

Session O-1.1 – Nervous System I: Development.**O-1.1.1 MORPHOMETRIC STUDY ON THE BRAIN EXPANSIVE PROCESS IN MAM-MALEMBRYOS**

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During the morphogenesis of the embryonic brain the expansive process of the anterior portion of the neural tube in the early stages of development is an essential phenomenon.

The bibliographical review shows that the previous studies are too partial.

Our objective was to carry out a global morphometric study of the expansive process of the embryonic brain during the stage in which it shows its maximum growth.

As a different growth rate was anticipated for each cerebral vesicle, something that will determine its subsequent volume and importance in the brain, the study of the volume evolution of each vesicle was made separately.

Sixty rat embryos were analyzed for this study. 10 embryos of each of the following stages: 10,7; 11,2; 11,7; 12,2; 12,7 and 13,2 days of development. They were classified according to the development degree, following the series of morphologic parameters described by Brown and Fabro in 1981.

They were all processed and divided into sections in order to estimate their volumes. But, in addition, due to our special interest in determining the volume of each cerebral vesicle separately, an additional step was included. This consisted in drawing on a paper the intervesicular limits on every histological section by using a *camera lucida* connected to the optical microscope.

The growth pattern of the brain and the cerebral vesicles was established during the fast growing period subsequent to the end of neurulation.

The cerebral fast growing stage, so far only described on chicken embryos, is also present on rat embryos, what suggests that it is a morphometric mechanism common to the early embryonic brain development in all superior vertebrates.

During this period a biphasic behaviour was detected. There was a first period of relatively slow growth, found between the days 10,7 and 11,7, mainly due to the cavity. The second period was of fast growth, between the days 11,7 and 13,2, due to the growth of the wall and the growth of the cavity. This is noticed either in the evolution of the global values, as on the values of each vesicle separately.

The brain growth is caused by the cavity expansion better than by the growth of the neuroepithelial wall. However, the relationship between both components appears to follow a specific pattern on each cerebral vesicle.

Moreover, the growth it will show appears to be determined by the functional importance of each part of the encephalon in the adult animal.

O-1.1.2 ONTOGENY OF TYROSINE-HYDROXYLASE mRNA EXPRESSION IN MID- AND FOREBRAIN: NEUROMERIC PATTERN AND NOVEL POSITIVE REGIONS

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Tyrosine hydroxylase (TH) is the rate-limiting enzyme in the synthesis of catecholamines and thus critical in determining the catecholaminergic phenotype. In this study we have examined the expression of *TH* mRNA by in situ hybridization in the embryonic mouse forebrain and midbrain and have mapped its localization according to the neuromeric pattern. We find that early in embryonic development, 10 to 12 days post-coitum (dpc), *TH* mRNA is expressed in ample continuous regions of the neuroepithelium, extending across several neuromeres. However, from 12.5 dpc onward, the expression becomes restricted to discrete regions which correspond to the dopaminergic nuclei (A8 to A15). In addition to these nuclei previously described, *TH* mRNA is also observed in regions which do not express this enzyme according to immunohistochemical studies. This difference in relation to protein expression pattern is consequent with the known posttranscriptional regulation of TH expression. The most representative example of novel positive region is the conspicuous mRNA expression in both medial and lateral ganglionic eminences. This result agrees with reports describing the capacity of striatal stem cells (that is, located at the lateral ganglionic eminence) to become dopaminergic in vitro. Other regions include the isthmus mantle layer, and the early floor plate of midbrain-caudal forebrain. On the whole, the expression map we have obtained opens new perspectives for evolutionary/comparative studies, as well as for therapeutic approaches looking for potentially dopaminergic cells.

O-1.1.3 NEUROGENETIC PATTERNS IN THE CHICKEN OCULOMOTOR AND TROCHLEAR NUCLEI

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The tritiated-thymidine autoradiographic method was employed to analyze neuronal birthday patterns across the oculomotor (III) and trochlear (IV) nuclei in the chick. Earlier results from this laboratory mapping in toto with acetylcholinesterase earliest differentiating neurons were corroborated as regards the stages in which earliest III and IV neurons appear (stages 15 and 17, respectively). Particular emphasis was dedicated to examine possible neurogenetic gradients. Along the longitudinal axis, a rostrocaudal gradient was clearly present for the III nuclear complex (earliest born neurons rostral) as a whole and also within each of its sub-nuclei. In contrast, the IV nucleus showed a very rough rostrocaudal difference, difficult to understand as a gradient. In addition, at least the Edinger-Westphal subnucleus of the III displayed as well a clearcut lateromedial neurogenetic gradient, which can be interpreted topologically as a dorsoventral gradient. These patterns are discussed within the context of molecular mitogenic and patterning effects known to spread from the midbrain-hindbrain boundary, as well as from the respective floor plate portions.

O-1.1.4 GENE EXPRESSION PATTERNS IN THE ALAR PLATE OF THE PRETECTAL REGION

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The molecular specification process of the different domains in the alar pretecal region involves the combinatorial expression of distinctive genes. Sets of genes expressed differentially reveal field subdivisions from early stages of differentiation and frequently can be followed into the specific cell populations that characterize adult structure. We constructed a molecular expression map of the chicken pretecal region with the aim to corroborate or identify specific histogenetic regions and their respective neuronal derivatives.

We mapped by situ RNA hybridization the genes *Dbx1*, *Dac2*, *Chi1*, *Pax6*, *Foxp1*, *Foxp2*, *Six3*, *Pax7*, *Meis1* and *Reelin* in chick embryos from stages HH10 until birth. We also performed immunohistochemical detection of *Pax7*, *Pax6* and *Reelin* proteins. In some cases we added counterstaining to recognize better the morphological elements in the mantle zone.

The analysis of these gene patterns corroborates the existence of three differentiated alar regions inside the pretecal region. 1) *Commissural pretecal*: this pretecal region delineates the route of axons ingressing or exiting the posterior commissure and lies at the caudal limit with the mesencephalon. *Pax7* is characteristically expressed throughout its ventricular and mantle zones. *Pax6* is also expressed in this domain, but only in the ventricular and periventricular. *Foxp2* is expressed selectively in a superficial neuronal population in the commissural pretecal region. 2) *Juxtacommissural pretecal*: this intermediate region immediately in front of the posterior commissure fibers is characterized by the expression of *Foxp1*, *Six3*, *Chi1*, *Dac2* and *Reelin* in its neuronal derivatives, distributed into deep, intermediate and superficial components. 3) *Precommissural pretecal*: this region reaches rostrally up to the thalamus. It is characterized by the expression of *Foxp2*, *Meis1* and *Reelin*. *Dbx1* is expressed in all three pretecal domains.

These patterns bear upon the relative proliferative origin and migration patterns of all the pretecal nuclei described long before in the literature, and identified some additional pretecal cell populations that had remained unknown until now.

Session O-1.2 – Nervous System II: Development, plasticity and connections of the cerebral cortex.

O-1.2.1 LACK OF EXPERIENCE-MEDIATED DIFFERENCES IN THE IMMUNOHISTOCHEMICAL EXPRESSION OF BBB MARKERS DURING THE POSTNATAL DEVELOPMENT OF THE RAT VISUALCORTIX

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External inputs are an essential requirement in the modelling of the visual cortex, mainly during the critical period, when congruous blood supply is needed. The blood-brain barrier (BBB) function regulates the passage of substances between blood and the brain parenchyma, which is one of the main differential features of central nervous system microvessels. The endothelial barrier antigen (EBA) has been reported as a specific marker for the BBB physiological function in rats.

We studied the postnatal development of cortical vascularization and EBA expression in the visual cortex of rats reared under opposite paradigms of visual experience: standard laboratory conditions (S), dark rearing (DR), enriched environment (EE) and dark reared rats in conditions of enriched environment (DR-EE) at 14, 21, 28, 35, 42, 49, 56 and 63 days postnatal (dpm). Paraffin embedded sections were immunohistochemically processed by EBA monoclonal antibody and the total vasculature was quantified by Lycopersicon esculentum (LEA) lectin histochemistry.

No qualitative differences were found between experimental groups, although quantitative differences were recorded that paralleled differences in vascular density. LEA expression was positive in the whole microvascular network at all ages, whereas some capillaries remained unstained for EBA, (90% at 14 dpm, 25% at 21 dpm and 3-7% from 28 dpm upwards). Vascular density underwent slight increases over the course of postnatal development in all groups, but quantitative differences were found from the beginning of the critical period. In DR rats, vascular density was lower starting at the 4th postnatal week but was significantly lower starting at the 5th postnatal week. EE rats showed similar but opposite behaviour, as vascular density was higher than in controls. Greater differences were recorded and also appeared earlier in the critical period, at the 4th postnatal week. We have not found that EE in dark reared rats promotes vascular density increasing and no quantitative differences were found between DR and DR-EE groups.

The vascular density on the visual cortex is modified by different conditions of visual experience and not by exposure to EE in darkness. This does not however influence the maturation of the BBB function.

O-1.2.2 IMMEDIATE EARLY GENE AS A METHOD TO STUDY THREE SHORT-MIDDLE AND LONG-LIGHT-WAVELENGTHS IN RATS

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c-Fos became a prototypical immediate early gene product to be used as an almost universal neuronal activity marker and to be involved in processing of information (or even underlying widespread plastic changes) in learning. In this study, we have used c-Fos expression to analyze neuronal stimulus, in order to use electroretinogram and behavioural tests, amply used in most of studies. We have characterised the c-Fos expression patterns in visual cortex of young rats stimulated by three different visual environments, using three visible bandpass filters, from the moment of their birth until 3 weeks after the time they open their eyes. Results show different immunocyto-

chemical patterns in visual cortex, depending on the characteristics of the stimulus. Despite most authors report a dichromatic vision in rats, with blindness to red light, we have found that there should be some red-light vision, especially in those who were living in a green-light visual environment.

O-1.2.3 NUMBER OF SYNAPTIC BOUTONS ON THE AXON INITIAL SEGMENT OF PYRAMIDAL NEURONS OF RAT INFRA-GRANULAR NEOCORTICAL LAYERS

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Herein we examine the axon initial segment (AIS) of typically and inversely oriented pyramidal neurons (TP and IP neurons, respectively) of the cortical infra-granular stratum. TP neurons were labelled after biotin dextranamine injections delivered into cerebral cortex. IP neurons were either Golgi-impregnated or filled with biocytin. Their AISs were subsequently reconstructed on drawings made from serial electron micrographs. Fully reconstructed AISs were: three of TP neurons with axon projection from area 18 to ipsi-lateral area 17, two of TP neurons with projection from area 17 to contra-lateral area 17 and eleven of IP neurons with unidentified axon projection. The cell bodies of nine of the latter neurons lay in areas 17-18 and the remaining in the pre-central motor cortex. The results show that the studied neurons can be subdivided into types and subtypes concomitant with axo-dendritic traits. TP neurons had few synaptic boutons on the thickest, shortest and straight-most AISs of all here-studied neurons. Within this cell type, ipsilateral-projection TP neurons had more synaptic boutons on their AISs (average, 21; range 20-22) than callosal-projection TP neurons (average, 15.5; range 15-16). In turn, synaptic boutons on IP-neuron AISs ranged between 11-37, the precise number varying with the AIS-origin site at the parent cell body. Thus, the number of boutons on AISs sprouting from apical dendrites typically would range between 11-18 (these AISs were the thinnest AISs of all here-studied neurons), whereas 21-29 and 31-37 boutons were respectively featured by AISs coming out from cell-body flanks either basal or lateral. AIS thickness and length were found to increase from the first of these IP subtypes to the next in said order. The functional significance of these findings must be further investigated, though indeed it deals with unique axon potential modulation endorsed by the combination of cell type and radial and areal location in the cortex.

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O-1.2.4 LONG-RANGE PROJECTION NEURONS IN THE SUBPENDIMAL ZONE AND ADJACENT WHITE MATTER IN RABBITS

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There are prenatally generated cells that express MAP2 in the ependimal and subependimal zones (EZ y SEZ, respectively) of young rabbits (Reblet et al., 2003). The aim of this study was to ascertain whether such neurons are the source of long-range axon projections. Rabbits aged about 2 postnatal months received pressure or iontophoretic injections of 0.2-0.4 μ l 1% CTb in one of the following cortical areas: primary somatosensory (SI), primary visual (VI), somatosensory-visual rim (S-V), anterior limbic (24b) and precentral, both medial (PrCM) and lateral (PrCL). The insular claustra of two additional animals were separately injected. All cortical injections yielded retrograde labelling of neurons placed in the white matter (WM) between the antero-lateral SEZ and the insular claustrum. After injections in 24b and PrCM, the number of WM labelled neurons in there was higher. Furthermore, some neurons were retrogradely labelled in the SEZ but only following 24b and PrCM injections. Beneath these latter injections we found labelled axons that proceeded towards the caudatus, in which they formed extensive terminal fields. Interestingly, some of these axons reached the subjacent lateral ventricle, wherein some ependimal-like cells were retrogradely labelled in a restricted area of the EZ. Claustral injections labelled fewer neurons at the WM. The results show for the first time that the axons of a number of WM neurons proceed to the cerebral cortex (in particular to the limbic cortex) rather than to the thalamus as reported before. In addition, other neurons at the antero-lateral SVZ have long-range axon projection to the limbic cortex.

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O-1.2.5 LAYER I OF THE CEREBRAL CORTEX IS MASSIVELY INNERVATED BY THALAMIC AXONS

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“Non-specific” thalamocortical projections to layer I (TCI) of the cerebral cortex have been cited as the likely structural substrate for the synchronization of large ensembles of neurons across widespread cortical territories (Llinás, 1997). The origin of TCI axons is unclear: they have been supposed to originate either from nuclei in or nearby the internal medullary lamina (Herkenham, 1986) or a widely dispersed population of thalamic neurons (the thalamic matrix, Jones 2001). However, the precise origin and relative anatomical weight of this projection has not been systematically investigated to date in any species.

In 31 adult rats we placed small or large epiplial deposits of fast-blue (FB) or diamidino-yellow in several cortical areas, to label TCI neuron somata. In some cases, thalami were immunolabeled against calbindin. In 12 further rats, iontophoretic microinjections of BDA (10Kd) were made in selected nuclei. Sections were examined using transmitted light, conventional and confocal epifluorescence microscopy.

Small (1-2 mm²) layer I areas are innervated by several thousands of thalamic neurons. Moreover, these neurons are located in many different nuclei throughout the thalamus. Some TCI neuron populations innervate remarkably widespread territories of the cerebral hemisphere, which encompass multiple, functionally disparaged areas. These TCI cells are mainly found in three regions: a) a ventral strip including the Anteromedial, Reuniens, Ventrolateral and VM nuclei; b) the Posterior and Lateral Posterior nuclei; and c) the ventromedial regions of the medial geniculate complex. In addition, large numbers of neurons in nuclei such as the Mediodorsal, Dorsal Lateral Geniculate, and Anterior contain neurons that innervate to layer I, although their axons remain restricted to a particular functional area.

Remarkably, anterogradely traced axons from LP and VM form a dense and non-homogeneous subpial meshwork. Unlike in primates, there is no strict colocalization of calbindin to TCI neurons.

Our study reveals an unexpectedly robust and widespread set of thalamic axons reaching layer I of the cerebral cortex. The anatomical organization of TCI neurons is consistent with a massive, divergent-and-convergent input from the thalamus onto the apical tufts of distal dendrites of cortical pyramidal neurons.

Session O-1.3 – Biomechanics.

RELATIONSHIP BETWEEN BODY COMPOSITION AND BIOCHEMICAL PROFILE IN A JUNIOR WEIGHTLIFTER DURING AN INTERNATIONAL CHAMPIONSHIP

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INTRODUCTION: Kinanthropometry has focused mainly in punctual research of the elite athletes. Weightlifting is an essential component of the training program in most of the Olympic sports, there is very little research in this discipline; even less showing how the competition affects the profile of an elite weightlifter.

This study analyses kinanthropometric variables and biochemical profile of a Spanish weightlifter competing in the European Championships, ranked among the best 5 competitors, previously and after the contest.

MATERIAL AND METHODS: International Spanish Weightlifter in 69Kg. category, aged 18. The method selected to study Kinanthropometry data was the established by Heath and Carter, followed by the ISAK-GREC (International Society for the Advancement of Kinanthropometry-Grupo de Referencia Español de Cineantropometría, Spanish Reference Group of Kinanthropometry). Fasting blood samples obtained in the morning. Informed consent obtained as established by National regulations and legislation. Statistics analysed by ANOVA with a significance of 95% ($p < 0.05$) and data processed by the PC statistical software SPSS 11.5.

RESULTS: Body Composition prior to contest, % Fat (Carter) = 6.68%; Muscular mass = 35.38Kg; Bone mass = 11.58Kg. and Residual weight = 17,05 Kg.

Biochemical profile prior to contest divided in anabolic Testosterone = 8,67ng/dl and catabolic by CPK = 368UI/dl and Cortisol = 18,4mcg/dl.

Body Composition posterior to contest, % Fat (Carter) = 6.70%; Muscular mass = 36.52Kg; Bone mass = 10.80Kg. and Residual weight = 17,23 Kg.

Biochemical profile posterior to contest divided in anabolic Testosterone = 9,58ng/dl and catabolic by CPK = 242UI/dl and Cortisol = 20,3mcg/dl.

DISCUSSION: Body composition showed increased muscular mass and decrease in bone mass. Its relation with biochemical parameters is paradoxical, because muscle mass develops but CPK values fall into normal ranges, recovering after competition from abnormal values that indicate muscle damage before the contest, not being affected the performance indeed, though supported by anabolic parameters. Catabolic processes are increased affecting bone mass, not muscle as should had been expected.

CONCLUSION: Weightlifting competition produces decreases bone mass, not muscle damage. The reasons for this paradox remain unclear, and not sufficiently explained. More research should be done to confirm these results.

O-1.3.2 ONTOGENIC PROPORTIONALITY STANDARD MODEL. AN ADAPTATION PROPOSITION FOR THE REFERENCE STANDARD MODEL IN KINANTHROPOMETRY FOR THE STUDY OF GROWTH POPULATIONS

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The kinanthropometric proportionality has been tackled since different strategies, excelling the "Phantom" model (Ross and Wilson 1974) like approach to the population average, unisexual, adult, interracial, correctly nourished and with middle physical activity degree. This definition reveals the difficulty of compare specific samples whose ideal does not correspond to the standard model (different ages, sex, geographic regions or physiopathologic situations).

From an ontogenic perspective, the changes in size and form during the growth, originate important allometric variations, because each anthropometric variable has its own growth speed.

It present a proportionality kinanthropometric model for evaluate in the time the adjustment for an individual to the ideal proportions for his age group or mature stage, that we will denominate "Ontogenic Proportionality Standard Model", as well as the technical for obtaining another models.

Checking the anthropometric databases of the bibliography, and applying the statistic-mathematical Cox-Box technique, a method has been developed for "scalability" the traditional Phantom, allowing to compare each Z index variation according the individual is developed respect the average values corresponding in age and sex.

We obtain reference tables with average values and standard deviations, which make an "Ontogenic Proportionality Model", group, with sexual differences and changing by the age. These allow, through the calculation of relative Z, know the different change speed in each anthropometric variable inherent in the growth process and development, discriminating between effects induced by the nutritional level or physical activity degree and ontogenic variations.

The traditional Phantom model “scalability” can be applied to different concepts; in a temporary sense: allows the control of the growth, maturation and aging processes, making the “Ontogenic Proportionality Model”; in a no temporary sense allows the study of specific populations and its adaptation to the ideal model of its particular group, allowing to value geoclimatic origin (“Regional Proportionality Model”), sport performance, nutritional state, physiopathologic situation, etc.

The Phantom model does not reflect the real variability of the human condition. The “scalability” of the Phantom, creates more real models, like the “Ontogenic Proportionality Model”, offering interpretative advantages over the traditional standard model.

O-1.3.3 ARTICULAR STRESS-CONTACT ZONES AND WEIGHT TRANSMISSION IN THE C4 ARTICULAR PROCESS: A FUNCTIONAL CT, mCTAND μ FEA STUDY

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A role for cervical articular processes (AP) in weight-bearing functions has been proposed but it is unclear which parts of the cartilage-subchondral bone plate of cervical joints support high load peaks at the end phase of joint excursions according to the type of motion executed. To provide evidence which zones of the superior articular process (SAP) are involved in load absorption and transmission, we focused in this study upon the articular stress contact zones in the C3/4 joint and the simulation of weight transmission in a μ FEA model of the C4 AP.

On five volunteers (male, 3; female 2) the C3/4 joints were scanned on a helicoidal CT at ventral and dorsal flexion and combined lateral inclination-axial rotation of the neck. Reformatted 1mm serial 2D-images showing the variations in position of the bony articular surfaces were recorded and 3D-reconstructed. Twenty C4 AP (seventeen male/ three female, 76 +/- 11 y) were scanned with a μ 40 CT, at a resolution of 36 μ m. 3D-metric (BV/TV, Tb.Th, ConnD) and nonmetric (SMI, TBPf, DA) indices assessed the state of trabecular architecture and those samples with best indices were used for construct the μ FEA models. In the μ FEA models simulations were made under appropriate constraint conditions.

Functional CT: In ventral flexion, the joint space is narrowed in its anterior part and opened in the posterior one, while the opposite situation is observed in dorsal flexion. In lateral flexion coupled with axial rotation both joints showed a narrowing of the medial zone of the joint space but in the ipsilateral joint, a central contact zone was observed.

μ CT: Subchondral trabeculae end mostly in the anterior and inferior walls of the AP. In the medial part of the AP, trabeculae end on a dense trabecular zone, suggesting important translation force moments.

μ FEA: von Mises stresses show high peaks in posterior, central and inferior trabeculae of the AP, the degree of which varies depending of the simulated end phase. The correlation between the articular contact zones and the force transmission zones provided experimental evidence for a different weight-bearing function of the C4 AP as to the vertebral bodies.

Session O-1.4 – Variations, Alterations and Dysfunctions of the Musculoskeletal System.

O-1.4.1 COMPARATIVE ANATOMY OF THE SUBACROMIAL VAULT IN HUMANS AND IN AFRICAN GREAT APES

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In the present study we have compared three anatomical parametres (morphology of the acromion, surface of the subacromial vault and the tilting angle of the acromion) in relation to the morphology of the subacromial space in human scapulae and in African great apes (chimpanzees and gorillas), with the aim of obtaining information about the origin of the impingement syndrome. This syndrome, a lesion in the supraspinatus tendon at the level of the subacromial vault, is considered the most frequent degenerative pathology affecting the human shoulder. This pathology has not been described in African great apes although these present a scapular anatomical pattern similar to that of humans since the three species belong to the group of orthograde primates. The main results obtained indicate that: a) African great apes present a hooked morphology of the acromion (Bigliani’s acromion type III), which is very infrequent in humans and whose presence has been suggested by some authors as a possible ethiopathogenic cause of impingement syndrome in humans; b) there are no statistically significant differences between the surface of the subacromial vault in humans and in African great apes that can account for the higher frequency of the impingement syndrome in humans related to a reduced space for the supraspinatus tendon; c) the tilting angle of the acromion is significantly larger in humans than in African great apes, a reduction of this angle has been suggested as an ethiopathogenic cause of the impingement syndrome in humans. These results support the theory of those authors that claim that the ethiopathogenic causes of the impingement syndrome in humans originate in the primary degeneration of the supraspinatus tendon rather than in the morphological details of the structures surrounding the subacromial vault.

O-1.4.2 HISTOMORPHOMETRIC EVALUATION OF OSTEOPOROTIC BONE FOLLOWING TREATMENT WITH GROWTH HORMONE AND OESTROGEN

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Osteoporosis is directly related to the female sex and advanced age. The oestrogen deficit that appears with menopause is one of the factors, although not the only one, which favours it, as demonstrated by the fact that this pathology also appears in men, although to a lesser extent.

In elderly people of both ages there is a progressive decrease in the growth hormone, which could be another contributing factor to osteoporosis.

With this background, our study assumed that bone quality in osteoporosis would improve following treatment with GH and/or oestrogen.

We used adult rats broken down into two initial study groups: a control group that remained unchanged throughout the entire experiment and another group that was ovariectomised. After 18 months the ovariectomised rats were divided into four subgroups: one ovariectomised group that received no treatment; another group treated with 2 mg/Kg/day of GH; another group treated with 150µg/week of estradiol valerianate, and the last group which received a combination of the two treatments. They received the treatment for two and a half months. They were then sacrificed and a histological and histomorphometric study conducted of the proximal metaphysis of the tibia.

The results showed that the histological appearance of the cortical bone is similar in all of the rats. The trabecular bone is more abundant and longer in the control group and in the group with both treatments.

The histomorphometry showed that the cortical bone area was similar in all groups, except the one treated with GH which was significantly larger. The trabecular bone area was lower in all groups, except that treated with both hormones which had values similar to those of the control group.

Based on these results, we concluded that the combined treatment with both hormones leads to improved bone quality, with the trabecular bone recovering to levels similar to those of the control group.

O-1.4.3 EVC KNOCK OUT MOUSE AS A MODEL TO STUDY THE MECHANISMS OF SKELETAL DYSPLASIA IN ELLIS-VAN CREVELD SYNDROME.

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Ellis-van Creveld syndrome (EvC, OMIM 225500) is an autosomal recessive disorder characterized by disproportionate short stature, narrow thorax, postaxial polydactyly, dysplastic teeth and nails and congenital heart defect. Patients with EvC have mutations in *EVC* or *EVC2*, two novel genes that lie in a head-to-head configuration on the short arm of chromosome 4. In order to study the mechanisms and molecular basis underlying the morphological alterations associated with this disorder, we generated an *Evc* knock out mouse by replacing *Evc* exon1 with the sequence corresponding to the *beta-galactosidase* gene. LacZ staining performed in whole embryos and vibratome sections of gelatin embedded specimens

revealed the *Evc* expression pattern during embryonic development. LacZ expression was first detected at E12.5 dpc, rising to a maximum at E15.5 dpc and decreasing from E17.5 dpc onwards. Related to skeletal elements, reporter expression was observed in the long bones of fore- and hind-limbs, scapula, ribs, osseous part of the inner ear, frontal bone, nasal septum, mandible and jaw bone, indicating that the mutation highly correlates with the chondrodysplastic alterations described in EvC patients. To examine defects in the long bones, we carried out Alcian blue/Alizarin red staining of skeleton preparations and histological analysis of *Evc* null mice. Comparing to wild type, *Evc* (-/-) neonates are smaller, involving a shorter calcified region in the ribs and in all segments of fore- and hind-limbs. Histology of the growth plate of the proximal portion of the tibia showed a reduced region of hypertrophic chondrocytes. In addition a morphological difference was observed in the tibia/femur articular region, that might be related to the "genu valgum" detected in patients. Von Kossa staining for calcified tissue evidenced a retarded induction of the periosteum surrounding hypertrophic chondrocytes in *Evc* knockout mice. These data will be discussed in the framework of recent models of endochondral bone formation.

O-1.4.4 TEMPOROMANDIBULAR JOINT DYSFUNCTION IN PROFESSIONAL SOCCER PLAYERS: ANALYSIS BY FINITE ELEMENT METHOD.

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Between 500,000 and 750,000 dento-maxillary injuries take place in the USA every year in the various sports. In the University of Tufts (Boston) the need has been recently expressed to carry out epidemiological studies in connection with injuries in the orofacial region in the various sports in order to provide adequate prevention.

Although this kind of injuries are usually related to fractures of nasal and malar bones, zygomatic and mandibular fractures and so on, few studies relate this kind of injuries to the secondary pathology of the Temporomandibular Joint (TMJ). This injuries are the origin of stiffness, oral opening enclosed, chronic pain, myalgia, headache, time and place disorientation, depression... That may be responsible for a lessening of efficiency in professional soccer players.

The objective of our work is to assess the secondary pathology of the TMJ in a group of professional soccer players and the knowledge of this pathology using the Finite Element Method.

Conclusion: TMJ examination may be taking into account to be included as a routine examination in professional soccer players.

O-1.4.5 SOMATOTYPE AND BODY COMPOSITION OF YOUNG SPANISH FOOTBALL PLAYERS. VARIATIONS IN THE COURSE OF THE SEASON.

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The variations of the somatotype and body composition of young Spanish football players (12-17 years) in the junior teams of the Real Zaragoza SAD measured between the beginning and end of the season have been studied.

The average of height, weight and diameters are over the same in general population and age. The fat percentages decrease from the category, 12-13 years (10.47 ± 2) to the category, 15-16 years (10.16 ± 1.6) increasing in category, 17-18 years (10.34 ± 1.2) to values near of professionals (10.32 ± 0.9). During the competition the changes in the fat are produced only in category 15-16 years. The fat weight and the lean weight increase with the age (of 4.78 ± 1.2 to 7.67 ± 1.3 of fat weight, at the age of 12-13 and of 38.98 ± 4.7 to 63.81 ± 5 , of lean weight for the same ages). The muscular and osseous components are increased from the beginning to the end of the season. The somatotype is displaced from ectomesomorph values of the category, 12-13 years and the category 15-16 years, to other less ectomorphs observed in category 17-18 years (2.3/4.7/3.3/ in the category, 12-13 years, to 2.1/4.6/2.9 in category 17-18 years). Along the season the mesomorph shows significant increases since the earliest ages.

O-1.4.6 CORRELATION BETWEEN BODY COMPARTMENTS AND AGE.

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Dual x-ray absorptiometry (DXA), which started out as a method for evaluating bone mass, has become the methodology of reference for *in vivo* measurement of corporal compartments due to its accuracy and precision. This method enables us to divide the body based on the tricompartimental model, considering the body composed of bone, fat and muscle. Given the variability of corporal composition due to age and other factors, we studied the behaviour of corporal compartments in relation to the individual's age and sex.

We took a population sample of 1.120 healthy subjects: 397 males and 723 females, ranging in age between birth and 80. We broke the sample down by sex into fifteen-year age groups, forming 16 different groups. After calibrating the equipment, a full body densitometry was conducted to obtain the average estimated values of the following variables: bone mineral content (BMC), soft non-fat tissue or lean mass (LM), fat mass (FM) and total soft tissue mass (TSTM), which includes lean mass and fat mass (LM+FM). We analysed the correlations in both men and women between the densitometry variables among themselves and those which occur with age, calculating the Pearson correlation coefficient and its statistical significance. The interdependencies found were very similar in both sexes for TSTM-BMC, TSTM-LM and TSTM-FM ratios. The behaviours for which we found the lowest ratios were LM and FM. The BMC-FM ratio is higher in women, while the strongest relationship in men is between BMC-LM. The age correlation of BMC, LM and TSTM is seen up to the age of 20 in men and up to the age of 15 in women. The FM correlates with age only up

to the age of 5 in men. In women, there is a positive correlation which is prolonged through the age of 15, the age associated with menarche.

Session O-1.5 – Anatomy Teaching I.

O-1.5.1 A BEHAVIOURIST ALGORITHM FOR LEARNING AN INSTRUMENTAL SUBJECT: ANATOMY.

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Introduction: New social demands are leading students to be considered as professionals, which obliges them to make decisions regarding their learning. Furthermore, society is becoming more and more critical of the failure rate in schools as it can be interpreted as misuse of public funds.

The traditional way of teaching Anatomy is based on a behaviourist algorithm, which consists of a theory class, followed by study, a practical class and finally assessment, which, if positive, enables the credits to be granted. Tutorship is on demand. If the qualification is not obtained, the process must be repeated.

On the basis of the traditional algorithm, we developed a new one in which students must make decisions on their degree of training. The aim proposed is for at least 95% of students to achieve accreditation with this method.

MATERIALAND METHODS: The study was carried out in second year students of Medicine, in the assessment examination on viscera and the results were compared with those obtained in first year. The algorithm begins with the theory class, which gives rise to a loop comprising a practical class and study on a database. Both are subject to self assessment. The practical class is co-tutored by students in rotation. The database is located in the Anillo Digital Docente (Digital Teaching Ring) website of the University of Zaragoza. Continuous assessment then takes place, enabling students to return to the previous stage or move on to qualification. Tutoring is on demand. At the end of the process a test was carried out to measure the students' level of satisfaction.

RESULTS: 96% obtained the credits. In the satisfaction test, 80% of the students answered that the results/work ratio was greater in second year.

CONCLUSION: We believe that greater student participation in decision making, together with strict selection for access to Medicine studies are two very important variables that have influenced our results.

O-1.5.2 INTERACTIVE DICTIONARY OF NEUROANATOMICAL TERMINOLOGY: A MULTIMEDIA RESOURCE FOR THE TEACHING-LEARNING OF THIS MEDICAL DISCIPLINE THROUGH PLAY.

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The European Union is currently undergoing a process of reforming the structure and organisation of its University degrees towards the creation –before 2010– of a *European Area of Higher Education (EAHE)*, which will in turn contribute to the consolidation of a knowledge-based Europe.

Accordingly, faced with the challenges and changes in the teaching-learning process of the Spanish University system, we must introduce new strategies and greater creativity in the ways teaching is done that focus on the students themselves as agents in this process of European convergence. In this sense, the incorporation of information and communications technologies into education provides a useful and attractive resource for the teaching of any discipline in the medical field. It is also well known that along history play is a fundamental aspect in the development of any individual, providing an incentive through which students can consolidate their knowledge and learn new contents.

Here we describe an informatic application (IT), for interactive consultation, offering the most relevant terminology used in the field of Neuroanatomy that facilitates, motivates and helps the understanding of this discipline.

The multimedia material was generated using the following programs:

- Dreamweaver, versions 3 and 4, used to compile the different pages both of the dictionary and of the games.
- Editplus 2- Notepad, used for programming in Javascript associated with the pages and for handling the definitions in XML format and DTD files.
- Photoshop: version 6, for the design of images and buttons.
- Macromedia Flash MX: for the design of animations and puzzles.

Microsoft Office (Excel and Access): version XP, for the configuration of definitions in XML format.

Students improve their attention to the curricular contents presented in IT formats. These activities capture their interest and stimulate them to achieve the goals set by the teacher. The reason for this could lie in the fact that the younger generation has grown up in a highly technological world in which visual and auditory stimuli predominate over the written word.

O-1.5.3 DEVELOPMENT OF AN OPEN SOFTWARE TO VISUALIZE ANATOMICAL SLICES AND CORREGISTERED 3D SURFACE MODELS. ANALYSIS OF THE OCULOMOTOR AND VISUAL SYSTEMS.

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In the last few years several multimedia programs have been introduced to the interactive study of anatomy. In relation to the nervous system, specific software has been developed to facilitate medical education training in sectional neuroanatomy, as well as to understand the spatial configuration of anatomical structures through 3D synthetic models. Recently, the analysis of the human brain morphology and functional anatomy using pre-designed 3D QuickTime VR scenes can also be interactively explored. However, most of these programs are closed and have

no free navigation support. In addition, some of their last versions use complex rendering techniques with high graphical workstation requirements, which make the practice of interactive sessions in standard PC's difficult.

Based on our own experience in the UB-Brain project, our group of Virtual and Simulated Anatomy is developing an open 3D visualization software, i.e., not restricted to the representation of a single anatomical region or functional system. The application will be externally configured, by means of different text files defining the elements of the graphic scene. The program, developed in visual C and active X technology under windows platforms, will contain a 3D-viewer and will simultaneously support two types of graphic elements: (1) images of any modality –anatomical, MRI, TC– oriented in the three spatial orthogonal planes: axial, coronal and sagittal; and (2) surface solid models defined by triangle polygonal meshes, aligned with the images. These anatomical models can be associated with a short description displayed in a text box. The functionality of the program is being tested with the modelling of the oculomotor and visual systems, which components have been identified from magnetic resonance images. This software can represent a powerful tool in experimental morphology, sectional anatomy and surgical planning.

Supported by Gabinet d'Avaluació i Innovació Universitària (Universitat de Barcelona, project 2003PID-UB/26) and Departament d'Universitats, Recerca i Societat de la Informació, Generalitat de Catalunya (project 233 MQD).

O-1.5.4 BLENDED-LEARNING STRATEGIES: A NEW TOOL FOR HUMAN ANATOMY TEACHING.

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The introduction of new computing technologies applied to teaching has meant a revolution in the methodology used for Human Anatomy teaching, with new tools that add to traditional teaching in both the classroom and the Dissection room. This fact, along with the need to adaptation to the EEES directives, demands a deep thought about teaching programs and methods that have been used up to now.

“Blended learning” can be a useful strategy for Anatomy teaching, adapted to the EEES. This teaching method is based on a blending of traditional methods and strategies that are characteristic of “e-learning”, so as to make active learning easier, to reduce the classroom time, and to improve or maintain students' level of achievement and long-term knowledge.

This essay compares the results that were obtained, when teaching Anatomy of the Locomotive System to two similar groups of students of the degree in Biology of the Universitat Pompeu Fabra. In one of these groups (BL group; n = 74), blended-learning strategies were used, in the other, (TT group; n = 66), we kept to traditional teaching, together with additional materials available through the web. Both groups were assessed using the same tests: multiple choice test, trial test and practical test.

The average grades showed differences that were statistically significant (BL 5,93 vs TT 5,1). The percentage of students that passed the tests from the first, was higher in the BL group (88% vs 76%), and there was a lower incidence of students that did not sit the exams in this same group (4% vs 13%). Satisfaction surveys were made, and showed an increase in the overall satisfaction with teaching methods (BL 7,6 vs TT 7,1).

In short, the use of blended-learning strategies has been proved to be better than traditional methods for Human Anatomy teaching.

O-1.5.5 ROLE OF ANATOMY AND EMBRYOLOGY IN THE REORGANISATION OF DIPLOMA (SHORT DEGREE) COURSES IN HEALTH SCIENCES.

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We are currently actively involved in the reorganisation of all the syllabuses of the different Health Sciences. The approach varies widely according to the different Universities and Degrees. From the viewpoint of Anatomy in Nursing, we would like to present some comments here about the role of the Anatomical Societies in the definition of the qualitative and quantitative roles of Anatomy in the Syllabuses of Health Science Degrees.

Starting point: The map of Anatomy in the Diploma Courses shows great quantitative and qualitative differences. We have found two main variables, which although not theoretically related, coincide in most cases. Firstly, Anatomy can be studied in an Anatomy Department or it can be included in general Departments such as Nursing. Secondly, while some Syllabuses have Anatomy as a separate subject, others include it in a larger area of study entitled Structure and Function of the Human Body. These 2 variables also imply quantitative differences, as depending on the particular University, the number of credits available can vary from 5 to 20 credits.

Perspectives for the Future: According to current plans for the Syllabus and its adaptation to ECTS credits, the subject, Structure and Function of the Human Body, will be included in the block called Basic Sciences, alongside Pharmacology and Nutrition. It is suggested that this block will have 14 attendance-based credits.

Role of Societies: If Anatomists do not take part in the definition of the role of anatomy in the new plans this could have a damaging impact on our speciality. The involvement of the Societies can play a crucial role in the definition of plans establishing the goals of Anatomy in the whole system of degrees and diplomas and in the establishment of a minimum number of credits to ensure these goals are achieved. This aim can be achieved more easily in Universities where there are specific Anatomy departments. Due to the weakness of anatomy in the common syllabus subjects, it will be necessary to complement it to ensure that it reaches the minimum number of 9.5 credits established by the 5b SAE Commission for Anatomy in Nursing.

O-1.5.6 HOW TO HELP MEDICAL STUDENTS WHO ARE FAILING ACADEMICALLY.

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In anatomical dissection, the teaching process is mediated by academic staff, often supported by advanced students in the role of tutors and/or demonstrators. The purpose of this study is to evaluate the effectiveness of a structured tutorial program for students with academic difficulties, turning them into teaching assistants.

The objectives are: 1) to encourage students to take responsibilities for their own learning. 2) to support students to correct deficiencies in their learning.

The number of students was limited for optimal interaction. Twelve voluntary medical students who have failed two or more times neuroanatomy examinations were accepted to assist anatomy faculty in the gross anatomy laboratory.

Neuroanatomy was divided into 8 units. Criteria of each tutorial session were defined previously and were provided to the students at least four days in advance. Teaching assistants met with anatomy faculty prior to each laboratory session to review structures on prosected specimens. Then, students were required to take a practical laboratory test and a written examination. Failure to attend any test or practical classes, and practical exam scores <95% during the experience would result in the student being dropped from the tutorial program. If at any time during the semester the student received a score in theoretical test <70%, they should meet with tutors and try to find out the cause of the problem. Examinations had a formative value not a summative value. Teaching assistants were required to attend at least two gross anatomy laboratories per week. By assuming the responsibility of teaching their classmates, 11/12 followed all the tutorial program. At the end of the course, students not only improve their understanding and retention of information of the topics they taught, but also as shown by the results of a questionnaire developed confidence in their abilities. Comparison of tutorial results and final results will be discussed.

O-1.5.7 HOW COULD HUMAN ANATOMY TEACHERS INTRODUCE STUDENTS INTO MORPHOLOGICAL RESEARCH?

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Human Anatomy is an essential subject in Medicine and others health careers as Physiotherapy and Odontology. Recently there has been a pressure to reduce the credit number in Human Anatomy teaching. However students can enlarge their anatomic knowledge if they collaborate as dissectors of the Human Anatomy Department and also can get credits for those tasks. The aim of this communication is to show that student collaboration with the Human Anatomy Department has important benefits. They can expand their anatomy knowledge and improve their medical curricula.

We teach the student how to dissect and to how to learn with human dissections. Afterwards we establish a protocol that shows them how to perform a scientific revision.

Students begin to dissect in the second degree when they pass the subject of Human Anatomy of Locomotor's System. Teachers instruct them how to dissect and how to learn with human dissections. Furthermore we introduce them how to begin to investigate. We have established a student protocol. When they identified a variation in the anatomical structure they search bibliography about these findings and its clinical importance. In this way we present a poster with their results.

The results of the study show that experiences with dissection in these students are always satisfactory and enhance their motivation for dissection and their clinical and scientific application.

O-1.5.8 HOW MANY EUROPEAN CREDITS (ECTS) ARE NECESSARY FOR TEACHING A STANDARD PROGRAMME OF THE LOCOMOTOR SYSTEM IN A SPANISH DEPARTMENT OF HUMAN ANATOMY AND EMBRYOLOGY?

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The Process of European Convergence definitive implantation in 2010 will carry out important changes in teaching Anatomy and Embryology in Spanish Medical Schools. Contents adaptation to this process must consider the time spent in teaching, as well as student workload to achieve the objectives of a programme. Adjusting both concepts is necessary and this requires their precise knowledge. The aim of this work was to determine what must be changed in our programmes, taking into account student's effort in learning such theoretical as practical lessons.

Ten students with the highest qualification in the University Access Exam were chosen to participate in this experience. Once a week, students were evaluated and different variables were measured in a document previously designed. Data were introduced in an EXCEL file and analyzed with EPIINFO S.1. statistical software. Mean and standard deviation for time spent by teacher and students, as well as possible correlation between them were calculated. Although a large variability was detected, lecturer spent about 1 hour for each theoretical lesson, while a student needed 1.8 hours to learn it. On the other hand, each practical session required 1 hour for teaching and 1.4 hours for learning.

The total time spent for student in learning the locomotor system programme was 386 hours, including 129 hours in attending classes, 193 for studying and 64 hours for preparing the exam. This time was equivalent to 13 ECTS. Since teaching of the locomotor system spans 18 weeks, the mean time spent by the student for this part of Anatomy was 21.4 hours per week.

This work was supported by several grants (Comunidad Autónoma de Madrid) got by 10 students who participated in this evaluation process.

Session O-2.1 – Systemic, Topographic and Clinical Anatomy.

O-2.1.1 TOPOGRAPHIC AND IMMUNOHISTOCHEMICAL STUDY OF THE JUXTAORAL ORGAN IN HUMANS

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In spite of the juxtaoral organ being first described and studied in the nineteenth century (Chievitz, 1885), especially by the Zenker group, this structure is not well known, and some aspects of its topography, structure and function have still to be established.

We dissected 10 adult corpses (in 5 cases bilaterally), which had been fixed in 15% formol. In four cases, coloured latex was injected into the primitive carotid artery, to facilitate dissection. The samples obtained were dehydrated in a graded series of ethanol and finally embedded in paraffin, and serial sections were prepared. For this study, 5 human fetuses of between 28 and 35 weeks development were used. These specimens were dissected bilaterally, extirpating tissue from the cheek. The samples obtained were fixed in paraformaldehyde at 4% and immersed in paraffin to be used in the histological and immunological study.

The juxtaoral organ had a specific location between the masseter, medial pterygoideal and buccinator muscles, close to the buccal nerve.

The histological study revealed the presence of two parts: the epithelial parenchyma and a capsule. The latter contained the vessels and nerves. Innervation of the juxtaoral organ by branches of the buccal nerve has been confirmed immunohistochemistry with antiNF (200KDa).

It is important to know of its existence so as not to confuse it with carcinomas in this region. The characteristics of the differential diagnosis between perineural invasion by carcinoma and the juxtaoral organ have been described recently (Pantanowitz and Balogh, 2003).

Work supported by Grant of Instituto de Salud Carlos III, PI03/0275

O-2.1.2 ANATOMY OF THE RECURRENT LARYNGEAL NERVE. CLINICAL IMPORTANCE.

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The location and preservation of the recurrent laryngeal nerve during thyroid gland surgery is the safest method for it not to be damaged and for paralysis of the vocal cords to be avoided. However, a good knowledge of the anatomy of the region is essential. Numerous studies have been

made of the recurrent laryngeal nerve and its anatomic variants, as well as of its relation to adjacent structures.

This study aims to provide new data on the surgical anatomy of the nerve in its cervical path. To do so, 135 surgical interventions carried out on the thyroid gland between the years 2000 and 2004 at the Hospital Universitari Joan XXIII (Tarragona) have been reviewed. Five Corpses were also dissected at the Faculty of Medicine and Health Sciences in Reus. The cervical path of the recurrent laryngeal nerve, its possible extralaryngeal division, the relation with the inferior thyroid artery or with its branches, and the number and location of the parathyroid glands observed are studied.

O-2.1.3 LUNG MORPHOLOGY AND RESPIRATORY CYCLE.

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It has been suggested that airway morphology is related to lung parenchyma structure. The purpose of this study is to describe the morphological changes that take place in the lung parenchyma and in the airways during the respiratory cycle with a view to establishing a relationship between them.

Adult Wistar rats were used to be put down at seven different points in the respiratory cycle: Inspiration, 10 and 20 cm. transpulmonary pressure, total lung capacity. Espiration, 20, 15, 10 and 0 cm transpulmonary pressure. The lungs were processed for morphometric study and bronchial and parenchymal variables, such as lung volume, number of alveoli, anatomic dead space, bronchial lumen surface and bronchial wall surface were quantified.

From the results it is established that the lung volume, the number of alveoli and the anatomic dead space increased on expiration and at high transpulmonary pressure. The bronchial lumen and the bronchial wall surfaces generally showed higher values in inflation than in deflation.

Our data lead us to consider that lung parenchyma tension and anatomic dead space increased and alveolar recruitment took place on inspiration. Quite the opposite occurred in the expiration process. The anatomic dead space was altered as a consequence of the variations in airway diameter and length. Lung parenchyma tension may have been of influence in the variations of the bronchial wall.

This study was carried out with the support of research grant from the DGA (Diputación General de Aragón) Spain.

O-2.1.4 BODY COMPOSITION AND BRONCHOPULMONARY FUNCTION IN HEALTHY YOUNG WOMEN.

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The influence of individual factors like sex, aging, height, and weight on bronchopulmonary function of healthy individuals have been described in a lot of studies.

By contrast, the role that plays the different body compartments on that function remains unclear.

Our purpose was to evaluate the influence of body composition on bronchopulmonary function of healthy young women.

We studied 20 healthy nonsmokers women aged 18-20. Bronchopulmonary function was evaluated with the parameters FVC, FEV1, PEF, and FEF 25-75, measured by forced spirometry. Total and partial values of the fat compartment, fat-free compartment, and bone compartment were evaluated by using dual-energy X-ray absorptiometry. Using the SPSS 12.0 program, we examine the statisticals of every parameter, and analyse the correlations between them.

FEF 25-75 was the spirometric variable that shows more positive correlations with body composition parameters. FVC shows positive and statistically significant correlations only with total fat free mass, and trunk fat free mass.

After adjustment for body mass index, all the significant correlations disappear, and only the FVC correlations with total and trunk fat free mass remain near the statistical significance.

O-2.1.5 STUDY OF THE SCROTAL SKIN VASCULARIZATION. SURGICAL APPLICATION IN URETHRAL RECONSTRUCTION.

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In 1997, *Gil-Vernet* described the technique of the biaxial epilated scrotal flap ("BAES-Flap") for the reconstruction of the stenoses of the male urethra.

Its design is based on the description of the cutaneous vascularization made by *Salmon* (1936), according to which the posterior side of the scrotum skin is irrigated by branches of the two superficial perineal arteries. However, there still were several doubts about the distribution of the arteries to modify the flap's length and width without endangering its vascular viability.

An anatomical study of the vessels which irrigate the scrotal skin and their distribution has been carried out and a correlation among the anatomical findings, the surgical technique basis and the results of its application in a group of patients has been established.

From the vascular point of view, it has been determined that the scrotal skin can be divided in three regions: two corresponding to both sides of the scrotum irrigated by branches of the inferior external pudendal arteries; and one corresponding to the skin of the medial line, both anterior and posterior, irrigated by the descending branches on the scrotal septum which come from the perineal arteries. These vessels run just next to both sides of the septum, just below the spongy body of urethra. All these vascular territories are connected by anastomoses among the cutaneous scrotal arteries of different origins.

Based on the vascular distribution and the clinical results, we can state that this flap does not have length restrictions and can be lifted from the posterior side of the scrotum until the anterior side which limits with the base of the penis, as long as the scrotal septum, where the vascularization runs, is included in its deep side. The flap's width can be reduced without risking its viability as the principal arteries that irrigate it come from the medial

line. Besides, the anatomoses existing among the different vascular territories of the scrotum permit a great versatility in its design.

O-2.1.6 HUMAN STEM CELLS: FUTURE STRATEGIES FOR BIOMEDICAL RESEARCH.

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The embryonic stem cells are characterized by pluripotency and plasticity, while adult stem cells are traditionally thought to be restricted in their differentiation potential to the progeny of the tissue in which they reside. In human, most adult tissues and organs contain stem cells capable of self-renewal, proliferation, and differentiation into functional progeny. These stem cells are more abundant in tissues with a high renewal rate, such as blood, epithelia, or the vasculature, and less abundant in tissues or organs with little renewal capacity, such as myocardial muscle or the central nervous system. In Europe and throughout the world, many protocols and procedures exist for the identification of different multipotent stem cell populations that are potential therapies in a clinical setting. These protocols include methods necessary for isolation, propagation, differentiation, storage, and application protocols permitting the use of stem cells and their products accordingly.

The primary goal of our research line has been the study of the mechanisms and consequent problems of proliferation and cell differentiation in general and especially in skeletal and myocardial muscle cells. We have centred on markers and gene expressions that have proven to be the key to elucidating the intrinsic mechanisms of muscle cell differentiation. We have established cultures of adult and embryonic myocardial cells, analyzing the modulation of gene expression and differentiation markers in neoplastic muscle cells (Rhabdomyosarcoma), and inducing differentiation by the use of specific agents.

Our recent results have allowed optimizing the culture conditions and manipulation of both the embryonic and adult human stem cells. This constitutes the future base of the experimentation, with the purpose of being able to carry out the differentiation directed towards cardiomyocytes of cardiopathy patient with the purpose to establish regenerative clinical therapies using these biological tools.

Session O-2.2 – Nervous System III: Circadian Rythms and Sleep. Brain Vascular System and Hydrocephaly.

O-2.2.1 SUBCELLULAR DISTRIBUTION OF DELTAOPIOID RECEPTOR ACTIVATION SITES IN GABA-CONTAINING AXONS MODULATING SLEEP IN THE CAT VENTRALORAL PONTINE TEGMENTUM.

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The ventral part of the nucleus reticularis pontis oralis (vRPO) is known to be a nodal link in the neural network involved in rapid eye movements (REM) sleep induction and maintenance. Although cholinergic mechanisms are critical in vRPO REM generation, other transmitters/modulators such as GABA or opioids are also involved. Thus, GABAergic stimulation of vRPO potently suppresses REM sleep in the freely moving cat; in contrast, morphine-vRPO microinjections increase REM sleep. These antagonistic effects in REM sleep modulation are most likely due to differential distribution of sites of action for either transmitter. To determine the functional sites for activation of delta opioid receptors (DOR) in relation to REM-suppressing GABA releasing sites in the cat vRPO, we used pre-embedding electron microscopic immunocytochemical dual labeling for DOR and GABA.

Over 33% of GABA-containing axon terminals within the vRPO showed DOR-immunolabeling. In those dually labeled axon terminals DOR-immunogold particles were mainly localized in the cytoplasm, but also on axonal plasma membranes having access to extracellular opioid ligands. DOR-immunolabeled GABAergic terminals had variable size and morphology but formed invariably symmetric inhibitory-type synapses with DOR-labeled (65%) or unlabeled (35%) dendrites. In addition, numerous GABA-immunolabeled axon terminals were apposed to DOR-immunogold labeled dendrites without any glial coverage, although no synaptic junction could be seen in the plane of section. These data provide ultrastructural evidence that DOR activation in vRPO can modulate the release of GABA, whose inhibitory postsynaptic actions are also subject to direct DOR modulation. Moreover, DOR also was detected in some GABA dendrites receiving multiple contacts, suggesting that DOR in vRPO may also regulate postsynaptic responses of GABA neurons to other transmitters. Our data provide ultrastructural evidence that DOR activation within the vRPO occurs mainly at presynaptic sites, suggesting that opioid-mediated GABA axonal release may be a key mechanism underlying the antagonistic actions of morphine and GABA in vRPO-REM sleep modulation. These results are directly relevant to understanding the brainstem opioid-mediated neural control of behavioral state and sleep.

Supported by CAM (GR/SAL/0188/2004) and MEC (BFI2003-00809)

O-2.2.2 TOPOGRAPHIC CIRCANNUAL VARIATIONS OF THE PINEALOCYTE NUCLEAR INDEXES IN THE ALBINO RAT PINEAL GLAND.

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Circadian and seasonal variations were observed in the karyometric index of pinealocytes in the peripheral and central zones of the distal pineal body of the rat over a 24-hour interval and during two natural photoluminous periods.

Previous morphological and physiological studies suggest a possible division of the pineal parenchyma of

some mammals in two layers, one "cortical" and another "medullar".

On the other hand, recently it has been described in the pineal of the rat, topographic differences on nuclear size of pinealocytes from distal to proximal. Also it has been suggested the possible existence of morphofunctional differences between the proximal, intermediate and distal regions of the pineal gland of the rat according to the Vollrath's classification.

In this work, we have studied these possible differences between cortical and central layers in each region, proximal, intermediate and distal, of the pineal gland of the albino rat.

The study involved 120 wistar rats over a 24-hour interval (06:00h, 10:00h, 14:00h, 18:00h, 22:00h and 02:00h) during four seasonal periods.

The results showed peripheral and central differences at different times of day during four season periods. There are also circadian, photophasic and seasonal differences between peripheral and central layers in the three, proximal, intermediate and distal regions. The variance analysis between cariometric indexes, point time, seasons and location were significative.

These results support that the pineal gland of the albino rat is influenced by circadian and seasonal photoperiod and shows morphofunctional independence between the different regions and layers, with groups of cells with different functional characteristics, depending on their location within the gland.

O-2.2.3 ALTERATIONS OF CEREBROSPINAL FLUID PROTEINS AND SUBCOMMISSURAL ORGAN SECRETION IN ARTERIAL HYPERTENSION AND VENTRICULAR DILATATION. A STUDY IN SHR RATS.

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The subcommissural organ (SCO) is a cerebral structure associated with the circulation and composition of the CSF, which secretes glycoprotein into the CSF where its greater part is condensed and forms the RF, and the other minor part becomes soluble into the CSF. It has also been demonstrated that the CSF protein composition is altered in the hydrocephalus and that the spontaneously hypertensive rats experience a progressive increase in the size of brain ventricles.

The objective of this study was to analyze the proteins in the CSF of spontaneously hypertensive rats, to study their possible role in the concomitance among hydrocephalus, arterial hypertension and the alterations in the subcommissural organ. Brains from control Wistar-Kyoto rats (WKY) and spontaneously hypertensive rats (SHR) sacrificed with chloral hydrate were used. Antiserum against some cerebrospinal fluid proteins band and Reissner's fiber (RF) were used for immunohistochemical study of the SCO. The ventricular dilation was observed in the SCO of the SHR and third ventricle ependyma sho-

wed immunoreactive material (IRM) for antibody against 141kDa protein band anti-B1 and 117 protein band anti-B2 and the SCO of the SHR showed a decrease of the IRM compared with WKY rats. Alterations in the expression of anti-RF were found to compare the SCO of the WKY and SHR groups. Our results demonstrate that hydrocephalus and hypertension are interconnected in this kind of rats which produces alterations in SCO secretions and some proteins of the CSF.

Acknowledgements: We thank Dr. E.M. Rodríguez for the generous gift of his antibody (AFRU). This work was supported by the Fundación Canaria de Investigación y Salud (FUNCIS) project nº 74/03.

O-2.2.4 VASCULAR PERMEABILITY FOR GADOLINIUM, EVANS BLUE AND ROSE BENGAL DYES RELATED TO MORPHOLOGY OF BRAIN MICROVESSELS.

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Microvascular network adapts to tissues metabolic requirements. The aim of this work is to compare the information obtained about vascular permeability by gadolinium, Evans Blue and Rose Bengal dyes with microvessels morphology in experimental gliomas.

46 Samples from 22 rats were used for the study. Gliomas were induced in Sprague Dawley rats by transplacental administration of Ethylnitrosourea on the 15th pregnancy day. Tumour localization and size were analysed by MR T2-w images. Animals were anesthetized with isoflurane and intraperitoneally injected with 0,6ml of gadolinium contrast (Gd-DTPA) and its intensity was showed on MR T1-w images. 30 minutes before autopsy time 1ml of Evans Blue (EB) or Rose Bengal (RB) (10mg/ml NaCl 0.9%) dyes were intravenously injected. Histology study by HE, LEA lectin histochemistry, and immunohistochemistry for Ki-67 and Blood Brain Barrier (BBB) markers: GluT-1 (glucose transporter-1) and EBA (Endothelial Barrier specific antigen) were performed.

Four different tissue conditions were identified: I-II-III-IV with mean volume of 4.06 ± 1.186 ; 50.842 ± 19.26 ; 55.24 ± 15.713 and 2108.10 ± 925.457 mm³, respectively. I-II show cerebral parenchyma similar vessels, positives for BBB markers, exhibited absence of contrast enhancement on T1-w images and negativity for EB and RB dyes. III tissue condition characterised by tortuous vessels with dilated lumen with immunoexpression of BBB markers, showed homogeneous signal increase on T1-w images and positivity for the dyes. IV condition displayed two vessel organizations: *Intratour area*; strong dilated vessels, which lost the EBA expression and displayed some vascular sections positives for GluT-1 and microvascular proliferations surrounding the necrotic-haemorrhages areas, negatives for EBA. *Tumour periphery area*; showed vessel as in III and microvascular proliferations around the neoplastic mass, some of them expressed BBB markers. This revealed a heterogeneous increase by gadolinium signal on T1-w images and dyes. The areas with strong dilated vessels showed hyperin-

tense signals whereas, haemorrhages, cysts and necrotic areas presented hypointense signals.

Anatomical regions displaying hyperintensive signal for gadolinium on T1-w images also show intravital dyes extravasation. These structures correspond with morphological aberrant vessel with increased Blood Brain Barrier permeability.

Session O-3.1 – Nervous System IV: Disorders, Malformations and Behavior.

O-3.1.1 NEW DATA ON THE EXPRESSION AND LOCALIZATION OF THE CELLULAR PRION PROTEIN IN THE CENTRAL NERVOUS SYSTEM OF MAMMALS.

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Transmissible spongiform encephalopathies are a group of fatal neurodegenerative diseases caused by prions that affect both humans and animals. Accumulation of the pathogenic form of the prion protein (PrP^{Sc}) is the major neuropathological feature in the post-mortem study of infected brains. Although the transformation mechanisms of the cellular isoform of the prion protein (PrP^C) into PrP^{Sc} remain unknown, it is commonly accepted that PrP^C plays an essential role in the development of these type of proteinopathies. Thus, the study of the expression and localization of PrP^C in the central nervous system (CNS) of mammals is essential.

In the current work, the study of the presence of PrP^C within the central nervous system of rats was performed by western blotting techniques. Our results showed a higher abundance of PrP^C in the cerebral cortex rather than in the brainstem, where the reactivity was lower. Moreover, immunohistochemistry allowed us to localize more precisely the cellular expression of the protein in the CNS. This method was also used to investigate the chemical nature of the PrP^C-containing neurons, by double labelling with both PrP-antibodies and a different number of neuronal markers.

As the brainstem of cows is most affected in bovine spongiform encephalopathy, we studied the expression of PrP^C in that region, and also the chemical nature of the neurons expressing PrP^C.

Our findings in the localization of PrP^C in the central nervous system of adult rats, along with the biochemical characterization of the subset of neurons expressing PrP^C and the immunohistochemical study performed previously in cats (1, 2), lead us to a better understanding of the physiology of PrP^C. This work also contributed to give new insights not only to the pathophysiology of prion diseases, but also to the propagation of PrP^{Sc} within the CNS in spongiform encephalopathies (1,2,3).

Work supported by grants BMH4-CT96-856 (EU), PIUNA 2002 and FPU.

¹ Velayos et al. (1998) *Brain Pathol.*, 8: 549-552.

² Velayos et al. (2002) *Eur. J. Anat.*, 6: 23-29.

³ Moleres et al. (2003) *Eur. J. Anat.*, 7: 85-90.

O-3.1.2 PULSED MODULATED FIELDS RADIATION TRIGGERS C-FOS ACTIVATION IN THE BRAIN OF RATS TREATED WITH SUBCONVULSIVE DOSES OF PICROTOXIN.

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The ubiquitous use of cellular phones raises the question about the effects of 900 MHz electromagnetic fields on the brain. In this study we investigated the radiation effects on the neuronal activity of rats –in which epilepsy was modelled by intraperitoneal injection of subconvulsive doses of GABA antagonist picrotoxin– exposed to a 2h of whether GSM-modulated (Global System for Mobile Communication) or unmodulated 900 MHz controlled radiations, in an experimental setup radiating an intensity similar to that emitted by mobile phones. 40 adult male Sprague-Dawley rats distributed in five groups (1: GSM + treated; 2: unmodulated + treated; 3: nonexposed + treated; 4: GSM + untreated, 5: nonexposed + untreated) were tested with c-Fos (a sensitivity marker of neuronal activity). The brains were prefixed by transcardial perfusion and their transverse sections (50µm) were processed for c-Fos immunohistochemistry. The positive-cells were counted via a 20X view field using a microscope connected to a morphometric software: the counts per brain area (0.3mm²) were expressed as means ± s.e.m. The significance of between-group differences was estimated through a two-way analysis of variance Tukey or Kruskal-Wallis tests. C-Fos-positive neurons counts did not show differences in neocortex, groups 1 (frontal: 118±6 vs. parietal: 111±7) and 2 (136±4 vs 110±6), but doubled those found in frontal cortex (63±7) and parietal cortex (77±5) of group 3. In paleocortex areas there were considerable differences between cellular counts of groups 1, 2 and 3, in piriform cortex (196±7, 149±8 or 110±8, respectively) and entorhinal cortex (187±6, 103±5 or 110±8). In hippocampal areas there were large differences between dentate gyrus groups 1 and 2 or 3 (283±20, 12±4 or 24±6), but lesser in the corresponding groups of CA₁ (34±4 vs. 11±2 or 8±4) and CA₃ (20±2 vs. 10±2 or 7±2) areas. Finally, for the same groups, there were important differences in thalamic areas: centromedial (70±5, 40±5 or 37±6) and centrolateral nuclei (83±7, 57±3 or 53). In groups 3 and 4 were observed low scattered cells in cortex thalamus and hippocampus areas, but there were important significance differences neuron counts with respect to the remaining groups. The results of this experiment suggest an influence of GSM fields on neuronal activities.

O-3.1.3 ANATOMY OF THE BRAIN IN A CASE OF HUMAN LISSENCEPHALY: MUTATION OF LIS1 GENE.

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We have studied structural and cellular organization in a lissencephalic brain diagnosed by molecular genetics: deletion of D1751866 marker in *Lis1* gene. The brain corresponded to a 14 years old girl that died because of an epileptic crisis. Macroscopically the brain was clearly lissencephalic in the caudal frontal and parietal lobules, with a pachygyric distribution of cerebral circumvolutions in prefrontal, occipital and temporal cortex. The alterations were similar in both telencephalic hemispheres.

Histological and immunohistochemistry analysis demonstrated that: 1) Pyramidal cells in Lissencephalic cortical domains presented altered orientations; 2) Interneurons of superficial cortical layers (CaBP+, CaR+ and PV+) showed alterations of their positions. Mainly these interneurons did not get into superficial layers and stopped in deeper layers of the cortex. This phenotype was much more severe in the hemispheric zones. In the ventricular and subventricular layers we have found interesting structural alterations: lack of ependymal cells and irregular distribution of the glial slind. The phenotype of this lissencephalic brain is discussed in relation to *Lis1/Lis1* mutant mice.

O-3.1.4 STUDY OF NEURONAL ALTERATIONS IN A LISSENCEPHALY MOUSE MUTANT MODEL.

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We have analyzed the possible neuronal alterations in a mouse mutant model (*Cahana et al., 2001 PNAS 98:6429-*) in which only one copy of the protein *Lis1* (*Lis/sLis1*) was truncated. In the both allele mutation the embryo dies before implantation but in the heterozygote form (*Lis/sLis1*) animals are viable and fertile.

Using transplant cortical experimental techniques at early embryonic stages and tracing the cells for short periods of time in vitro, we have found early alterations (in the direction and movement) in the source where inhibitory cortical neurons arised towards the cortex (the tangential migration). These initial alterations were also detected by aberrations in the radial glia and pyramidal cell morphology of the cortex.

Postnatally and by immunohistochemistry techniques the cortical layering of these mice was still altered (the radial migration) based mainly in the distribution of the parvalbumin population. Thus this mutant mouse model might be of important interest to further understanding the cortical neural alterations of human lissencephaly.

O-3.1.5 NEUROSCIENCE AND PSYCHOANALYTIC THEORY.

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Recent neuroscientific findings (Ledoux, Damasio, Bechara; Cahill; Gazzanig, Rizzolatti, Blakemore) seen to

have identified some of the underlying biological structures that may support Psychoanalytic Theory, otherwise considered an ethereal discipline. In 1998 Rizzolatti and Arbib located a group of neurons in the Premotor F5 and Parietal Cortex of Monkeys they would later term Mirror Neurons. These neurons fired whenever the subject executed a movement, as well as when the subject watched someone else make the same movement. Moreover, Mirror Neurons became activated when the subject received visual, auditive, or sensitive stimuli. It is also believed that Mirror Neurons are triggered by significant actions. Later findings have uncovered the existence of an analogous system in humans.

It has been hypothesized that one of the functions of this group of neurons consists of creating mental representations of actions to be able to understand and reproduce them in the future. Acknowledging and classifying other people's actions is key to social behavior and communication for it sets guidelines for appropriate future conduct (Pines). Psychoanalytic Theory establishes the difference between identification and imitation, the former being triggered by an individual's wish to become closer to an ideal. This ideal is embodied by another subject whose qualities are to be attained. Imitation is merely an act of reproducing the behavior of others, not of becoming like the other. Through the discovery of Mirror Neurons it becomes evident that evolution seems to have ensured the biological basis that favors the process of identification (Rizzolatti and Arbib, 1998). In the act of interpreting someone else's intentions it becomes clear that the interpreter manages to do so by using the mechanism of projection. However, this should not be exclusively considered a defense mechanism for it also has a structural function as it facilitates social interaction by helping us understand the intentions of others.

What would happen if Mirror Neurons became impaired? Would this be the case of those individuals that have a right hemisphere lesion on their brain and suffer from anosognosia, a neurological disorder that makes individuals unable to recognize their own paralysis, least of all recognize it in others? However, we believe that both, neurology and environment are crucial to an individual's adequate development.

Session O-3.2 – Nervous System V: Basal ganglia and Parkinson's Disease.

O-3.2.1 DISTRIBUTION OF THE NADPH-DIAPHORASE POSITIVE INTERNEURONS IN THE HUMAN VENTRAL STRIATUM.

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The histochemical staining for NADPH-diaphorase (NADPH-d) in the human striatum reveals a population of medium-sized neurons that form approximately 2% of the total neuronal population. This subset of striatal interneurons contains neuronal nitric oxide synthase and use gamma-aminobutyric acid for interneuronal communication. The ventral striatum (VST) refers to the part of the striatal complex that receives afferents from allocortical areas and is involved in motivational behaviour and rewards. This striatal territory is composed of the nucleus

accumbens (Acb), which is divided into a core, shell and rostral pole, and the ventral part of the caudate nucleus (Cn) and putamen (Put). We applied immunohistochemical and histochemical procedures to postmortem human brain material from five healthy individuals to study the distribution of the NADPH-d-positive (+) neurons throughout the entire rostrocaudal extent of the VST. The subdivision of the Acb into the shell and core was visualized with either calretinin (CR) or substance P immunoreactivity, which are mainly expressed in the shell. The VST harbors numerous NADPH-d+ neurons that possess an elongated perikarya (diameter 9-27 μm) that give rise to 2-4 long and poorly branched dendrites. Some of these cells expressed a weak NADPH-d staining and were scattered among other numerous intensely labelled ones. The intensely stained NADPH-d+ neurons were widely distributed in the ventral portion of the Put, whereas in the Cn they abounded in a ventromedial band largely enriched in NADPH-d neuropil. The distribution of these cells in the Acb varies depending upon the rostrocaudal level under consideration, being mainly located in the highly CR-immunoreactive ventromedial aspect of this nucleus. The weakly labeled NADPH-d cells do not intermingle with the intensely stained ones and they populate areas of the Cn and the Acb that contain less stained NADPH-d and CR neuropil. These results show that the weakly and intensely NADPH-d-labeled cells of the human VST are preferentially distributed in the core and shell regions of the ACb, respectively. Therefore, the variation in the intensity labelling for NADPH-d showed by these striatal interneurons might be related to the different functional roles of these two accumbal entities.

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O-3.2.3 CHANGES OF GAD mRNA EXPRESSION IN THE BASAL GANGLIA IN NK1-KO MPTP-TREATED MICE.

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Parkinson disease is characterized by a neuronal loss in the substantia nigra *pars compacta* (SNpc). The dopamine depletion induces a significant loss of NK1 receptor expression in the striatum and in both direct and indirect pathways of the basal ganglia. Moreover, Substance P modulates both the intrastriatal circuits as well as the GABAergic projection of the direct pathway which is downregulated in parkinsonism. In the present study we used 14 C57bl6 mice, 14 mice lacking the gene for the NK1 receptor (NK1-KO), and 14 wild-type mice. 7 mice of each group were intraperitoneally injected with 20 mg/Kg MPTP during 4 days. Twenty four hours after the last treatment mice were sacrificed. The other mice were used as control. We evaluated the loss of dopaminergic neurons in the SNpc after MPTP treatment in the three groups, and the level of GAD mRNA expression in the SNpr, in the entopeduncular nucleus, in the globus pallidus and in the striatum. The loss of dopaminergic neurons was similar in the all three-treated groups when compared to their controls. MPTP intoxication increases GAD mRNA expression in the SNpr in all groups but in the

NK1-KO mice was significantly higher than in the other two groups. In the entopeduncular nucleus we observed an increased GAD mRNA expression in C57bl6 and in wild type but not in NK1-KO group. In contrast, in the globus pallidus we found significant higher levels in NK1-KO mice when compared with the others groups. At the level of the striatum, the GAD mRNA expression showed a significant decrease only in the NK1-KO MPTP-treated group. These data show that the importance of NK1 receptor in basal ganglia balance. However, to elucidate the consequences of this receptor in the pathophysiology of the basal ganglia more studies are still needed.

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Session O-3.3 – Embryology.

O-3.3.1 FORMATION OF FIFTH PHARYNGEAL POUCH IN RAT EMBRYOS.

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The rat is considered an excellent comparative experimental model of human development (Gaubert-Cristol and Godlewski, 1991). In a previous step to the continued study of the origin and evolution of thyroid parafollicular cells and ultimo branchial body, the formation of 4th and 5th pharyngeal pouches in rat embryo was studied. The origin of the ultimobranchial body is controversial in experimental animals such as rat or mouse. Rogers (1927) reported that 22-24 somites arise in the rat as an endodermal evagination from the caudal portion of the 3rd pharyngeal pouch, isolated in embryos on gestational days 15-16. Rogers refutes the existence of the 4th pouch and agrees with Zuckerkandl (1903) on the absence of the 5th pouch. Most authors report the emergence of the 4th pouch (Fontaine, 1975; Manley and Capecchi, 1998; Peters et al., 1998; Manley et al., 2004) and even refute the existence of the 5th pouch. In humans, there appears to be unanimity that it arises from the 5th pharyngeal pouch. However, authors like Larsen (2003), Sadler (2004), Stone (2004) and Carlson (2005), among others, consider this 5th pouch to be part of the 4th pharyngeal pouch. Mérida-Velasco et al. (1989) observed in humans the formation of a 5th individualised pharyngeal pouch, independent from the 4th pouch, which gives rise to the ultimobranchial body.

A study was conducted on 24 rat embryos of 11-18 days, three for each study, fixed in 4% formalin and paraffin-embedded, staining 8 μm -thick sections with haematoxylin-eosin for their study under conventional light microscope.

Results demonstrated the existence of the 5th pharyngeal pouch, which arises as an individualised evagination of the pharynx in rat embryos on gestational day 12.

This study was supported by FIS grant PI02/0492 from the Spanish Ministry of Health and Consumption (Carlos III Health Institute) and European Union (FEDER).

O-3.3.2 DEVELOPMENTAL STAGES OF THE STAPES IN HUMAN.

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Two basically different theories have been proposed to explain stapedia development. One corresponds to a single origin from Reichert's cartilage (Hamilton-Mossman, 1975, Corliss, 1979; Sadler, 2001; Larsen, 2003; Carlson, 2005); and the other suggests a double origin: the stapedia base from the otic capsule and the rest from Reichert's cartilage (Caudwell and Anson, 1942; Masuda et al. 1978).

The objective of our study is to contribute to knowledge about stapedia development and its most important developmental stages. To do this, we study 30 human embryos from the collection of the Embryology Institute of the Universidad Complutense de Madrid, with C-R lengths between 6 and 28.5 mm. (O'Rahilly stages 13 to 23).

According to our observations, there are six main stages in stapedia development: 1. Appearance of the stapedia anlage (stages 14-15), in the mesenchyme of the superior end of the second branchial arch. 2. Appearance of the interhial formation (stage 16), the structure that separates the stapedia anlage from the anlage of Reichert's cartilage. 3. Demarcation of the stapedia anlage (stage 17), with a superior portion (base) independent of the otic capsule and another inferior portion formed by two condensations (stapedial limbs) separated by the stapedia artery. 4. Chondrogenesis phase (stages 18-19). 5. Cartilaginous phase and obliteration of the stapedia artery (stages 20-21). 6. Demarcation of the interhial formation (stage 22), with an internal segment that forms the tendon of the stapedia muscle.

O-3.3.3 DEVELOPMENTAL STAGES OF THE JUXTAORAL ORGAN IN HUMANS.

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When studying Chievitz salivary glands (1885), a small epithelial cord was observed in human embryos next to the parotid duct. This structure has received several

names including that of Chievitz organ. Ramsay (1935) demonstrated that this organ is constantly present in human embryos and fetuses, and is a transient structure that disappears after birth. From 1962 onwards, Salzer and Zenker, called it the juxtaoral organ, the name by which it is still known today.

We carried out a histological study of this structure in 55 embryos (O'Rahilly's stages 16-23) and 90 human fetuses (9-17 weeks of development) belonging to the Collection of the Embryology Institute of the UCM.

During O'Rahilly stages 16-17, an epithelial condensation appears at the base of the transversal groove of the primitive mouth, proximal to the mandibular nerve, which corresponds to the prospective area of the juxtaoral organ. During O'Rahilly stages 18-19, the anlage of the juxtaoral organ separated off from the epithelium from which it had originated. During O'Rahilly stages 20-23 the anlage of the juxtaoral organ received innervation from the buccal nerve. During the 11-12 week of development the anlage of the organ was surrounded by condensed connective tissue, which constituted its capsule.

Our study distinguishes 3 main periods in juxtaoral organ development: the period corresponding to epithelial condensation and invagination, O'Rahilly's stage 16-17, during which the organ separates off and becomes innervated from O'Rahilly's stage 18-23, and the period of capsular formation after the 11th week of development.

Study of its development and comparison of this with development of the temporomandibular joint, seems to suggest that the function of the juxtaoral organ is related with the mechanical activity of the region.

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O-3.3.4 NEW FINDINGS ON VAGINALEMBRYOLOGY.

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Our objective is to demonstrate our own hypothesis of the development of the vagina observed from women with genital malformations, especially patients with an obstructed hemivagina and a ipsilateral renal agenesis. This theory consists of the following: the vagina comes from completely fusion of the mesonephric and paramesonephric ducts, with the participation of Müller tuberculum and explain the embryologic etiology of all the malformations reported.

The material used were rat embryos (n=250) between 15th (indifferent stage) and 21th (vagina totally developed). We made histological slides through the genito-urinary system and stained them with hematoxilina-eosina. then, we made a reconstruction of the vagina development. We also use immunohistochemical markers (GZ1 y GZ 20) specific from Wolff. We also used four adult rats to demonstrate that Wolff also stay in adult rat vagina.

Our results are the following: Müller ducts fused in one tube but after they diverge until they fused with the sinus bulbs (they are really derived from Wolff). We also

found positive stained with immunohistochemical markers between the two sinus bulbs and between the ureter and Wolff duct. We also found positive stained with GZ 1 y GZ 20 in the adult rat vagina.

We conclude that there is a contribution of wolffian ducts and Müller's tubercle in vagina embryology. We think that genito-urinary malformation classification proposed by Ación P, Ación M y Sánchez Ferrer M, should be used because explains the the embryologic etiology of all the malformations reported.

Session O-3.4 – Anatomy Teaching II

O-3.4.1 IMPACT OF THE NEW INFORMATION TECHNOLOGIES ON ANATOMICAL LEARNING: FIRST EVALUATION.

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The authors present the results of their pilot experience about the virtual learning in Clinical Anatomy in a voluntary group of students of Medicine during the curs 2002-2003.

The authors analyse the results obtain by this group of students in theoretical knowledge in relation with the rest of the class, the opinion of the voluntary group about the virtual experience in anatomical learning and the psicopedagogical information elaborate by the virtual learning team of their University.

The valuation of the theoretical knowledge is made by the end note obtain by all the students of Clinical Anatomy. The opinion of the student's voluntary group is made with a questionnaire elaborate by the virtual learning team of the University. The psicopedagogical information has been elaborated by the same multidisciplinary team named "Itaca Project".

The results obtain in theoretical knowledge show that all the voluntary group made the final exam in June and the oral interview to high up the end note obtaining more than a notable the 97% of this pilot group.

Between the conclusions we remark the few participation in the pilot experience, only the 6% of the students matriculated in Clinical Anatomy, and the high interest of the voluntary group by the subject. The students that have participate in the experience think the virtual learning in Anatomy is useful to meliorate the access to the docent materials and favour the interaction student- student and teacher- student. The flexibility in the hours to study and the difficulty in the discharge of some images have been the technical characteristics distinguish by the students.

So the authors think the experience is the beginning of a new period in the anatomical learning, but it is necessary introduce some modifications in the structure of the curs during the next year.

O-3.4.2 PRELIMINARY STUDY OF THE STRESS PROVOKED IN FIRST YEAR MEDICAL STUDENTS DURING THEIR EXPERIENCE IN THE DISSECTION ROOM.

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The cadaver dissection has been and still is essential in the teaching and learning of Anatomy. Nevertheless, we must consider the difficulties experienced by some students to adapt to dissections. In some occasions, the contact students-cadaver leads them to forget their own feelings to be able to go on with the dissection. This defensive attitude in front of a negative and sometimes traumatic experience, which they undoubtedly suffer in greater or lesser degree, might influence their capacity to relate with future patients.

It has been proven that prior to dissecting, teaching about the process of dying and death in its different aspects reduces these adverse reactions. That is why we decided to make a preliminary study of intervention over one of two first year Anatomy Human student groups to diminish the negative stress provoked by the experience of dissection.

In the experimental group, we designed the study and intervention in three phases based on the dissection practice. 1) A presentation by the teacher before starting. 2) Two weeks after starting, discussion in small groups about their experience with dissection. 3) A written communication about the dissection experience.

After the intervention, we passed a test to the experimental and control groups to collect sociodemographic data about the topic, participation in the intervention and symptoms of the stress perceived.

The data were analyzed using the 12.0 version of the SPSS programme for Windows. The association study between the variables of stress symptoms and the intervention made was significant in 11 of the 18 questions.

This extremely revealing result obtained in such a modest investigation match the experience of other foreign universities that have been giving lessons about death and terminally ill patients during dissection practice with satisfactory result.

We believe it is of great interest to foster this contact between the department of Anatomy and pupils to show the humanistic knowledge acquired during intermediate teaching, especially that related to the process of dying and death.

O-3.4.3 PERSPECTIVE OF THE SPANISH TEACHER OF ANATOMY REGARDING EMOTIONAL RESPONSE OF STUDENTS IN THE DISSECTION ROOM.

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Two perspectives regarding how to deal with the emotional response students in dissection room (DR) coexist. On the one hand, the anatomists would teach only the organization of the human body and the student must learn a scientific attitude in the DR characterized by a "distant emotional interest" (Dyer and Thorndike, 2000). On the other hand, several authors (Penney, 1985; Tschers-

nig et al., 2003) have described the need for students to be emotionally prepared in the face of an unusual experience like the DR. From this perspective, the need to express and control emotions and not to suppress them seems to be a more positive approach in the training of medical students and other health care professionals.

In this study are presented the profile of the opinion of Spanish teacher of Anatomy (participants of the XXI Congress of the Spanish Society of Anatomy) related to anatomical dissection: 1) its relative roles as the exclusive source of anatomy teaching, as a source for medical research, or to assist the future professional to acquire emotional control; 2) the attitude and behavior they expect the student to have in the dissecting room; 3) whether the student-cadaver relationship can convey knowledge and attitudes affecting the future doctor-patient relationship; and 4) the anatomists' attitudes toward donation.

The result obtained (Arráez et al., 2004) shows that Spanish Anatomists considered dissection to be mainly an instrument for professional training and to help develop professional skills. They gave little importance to the role it could play in helping students to control their emotions. However, this aspect was considered to be more important by anatomists who also valued a close doctor-patient relationship. Moreover, a majority of anatomists felt that the student's attitude and behavior during dissection could be to some extent reflected in future relationships with patients. However, they did not feel that this dissection-related attitudes would distinguish between future "good or bad" doctors. Finally, anatomy teachers are generally in favor of donation (86.5%), especially of *organs alone* (52.7%), and this aspect was not affected by the anatomist's religious beliefs.

O-3.4.4 SCAT METHODOLOGY: STUDENT CENTERED ANATOMY TEACHING. OSTEOLOGY MANUAL AND MIOLOGY MANUAL.

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The development of the educational project of the Area of Structure and Function of the Human Body at the Universidad Internacional de Catalunya (UIC), was started when our university was created in 1998, based on the SCAT methodology (student centered anatomy teaching).

This method aims to improve the study of clinical and functional anatomy. Is not only based on a theoretical study lectures but also includes observation and manipulation of artificial and natural anatomic models.

The SCAT methodology includes:

- Bone collection: learning guides with bone, muscular and visceral models.
- Clinical cases.
- Dissection laboratory: dissection guides, by objectives.
- Multimedia tools: projections of interventions relating surgical actions with the surgical anatomy.
- Bibliography: "Osteology Manual" and "Myology Manual".

The manuals start with self assessment of the students knowledge topic. Following topics are distributed by levels of difficulty (basic, medium and difficult); a characteristic is that knowledge of the last level must be consolidated before to starting a new level. We have worked on specific and general objectives from various degree programs (medicine, dentistry, physical therapy and nursing).

After applying the SCAT methodology for two years we can attest to their efficacy. "Osteology Manual" and "Miology Manual" are very useful for studying the human body and they systematize teaching and learning.

The program meets the requirements of the European Higher of Education Space.