Microscopy TODAY

Coming Events

2010

4th CIMST Interdisciplinary Summer School on Bio-medical Imaging
September 6–17, 2010, ETH Zurich, Switzerland
www.cimst.ethz.ch/education/summer_school/10

37th Annual SCUR Meeting
September 7–8, 2010, Helsinki, Finland
www.scur.org

The Fourth Brazil School for Single Particle Cryo-EM
September 8–19, 2010, Rio de Janeiro, Brazil
www.single-particles.org/school_2010/index.html

Bio-Trac 35 "Immunofluorescence and Confocal Microscopy"
September 14–16, 2010, Bethesda, MD
www.biotrac.com

XXI International Symposium of Morphological Sciences (ISMS)
September 18–22, 2010, Messina-Taormina, Sicily, Italy
www.ismstaormina2010.com/index.asp

International Microscopy Congress
September 19–24, 2010, Rio de Janeiro, Brazil
www.imc-17.com

ALM2010—Advanced Light Microscopy Symposium 2010
September 23–24, 2010, Ghent University, Belgium
www.alm2010.ugent.be/

Histotechnology Symposium
September 24–29, 2010, Seattle, WA
www.nsh.org/content/registration

American Society for Clinical Pathology Annual Meeting
October 27–31, 2010, San Francisco, CA
www.ascp.org/2010AnnualMeeting/

Optical Microscopy & Imaging in the Biomedical Sciences—MBL
October 5–14, 2010, Woods Hole, MA
www.mbl.edu/education/courses/special_topics/om.html

2011

Microscopy & Microanalysis 2011
August 7–11, 2011, Nashville, TN

2012

Microscopy & Microanalysis 2012
July 29–August 2, Phoenix, AZ

2013

Microscopy & Microanalysis 2013
August 4–8, Indianapolis, IN

More Meetings and Courses
Check the complete calendar near the back of this magazine and in the MSA journal *Microscopy and Microanalysis*.

Carmichael's Concise Review

Sperm Seen Competing

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It is well known that females of some insects mate with more than one male before the ova are fertilized. The post-copulatory behavior of the sperm has been studied for decades, but until now there has not been a method to definitively determine the "ownership" of sperm within the female genital tract. In a very clever study, Mollie Manier, John Belote, Kirstin Berben, David Novikov, Will Stuart, and Scott Pitnick offer an answer to this dilemma [1].

The solution was to genetically engineer two groups of *Drosophila melanogaster* (fruit flies) males. Each group would express a protein labeled with either green fluorescent protein (GFP) or red fluorescent protein (RFP) in sperm heads that can be easily observed and unambiguously differentiated within the reproductive tracts of females (see Figure 1). Multiple tests of male fitness relevant to sperm and/or ejaculate function were assayed, with transgenic males compared to each other and to a wild-type strain. Although there were some differences, all three strains fell within the known typical range of values. Moreover, subsequent experiments were unbiased because adequate controls were consistently performed, such as varying the mating order of GFP and RFP males.

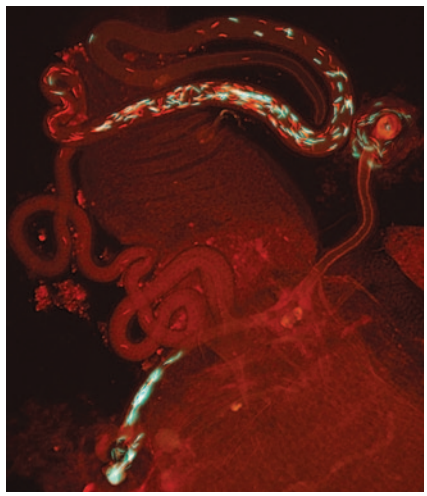

Figure 1: Rival sperm with green or red heads (protamine-tagged GFP or RFP) within the sperm-storage organs (i.e., paired spermathecae and seminal receptacle) of a female *D. melanogaster*.

Manier et al. quantified 1) spatiotemporal patterns of sperm storage and use by the female after re-mating, 2) the extent and timing of sperm ejection by females, and 3) the influence of re-mating on resident sperm motility. They also revealed two different mechanisms by which resident sperm are displaced from the sperm-storage organs after re-mating and which contribute to last-male sperm precedence. First, there was an early release of some resident sperm from storage organs, a process that does not involve second-male sperm. This release of resident sperm was presumptively mediated by the female and triggered by male accessory gland proteins and/or mechanical stimulation of copulation. Second, resident sperm appear to have been physically displaced over time from sperm-storage organs by incoming second-male sperm.

They also addressed the question of why males ejaculate many more sperm than can be stored in the female genital tract. This is important because the sperm of these fruit flies are many times longer (1800 μm) than any distance they travel within the female and that storage appears to be a rapid and efficient process. Their evidence suggests that excess sperm, and perhaps their mobility, are adaptations to sperm competition, specifically to physical displacement of resident sperm. Their results also suggest that ejaculate size is evolving via sexual selection mediated by sperm competition. It was also established that females can eject sperm.

Finally, experiments suggested that sperm motility did not change upon re-mating and that sperm were used in direct proportion to their prevalence. This suggests that the sperm of either male is equally competitive in regards to fertilization, which correlates directly with their prevalence.

The observations of Manier et al. corroborate some previously conjectured mechanisms related to fertilization success. These include sperm displacement and sperm ejection by females. Most importantly, a complex and dynamic array of processes underlying fertilization success can now be dissected in targeted, detailed genetic analyses to reveal specific behavioral, physiological, and biochemical mechanisms relevant to post-copulatory sexual selection. This is certainly an important contribution to the field [2].

References

[1] MK Manier, JM Belote, KS Berben, D Novikov, WT Stuart, and S Pitnick, *Science* 328 (2010) 354–57.
[2] The author gratefully acknowledges Dr. Scott Pitnick for reviewing this article.

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