METHODS: Spinotrapezius muscles of adult Wistar rats were exteriorized and loaded with the fluorescent probe Fura-2 AM for 60 minutes. Then, the muscle were mounted on heated glass hotplate and $[Ca^{2+}]_i$ was determined by fluorescence microscopy. The surface temperature of the muscles was set at 30 (n = 6), 37 (n = 9) and 42 ^oC (n = 7). After 90 minutes observation, 10% Evans Blue was loaded for 30 minutes to identify the permeability of the plasma membrane.
RESULTS: There was no significant change of $[Ca^{2+}]_i$ over the 100 minutesH observation period for 30 and 37 ^oC conditions. In contrast, the 42 ^oC conditions induced a significant $[Ca^{2+}]$i increase of 17.5 ± 0.7% ($P < 0.01$) at 20 min of 42 ^oC . Subsequently, $[Ca^{2+}]_i$ decreased to 22.3 ± 0.4% ($P < 0.01$) below baseline at 90 min. The myocytes swelled visibly as [Ca2+]i decreased and a concomitant increase in myocyte permeability became evident (Evans Blue positive reaction).
CONCLUSIONS: This *in vivo* physiological model demonstrated that 42 ^oC heat stress produces degeneration of the plasma membrane and leads to, or is associated with, failure of $[Ca^{2+}]$i homeostasis.

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Rat Skeletal Muscle Microvascular Oxygen Partial Pressure During Hyperbaric Oxygen Versus Air

Kohei Yamakoshi[1], Kazuyoshi Yagishita[2], David C. Poole[3], Yutaka Kano[1]. *[1]University of Electro-Communications, Tokyo, Japan. [2]Tokyo Medical and Dental University, Tokyo, Japan. [3]Kansas State University, Manhattan, KS.*
(No relationships reported)

Hyperbaric oxygen (HBO) therapy is effective for the treatment of tissue hypoxia, for example, in recovery from traumatic muscle damage. However, given the toxicity of high O_2 pressures especially in the lung and also the presence of hyperoxic vasoconstriction in skeletal muscle there is a pressing need to establish the efficacy of different O_2 delivery protocols for raising microvascular O_2 partial pressures(i.e., $PmvO_2$, which reflects the dynamic balance between O_2 delivery (QO_2) and utilization (VO_2)rates).
PURPOSE : To determine the $PmvO_2$ response to changes in atmospheric pressure (1.0-3.0 atmospheres absolute: ATA) and oxygen concentration (21% vs 100% O_2).
METHODS : Phosphorescence quenching techniques were used to measure $PmvO_2$ in tibialis anterior muscle of anesthetized male Wistar rats (11 weeks, n = 13) during hyperbaric conditions. The small animal hyperbaric chamber was pressurized with either oxygen (100% O_2: HBO) or air (21% O_2: HBA) to 3 ATA at 0.2 ATA/min.
RESULTS : $PmvO_2$ increased linearly for HBA (1.0 ATA : 24.0 ± 2.7 Torr, 3.0 ATA : 64.8 ± 12.4 Torr) and HBO (1.0 ATA : 26.6 ± 3.5 Torr, 2.4 ATA : 125.5 ± 16.7 Torr), however, from 2.4 ATA to 3.0 ATA of HBO, $PmvO_2$ demonstrated little further change. The relationship between calculated inspired PO_2 (PiO_2) and $PmvO_2$ was expressed by a linear regression. The regression line for HBA was steeper for HBO (HBA : slope = 0.12, $r^2 = 0.99$; HBO : slope =0.06, $r^2 = 0.98$). The improved efficacy of HBA over HBO (with respect to $PmvO_2$) may reflect that the presence of N_2 acts as a respiratory "strut" keeping alveoli open and better preserving pulmonary oxygen diffusing capacity.
CONCLUSIONS : It is possible to double muscle $PmvO_2$ using 3 ATA air. If this increase is therapeutically effective it may avoid some of the pernicious effects (toxicity, atelectasis) of pure O_2 inhalation. However, if $PmvO_2$ over ~75 Torr is desired, HBO is required. The mechanism for the differential relationship between HBA and HBO warrants investigation.

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Effect of Joint Angle and Isometric Contraction Intensity on Mechanomyographic Responses of the Biceps Brachii

Swapan Mookerjee, Matthew J. McMahon. *Bloomsburg University, Bloomsburg, PA.* (Sponsor: Eric Rawson, FACSM)
(No relationships reported)

PURPOSE: To examine the influence of elbow joint angle and contraction intensity on mechanomyographic (MMG) responses at the biceps brachii.
METHODS: 14 male subjects (mean ± SD, age 22.1 ± 2.3 years) performed maximal isometric voluntary contractions (MVIC) at elbow flexion angles of 60°, 90°, and 120°. On a separate day, subjects performed 35- second contractions at two levels of MVIC (50%, 75%) within each joint angle, in randomized order. MMG recordings were made at the biceps brachii. A 30-second segment of the signal was analyzed to determine the Root Mean Square (RMS).
RESULTS: Mean (±SD) MMG linear slope coefficients for elbow joint and percentage of MVIC are presented below. Two-way repeated measures ANOVA revealed no significant effect of elbow joint angle or contraction intensity.

	MMG 50% MVIC			MMG 75% MVIC		
	60°	**90°**	**120°**	**60°**	**90°**	**120°**
Mn	0.030	0.027	0.017	0.025	0.016	0.017
SD	0.019	0.025	0.022	0.030	0.019	0.029

Polynomial regression analysis of MMG versus time relationships indicated that at 50% MVIC, quadratic models provided the best fit for the 60° (r^2=0.72), and 120° (r^2=0.94) joint angles, followed by a cubic model at 90° (r^2=0.81) . At 75% MVIC, a quadratic model provided the best fit at the 120° joint angle (r^2=0.79), whereas a cubic model was the best fit at the 60° (r^2=0.92) and 90° (r^2=0.74) joint angles, respectively.
CONCLUSIONS: The MMG-Time relationship was not influenced by the two contraction intensity levels. It appears that within this test protocol, the motor control strategies of the biceps brachii are similar across these elbow joint angles.

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Electromyographic Responses after Concentric and Eccentric Exercises on the Forearm Flexor

Xin Ye, Travis W. Beck, Nathan P. Wages. *University of Oklahoma, Norman, OK.*
(No relationships reported)

Concentric and eccentric muscle actions are involved in daily and sports activities. Unlike concentric muscle action, eccentric muscle action is associated with greater mechanical efficiency, but has higher impact on force decrement. When used properly, the surface electromyography (sEMG) is a very useful technique to examine neural control strategies in skeletal muscles.
PURPOSE: To examine the acute EMG responses following maximal concentric and eccentric exercises in the forearm flexor.
METHODS: Twenty-six healthy men (mean ± SD age = 23.6 ± 3.8 years; height = 179.8 ± 6.5 cm; mass = 87.1 ± 14.4 kg) did 6 sets of 10 repetitions of maximal isokinetic concentric (CON) and eccentric (ECC) exercise on their dominant forearm flexor at two separate visits. Before (PRE) and after (POST) the exercise interventions, the subjects performed isometric forearm flexion maximal voluntary contractions (MVCs), followed by submaximal isometric forearm flexion muscle actions at 40% of the PRE MVC for 10 seconds. EMG was recorded