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Bilateral Anatomical Variations of Musculature of the First Dorsal Fibro-Osseous Compartment of the Wrist.

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Introduction: The tendons of the abductor pollicis longus (APL) and extensor pollicis brevis (EPB) are located in the dorsal carpal region. The knowledge of anatomical variations of the first dorsal fibro-osseous compartments muscle wrist is clinically relevant to De Quervain's stenosing tenosynovitis and reconstructive surgeries. A variety of reports of multiple insertion tendons in the first dorsal fibro-osseous compartment of the wrist is found in literature, but among these are few reports describing the occurrence of fusion. Objective: Report an unusual anomalous bilateral fusion of muscle bellies of the first dorsal compartment of the wrist.

Methods: The upper limbs of 32 cadavers were analyzed. The description of the characteristic morphology was performed taking into account the origin and insertion pattern of muscle fibers. Anthropometric measurements of muscle were carried out using string over the muscle belly or tendon being measured using a universal digital calliper (Mitutoyo®).

Results: The presence of fusion of the muscle belly of the APL and EPB was found in five limbs and bilaterally observed in one cadaver. The abductor pollicis longus of the right upper limb (ALP_R) was 9.0 cm long, with the presence of two insertion fascicles, one for the abductor pollicis brevis and the other to the opponens pollicis. The abductor pollicis longus of the left upper limb (ALP_L) was trifurcated into: intermediate tendon (I), lateral tendon (L) and medial tendon (M). The intermediate tendon was 7.5 cm long and lateral tendon 7.0 cm. The tendons I and L were inserted in the base of the first metacarpal, while tendon M had three fascicles inserted: abductor pollicis brevis, opponens pollicis, and anteromedial region of the base of the first metacarpal. The extensor pollicis brevis of the right upper limb (EPB_R) was 7.2 cm in length, 1.2 cm in width, while the extensor pollicis brevis of the left upper limb (EPB_L) was 8.5 cm in length and 1.1 cm in width. Bilaterally ECP origin was observed in the dorsal radial region and insertion of the dorsal aponeurosis at the metacarpophalangeal joint of the thumb level.

Conclusion: An unusual fusion of the APL and EPB, concomitantly with a variant insertion pattern, is the highlight of the current case report. Our case study shows that these additional tendons may prove to be biomechanically advantageous. Moreover, these tendons may be effectively used for reconstructive surgery.

Aberrant Contribution of Extensor Pollicis Longus of the First Dorsal Compartment of the Wrist.

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Introduction: Knowledge of the anatomical variations of the muscles of the first dorsal fibro-osseous compartment of the wrist is clinically relevant to De Quervain's stenosing tenosynovitis and reconstructive surgery. In the literature are found a variety of reports of multiple tendons of insertion in the first dorsal fibro-osseous compartment of the wrist, but among these are few reports describing the occurrence of fusion and muscle contributions.

Objective: This report describes an unusual bilateral aberrant contribution of the extensor pollicis longus (EPL).

Methods: The description of the characteristic morphology was performed taking into account the origin and insertion pattern of the muscle fibers. Anthropometric measurements of muscle were carried out using string over the muscle belly or tendon being measured using a universal digital calliper (Mitutoyo®).

Results: In the same cadaver was found the presence of this contribution and an anomalous muscle function of the abductor pollicis longus (APL) and extensor pollicis brevis (EPB). The APL of the right upper limb (ALP_R) was 11.5 cm in length and 2.7 cm in width. The ALP_R had a single tendon of 9.0 cm length, with the presence of two insertion fascicles, one for the abductor pollicis brevis (APB) and the other to the opponens pollicis (OP). The APL of the left upper limb (ALP_L) was 15.7 cm in length and 2.5 cm in width. The tendon of ALP_L was trifurcated into intermediate tendon (I), lateral tendon (L) and medial tendon (M). The I tendon was 7.5 cm long, whereas the M and L tendons were 7.0 cm in length. The L and I tendons inserted in the base of the first metacarpal, while M tendon had three fascicles inserting: APB, OP and anteromedial region of the base of the first metacarpal. Both the EPBs received an unusual donation from the EPLs by a slender auxiliary tendon, with an average length of 9.2 cm, which intersected obliquely and laterally under the extensor retinaculum, entering within the first dorsal compartment of the wrist, merging with the tendon of EPB. The EPB of the right upper limb (EPB_R) was 7.2 cm in length, while the EPB of the left upper limb (EPB_L) had a length of 8.5 cm. The innervation of these fused muscle bellies was as usual, by the posterior interosseous nerve. In the wrist and hand region no neurovascular variation was found.

Conclusion: Atypical contribution over the EPL and unusual fusion of APL and EPB, concomitant with a variant insertion pattern, is the highlight of the current case report. This case report shows that these additional tendons may prove to be biomechanically advantageous. Furthermore, these tendons may be effectively used for reconstructive surgery.

Morphology, Development and Heterochrony of the Carapace of *Podocnemis expansa* (Testudines, Podocnemididae).

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Introduction: The Testudines present a particular morphological structure formed by the shell that comprises a ventral portion, the plastron, and a second, dorsal portion, the carapace. We discuss the possible intra-specific alterations that occur during all of the embryonic period, due to the importance of ontogenic data in the interpretation of new fossils which document the evolution of the lineage of the turtles, as well as for the understanding of the anatomy of the current living groups.

Objective: Description of the morphology, formation sequence and development of the carapace bones of *P. expansa*.

Methods: Embryos (62) and nestlings (43) of *Podocnemis expansa* were acquired in the reproduction field in the River Araguaia – GO. Each specimen was fixed in 10% formaldehyde solution, cleared, and the bones and cartilages stained with Alcian blue and Alizarin red S, respectively. Some embryos were also dehydrated and embedded in paraffin following the basic histology protocol for H & E staining.

Results: The carapace has mixed osseous structure of endo and exoskeleton.

This structure begins its formation in the beginning of stage 16 with the ossification of the periosteal collar of the ribs. With the exception of the peripheral bones, the other ones begin their ossification during the embryonic period. On histological investigation it was found that the costal bones and neural bones have a close relation to the endoskeleton components, originating themselves as intramembranous expansions of the periosteal collar of the ribs and neural arches, respectively. The condensation of the mesenchyme adjacent to the periosteal collar induces the formation of spikes that grow in trabeculae permeated by fibroblasts below the skin. The bone from the nuchal region also ossifies in an intramembranous way, but does not show direct relation to the endoskeleton.

Such information confirms those related to the other Pleurodira, mainly with *Podocnemis unifilis*, sometimes with conspicuous variations in the chronology of the ossification events.

Conclusion: Costals and neurals are plates derived from ribs and neural arches, respectively, in continuity with the periosteal collar of the endoskeleton. There were chronological differences in the ossification of the carapace of *P. expansa* in comparison to the other Testudines. The first element to form was the ribs, which presented uniformity among the reported species. The Podocnemididae *P. expansa* and *P. unifilis* share many similarities during their carapace ontogeny. The main differences are in the chronology, and they may express variations because of abiotic variations that influence the incubation period. The phylogenetic proximity of these two species may also explain such similarity.

Epoxy Resin Embedding Technique: Removal of the Propylene Oxide Step Before Impregnation.

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Introduction: Propylene oxide (PO) is an organic compound with the molecular formula $\text{CH}_3\text{CHCH}_2\text{O}$. This colorless volatile liquid is produced on a large scale industrially and its major application is for the production of polyurethane plastics. PO is commonly used in the preparation of biological samples for electron microscopy, to remove residual ethanol previously used for dehydration. In a typical procedure, the sample is first immersed in a mixture of equal volumes of ethanol (ETH) and PO for 5 minutes, and then four times in pure PO, 10 minutes each. PO was once used as a racing fuel, but that usage is now prohibited for safety reasons. It is also used in thermobaric weapons, a type of explosive that utilizes oxygen from the surrounding air to generate an intense, high-temperature explosion. Due to its explosive characteristics, the Brazilian army ministry imposed several restrictions on the importation and use of PO even for research purposes.

Objective: We aimed to develop an epoxy resin embedding technique for electron microscopy samples, removing the PO step between ethanol dehydration and epoxy resin impregnation.

Methods: The epoxy resin used in this study was the EMBED 812[®] from Electron Microscopy Sciences Inc. (Catalog # RT 14120). Biological samples consisted of sural nerves from male Wistar rats, with ages from 30 days to 720 days. Nerves were fixed in 2.5% glutaraldehyde (Merck) and dehydrated in graded ETH (Merck), from 25% to 100%, for 5 minutes each. After the dehydration, impregnation was performed in a mixture of 100% ETH and resin, first in a proportion of 2:1 and then in a proportion of 1:2, for 2 hours each. Afterwards, the nerves were left overnight (~18 hours) in pure resin, before embedding. The infiltration steps were performed under orbital agitation at room temperature the entire time, including the overnight step. Samples of all experimental groups were histologically processed at once so that they were submitted to absolutely the same experimental conditions throughout the experiments.

Results: Semi-thin (0.5 μm thick) transverse sections of the fascicles were stained with 1% toluidine blue and examined with the aid of an Axiophot II photomicroscope (Carl Zeiss, Jena, Germany). The images were sent via a digital camera to an IBM/PC where they were digitized. The study of nerve fascicles, myelinated fibers and endoneurial space were performed following the methods developed in our laboratory. All nerves showed good preservation of structures and general morphological characteristics of the sural nerve fascicles were similar to those previously described. Very few artefacts were present in some images, not necessarily related to the embedding technique.

Conclusion: The described technique proved to be reliable, reproducible and efficient for epoxy resin embedding of nerve samples, without the use of PO. The image quality of samples was high enough to allow morphometric studies.

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Craniometric Data of the Buff-Necked Ibis (*Theristicus caudatus*) (Boddaert 1783).

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Introduction: The buff-necked ibis is a bird of the Order Ciconiiformes, Threskiornithidae Family, which has long legs and wide light-colored wings with particular black marks on the periophthalmic region. It has an exclusively South American distribution and even though it is a species with great adaptability to anthropogenic environments, its anatomical features have not yet been described.

Objective: The aim of this study was to obtain measurements of the skulls of the buff-necked ibis to contribute to the anatomy of the species, as well as for veterinary comparative anatomy.

Methods: Craniometric aspects of six buff-necked ibis adults were analyzed. The birds, which died of various causes, came from the SAAS of UNICENTRO, and were donated to the Animal Anatomy Laboratory of the same institution. The measurements of the skulls of the animals were performed after previous removal of the skin, fascia and superficial musculature with surgical instruments and subsequent maceration. Clarification was performed with H₂O₂ and a final cleaning of the skulls finished the preparation. With the use of an analogue caliper, the following measures were taken: maximum skull length, the free end of the maxillary rostrum to the most caudal point of the supraoccipital bone; maximum width of the skull measured between the post-orbital processes right and left; maximum height measured from the basilar portion of the rostrum parasphenoid to the highest region of the skull (common point between supraoccipitoparietal, interfrontal and frontoparietal sutures); maximum width measured between suprameatic processes right and left; distance between the jaw and post orbital process; distance between the maxillary rostrum and the highest region of the skull; distance between the maxillary rostrum and the basilar portion of the parasphenoid; distance of paraoccipital processes from each other; and length and width of the foramen magnum.

Results: The average value for maximum skull length was 19.44 cm (SD: 0.79 cm); the average value for the maximum width of the skull was 3.45 cm (SD: 0.09 cm); average maximum height of the skull was 2.84 cm (SD: 0.14 cm); average maximum hind width was 2.91 cm (SD: 0.06 cm); the average distance between the jaw and the post-orbital process was 17.59 cm (SD: 0.72 cm); average value of the distance between the jaw to the highest region of skull was 18.34 cm (SD: 0.93 cm); the distance between the maxillary rostrum and the basilar portion of the rostrum parasphenoid was 15.90 cm (SD: 1.78 cm); average value of distance between each process paraoccipitalis was 2.49 cm (SD: 0.06 cm); and the average length and width of the foramen magnum was respectively 0.79 cm (SD: 0.10 cm) and 0.79 cm (SD: 0.02 cm).

Conclusion: The data obtained in this study elucidate the craniometry of the buff-necked ibis (*Theristicus caudatus*) and can be used as a basis for comparative anatomy studies as well as providing knowledge about the morphology of this avian species.

Applicability of an Educational Game for Heart Anatomy: A Pilot Study

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Introduction: The study of human anatomy covers different teaching methodologies that provide the best construction of learning and hence better understanding of the human body. Among these educational strategies, games can be effective instructional tools.

Objective: To assess the applicability of an educational game as a motivator for the learning process of heart anatomy.

Methods: A pilot study was undertaken with undergraduate students from an educational institution in the city of Salvador/BA who have had practical lessons of heart anatomy. A board game was devised consisting of two overlapping circles of different sizes and a roulette-type pointer. The tray was divided into 32 areas (places) in which letters or the numbers 1 to 6 were placed, simulating a die. The letters have content related to the subject matter through pictures or questions. After the game, an evaluation questionnaire was provided to the players. The questionnaire consisted of 9 questions based on Nielsen instructions and Grassioulet, related to perceptions of the educational character, fun and play structure. Of the 9 questions, 7 were objective and related to perception of the game's educational character; these were scored according to the Likert scale of 1 to 5 points, with the total sum ranging from 7 to 35 points (representing respectively the least and the greatest educational character). The last two questions that reported the fun and the play structure were analyzed using percentages.

Results: The game was applied to 30 graduate students of the same class. Regarding the perception of the educational character of the game, the scores ranged from 24 to 35. As for their feelings about playing, 54.3% found it enjoyable, 28.6% felt joy, 5.7% considered it boring, 2.9% felt fatigue; other sensations amounted to 8.6% (learning, anxiety or no sense). When asked about the structure of the game, 56.7% would not change any features and 43.3% suggested changes. Among the changes, increasing the letters was the most common suggestion found, followed by increase houses and, in the letters of images, make the questions more specific.

Conclusion: The educational game helped in the process of learning the anatomy of the heart, according to results from 'good' to 'great' perception of the educational character provided by this study. In addition, most students considered the game fun and felt joy, thus making learning enjoyable in human anatomy and more efficient, suggesting greater success in the achievement of knowledge by students. Modifications in the play structure, as pointed out in this research, will be incorporated, and it is intended to expand the use of this tool with other graduate students, as well as through the inclusion of other body systems.

The Dissection Workshop as a Tool in the Production of High Quality Anatomical Specimens.

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Introduction: Due to the lack of human bodies for Anatomy teaching in Brazilian universities and the difficulty in obtaining them, body preservation methods have been improved with the emergence of new techniques such as plastination, which offers better resistance and durability to the tissues. However, dissection remains an indispensable method for the production of high-quality specimens capable of being preserved through the process of plastination. Therefore, specific spaces for the practice of dissection can optimize the use of human bodies, in addition to providing a broader learning experience in Anatomy and promoting the production of anatomical specimens to be plastinated.

Objective: To demonstrate the relevance of a space for dissection, such as the Dissection Workshop at UFCSPA, in the promotion of teaching and in providing specimens to undergo the process of plastination.

Methods: The Dissection Workshop is an extension course for undergraduate students who have completed the discipline of Human Anatomy. On average, 30 positions are available for students in each course. Each course is composed of 16 sessions of 2.5 hours each, totaling 40 hours. The sessions consist of lessons of different dissection techniques and practical activities supervised by professors. The dissections are performed in groups of up to 4 students, using selected material and following previously stated objectives.

Results: The course first took place in 2010, when only 20 positions were available for monitors and scholars from the discipline of Anatomy. Given the interest, more positions were offered over the years. In 2014, there were 30 positions available and over 100 students enrolled in the course. An average of 8 specimens are produced every year. They are used as teaching material in gross anatomy classes to undergraduate courses and the highest quality specimens are displayed in an annual exhibition held by the discipline in the Anatomy Museum, which received more than 6,500 visitors in its last edition. The Dissection Workshop also allows the development of research related to the produced material and the analysis of the impact of its activities on the participants' academic training. On average, the program is presented at 4 different scientific events in the field every year.

Conclusion: The Dissection Workshop at UFCSPA provides undergraduate students the opportunity to consolidate their knowledge in Human Anatomy and to learn surgical techniques through dissection. Moreover, high quality materials are produced to be used in practical anatomy classes and to be exhibited in the Anatomy Museum. As specimens are required to be dissected prior to being plastinated, the Workshop, in addition to being a teaching environment, allows the production of an impressive number of high technical quality anatomical specimens capable of undergoing plastination.

Heart Rate Variability Comparison between Healthy Men and Women under Musical Stimulus.

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Introduction: Music is used as a therapeutic resource because it is considered to have the ability to reduce stress, anxiety, blood pressure and heart rate. The primary auditory cortex is more active in noise or musical stimulus in both men and women, but women have greater stimulation while men show the de-activation of the right prefrontal cortex.

Objective: The aim of this study was to compare the heart rate variability (HRV) between healthy men and women under different musical stimuli.

Methods: Twenty-two men and thirty women were studied, who had never previously studied music or any musical instrument. Four different pieces were performed (Third Symphony by Beethoven, Day Light of Konoha, Bad Romance and Drum Solos) for 20 minutes (5 minutes each piece) preceded by a rest period of five minutes in silence. Throughout this period the volunteers were instructed to remain at rest, with quiet breathing and avoiding talking to the evaluators. Heart rate (HR) data were collected by a HR monitor (Polar brand, model no. RS800CX). Data analysis was done in the time domain, through RMSSD and pNN50 indexes and in the frequency domain using the low attendance figures - BF (sympathetic activity), high frequency - AF (parasympathetic activity) and LF / AF (sympathovagal modulation). The t-test was used for unpaired comparison between groups of men and women.

Results: Statistically significant differences were found ($p < 0.05$) in the AF index while running music 4 (Drum Solos).

Conclusion: Women showed greater parasympathetic predominance compared to men.

Silicone Plastination Technique of the Human Brain

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Objective: Silicone plastinated specimens have a number of advantages compared to conventional specimens and are widely used as visual aids in teaching the central nervous system. However, because of the special features of nervous tissues, plastination of the whole brain often leads to considerable specimen shrinkage and deformation. The objective of this research is to develop a silicone plastination technique for the whole human brain with minimal shrinkage.

Methods: After craniotomy has been done the brain is mobilized with the cerebellar tentorium incised from the upper edges of the petrous part of the temporal bones. The cranial nerves are then cut, as well as the internal carotid arteries and vertebral arteries close to the cranial base. The spinal cord is cut as low as possible in the vertebral canal with long curved scissors, then the brain together with cranial dura mater is removed carefully and put into an oval container. Special cannulas are placed into the vertebral and internal carotid arteries, and 250-300 ml of 20% formalin solution is injected for the preliminary fixation. Further fixation is done by suspending the brain in a container filled with 1% formalin for 2 weeks. The process is then repeated while increasing the concentration of the fixing solution to 3%, 5%, 7% and leaving the specimen for 1 week respectively in each solution. The last stage of fixation is keeping the brain in 10% formalin solution for at least 3 weeks. After fixation has been completed, cranial arachnoid mater and dura mater are removed. The cerebellum is then fixed to the lower surface of the occipital lobes with thin wooden sticks to prevent deformation and preservation of the natural brain shape. Dehydration is done with pure acetone at -25° C for 6-7 weeks changing the solution once a week. The degreasing stage is normally omitted, and the brain is placed directly into a silicone composition consisting of low-molecular silicone and cross-linker. Impregnation is done in a vacuum chamber at room temperature for 10 days, decreasing the pressure slowly and closely controlling acetone bubbles rising. Impregnation is completed at 1-3 mm mercury and considerable decrease in the number of acetone bubbles. The object is then removed from the silicone bath and exposed for 10-12 hours to allow excess polymer to drain. The surface of the specimen is sprayed with catalyst for polymerization and it is left in an air-tight wrapping for several days. Shrinkage rate is evaluated by specimen volume changes during plastination. The method of evaluation involves submerging the brain in water before dehydration and after silicone curing.

Results: More than 250 specimens of the human brain have been plastinated using this technique. It has been established with morphometric measurements that the shrinkage rate of the whole brain does not exceed 12 % of the original volume and is even less for smaller brain specimens.

Conclusion: This technique is more time- and labor-intensive compared to conventional methods but allows the production of plastinated brain specimens of natural size and shape.

Plastination in Combination with Classical Anatomy Learning Tools: an Experience at Cambridge University

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Introduction: The University of Cambridge (UK) has a wide experience in education; its system is recognized as one of the best in the world. A careful selection process, based on academic background, in addition to a teaching methodology which combines University facilities with small groups teaching by the Colleges (supervisions) ensures the success of this higher education system. However, the Department of Physiology, Development and Neuroscience have never used plastinated specimens to teach anatomy. In contrast, the University of Murcia has wide experience in the design, development and use of plastinated organs. An educational innovation project over a complete academic year would make it possible to share, and learn from, the teaching experiences of these two universities. The aim of this study was to survey the views of veterinary students regarding the use of plastinated prosections alongside wet cadaver dissection within practical sessions and their use in the small-group supervisions that are an important feature of a Cambridge undergraduate education.

Methods: This study was conducted in the context of the undergraduate curriculum at the Cambridge Veterinary School (UK), in the academic year 2014/2015 following the courses taught in first year (67 students): Veterinary Anatomy and Physiology (VAP); and in second year (64 students): Veterinary Reproductive Biology (VRB) and Comparative Vertebrate Biology (CVB). A collection of 135 plastinated specimens processed by the standard S10 method in the Plastination Laboratory of the School of Veterinary Medicine, (University of Murcia, Spain) were selected in response to the content of the programs. Specimens were accessible during practical sessions alongside wet cadavers in the dissection room. After the practicals, students had free access to the plastinated specimens in the Veterinary Anatomy Museum where they were also available for their supervision meetings. An anonymous closed questionnaire, using a five point numerical estimation Likert scale (1-5 grades), was completed by the students to gather information relating to the effectiveness of the plastinated specimens as a learning resource.

Results: The level of student satisfaction with the combined use of wet dissections and plastinated prosections in the dissection room was high (4.48), although it was higher ($p < 0.05$) for the second year students (98.4%) than for the first year students (95.5%). They felt the specimens allowed them to see details which were often more difficult to identify in their dissections, for instance nerves. The handling of prosections by the students made it faster and easier for them to understand and learn anatomy. The use of plastinated organs combined with wet cadaver dissection was more important for those students who have previous experience of learning anatomy only with cadaver dissection. 87% of students would like to have access to plastinated specimens during wet cadaver dissection in the practicals. This proportion rose significantly ($p < 0.01$) to 96.9% for the second year students compared to 77.7% for the first year students. The time spent by Cambridge students in small group supervisions is very high compared with other universities. All supervisors who used the plastinated organs during this experience felt they facilitated their teaching and would like to have specimens available in future.

97.7% of students thought that the plastinated specimens helped them in general to understand and learn anatomy. This proportion was significantly higher for second year students (100%) than for first year students (95.8%). All students surveyed (100%) agreed or strongly agreed to the recommendation of the use of plastinated specimens next year.

Conclusion: In the opinion of students the use of plastinated specimens in the dissection room combined with wet cadaver dissection benefited the learning of anatomy. The students felt the use of plastinated prosections, as a tool for learning anatomy, was highly effective when their use in the practical program was combined with their use during small group supervisions.

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Waterlogged Archaeological Ivory Conservation. Elephant Tusks From Bajo de la Campana Phoenician Shipwreck Site, at the Museo Nacional de Arqueología Subacuática.

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Objective: Between 2007 and 2011, the systematic archaeological excavation on the underwater site Bajo de la Campana, San Javier, Murcia, was developed under a cooperation agreement signed between the Ministry of Culture of Spain and the Institute of Developed Nautical Archaeology, Texas A & M University (TAMU). Recovered materials from a Phoenician wreck with the same name, dating VII to VI B.C. are an important testimony of the maritime trade in Phoenician times in southeast Spain, one of the rare and unique findings now known, three Phoenician shipwrecks in Spain (Mazarrón I, II and Bajo de la Campana) and two on the coast of Israel (Tanit and Elissa). The wreck was carrying a cargo of raw materials, with manufactured and luxury goods. Among more than 1000 artefacts recorded, 53 elephant tusks stand out, some with preserved inscriptions. A research project on waterlogged archaeological ivory conservation is being developed by the National Museum of Underwater Archaeology. The main goal is to study ivory, the altering factors of an underwater environment and degradation processes during burial. All this information allows us to find a conservation treatment able to dry tusks, ensuring dimensional stability. The plastination laboratory of The Veterinary Medicine Faculty, University of Murcia, has participated actively in the application of the plastination procedure to preserve ivory from Bajo de la Campana. First tests were applied on two samples with two different procedures, S15 + S3 mixture (Biodur®) and PR10 + CR20 mixture (Corcoran®), at room temperature. The successful results encouraged us to apply the first one, Biodur®, on a tusk fragment and then on complete tusk, with excellent results.

Methods: The use of plastination as a conservation method for underwater archaeological materials began with tests on two samples of waterlogged archaeological ivory of 5 cm. diameter and 2 cm thick; two different procedures were

compared, S15 + S3 mixture (Biodur®) and PR10 + CR20 mixture (Corcoran®) at room temperature. A 3D-CT scan, study monitoring and baseline weight pictures were obtained from the samples before and after the plastination procedure in order to determine the degree of change caused by this procedure. Success in the first results, based on the criteria of dimensional stability and final appearance, were especially in the sample treated with mixture S15 + S3 (Biodur®), made us apply this procedure on a tusk fragment, n° inv. SJBC_11_2980, 24 cm length and maximum diameter of 4.6 cm. Initial wet weight: 373.61 g, final weight: 370.70 g. After 27 days of dehydration with acetone at -25 ° C, samples were impregnated with a mixture S15 + S3 (Biodur®) for 14 days, 8 days at room temperature. Curing with cross-linker S6 took 12 days in the gas-curing chamber. This time, we did not remove the excess before curing the silicone, to study the feasibility of removal. Finally, we applied the Biodur® procedure on a tusk, n° inv. SJBC_11_1926, 104cm length and 8.4 cm maximum diameter. Initial wet weight: 4,850 kg Final weight: 4,445 Kg. After 27 days of dehydration with acetone at -25 ° C, samples were impregnated with mixture S15 + S3 (Biodur®) for 30 days, 16 days at room temperature. Curing with cross-linker S6 took 12 days in the gas-curing chamber. Removing polymer excess before curing, we observed little detachment of cementum, the outer layer of tusk, and a small fragment of distal end due to underwater environment damage on the tusks. All these small fragments will be re-attached, once mechanical removal of polymer on the surface is finished.

Results: With the S15 + S3 mixture (Biodur®) procedure applied on Bajo de la Campana's samples and two tusks, we have had very satisfactory results regarding dimensional stability and final appearance. The polymer selected, S15, due its low viscosity, shows optimal incorporation capability and stability. The removal of surface polymer, before or after curing, is possible mechanically and we can get a very natural appearance. Dimensional studies using 3D scanning and aging tests are underway to evaluate the effectiveness of the treatment.

Conclusion: The method of plastination S15 + S3 mixture (Biodur®) used in the conservation of archaeological heritage, elephant tusks of the underwater site Bajo de la Campana, seems to be a viable methodology that could preserve our cultural heritage and the scientific and historical content they own, and may be invaluable for study and exhibition.

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Museum of Anatomy: an Environment for the Democratization of Knowledge.

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Introduction: The UFCSPA Museum of Anatomy is a temporary exhibition, held annually since 2008, which aims to demystify the use of human bodies for teaching. Every year, it has been improved by the expansion of its infrastructure, resources, accessibility and number of visitors. In 2015, along with the combination of art, culture and technical information, the Museum offered interactive applications that provided a unique knowledge environment. Thus, public and private schools, universities and the general public had the opportunity to observe the way that bodies donated to UFCSPA's Body Donation Program for Education and Research in Anatomy (BDP) are used for learning anatomy.

Objectives: To evaluate the impact of the Museum as a learning tool and its function in the socialization of knowledge for internal community (teachers, students and UFCSPA employees), external community and for volunteer tutors.

Methods: The authors analyzed data collected from the satisfaction survey questionnaires (containing the ways the event was publicized) applied to visitors and guides in order to assess the importance of the exhibition in their professional training and social development. Record books containing information on the number of visitors and their institution of origin were also analyzed.

Results: The exhibition, in 2015, lasted 7 days and occupied two floors of UFCSPA's Building 2 (total area of 680m²) and had a total of 6,597 visitors in 2015, of which 647 (9.8%) were members of the internal community. In relation to the 5,950 (90.2%) external visitors, 24.06% were members from the community in general, 23.2% were from colleges, 17% from public schools, 11.56% from private schools, 9.35% from technical schools and 4.93% were from pre-university courses. The total number of questionnaire respondents was 2,936 (44% of visitors) and, of these, 36% answered that they became aware of the Museum by school trips, 28% Facebook, 23% Friends, 6% Site of the university, 3% Poster and Others, and 0.7% email. When referring to the quantity and quality of available audio-visual resources, approximately 97% rated them as either 'Very Good' or 'Good'. As for infrastructure, 95.64% rated it as 'Very Good' or 'Good' and 91.79% approved of the organization and dynamics of the activities. Regarding the language used by the guides during the visit, 94.58% considered it as 'Very Good' or 'Good'. When asked if they would recommend the Museum of Anatomy to someone else, 98.88% answered 'Yes'. The Museum had 62 undergraduate volunteer guides, of which 91.93% considered that the event contributed to their education and all of them (100%) agreed that the Museum is a tool in the democratization of knowledge.

Conclusion: The 2015 UFCSPA Museum of Anatomy reached a record number of participants in comparison with previous editions and reached different audiences, proving to be an important tool for democratizing knowledge. The visitors' and guides' positive evaluation showed how relevant the Museum's role is in teaching the population. Thus, the Museum proved itself as an accessible way to add culture and science in the same space.

Anatomical Specimen Plastination with an Alternative Silicone (Polisil™)

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Introduction: The technique of plastination was created in 1977 by Gunther von Hagens, and since then it has become an important procedure for preparing anatomical specimens. One of the most widely used polymers in this technique is Biodur™ S10 silicone, which was specially developed and tested by von Hagens in Germany. As a consequence of the high costs of S10 importation, it is necessary to find an alternative polymer to enable the application of this technique in Brazil. Objective: The aim of this study was to compare the time course and the final results of room temperature plastination using two distinct polymers: Poliplasti 10 (P10), Polisil™, and Silicone S10 from Biodur™.

Methodology: Four bovine kidneys, donated by Mafrical Inc. were used for experimental procedures. After 30 days of fixation with 10% formalin, the specimens were dehydrated through baths of pure acetone, changed once a week for three weeks. Next, forced impregnation at room temperature (20-25 °C) was performed. For this step, at first the specimens were submerged in the test polymers – P10 and S10 – which were already mixed with their cross-linking agents TES and S6, respectively. After that, they were submitted to a progressively lowered pressure by using independent, but similar, vacuum pumps (Busch-KB0010E, 12 m³/h). After impregnation, the specimens were treated, with the use of a pencil, with the specific catalysts for curing and hardening: DBTL (Polisil™) for the kidneys impregnated with P10, and S3 (Biodur™) for the kidneys impregnated with S10.

We obtained the following results: 1) the specimens prepared with the P10 silicone suffered from shrinkage, which occurred after the beginning of the forced impregnation, generating a more wrinkled appearance to them when compared to those impregnated with S10; 2) comparing to S10, the process using P10 was significantly longer, in the order of 30% longer for impregnation and 300% for catalysis. Besides, it was necessary to volatilize the cross-linking agent TES after catalyst application. With this study we suggest that the higher shrinkage of the specimens impregnated with P10 is probably due to the three-fold higher viscosity of this polymer when compared to S10. The higher time for catalysis of P10 may be due to the use of a lower concentration than is necessary for this process.

Conclusion: In spite of being not so efficient, impregnation with the Polisil silicone proved to be possible, but more tests are necessary to adjust some variables in the technique and/or in the chemicals, in order to obtain a more satisfactory result.

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Evaluation of Professors' Knowledge about Plastination Technique at the Health Sciences Center of Federal University of Espírito Santo

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Introduction: Plastination is a revolutionary conservation method of biological specimens created by Gunther von Hagens (Germany, 1977). This technique presents several advantages, such as the long duration of anatomic specimens and absence of toxic substances. Thus it can be largely used in research, teaching and anatomy-related activities at the University and the community.

Objectives: To evaluate professors' perception and knowledge about plastination technique at the Health Sciences Center.

Methods: Professors of the Health Sciences Center were randomly invited to answer a questionnaire about plastination methods and its presence at this Center, to evaluate their knowledge about this matter.

Results: Twenty professors participated of the present study, 18 women and two men. The first question was whether the interviewee had ever heard of plastination, and 65% (n=13) of them were not aware of the technique. Only two (10%) participants had heard of Gunther von Hagens. Four (20%) volunteers had visited exhibitions with plastinated specimens. Most participants (n=11; 55%) did not know whether they wanted to study in plastinated specimens, 15% (n=3) did not respond and 30% (n=6) said it would be nice to study in plastinated specimens. Moreover, 35% (n=7) of interviewees believe that plastinated specimens can replace those preserved in formaldehyde and glycerine. Lastly, the majority of professors (n=13; 65%) were not aware that there is a Laboratory of Plastination at Federal University of Espírito Santo and that an international meeting will be hosted at the Center.

Conclusion: The present study demonstrated that, despite plastination having several advantages, this technique is not well known by professors at the Health Sciences Center of the Federal University of Espírito Santo. Thus, activities such as the organization of events aiming to publicize and to spread knowledge of plastination are of extreme importance.

Evaluation of Undergraduate Students' Knowledge about Plastination Technique at the Health Sciences Center of Federal University of Espírito Santo

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Introduction: In 1977 Professor Gunther von Hagens created an extraordinary new technique of body preservation to teach macroscopic anatomy that was called plastination. Since then, this method has been refined and popularized and is used as a vehicle to bring the knowledge about the human body to students, health professionals and the general public.

Objective: This work aims to evaluate the students' knowledge about plastination in the Health Sciences Center (HSC) of Federal University of Espírito Santo (UFES).

Methods: Students of Audiology and Speech Therapy, Dentistry, Medicine, Nursing, Nutrition, Occupational Therapy, Pharmacy and Physical Therapy programs that are currently studying anatomy were invited to answer a questionnaire about plastination. It was composed of ten questions, with personal information (gender and undergraduate school) followed by specific questions about plastination, including knowledge about the technique and the creator of the method, visits to exhibitions, personal experiences with this technique, desire to study in plastinated specimens and whether they knew that there is a plastination lab at our University.

Results: Three hundred and sixty-six students answered the questions. Only 111 (30.3%) students mentioned that they were aware of the plastination technique and 40 (10.9%) of them knew who was the creator of this method. Those who declared themselves to be aware of plastination were mostly Physical Therapy students (n=36; 32.4%). Only 34 (9.3%) students had been to a plastination exhibition, most of them were studying medicine (n=11; 32%) and they had visited exhibitions located in Espírito Santo. Many students would like to study in plastinated specimens (n=124; 33.9%), mainly those enrolled in Physiotherapy (n=39; 54.2%) and Audiology and Speech Therapy (n=22; 47%). Only 61 (16.7%) of the students believed that plastinated specimens are able to replace those preserved in formaldehyde and glycerine. Eighty-one (22.1%) students were aware that there is a plastination lab at UFES, mostly Physiotherapy students (n=40; 55.6%). The technique was described as 'interesting' (n=11; 15.9%), 'very interesting' (n=4; 5.8%), 'innovative' (n=4; 5.8%), 'amazing', 'incredible' and 'fantastic' (n=3; 4.3% each).

Conclusion: Plastination needs to be better publicized among our students. However, when analyzing those who had a chance to get to know this technique, there was an evident admiration along with the desire to study in plastinated specimens, mostly shown by Physical Therapy students.