

# Mammary Cancer in Humans and Mice: A Tutorial for Comparative Pathology. The CD-ROM

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This article introduces a CD-ROM containing whole-mount and histological images of normal growth and development of both the mouse mammary gland and the human breast. It also covers nonneoplastic lesions and neoplasias in both species including a catalog of lesions in genetically engineered mice. Instructions, with examples, on techniques such as whole-mount preparation, immunohistochemistry, *in situ* hybridization, and common histological stains are provided. The images are based on full-scale 1996 × 1640 pixel images at 300 pixels/inch and are annotated. Every genetically engineered model has one or more accompanying citations. Tables are provided for orientation and organization. The CD includes zoom capabilities, a search engine, and a help mode.

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**KEY WORDS:** Mouse mammary gland; human breast; oncogenes; breast cancer; CD-ROM; histopathology; mammary development.

Enclosed in this issue is a CD-ROM entitled, "Mammary Cancer in Humans and Mice: A Tutorial for Comparative Pathology." This CD-ROM is designed to provide the newcomer to mammary biology a source of histopathology images of the common lesions found in the human breast and the mouse mammary gland. It is designed for graduate students and postdoctoral fellows and is provided as a CD-ROM for those students who do not have high-speed access to the Internet at home.

The CD-ROM was the brain-child of the organizers of the Workshop on Mouse Models of Human Cancer, held in Annapolis, Maryland, in March 1999. The Workshop organizers, Drs. Jeffrey Green, Lothar Hennighausen, and Lalage Wakefield, were

able to collect tissue blocks and histology slides from around the world that represented 90% of the published models at the time. The slide collection consisted of 175 slides, covering 39 models of genetically engineered mice (GEM) involving 26 genes and five promoter systems. In addition, three transplantation models, two carcinogen-induced models, and "spontaneous" mouse mammary tumor virus (MMTV)-induced lesions were represented. Each member of the Pathology Panel (M. Anver, R. Cardiff, B. Gusterson, R. Jensen, M. Merino, S. Rehm, J. Russo, F. Tavassoli, and J. Ward) received a slide set in advance of the meeting. The Annapolis Workshop was convened March 5 and 6, 1999. During the workshop, the Pathology Panel discussed the slides and heard presentations from various mammary biologists who had created the models. The Pathology Panel reconvened in Bethesda, Maryland, on July 28 and 29 to review their conclusions.

The Pathology Panel was asked to make recommendations concerning the pathobiology and develop a nomenclature for genetically engineered mice (GEM). One of the major observations at the workshop was that the medical and veterinary pathologists do not necessarily have a common vocabulary to de-

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scribe or name specific lesions. The language gap is even worse between the pathologist and the mammary and molecular biologist. An *Oncogene* review article (1) was designed to provide our mammary and molecular biology colleagues guidelines for understanding the insights of pathology.

The meeting organizers felt that the rest of the scientific community would benefit from the Annapolis slide set. However, the slide collection could not be shared with every laboratory doing mammary tumor research. Further, publication of a limited set of images in the standard journal format would not provide the scientific community with these wonderful resources. As an alternative, they obtained funding from Cancer Genome Anatomy Project (CGAP) to develop a CD-ROM.

The CD-ROM includes examples of normal growth and development, nonneoplastic lesions, and breast cancer. Instructions, with examples, on techniques such as whole-mount preparation, immunohistochemistry, *in situ* hybridization, and common histological stains are provided. All images are annotated and every GEM model has an accompanying citation. Tables are provided for orientation and organization. The CD-ROM includes zoom capabilities, a search engine, and a help mode. We hope that the CD-ROM is easy to navigate.

Ulrike Wagner and Dr. R. D. Cardiff were commissioned to develop the CD-ROM. Most of the images of human and mouse mammary glands were provided by Dr. Cardiff. However, we were fortunate to obtain the slide collection of Dr. Hanne D. Jensen, University of California, Davis. Dr. Jensen's images illustrate the subgross (three-dimensional) histology and pathology of the human breast. Dr. Jensen also

annotated the images. Additional images of human pathology were provided to supplement the Jensen collection. Wagner was responsible for the design and production of the CD. Jai Evans, Christopher Santos, and Jeff Wolski developed the JavaZoom Applet and JavaScript search engine. A number of investigators provided blocks and specific samples. They are acknowledged in the appropriate sections of the CD-ROM and their names are listed in its Appendix.

Above all, this CD-ROM is an experiment in the future of publishing. It is a far-sighted and bold attempt to provide the readership with modern multimedia advantages. The images are all based on full-scale 1996 × 1640 pixel images at 300 pixels/inch. The resolution exceeds that of any current electronic journal page and provides various "zoom" options for high-resolution viewing. Some images and text are "outlinked" for those who wish to use the Internet to "drill down" for greater detail. The Authors and the Editors are very interested in receiving evaluations of the CD-ROM. As with any experiment, it will have shortcomings. It does assure wider distribution of a key resource and a glance at the future of scientific publishing. Please let us know what you think.

## REFERENCE

1. R. D. Cardiff, R. A. Anver, B. A. Gusterson, L. Henninghausen, R. A. Jensen, M. J. Merino, S. Rehm, J. Russo, F. A. Tavassoli, L. M. Wakefield, J. M. Ward, and J. E. Green (2000). The mammary pathology of genetically engineered mice: The consensus report and recommendations from the Annapolis Meeting. *Oncogene* **19**:968–988.