- complex and non-major histocompatibility complex genes. *Am J Pathol.* 1996;**149**:1675
- 4 Vingsbo-Lundberg C, et al. Genetic control of arthritis onset, severity and chronicity in a model for rheumatoid arthritis in rats. *Nat Genet.* 1998;**20**:401
 - 5 Vingsbo-Lundberg C, et al. Increased serum levels of cartilage oligomeric matrix protein in chronic erosive arthritis in rats. *Arthritis Rheum.* 1998;**41**:544
 - 6 Lu S, Holmdahl R. Different therapeutic and bystander effects by intranasal administration of homologous type II and type IX collagens on the collagen-induced arthritis and pristane-induced arthritis in rats. *Clin Immunol* 1999;**90**:119
 - 7 Holmdahl R, et al. Type II collagen autoimmunity in animals and provocations leading to arthritis. *Immunol Rev.* 1990;**118**:193
 - 8 Brunsberg U, et al. Expression of a transgenic class II Ab gene confers susceptibility to collagen-induced arthritis. *Eur J Immunol.* 1994;**24**:1698
 - 9 Kjellén P, et al. The structural basis of MHC control of collagen-induced arthritis; binding of the immunodominant type II collagen 256–270 glycopeptide to H-2Aq and H-2Ap molecules. *Eur J Immunol.* 1998;**28**:755
 - 10 Trentham DE, et al. Autoimmunity to type II collagen: an experimental model of arthritis. *J Exp Med.* 1977;**146**:857
 - 11 Holmdahl R, et al. Homologous collagen-induced arthritis in rats and mice are associated with structurally different major histocompatibility complex DQ-like molecules. *Eur J Immunol.* 1992;**22**:419
 - 12 Carlsén S, et al. Cartilage oligomeric matrix protein (COMP)-induced arthritis in rats. *Clin Exp Immunol* 1998;**114**:477

Tissue engineering and stem cell biology – Friday 15 June, 16.00-17.30/Forum Hall

SP0083 EFFORT-INDUCED HYPERTHERMIA: SIMILARITIES WITH MALIGNANT HYPERTHERMIA

P Cozzone, G Kozak Ribbens, S Confort Gouny, D Figarella Branger, M Aubert, D Bendahan. Centre de Résonance Magnétique, Biologique Et Médicale – UMR CNRS6612, Faculté de Médecine, Marseille, France

10.1136/annrheumdis-2001.30

Effort-induced hyperthermia, also called exertional heat stroke (EHS) is due to an imbalance between internal heat production and heat loss, generally exacerbated by several factors such as inadequate fluid, caloric, and/or electrolyte intake, and is associated with a classical symptomatology, i.e. increased body temperature (higher than 40°C), neurological impairment that could lead to coma with the addition of rhabdomyolysis-induced myoglobinuria and acute renal failure. EHS generally occurs during strenuous activity under hot and humid environmental conditions. Subjects are often healthy young adults with no apparent clinical or biological deficits. The pathogenesis of a EHS episode differs from a malignant hyperthermia (MH) crisis. However, both conditions share some similarities in symptoms, such as the abnormal increase in core temperature. The triggering agent is different. MH is a disorder of skeletal muscle in which volatile anaesthetics and depolarizing muscle relaxants trigger a sustained increase in myoplasmic calcium concentration, thereby producing hyper-metabolic and contractile activities. MH crisis occurs in predisposed subjects and leads to a dramatic increase in core temperature. In addition, neurological signs are rarely recorded during a MH crisis, and dantrolene is used to prevent a fatal issue, whereas cooling is largely used as therapy during EHS. DNA mutations involved in the susceptibility to MH have been reported for only 50% of subjects susceptible to MH and for the remaining 50% this information is still not available. With respect to EHS subjects, no information regarding MH mutations has been reported so far.

Due to some similarities between MH and EHS, it could be hypothesised that EHS, in the same way as MH, is associated

with the existence of an infraclinical myopathy. In this respect, electromyographic, histological and metabolic studies have provided conflicting and scanty results. In the present study, we analysed the physiological (using *in vitro* contracture tests) and metabolic (using 31-phosphorus magnetic resonance spectroscopy, 31P MRS) bases of EHS. We addressed the issue of possible etiological similarity between the group of EHS subjects and MH susceptible (MHS) subjects for whom a noninvasive diagnostic strategy has been recently reported.

Using 31P magnetic resonance spectroscopy, we have analysed the muscle energetics of 26 EHS subjects for whom *in vitro* halothane-cafeine contracture tests were abnormal and investigated possible similarities with subjects susceptible to malignant hyperthermia. An early decrease of pH was noted during the first minute of exercise in EHS subjects as compared to controls. EHS subjects were divided into two subgroups according to the diagnostic score previously developed for MHS subjects. The 19 subjects (73%) with a score higher than 2 displayed a significantly larger caffeine-induced and earlier ryanodine-induced contractures on muscle biopsies as compared to the rest of the group (7 subjects). The results demonstrate that muscle energetics is abnormal in subjects who have suffered from EHS and suggest a possible link between MH and EH, although all EHS patients cannot be considered as MHS. Metabolic abnormalities in EHS subjects detected by 31P MRS may indicate a defect affecting the calcium release channel of the sarcoplasmic reticulum which translates as a very abnormal ryanodine contracture test by IVCT. We conclude that, similarly to MH crisis, EHS is related to a failure of muscle energetics that may be associated with a latent myopathy which is readily identified by non invasive 31P MR spectroscopy.

SP0084 DYSBARIC OSTEONECROSIS

¹B Fouquet, ²P Goupille, ²J Valat. ¹Physical Medicine and Rehabilitation, Tours, France; ²Rheumatology, Hospital Trousseau, Tours, France

10.1136/annrheumdis-2001.31

Dysbaric osteonecrosis is a serious complication for those exposed to a hyperbaric environment, occurring in 17% amongst compressed air workers and 4.2% amongst divers. The prevalence of bone lesions increases with age, the number of bends, the number of hours worked in the present contact, obesity, experience greater pressures of air or at greater depths. Dysbaric osteonecrosis appears to be independant of decompression sickness.

Bones lesions are mainly symmetrical and multiple, occurring in (1) the shafts of the femora or tibiae and the heads and necks of the humeri or femora, (2) next to the joint surface, the so-called "juxta-articular lesions". The juxta-articular lesions almost never occur near the articular surfaces of the knee or elbow joints. The sites in the skeleton at which the lesions occur are those at which fatty marrow is found in the mature adult.

The pathogenesis of osteonecrosis may involve several factors: circulatory impairment by extravascular or intravascular bubbles, lipid aggregation, fibrin-platelet thrombi, release of vasoactive substances, bas-induced osmosis. It has been suggested that injured marrow adipocytes can release vaso-active substances that can play a systemic procoagulant role in triggering disseminated intra-vascular coagulation.

The basic radiologic abnormality is usually an increase in the density, less often it may be a decrease. There may be a long