

time needed to print. Materialise e-Stage software generated automatic supports in order to support the build because of the complex structures being built. ABS plastic models of the death mask and skull were manufactured using a Fused Deposition Modelling (FDM) machine at the Department of Industrial & Manufacturing Engineering, University of Malta. A chemical cleaning process then removed the supports.

Results: Two models of the Egyptian mummy were produced – a replica of the death mask and an exact 3D reconstruction of the mummy's skull.

Conclusion: The models produced will form the basis for facial reconstruction of the mummy's head using the Manchester method, which involves rebuilding the face based on ultrasound facial soft tissue thickness measurements at specific locations on the skull.

P6.15

The effect of *Euphorbia characias* and *Opuntia ficus-indica* extracts on HL60, Kasumi and K562 leukaemia cell lines

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Introduction: Blood cancer is caused by lack of correct differentiation of the precursor cells in the bone marrow therefore many immature cells are released into the blood in large numbers causing immunological deficiency, anaemias, clotting disorders. Recent advances in leukaemia therapy involve differentiating agents like retinoic acid. This however only treats one particular kind of leukaemia (APL) efficiently.

Aim: To investigate the effects of the *Euphorbia characias* (Mediterranean spurge - MS) and a patented *Opuntia ficus-indica* (Prickly pear) extract with all-transretinoic acid (ATRA) on HL60, K562 and Kasumi cell lines to see if differentiation is enhanced by these extracts.

Methodology: Leaves from the MS were ground and dissolved in 70% ethanol whilst a further extraction of the same re-dried crushed plant leaves was prepared in DMSO (dimethyl sulfoxide). Test cell lines were cultured and the cells counted to obtain equal numbers of cells for each well sample. The extract was added to the cells in the wells. Nitrobluetetrazolium (NBT) testing which assays the differentiation of the cells towards a granulocyte or monocyte phenotype was assessed with 5 duplicates for each concentration: 100 part per million (ppm), 50ppm, 10 ppm, 1 ppm as well as positive (known differentiating agent) and negative (medium alone) controls. Tex-OE[®] was used with ATRA to see if differentiation was enhanced.

Results: Initial tests showed differentiation with the 70% ethanol extract of MS particularly on the HL60 and K562 cell lines; less obvious differentiation was observed on the Kasumi cell line. The DMSO extract of *Euphorbia characias* showed less promising results. Tex-OE[®] was found to be effective only with high concentrations when combined with ATRA on HL60 cells.

Conclusion: These positive results suggest that further work needs to be done on other cell lines and on primary leukaemia cells to establish if there is an effect on them.

P6.16

Design and manufacture of an artificial rib

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Introduction: Rib replacement may be required during chest wall reconstruction performed after chest wall resection for malignancy. Present repair techniques can be very rigid and cumbersome and affect patients' respiration.

Aim: To design a novel and alternative chest wall reconstruction technique with an artificial rib that allows ease of insertion, use in differing chest shapes and allows more normal post-op respiratory physiology.

Methodology: An artificial rib was designed using three dimensional (3D) modelling with computer-aided design (CAD) and prototyped using computer aided manufacturing (CAM) techniques at the University of Malta. Rapid prototyping machines were used to produce prototypes first in ABS plastic and then in sintered titanium with an electron beam melting (EBM) machine. A later prototype was manufactured from titanium plate using water jet technology. These prototypes were assessed for fit and ease of placement on a plastic human skeleton. A survey of cardiothoracic surgeons at Mater Dei Hospital was performed to measure satisfaction by surgeons using the device.

Results: Tensile testing of the titanium prototype showed that it could withstand over twice the maximum tensile strength that it would be exposed to in the body without any material deformation. Evaluation of user friendliness was accomplished with the use of a questionnaire. The artificial rib was rated as good (4/5) for surface finish and surgical satisfaction and excellent (5/5) for ease of use, fixation properties, flexibility and biomechanical fit. Ease of placement was also assessed by video-recording surgeons attaching the device to a skeleton.

Conclusions: The design and manufacturing of an artificial rib that mimics normal rib shape and contour should be a significant improvement in patient comfort over the methylmetacrylate sandwich prosthesis currently used in chest wall reconstruction.

P6.17

The role of cytokines in hidradenitis suppurativa

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Introduction: Hidradenitis suppurativa is a chronic, recurrent, inflammatory skin condition. It usually presents with debilitating, deep-seated nodules in areas bearing apocrine-glands. Although numerous causes have been proposed, the exact pathogenesis of hidradenitis suppurativa remains unknown.

Aim: To review the possible role of cytokines in the aetiology and pathogenesis of hidradenitis suppurativa.

Methodology: Papers retrieved from two databases (PubMed and Academic Search Complete [EBSCO]) were reviewed.

Results: Although there seems to be no abnormality with regards to the adaptive immune system, the high comorbidity of hidradenitis suppurativa with immune-deficient diseases such as Crohn's disease (up to 39%), superimposed with the achievements acquired with anti-tumour necrosis factor-alpha (TNF- α) pharmaceuticals may indicate an alteration of the innate immune system. An alteration of the immune system results in the release of a plethora of cytokines. Although initially released as a transient defence mechanism, if persistent, chronic disease may eventually develop. When compared to normal subjects elevated cytokine levels are found not only in lesional but also in perilesional hidradenitis suppurativa, providing a possible reason for the high recurrence rate after surgery. The highly inflammatory nature of hidradenitis suppurativa is highlighted by the fact that these cytokine levels are even more elevated than those in some psoriasis patients. TNF- α , interleukin-10, interleukin-12, interleukin-17, interleukin-20 (IL-20), interleukin-22 (IL-22), interleukin-23, and interleukin-1b are all cytokines which are dysregulated in patients with hidradenitis suppurativa.

Conclusion: Cytokines play a role in the pathogenesis of hidradenitis suppurativa, and thus, modulation of these factors will help in managing this condition.