



CURRICULUM VITAE OF

EVELINA Y. BASENKO

A. EDUCATION

Ph.D. (Molecular Genetics) 2008 The University of Georgia, Athens, GA.

Thesis: Studying telomere capping and the genetics of Recombinational Telomere Elongation (RTE) in *Kluyveromyces lactis*.

M.S. (Poultry Science with minor in Genetics) 2003 Mississippi State University, Mississippi State, MS

Thesis: Effects of S6-strain *Mycoplasma gallisepticum* inoculation at either 10, 22, or 45 weeks of age on performance, egg, blood, and visceral characteristics of commercial laying hens.

B.S. (Animal Science: Genetics and Breeding) 2000 Kherson Agrarian State University, Kherson, Ukraine

B. RESEARCH INTERESTS:

I am studying the mechanism of telomere elongation through recombination. The results of my research will help to better understand cancer formation and aid in developing tumor suppressive drugs.

1. Background: According to the American Cancer Society statistics report 2007, cancer is a second leading disease which causes over half million deaths every year. Despite of the advances in cancer treatment, the percent of certain cancers continuing to rise every year and scientists around the world are trying to develop new methods to treat cancer.

Cancer cells rely in their formation and survival on repetitive DNA sequences telomeres, which are located at the end of linear chromosomes. The main part of chromosomes is constituted by genes. Telomeres protect or “cap” internally located

genes from damage. Humans are born with a certain telomere length which gradually declines as cells divide. Telomere shortening occurs due to incomplete replication of DNA at chromosomal ends and damage to DNA by environmental factors. Loss of chromosomal capping due to severe telomere shortening is thought to be of the factors causing ageing. Extreme telomere shortening leads to termination of cell division and has been suggested to be a cancer preventative pathway. In order to survive and achieve indefinite division potential (become immortal) cancer cells have to bypass the termination of cell division and to elongate their telomeres. There are two pathways to telomere extension in cancer cells. Majority of malignant achieve unlimited telomere elongation through the activation of telomerase, a reverse transcriptase enzyme responsible for the synthesis of telomeres. Telomerase is normally inactive in almost all normal human cells. However, 5-10% of human cancers, such as soft tissue sarcomas, astrocytic brain tumors and osteosarcomas activate Alternative Lengthening of Telomeres pathway which relies on telomere-telomere recombination, a process where one telomere copies DNA sequence from another telomere. These cells utilize proteins which are normally involved in DNA repair in normal cells. Therefore the development of drugs against ALT cancers is a challenging task and requires deep understanding of the processes involved in the mechanism of telomere elongation through recombination.

2. Project Description. The major goal of my research is to determine the genetic requirements for telomere-telomere recombination using *Kluyveromyces lactis* as a model organism. *K. lactis* is a classical model organism in telomere research. Our lab is the only lab conducting studies on telomere-telomere recombination mechanism in this organism and I am the only trained researcher to complete my current projects.

Earlier, our lab postulated a model for understanding the mechanism of telomere-telomere recombination (Natarajan and McEachern, 2002). According to this model tiny telomeric circles (t-circles) act as templates to elongate telomeres. Our collaborator, Dr. Jack Griffith at the University of North Carolina, Comprehensive Cancer Center, reported that abundant t-circles were found in ALT-type cancers. These t-circles were suggested to be an important factor in telomere elongation in cancer cells. The mechanism of t-circle formation is not understood. It was hypothesized that t-circles can be formed through resolution of higher order telomeric structures called telomeric loops (t-loops). T-loops were found in both, human and yeast cells (Cesare *et al.*, 2007). This demonstrates that *K. lactis* is an excellent model for t-circle and t-loop studies.

3. Approach: To discover genes required for telomere-telomere recombination, t-circle and t-loop formation I am using techniques of gene cloning, gene replacement, DNA analysis through one- and two-dimensional gel electrophoresis, Southern blotting, and Electron Microscopy analysis.

C. CURRENT RESEARCH ACTIVITIES:

Currently I am working on three projects:

- a) Studying the mechanism of telomere-telomere recombination,
- b) Discovering genes required for t-circle production

c) Determining the genetic requirements for t-loop formation and resolution.

I constructed several mutants lacking genes involved in recombination within genome (*RAD50*, *RAD51*, and *RAD59*, and *SGS1*). I also performed cloning and disruption of *MUS81* gene which is believed to be involved in the resolution of looped structures. Our hypothesis is that *MUS81* can be a novel gene important for t-circle production.

In order to determine the effect of mutations in *RAD50*, *RAD51*, *RAD59*, *SGS1*, and *MUS81* on t-circle and t-loop formation I will analyze telomeric DNA using Electron Microscopy.

D. RESEARCH PROGRESS and ACHIEVEMENTS:

1. Cloned *MUS81* gene, constructed plasmid vectors with wild type and mutated gene.
2. Created strains with mutations in *RAD50*, *RAD51*, *RAD59*, and *SGS1*.
3. Developing a new technique to detect 1bp mutation within telomerase DNA template in *Kluyveromyces lactis* in order to differentiate between wild type and mutated strains.

E. EMPLOYMENT HISTORY

1. RESEARCH EXPERIENCE: 7 years

2003-present

Position: Researcher (Funding Source: **National Institute of Health**).

Grant name: "NIH Telomere McEachern", No. 10-21-RR093-286

Project title: Studying telomere capping and the genetics of Recombinational Telomere Elongation (RTE) in *Kluyveromyces lactis*.

Principal Investigator: Dr. Michael McEachern.

Location: Department of Genetics, The University of Georgia, Athens, GA

2001-2003:

Position: Researcher (Funding Source: Assistantship from the Department of Poultry Science, Mississippi State University, Mississippi State, MS

Project title: Effects of S6-strain *Mycoplasma gallisepticum* inoculation at either 10, 22, or 45 weeks of age on performance, egg, blood, and visceral characteristics of commercial egg laying hens.

Principal Investigator: Dr. David Peebles.

Location: Department of Poultry Science, Mississippi State University, Mississippi State, MS.

2. TEACHING EXPERIENCE: 4 years

2003-2005

Subjects: Genetics 4200, Biology 1107

Location: The University of Georgia, Athens, GA

2000-2002

Subject: Genetics 3103

Location: Mississippi State University, Mississippi State, MS

F. COLLABORATIONS

I established collaboration with internationally recognized scientist Dr. Jack Griffith, the Cancer Comprehensive Center, University of North Carolina at Chapel Hill, NC.

G. INDIVIDUALLY SUPERVISED

UNDERGRADUATE RESEARCH/LABORATORY

The University of Georgia:

1. Greg O'Neil, Undergraduate Research, 2007.
Project title: The effect of mutations in *RAD51* and *RAD59* on homologous recombination within subtelomeric sequences in *K. lactis*.
2. Matt Schultz, undergraduate lab supply worker, 2007.
3. Rahila Chaudhry, Undergraduate Research, 2006.
Project title: Studying of telomere phenotypes in survivors from *rad51*, *rad59*, *rad50* and telomerase deletion mutants in *K. lactis*.
4. Nathan Crain, Undergraduate Research, 2005.
Project title: Studying *stn1-M1* ALT-like mutant.

H. PROFICIENCY and SKILLS

Molecular Genetics:

1. Gene cloning.
2. Gene disruption.
3. Gene replacement in live cells.
4. Construction of vectors for gene amplification in *Escherichia coli* (*E. coli*).
5. DNA isolation from *E.coli* and yeast.
6. Yeast tetrad dissection microscopy.
7. Two dimensional Gel Electrophoresis

Software/Statistical applications:

1. Statistical Analysis System (SAS) by SAS Institute for statistical analysis of trial data across time and trial treatments.
2. Variants of algorithm for different types of searches/alignment (depending on the nature of the query sequence (DNA, protein) and the database) BLASTN, BLASTP, and FASTA
3. Bioinformatics: SWISS-PROT, TrEMBL, and PDB protein sequence and structure databases

4. DNA sequence analysis and map construction of cloned sequences: NEBcutter V2.0, DNA sequencer
5. Gene cloning support programs: Primer3, Sigma Genosys
6. Gene identification by homology in various species: Génolevures by Center for Bioinformatics, Artemis by Sanger Institute.
7. Operating systems: Microsoft/Macintosh.
8. Analysis of DNA hybridization: PhosphoImager by GE Healthcare

I. NATIONAL/INTERNATIONAL RECOGNITIONS FOR EXCELLENCE:

1. Invited speaker at the Poultry Science Department, Mississippi State University, 2006. Talk title: Telomeric recombination: an ALternative pathway to cellular immortality.
2. Editor of Wikipedia, Telomere and Telomerase section. Log in name: Eve basenko.
3. Recipient of Sigma Xi Aid-in-Research Grant, 2005.
4. Co-author in Book Chapter "Arabidopsis Genome Initiative". Principles and Practice of Plant Genomics, Vol. 3: Advanced Genomics, Prologue by Dr. Normon, R.E. Borloug, Eds: C. Kole and Albert G. Abbot, Science Publishers Inc., New Hampshire and Edenbridge Ltd. British Isles.
5. Certificate of proficiency in poultry phlebotomy and necroscopy, Mississippi State University, MS, 2003.
6. Associate member of Sigma Xi Society (for distinguished students who conducted independent research and published works), 2003-present.
7. Member of Gamma Sigma Delta, The Honor Society of Agriculture, for students with superior ability to carry on research and/or advanced study in agriculture and showed promise of making worthwhile contributions in science, 2003-present.
8. Donald Zacharias Teaching Assistant of the Year Award, Master's Level, Mississippi State University, 2003.
9. Award Nominee for Donald Zacharias Teaching Assistant of the Year, Mississippi State University, 2003.
10. Secretary of Graduate Student Organization at Mississippi State University, 2002-2003
11. Certificate of presentation at the International Poultry Scientific Forum, Atlanta, GA, 2002.
12. The United States Department of State certificate for successful completion of the Freedom Support Act (FSA) Undergraduate program, signed by the Assistant Secretary for Educational and Cultural Affairs Mr. William B. Bader, 2000.
13. Certificate of Achievement in Recognition of Completion of Exchange Visitor Program at Mississippi State University, 2000.
14. Internship at the Poultry Science Department, Mississippi State University, 2000.

15. Dean's scholar, College of Agricultural and Life Sciences, Mississippi State University, 2000.
16. President's scholar at Mississippi State University, 1999.
17. ACTR/ACCELS exchange program scholarship \$20,000 to study at Mississippi State University, Mississippi State, MS, 1999-2000.
18. Scholarship for outstanding undergraduate students, Kherson Agrarian State University, Kherson, Ukraine, 1998-2000.

J. MEMBERSHIPS IN SCIENTIFIC SOCIETIES

1. Sigma Xi Scientific Society.
2. Gamma Sigma Delta Scientific Society.
3. Graduate student organization, the University of Georgia.

K. RECOGNITION IN NEWS ARTICLES

- 2007 Newsletter Genetics at Georgia: recognition for receiving Sigma Xi research grant, online: http://www.genetics.uga.edu/pdf/newsletter_07.pdf
- 2003 University Relations News Bureau at the Mississippi State University, online: <http://www.msstate.edu/web/media/detail.php?id=2084>

L. PUBLICATIONS AND CONFERENCE PRESENTATIONS

1. Iyer, S., Cesare A., **Basenko E. Y.**, Griffith, J., and McEachern, M. **2007**. Factors influencing ALT- like RTE in *K. lactis* (in preparation).
2. **Basenko, E. Y.**, Chaudhry, R., Iyer, S., and McEachern, M., **2007**. Genetic requirements for survivor formation in *Kluyveromyces lactis*. Telomeres and Telomerase Conference. Cold Springs Harbor Laboratories. New York, NY.
3. **Basenko, E. Y.** and R. Chaudhry, **2007**. Human cancer cells achieve immortality through activation of telomere maintenance pathway. Understanding this pathway in other eukaryotes will help us to elucidate the mechanism of cancer formation. Georgia Science Teachers Annual Conference. Athens, Georgia.
4. **Basenko, E. Y.** **2006**. A mutation in the protein *Stn1* leads to an ALT-like telomeres in yeast *K. lactis*. Georgia Graduate Student Interdisciplinary Conference, Athens, GA.
5. **Basenko, E. Y.**, Peebles, E. D. , Branton, S. L. , Whitmarsh, S. K. , and Gerard, P. D. **2006**. Digestive and reproductive organ characteristics of commercial egg laying hens inoculated with S6-strain *Mycoplasma gallisepticum* at either 10, 22, or 45 weeks of age. Proc. SPSS, Poultry Sci. 85(Suppl. 1):148(Abstract. #12).

6. Peebles, E. D., **Basenko E. Y.**, Branton, S. L. , Whitmarsh, S. K. , and Gerard, P. D., **2006**. Effects of S6-strain *Mycoplasma gallisepticum* inoculation at 10, 22, or 45 weeks of age on the digestive and reproductive organ characteristics of commercial egg-laying hens. *Poultry Sci.* 85:825-830.
7. Peebles, E. D., **Basenko, E. Y.**, Branton, S. L., Whitmarsh, S. K., Maurice D. V., and Gerard, P. D. **2006**. Effects of S6-strain *Mycoplasma gallisepticum* inoculation at ten, twenty-two, or forty-five weeks of age on the egg yolk composition of commercial egg-laying hens. *Poultry Sci.* 85:1502-1508.
8. Peebles, E. D., **Basenko, E. Y.**, Branton, S. L., Whitmarsh, S. K., and Gerard, P. D., **2006**. Effects of S6-strain *Mycoplasma gallisepticum* inoculation at ten, twenty-two, or forty-five weeks of age on the blood characteristics of commercial egg-laying hens. *Poultry Sci.* 85:2012-2018.
9. Iyer, S., **Basenko, E. Y.**, Cesare, A., Griffith, J., and McEachern, M. **2005**. A defect in telomeric protein triggers an ALT-like recombinational runaway telomere elongation and telomeric rapid deletion. Biomedical and Health Sciences Institute (BHSI) conference, Athens, GA.
10. Iyer, S., Cesare, A., **Basenko, E. Y.**, Griffith, J., and McEachern, M. Gerontological Society of America. Annual Scientific Meeting and AFAR Grantee Conference, **2005**. Klstn1-M1: A unique yeast model system for elucidating telomere capping defects and recombinational telomere elongation. Orlando, FL.
11. Iyer, S., Groff-Vindman, C., Cesare, A., Topcu, Z., Natarajan, S., **Basenko, E. Y.**, Harris, L., Griffith, J., and McEachern, M., **2005**. Mechanisms of recombinational telomere elongation in the yeast *Kluyveromyces lactis*. Genetics Recombination and Chromatin Rearrangements, FASEB Summer Research Conference. Snowmass Village, Colorado.
12. Iyer, S., **Basenko E. Y.**, Cesare, A., Griffith, J., and McEachern, M. **2005**. A defect in STN1 *K. lactis* protein triggers an ALT-like recombinational runaway telomere elongation and telomeric rapid deletion. Telomeres and Telomerase Conference. Cold Springs Harbor Laboratories, New York, NY., p.60.
13. **Basenko, E. Y.**, Peebles, E. D., Branton, S. L., Whitmarsh, S. K., and Gerard, P. D. **2005**. Effects of S6-strain *Mycoplasma gallisepticum* inoculation at ten, twenty-two, or forty-five weeks of age on the performance characteristics of commercial egg laying hens. *Poultry Sci.* 84:1663-1670.
14. **Basenko, E. Y.**, Park, S. W., Peebles, E. D., Branton, S. L., Maurice, D. L., Whitmarsh, S. K., and Gerard, P. D. **2004**. Egg characteristics of commercial egg laying hens between 20 and 58 weeks of age when inoculated with S6-strain of *Mycoplasma gallisepticum* at 10, 22, or 45 weeks of age. *Poultry Sci.* 83(Suppl. 1):108.10

- 15. Basenko, E. Y.,** Peebles, E. D., Branton, S. L., Gerard, P. D., Burnham, M. R., and Whitmarsh, S. K. **2003.** Blood characteristics of commercial egg laying hens between 20 and 58 weeks of age when inoculated with S6-strain of *Mycoplasma gallisepticum* at 10, 22, or 45 weeks of age. Proc. SPSS, Poultry Sci. 82(Suppl. 1):91.
- 16. Basenko, E. Y.,** Peebles, E. D., Gerard, P. D., Branton, S. L., and Whitmarsh, S. K. **2003.** Demonstrated effects of S6-strain *Mycoplasma gallisepticum* inoculation on hematocrit and serum calcium in two different flocks of commercial layers between 20 and 58 weeks of age. Poultry Sci. 82(Suppl. 1):34.
- 17. Basenko, E. Y.,** Peebles, E. D., Branton, S. L., Gerard, P. D., Burnham, M. R., and Whitmarsh, S. K. **2002.** Comparative effects of 10 and 22 week inoculations of S6-strain *Mycoplasma gallisepticum* on performance of commercial egg laying hens. Proc. SPSS, Poultry Sci. 81(Suppl. 1):126.
- 18. Basenko, E. Y.,** Peebles, E. D., Branton, S. L., Gerard, P. D., Burnham, M. R., and Whitmarsh, S. K. **2002.** Performance of commercial egg laying hens between 32 and 60 weeks of age after inoculation with S6-strain of *Mycoplasma gallisepticum* at 10, 22, or 45 weeks of age. Poultry Sci. 81(Suppl. 1):32.