIVATION ENHANCES CITRULLINE CONTENT IN THE LATERAL GENICULATE NUCLEUS OF NEW-BORN RATS AND THIS IS PREVENTED BY N^{ω}-NITRO-L-ARGININE METHYL ESTER (L-NAME)

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In mammals, monocular deprivation (MD), during early postnatal development, causes cell shrinkage and decreases the number of Y cells in the lateral geniculate nucleus (LGN), leading to loss of visual responses in cortical neurones and reduction in visual acuity (Rauschecker, 1991). We have recently shown that MD for 2, 7 and 14 days produces apoptosis in the LGN of new-born rats and this is prevented by L-NAME, an inhibitor of nitric oxide synthase (NOS) (Nucci *et al.*, 1998). Here we report that, under similar experimental conditions, MD for 24 h and 48 h increases LGN content of citrulline, the co-product of nitric oxide (NO) synthesis, and this is abolished by treating the animals with L-NAME. The right eyelids of Long Evans new-born rats (post-natal day=14 (P14); 20±5 g; n=6 per group) were sutured for 24 h, 48 h and 7 days. Age-matched, non-deprived rats (n=6 per group) were used as control. Test groups received injections of L-NAME (3mg/kg^{-1}, i.p. twice daily during MD), or of D-NAME (same treatment schedule), a less active inhibitor of NOS. The LGN levels of citrulline were determined by high-performance liquid chromatography (see Bagetta *et al.*, 1995) and expressed as nmol of citrulline/g of wet tissue weight. The resulting means±s.e.m. from MD and control rats were evaluated statistically for differences. As shown in table 1, LGN citrulline levels increase in control rats from P15 to P21, in agreement with previous data indicating that, in the LGN, mature NOS expression is achieved at the third postnatal week (Bertini and Bentivoglio, 1995). MD for 24 and 48 h enhances LGN concentrations of citrulline by 47% and 32% respectively ($p<0.05$ vs control), suggesting that MD induces excessive NO accumulation in the LGN of new-born rats, and this may be implicated in the mechanisms of MD-evoked apoptosis. In accordance to this hypothesis, treatment with L-NAME, but not with D-NAME, reduces the increased levels of citrulline (present data) and prevents MD-induced apoptosis (Nucci *et al.*, 1998). After 7 days of MD the citrulline content does not differ from control, suggesting that early NO accumulation induced by 24 and 48 h of MD may trigger biochemical alterations leading to the expression of MD-induced apoptosis in new-born rats.

Table 1: Citrulline content in the LGN of new-born rats

	24 h (P15)	48 h (P16)	7 days (P21)
Control	124±7	138±12	178±11
MD	182±7*	182±10*	177±10
MD+L-NAME	153±8	140±7	
MD+D-NAME	175±5*	169±6*	

*$p<0.05$ vs age-matched controls (Student's "t" test)

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298P A COMPUTER-BASED INTERACTIVE TUTORIAL TO TEACH THE PHYSIOLOGY AND PHARMACOLOGY OF THE NEUROMUSCULAR JUNCTION TO UNDERGRADUATE STUDENTS

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Computer-based learning is now a feature of most undergraduate courses and is used to support or even substitute for traditional lectures and laboratory classes. Here we demonstrate a computer-based interactive tutorial covering the essentials of the neuromuscular junction. Learning by this method is non-intimidating, is independent of time and place, may be self-paced and may take place either individually or in small groups. It is designed for undergraduates from a range of courses e.g. medicine, pharmacology, physiology and the biosciences.

The program is divided into several sections:
Introduction which gives an overview of content and approach of the program;
Neuromuscular Transmission which uses animated stepwise sequences to describe synthesis of acetylcholine, transmitter release mechanisms, action of acetylcholine at receptors and transmitter inactivation;
Acetylcholine Receptors which describes the function of and action of acetylcholine at both pre- and post-synaptic nicotinic receptors;
Pharmacology which gives examples of, and describes the characteristics and mechanism of action of depolarising and non-depolarising neuromuscular blocking agents and anti-cholinesterases;
Clinical Aspects which covers the clinical use of neuromuscular blocking agents and anticholinesterases (particularly for treatment of myaesthenia gravis). This section describes how depth of blockade may be monitored, and the pharmacokinetics, characteristics, side-effects and drug interactions of clinically used drugs.

It was developed using Multimedia Toolbook ® (Asymetrix) to run on IBM PC compatibles, capable of running Windows™ version 3.1 or better (Microsoft), with a 256 colour VGA monitor and a mouse.

The approach is to combine succinct textual/factual descriptions with graphics and to use features such as animation and hotwords where appropriate. Hotwords function either to define terms which may be unfamiliar to the student or to provide additional, sometimes more detailed or advanced, information. Some experimental data which illustrates the different actions of neuromuscular blocking agents in animal models is also used. The program contains numerous self-assessment questions e.g. multiple choice and true/false questions with feedback, drag and drop exercises (to test e.g. knowledge of stepwise sequences), and clinically-related scenarios. These are designed primarily to promote and reinforce learning rather than to test students.

It is estimated that the program would occupy students for perhaps three to four hours of self-directed study. It could be used for revision, primary learning or as a tutorial aid.