143 Journal writing. C. L. Hicks*, *University of Kentucky, Lexington*.

Students doing summer internships within the Food Science Group at University of Kentucky are required to keep a journal. After the internship is acquired the student signs a contract where they agree to make daily entries into a journal about what they did and learned each day. The contract also requires that the student check in with their advisor on a monthly basis and give a presentation about what they learned during the internship the following semester. Once the contract is completed, the student is automatically registered for the internship course the semester following the internship. As the internship proceeds the student meets with his/her advisor who checks their journal and makes suggestions as to how the journal can be improved. Under this system most students keep fairly detailed journals. Many students not only keep information about their internships but also include information about other personal events. Students are encouraged to keep the raw notes in their journal, so many journals are filled with sticky notes attached to the pages where the journal entries were made. Many students prefer to keep their journals in an electronic format. The journal serves as a primary source of information that the presentation is developed from the following semester. Advisors do not correct journal entries, but do encourage that journals are legible and contain insights about the internship. Most students have shorter daily entries in their journals at the beginning of the internship and more extensive entries near the end of the internship. Most students state that by keeping a journal for an extensive period their writing fluidity is enhanced and as a result they write term papers in a more succinct flowing manner.

Key Words: teaching, internships, journal

144 Students' perception of writing assignments in contrasting learning environments. M. Wattiaux*, *University of Wisconsin, Madison*.

Our objective was to determine students' perception of writing (W), reading (R), discussion (D), and practical hands-on activities (A) in six classes taught in 2008. Classes included sophomores enrolled in 272 Precapstone Seminar; freshmen and seniors in 302 Dairy Cattle Husbandry Practicum; students of mixed standing enrolled in 375 Mexico Seminar; seniors in 414 Ruminant Nutrition; juniors, seniors and master students enrolled in 468 Managing the Environmental Impacts of Livestock Operations; and doctoral candidates enrolled in 875 College Classroom: Teaching in Sciences and Engineering. The W assignments included the submission of a draft and a final resume (272), a weekly question and answer notebook (302), weekly journal entries (375), a take-home case study (468), and weekly thought papers (875). Students scored how the W, R, D, and A of the class helped their learning on the following scale: 1-2=not at all, 3-4=a little, 5-6=somewhat, 7-8=a lot, and 9-10=a great deal. Data were analyzed with proc mixed of SAS (see results in Table). Except for 875, W scores were the lowest scores in all classes in which they were evaluated. The score (means ± SD) for the item "I learned in this class" (L score) was: 7.8 ± 1.2, 9.1 ± 1.1, 8.5 ± 1.7, 6.4 ± 2.6, 8.7 ± 1.1 and 8.4 ± 1.3 for 272, 302, 375, 414, 468 and 875, respectively. The L score minus the W score differed among classes (*P=0.03*) and was the lowest for 272 (L-W = 0.4) and 875 (L-W=1.2), intermediate for 302 (L-W=1.6) and 468 (L-W=2.3), and highest for 375 (L-W=3.3) suggesting that the sophomores writing their resume and the doctoral candidates writing their thought papers perceived a relatively higher contribution of the W assignment to their overall learning than the W assigned in 302, 375 and 468. The design of successful W assignments must consider student standing, learning objectives, and the other pedagogical elements of the course environment.

Table 1.

Class	N	W score	R score	D score	A score	P value
272	14	7.4	na	na	9.3	<.01
302	8	7.5	na	na	10.0	.01
375	13	5.2[a]	8.7[b]	8.5[a]	na	<.01
414	19	na	6.2[b]	6.6[a]	7.3[a]	.09
468	11	6.5[b]	8.1[a]	8.8[a]	7.2[b]	<.01
875	16	6.8	7.2	7.7	6.6	.47

na = not applicable; a, b: means in a row with different superscripts differ, *P<.05*.

Key Words: assessment, SoTL

ASAS Cell Biology Symposium

145 Redox regulation of cysteine-dependent enzymes. R. P. Guttmann*, *University of Kentucky, Lexington*.

It is well-established that maintenance of the intracellular redox state is critical for cell survival and that prolonged or abnormal perturbations towards oxidation result in cell dysfunction. This is exemplified by the widespread observation of oxidative stress in many pathological conditions as well as the positive effects of anti-oxidants in treating certain conditions or extending life-span itself. In addition to the effects of oxidation on the lipid bi-layer and modification of DNA in the nucleus, proteins are also modulated by redox state. One of the primary targets of oxidation within a protein is the amino acid cysteine, whose thiol-side chain is highly sensitive to all types of oxidizing agents. While this sensitivity is used within the cell as potent defense mechanisms to prevent oxidation such as glutathione, the use of cysteine in the active site of enzymes leaves them open to oxidant-mediated damage. Whether the damage is due to a pathological condition or to post-mortem mediated loss of redox homeostasis, cysteine-dependent enzymes are targets of all forms of reactive oxygen, nitrogen and sulfur species. A greater understanding the redox-mediated control of cysteine-dependent enzymes opens the door to the selective use of anti-oxidants to prevent or reverse the cellular damage their inhibition causes.

Key Words: anti-oxidant, glutathione, cell death

146 Redox regulation of cell function in skeletal muscle: Effects of contractile activity and implications for aging muscle. G. L. Close*, E. D. O'Neill, and M. J. Jackson, *University of Liverpool, UK*.

Skeletal muscle comprises approximately 40% of the human body and could be described as the largest organ system in the human body (1). Skeletal muscle is terminally differentiated post-mitotic tissue that is subjected to considerable day to day stresses. Fortunately, skeletal

muscle has the remarkable ability to adapt and remodel providing protection against future stresses (2). Skeletal muscle fibres continually generate reactive oxygen species (ROS) (3) and this production is increased during physical activity (4). For many years, this potentially deleterious effect of increased ROS generation has been termed oxidative stress and attempts to prevent ROS generation have been, and continue to be, advocated (5). However, there is emerging evidence that ROS also play physiological roles mediating cell signalling and adaptation (6; 7). Redox regulation of skeletal muscle function may therefore be essential in cellular adaptation. Inconsistencies in the literature may be due to the difficulties in assessing ROS production. Our group has utilised novel techniques to study ROS in skeletal muscle such as fluorescent microscopy (8), microdialysis (9) and transgenic mouse models (10). We have been able to identify the site of ROS production and identify a number of redox regulated transcription factors that play a fundamental role in skeletal muscle adaptation to stresses (6). Data will be presented on these adaptations in skeletal muscle and provide evidence that dysregulation of redox regulated processes may impair cellular adaptations (11) and promote muscle atrophy. 1. Close GL et al., Sports Med 35:413-427, 2005 2. McArdle A et al Ageing Res Rev 1:79-93, 2002 3. Jackson MJ, IUBMB Life 60:497-501, 2008 4. Reid MB, Free Radic Biol Med 44:169-179, 2008 5. Close GL et al., Comp Biochem Physiol A Mol Integr Physiol 142:257-266, 2005 6. Vasilaki A, et al., Mech Ageing Dev 127:830-839, 2006 7. Gomez-Cabrera MC et al., J Physiol 567:113-120, 2005 8. Pye D et al., J Physiol, 2007 9. Close GL et al., Free Radic Biol Med 39:1460-1467, 2005 10. Broome CS et al., Faseb J 20:1549-1551, 2006 11. Khassaf M et al., J Physiol 549:645-652, 2003

Key Words: skeletal muscle

147 Mammalian epididymal glutathione peroxidases control the maintenance of sperm DNA integrity. E. Chabory, P. Vernet, R. Cadet, F. Saez, and J. R. Drevet*, *GReD, Clermont Université*, *Aubiere, France*.

In mammals, post-testicular epididymal sperm maturation is considered an essential step for the transformation of immature testicular gametes to mature spermatozoa capable of fertilization. Reactive oxygen species (ROS) have clearly been shown to be key actors in this maturation process. However, spermatozoa are extremely sensitive to oxidative attacks that were correlated with lipid peroxidation, DNA damage and impaired sperm motility. To precisely control the level of hydrogen peroxide in the vicinity of the male gamete the mammalian epididymis uses a panel of non enzymatic and enzymatic scavengers among which the glutathione peroxidase (GPx) family is highly represented. Within the various GPx proteins expressed in the mammalian epididymis, GPx5, occupies a unique position since it is the sole secreted GPx that will be directly in contact with the male gamete during its journey in the epididymal luminal environment. To find out how important this protein is for the epididymis physiology and the male gamete, GPx5-null mice were generated. Histological analyses of the GPx5-/- epididymides followed by cytological sperm examination did not show any obvious signs of morphological alterations. Overall, fertility parameters of GPx5-/- sexually mature male mice were not affected. However, a clear increase in developmental defects were noticed when WT females were crossed with aging GPx5 deficient males (over one year old). Cytometry analyses have shown a significant decrease in sperm DNA compaction in cauda epididymides from GPx5 null mice. In addition, sperm DNA oxidation was noticed in GPx5-/- mice using β-oxodG as a marker. Nuclear peroxidative attacks were also observed in cauda epididymidis epithelium. Quantitative PCR analyses have confirmed that the cauda epididymidis of the GPx5-/- mice is engaged in an antioxidant response. Overall, the data collected show that the lack of GPx5 protein leads to oxidative stress within the epididymis resulting in sperm nucleic alterations. *This work was supported by the CNRS, the French Ministry of Education, the Ernst Schering Research Foundation (Berlin, Germany) and CONRAD (Contraceptive Research & Development, New York, USA).*

148 A theoretical approach to sperm preservation based upon mitochondrial energetics. D. P. Froman*, *Oregon State University*, *Corvallis*.

To date, sperm preservation has depended upon a trial-and-error experimental approach. Even though this approach enabled bovine sperm to become a commodity, semen preservation remains problematic for many species. The present work outlines an alternative approach. In previous work, mitochondrial calcium cycling and phospholipase A_2 were proven critical to fowl sperm motility. Thus, it was inferred that fowl sperm use an endogenous substrate to ascend the hen's vagina. It is noteworthy that fowl sperm reside with the oviduct's sperm storage tubules (SST) over an interval of days to weeks after insemination. In this regard, additional previous work outlined a model wherein in vivo sperm storage was explained in terms of exogenous long chain fatty acids (released from SST epithelial cells) and sperm cell oxidative phosphorylation. Moreover, this model afforded an explanation for sperm egress from the SST based on mitochondrial senescence. Collectively, these facts and inferences presented the possibility that sperm could be inactivated by disrupting mitochondrial calcium cycling and thereby preserved. However, this possibility also posed a problem: maintenance of the mitochondrion's inner membrane potential within inactivated sperm. The present work details a series of experiments in which fowl sperm were inactivated by treatment with the calcium chelator BAPTA and then reactivated by treatment with calcium ions. Cessation of mitochondrial calcium cycling was proven by flow cytometry and fluorescence microscopy. When treated sperm were cooled to 10 C, inactivated sperm could be reactivated over a 5-h interval. When stored sperm were held for 3 h prior to reactivation and insemination, fertility was 88% of the control. Storage did not affect hatchability. In summary, short-term storage was realized by manipulating mitochondrial function. It is proposed that: (1) Complex V consumes ATP within inactivated sperm and by doing so maintains the mitochondrion's inner membrane potential, (2) ATP is regenerated from phosphocreatine by creatine kinase, and (3) necrosis follows depletion of intracellular phosphocreatine.

Key Words: calcium, mitochondria, sperm