**RICHARD BAER**

**Overview**

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**Academic Appointments**

* Professor of Pathology & Cell Biology

**Administrative Appointments**

* Deputy Director, Institute for Cancer Genetics
* Associate Director for Basic Research, Herbert Irving Comprehensive Cancer Center

**Research**

Women who carry germline mutations in the BRCA1 tumor suppressor gene are prone to develop basal-like triple-negative breast tumors, an especially lethal subtype of human breast cancer. Richard Baer studies the mechanisms by which BRCA1 suppresses tumor formation and how these mechanisms are disrupted in BRCA1 mutation carriers. In vivo, BRCA1 exists in the form of a heterodimer with another structurally-related tumor suppressor, the BARD1 protein. Most of the cellular functions attributed to BRCA1, including its critical activities in genome stability and tumor suppression, are mediated by the BRCA1/BARD1 heterodimer. The Baer laboratory uses biochemical, cellular, and organismal approaches to characterize the BRCA1/BARD1 complex and its associated factors, such as the DNA repair protein CtIP. These studies seek to define the biological functions of the BRCA1/BARD1 pathway, particularly with respect to maintenance of genome stability, and how the loss of these functions promotes breast and ovarian cancer.

**Selected Publications**

1. **CtIP is essential for early B cell proliferation and development in mice**Liu X, Wang XS, Lee BJ, Wu-Baer FK, Lin X, Shao Z, Estes VM, Gautier J, Baer R, Zha S  
   J Exp Med. 2019.  
   PMID: 31097467, DOI: 10.1084/jem.20181139
2. **The BRCT Domains of the BRCA1 and BARD1 Tumor Suppressors Differentially Regulate Homology-Directed Repair and Stalled Fork Protection**Billing D, Horiguchi M, Wu-Baer F, Taglialatela A, Leuzzi G, Nanez SA, Jiang W, Zha S, Szabolcs M, Lin CS, Ciccia A, Baer R  
   Mol Cell. 2018.  
   PMID: 30244837, DOI: 10.1016/j.molcel.2018.08.016
3. **Genomic instability during reprogramming by nuclear transfer is DNA replication dependent**Chia G, Agudo J, Treff N, Sauer MV, Billing D, Brown BD, Baer R, Egli D  
   Nat Cell Biol. 2017.  
   PMID: 28263958, DOI: 10.1038/ncb3485
4. **The interaction between CtIP and BRCA1 is not essential for resection-mediated DNA repair or tumor suppression**Reczek CR, Szabolcs M, Stark JM, Ludwig T, Baer R  
   J Cell Biol. 2013.  
   PMID: 23712259, DOI: 10.1083/jcb.201302145
5. **BRCA1 tumor suppression depends on BRCT phosphoprotein binding, but not its E3 ligase activity**Shakya R, Reid LJ, Reczek CR, Cole F, Egli D, Lin CS, deRooij DG, Hirsch S, Ravi K, Hicks JB, Szabolcs M, Jasin M, Baer R, Ludwig T  
   Science. 2011.  
   PMID: 22034435, DOI: 10.1126/science.1209909
6. **The basal-like mammary carcinomas induced by Brca1 or Bard1 inactivation implicate the BRCA1/BARD1 heterodimer in tumor suppression**Shakya R, Szabolcs M, McCarthy E, Ospina E, Basso K, Nandula S, Murty V, Baer R, Ludwig T  
   Proc Natl Acad Sci USA. 2008.  
   PMID: 18443292, DOI: 10.1073/pnas.0711032105
7. **Structural requirements for the BARD1 tumor suppressor in chromosomal stability and homology-directed DNA repair**Laufer M, Nandula SV, Modi AP, Wang S, Jasin M, Murty VV, Ludwig T, Baer R  
   J Biol Chem. 2007.  
   PMID: 17848578, DOI: 10.1074/jbc.M705198200
8. **The BRCA1/BARD1 heterodimer assembles polyubiquitin chains through an unconventional linkage involving lysine residue K6 of ubiquitin**Wu-Baer F, Lagrazon K, Yuan W, Baer R  
   J Biol Chem. 2003.  
   PMID: 12890688, DOI: 10.1074/jbc.C300249200
9. **The BRCA1/BARD1 heterodimer, a tumor suppressor complex with ubiquitin E3 ligase activity**Baer R, Ludwig T  
   Curr Opin Genet Dev. 2002.  
   PMID: 11790560, DOI: 10.1016/s0959-437x(01)00269-6
10. **The C-terminal (BRCT) domains of BRCA1 interact in vivo with CtIP, a protein implicated in the CtBP pathway of transcriptional repression**Yu X, Wu LC, Bowcock AM, Aronheim A, Baer R  
    J Biol Chem. 1998.  
    PMID: 9738006, DOI: 10.1074/jbc.273.39.25388
11. **Identification of a RING protein that can interact in vivo with the BRCA1 gene product**Wu LC, Wang ZW, Tsan JT, Spillman MA, Phung A, Xu XL, Yang MC, Hwang LY, Bowcock AM, Baer R  
    Nat Genet. 1996.  
    PMID: 8944023, DOI: 10.1038/ng1296-430
12. **TAL1, TAL2 and LYL1: a family of basic helix-loop-helix proteins implicated in T cell acute leukaemia**Baer R  
    Semin Cancer Biol. 1993.  
    PMID: 8142619, DOI:
13. **TAL2, a helix-loop-helix gene activated by the (7;9)(q34;q32) translocation in human T-cell leukemia**Xia Y, Brown L, Yang CY, Tsan JT, Siciliano MJ, Espinosa R, Le Beau MM, Baer RJ  
    Proc Natl Acad Sci USA. 1991.  
    PMID: 1763056, DOI: 10.1073/pnas.88.24.11416
14. **Site-specific recombination of the tal-1 gene is a common occurrence in human T cell leukemia**Brown L, Cheng JT, Chen Q, Siciliano MJ, Crist W, Buchanan G, Baer R  
    EMBO J. 1990.  
    PMID: 2209547, DOI:
15. **The tal gene undergoes chromosome translocation in T cell leukemia and potentially encodes a helix-loop-helix protein**Chen Q, Cheng JT, Tasi LH, Schneider N, Buchanan G, Carroll A, Crist W, Ozanne B, Siciliano MJ, Baer R  
    EMBO J. 1990.  
    PMID: 2303035, DOI: