

# ATLAS ANTIBODIES IN BREAST CANCER RESEARCH

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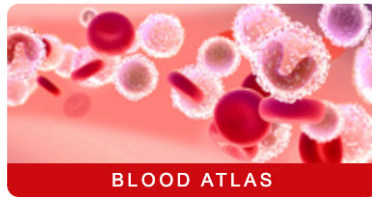
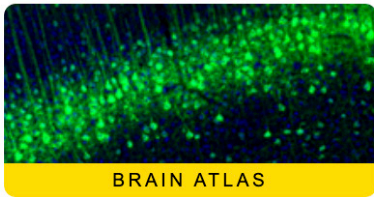
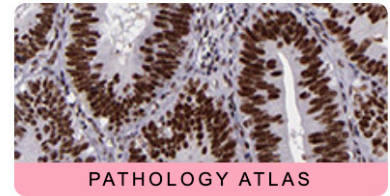
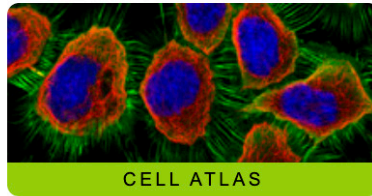
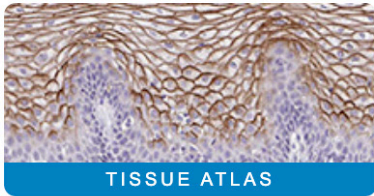
**Contact (24)**







# THE HUMAN PROTEIN ATLAS



## The Human Protein Atlas: a map of the Human Proteome

The Human Protein Atlas (HPA) is a Swedish-based program initiated in 2003 with the aim to map all the human proteins in cells, tissues and organs using integration of various omics technologies, including antibody-based imaging, mass spectrometry-based proteomics, transcriptomics and systems biology.

All the data in the knowledge resource is open access to allow scientists both in academia and industry to freely access the data for exploration of the human proteome.

The HPA project aims to present an expression map of the complete human proteome. To accomplish this, highly specific Triple A polyclonal antibodies are developed against all protein-coding human genes and protein profiling is established in a multitude of tissues and cells using tissue arrays. The antibodies are tested in immunohistochemistry (IHC), Western blot (WB) analysis, protein array assay and immunofluorescent based confocal microscopy (ICC-IF).

The Human Protein Atlas program has already contributed to several thousands of publications in the field of human biology and disease and it is selected by the organization ELIXIR ([www.elixir-europe.org](http://www.elixir-europe.org)) as a European core resource due to its fundamental importance for a wider life science community.

The Human Protein Atlas consortium is mainly funded by the Knut and Alice Wallenberg Foundation.

The Human Protein Atlas consists of six separate parts, each focusing on a particular aspect of the genome-wide analysis of the human proteins:

- The [Tissue Atlas](#) shows the distribution of proteins across all major tissues and organs in the human body.
- The [Cell Atlas](#) shows the subcellular localization of proteins in single cells.
- The [Pathology Atlas](#) shows the impact of protein levels for survival of patients with cancer.
- The [Brain Atlas](#) explores the protein expression in the mammalian brain by integration of data from three mammalian species: human, pig and mouse.
- The [Blood Atlas](#) contributes with data regarding the cell types and proteome of human blood.
- The [Metabolic Atlas](#) enables the exploration of protein function and gene expression in the context of the human metabolic network.

The HPA project employs tissue microarrays with samples from 44 different normal human tissues, 20 different cancer types and 44 different human cell lines. The 44 normal tissues are present in triplicate samples and represent 82 different

cell types. All the IHC images for the normal tissue have undergone pathology-based annotation of expression levels.

## References

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[proteinatlas.org](http://proteinatlas.org)





# Triple A Polyclonals

## Triple A Polyclonals - the Building Blocks of HPA

The uniqueness and low cross reactivity of Triple A Polyclonals to other proteins are due to a thorough selection of antigen regions, affinity purification on the recombinant antigen, validation using several methods and a stringent approval process.

## Development

The Triple A Polyclonals are developed against recombinant human Protein Epitope Signature Tags (PrESTs) of approximately 50 to 150 amino acids. These protein fragments are designed, using a proprietary software, to contain unique epitopes present in the

native protein suitable for triggering the generation of antibodies of high specificity. This is achieved by a complete human genome scanning to ensure that PrESTs with the lowest homology to other human proteins are used as antigens.

## Approval

The approval of Triple A Polyclonals relies on a combined validation of the experimental results using IHC, WB or ICC-IF, from RNA sequencing and from information obtained via bioinformatics prediction methods and literature. Since the literature is often inconclusive, an important objective of the HPA project has been to generate paired antibodies with non-overlapping epitopes towards

the same protein target, allowing the results and validation of one antibody to be used to validate the other one.

## Triple A Polyclonal catalog

Today, there are more than 17,000 Triple A Polyclonals and new antibodies are added each year.

The antibodies developed and characterized within the Human Protein Atlas project are made available to the scientific community by Atlas Antibodies under the brand name "Triple A Polyclonals". The antibodies are available in 25 and 100  $\mu$ L size.

The product numbers of Triple A Polyclonals start with "HPA".

# PrecisA Monoclonals

Atlas Antibodies also provide a selected number of mouse monoclonal antibodies, under the brand name PrecisA Monoclonals. The PrecisA Monoclonal catalog is regularly expanding with new products every year.

## Unique Features

Special care is taken in offering clones recognizing only unique non-overlapping epitopes and/or isotypes. Using the same stringent PrEST production process and characterization procedure as for the Triple A Polyclonals, the PrecisA Monoclonals offer outstanding performance in approved applications, together with defined specificity, secured continuity and stable supply. In general they also permit high working dilutions and contribute to more standardized assay procedures.

## Clone Selection

Functional characterization is performed on a large number of ELISA positive cell supernatants to select the optimal clones for each application prior to subcloning and expansion of selected hybridomas.

## Epitope Mapping

Clones are epitope-mapped using synthetic overlapping peptides in a bead-based array format for selection of clones with non-overlapping epitopes only.

## Isotyping

All PrecisA Monoclonals antibodies are isotyped to allow for multiplexing using isotype-specific secondary antibodies.

## Hybridoma Cell Cultivation

Atlas Antibodies use in-vitro methods for the production scale-up phase thus replacing the use of mice for production of ascites fluid.

## Antibody Characterization

The characterization of PrecisA Monoclonals starts with an extensive literature search to select the most relevant and clinically significant tissues to use for IHC characterization. Often there are more than one tissue type displayed in the IHC application data for each antibody.

In addition to positive stained tissue, a negative control tissue staining is also displayed and if relevant, clinical cancer tissue staining.

The Western blot (WB) characterization includes results from endogenous human cell or tissue protein lysates or optionally recombinant full-length human protein lysates.

Each PrecisA Monoclonal is thus supplied with the most relevant characterization data for its specific target.

PrecisA Monoclonals are developed by Atlas Antibodies, based on the knowledge from the Human Protein Atlas with careful antigen design and extended validation of antibody performance. With precise epitope information following all monoclonals, these precise, accurate and targeted antibodies are denoted PrecisA Monoclonals. The antibodies are available in 25 and 100  $\mu$ L size.

The product numbers of PrecisA Monoclonals start "AMAb".



# Clinical markers (ESR1, HER2, Ki67, PGR)

- established clinical breast cancer markers

Target protein	Product Name	Product Number	Validated Applications
Estrogen receptor	Anti-ESR1	<a href="#">HPA000449</a> <sup>1</sup>	IHC*,WB*,ICC-IF
Estrogen receptor	Anti-ESR1	<a href="#">HPA000450</a> <sup>1</sup>	IHC*,WB*
Estrogen receptor	Anti-ESR1	<a href="#">AMAb90867</a>	IHC,WB*,ICC-IF
Progesteron receptor	Anti-PGR	<a href="#">HPA004751</a> <sup>2</sup>	IHC*
Progesteron receptor	Anti-PGR	<a href="#">HPA008428</a> <sup>3</sup>	IHC*
Progesteron receptor	Anti-PGR	<a href="#">HPA017176</a>	IHC*
HER2/ERBB2	Anti-ERBB2	<a href="#">HPA001383</a> <sup>3,4</sup>	IHC,WB,ICC-IF
HER2/ERBB2	Anti-HER2	<a href="#">AMAb90627</a>	IHC,WB
Ki67/MKI67	Anti-MKI67	<a href="#">HPA000451</a> <sup>5,6</sup>	IHC*,ICC-IF
Ki67/MKI67	Anti-MKI67	<a href="#">HPA001164</a> <sup>7</sup>	IHC*,ICC-IF
Ki67/MKI67	Anti-MKI67	<a href="#">AMAb90870</a>	IHC,ICC-IF

\* Products with enhanced validation for indicated application

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2. Pereira CB *et al.* Prognostic and Predictive Significance of MYC and KRAS Alterations in Breast Cancer from Women Treated with Neoadjuvant Chemotherapy. *PLoS One* 2013;8(3):e60576.

3. Huvila J *et al.* Progesterone receptor negativity is an independent risk factor for relapse in patients with early stage endometrioid endometrial adenocarcinoma. *Gynecol Oncol* 2013 Sep; 130(3):463-9.

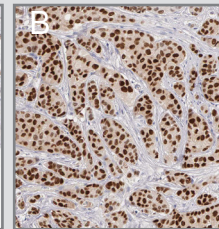
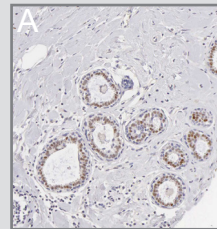
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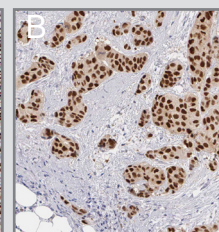
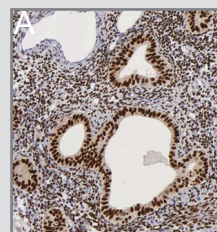
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## Estrogen receptor

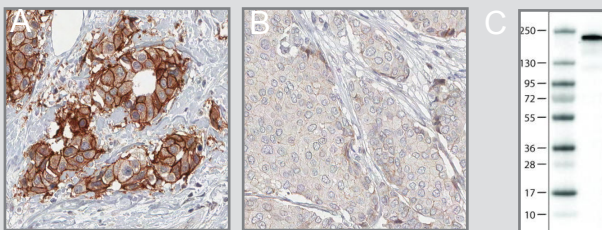


(A) IHC staining with the Anti-ESR1 antibody (HPA000449) shows distinct nuclear positivity in glandular cells in human breast tissue and (B) in tumor cells in breast cancer samples.



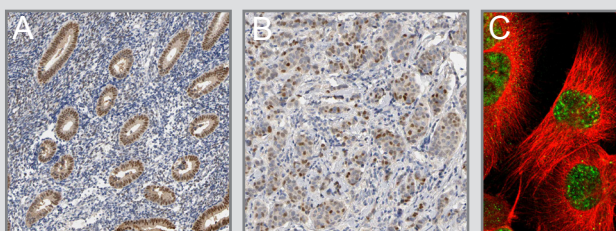
(A) IHC staining using the Anti-ESR1 antibody (HPA000450) shows strong nuclear positivity in glandular and stromal cells of human corpus, uterine tissue and (B) in tumor cells in breast cancer.

## HER2/ERBB2



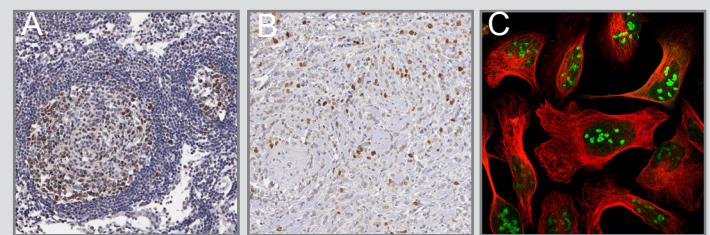
(A) IHC staining of human breast tumour using Anti-HER2 (AMAb90627) shows strong membranous (combined with moderate cytoplasmic) positivity in tumour cells in HER2-positive ductal carcinoma (in brown), (B) HER2-negative ductal carcinoma shows no membranous positivity. (C) HER2 is detected in the breast cancer cell line SK-BR-3 by Western blot analysis.

## Progesteron receptor

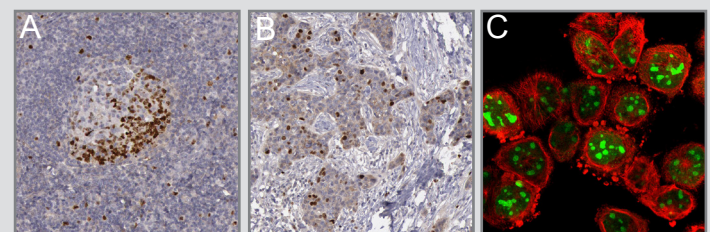


(A) IHC staining using the Anti-PGR antibody (HPA004751) in normal human corpus (uterine) tissue shows strong nuclear positivity in glandular cells (in brown). (B) Staining of tumor cells in breast cancer shows strong nuclear positivity (in brown). (C) ICC-IF shows nuclear staining in U-251MG cells (in green).

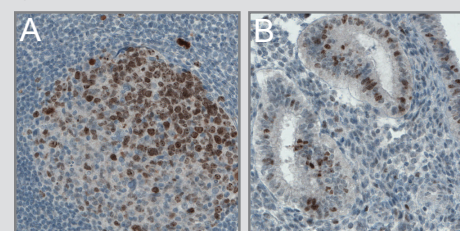
## Ki67



(A) The Anti-MKI67 antibody (HPA000451) shows strong nuclear positivity in a fraction of cells in the reaction center in human lymph node using IHC. (B) In breast cancer, the staining of tumor cells is also nuclear. (C) ICC-IF staining of the human cell line U-2OS shows positivity in nucleoli (in green).



(A) IHC staining of human tonsil tissue using the Anti-MKI67 antibody (HPA001164) shows nuclear staining of reaction center cells. (B) In tumor cells in breast cancer, the staining is mainly nuclear. (C) ICC-IF in U-2OS cells show strong positivity in nucleoli (in green).



(A) IHC staining of lymph node in human colon shows strong nuclear and nucleolar immunoreactivity in the reaction center cells using the monoclonal Anti-MKI67 antibody (AMAb90870). (B) nuclear positivity in a subset of glandular cells in human uterus.

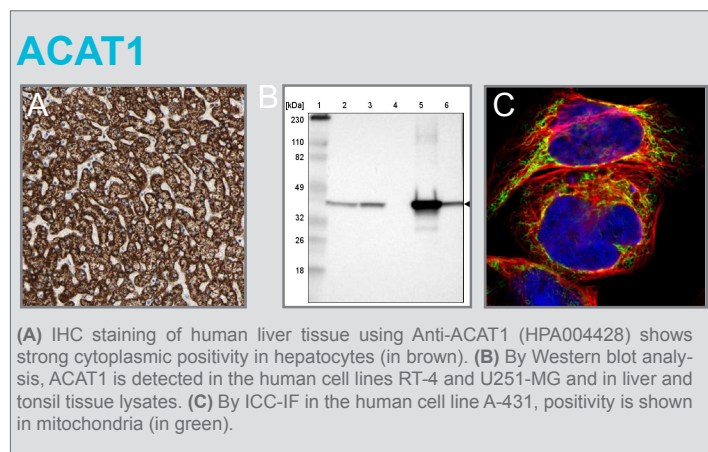


# Antibodies used in Breast Cancer Research

In this section, antibodies are selected either based on a published reference or for the relevance in breast cancer of the corresponding target protein.

Target Protein	Product Name	Product Number	Validated Applications
53BP1	Anti-TP53BP1	<a href="#">HPA008788</a>	WB, ICC-IF
53BP1	Anti-TP53BP1	<a href="#">HPA022133</a>	IHC, WB*, ICC-IF
ACAT1	Anti-ACAT1	<a href="#">HPA004428</a> <sup>1</sup>	IHC*, WB*, ICC-IF
ACAT1	Anti-ACAT1	<a href="#">HPA007569</a> <sup>2-4</sup>	IHC*, WB*, ICC-IF
ADAM2/CT15/PH30	Anti-ADAM2	<a href="#">HPA026581</a> <sup>5</sup>	IHC*
AGR2	Anti-AGR2	<a href="#">HPA007912</a> <sup>6</sup>	IHC*, WB*, ICC-IF
AIB1/NCOA3	Anti-NCOA3	<a href="#">HPA024210</a> <sup>7</sup>	IHC, WB, ICC-IF
AKAP1/PRKA1	Anti-AKAP1	<a href="#">HPA008691</a> <sup>8</sup>	IHC, WB*
AKT3/PKB gamma	Anti-AKT3	<a href="#">HPA026441</a> <sup>9,10</sup>	IHC, WB
AMOTL1	Anti-AMOTL1	<a href="#">HPA001196</a> <sup>11</sup>	IHC, ICC-IF
Amphiregulin	Anti-AREG	<a href="#">HPA008720</a> <sup>12</sup>	IHC
ANAPC15/C11orf51	Anti-ANAPC15	<a href="#">HPA036596</a>	IHC, WB*, ICC-IF
Anillin/ANLN	Anti-ANLN	<a href="#">AMAb90662</a>	IHC*, WB*, ICC-IF
Anillin/ANLN	Anti-ANLN	<a href="#">HPA005680</a> <sup>13,14</sup>	IHC*, WB*
ARG1	Anti-ARG1	<a href="#">HPA024006</a> <sup>15-17</sup>	IHC*, WB*
ARG1	Anti-ARG1	<a href="#">AMAb90545</a>	IHC, WB
ASAH1	Anti-ASAH1	<a href="#">HPA005468</a> <sup>18-22</sup>	IHC, WB*
BAAT1/BRAT1	Anti-BRAT1	<a href="#">HPA029455</a>	IHC, WB*
BARD1	Anti-BARD1	<a href="#">HPA044864</a>	IHC*
Beta-Catenin	Anti-CTNNB1	<a href="#">HPA029159</a>	IHC*, WB, ICC-IF
Beta-Catenin	Anti-CTNNB1	<a href="#">HPA029160</a>	IHC*, ICC-IF
Beta-Catenin	Anti-CTNNB1	<a href="#">AMAb91210</a>	IHC, WB, ICC-IF
BIRC3/API2	Anti-BIRC3	<a href="#">HPA002317</a> <sup>23-25</sup>	IHC, WB, ICC-IF

\* Products with enhanced validation for indicated application



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Target Protein	Product Name	Product Number	Validated Applications
BIT1/ PTRH2	Anti-PTRH2	<a href="#">HPA012897</a> <sup>26-28</sup>	IHC,WB,ICC-IF
Blooms Syndrome Prot	Anti-BLM	<a href="#">HPA005689</a> <sup>29-30</sup>	IHC,ICC-IF
Bmi1	Anti-BMI1	<a href="#">HPA030472</a>	IHC,WB*
BRCA2	Anti-BRCA2	<a href="#">HPA026815</a>	ICC-IF
BRIP1/FANCI	Anti-BRIP1	<a href="#">HPA005474</a> <sup>32</sup>	IHC,WB*,ICC-IF
CASP8	Anti-CASP8	<a href="#">HPA001302</a>	IHC,WB,ICC-IF
CASP8	Anti-CASP8	<a href="#">HPA005688</a>	IHC,WB
CAXII/CA12	Anti-CA12	<a href="#">HPA008773</a> <sup>33-36</sup>	IHC,ICC-IF
CAXII/CA12	Anti-CA12	<a href="#">AMAb90639</a>	IHC,WB
CD44	Anti-CD44	<a href="#">HPA005785</a> <sup>37-43</sup>	IHC,WB*,ICC-IF
CD82	Anti-CD82	<a href="#">HPA028900</a>	IHC*,WB*
CDH1	Anti-CDH1	<a href="#">AMAb90863</a>	IHC*,WB*
CDH1	Anti-CDH1	<a href="#">HPA004812</a>	IHC*
CEA/CEACAM5	Anti-CEACAM5	<a href="#">HPA019758</a>	IHC*,WB,ICC-IF
CHEK2	Anti-CHEK2	<a href="#">HPA001878</a>	IHC,WB*,ICC-IF
CKB	Anti-CKB	<a href="#">HPA001254</a> <sup>44,45</sup>	IHC*,ICC-IF
CRABP2	Anti-CRABP2	<a href="#">HPA004135</a> <sup>46</sup>	IHC,WB*,ICC-IF
CT83/KK-LC-1	Anti-CT83	<a href="#">HPA004773</a> <sup>47</sup>	IHC,WB
CTNND1	Anti-CTNND1	<a href="#">HPA015955</a>	IHC,WB*,ICC-IF
Cyclin E1	Anti-CCNE1	<a href="#">HPA018169</a> <sup>48</sup>	IHC,ICC-IF
cyklin A2	Anti-CCNA2	<a href="#">HPA020626</a>	WB*,ICC-IF
Cytokeratin 14/CK14	Anti-KRT14	<a href="#">HPA023040</a>	IHC*,WB
Cytokeratin 17/CK17	Anti-KRT17	<a href="#">HPA000452</a> <sup>49</sup>	IHC,WB*,ICC-IF
Cytokeratin 17/CK17	Anti-KRT17	<a href="#">HPA000453</a>	IHC*,WB*

\* Products with enhanced validation for indicated application

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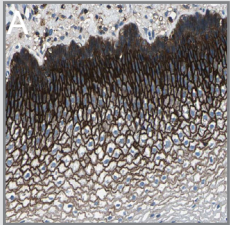
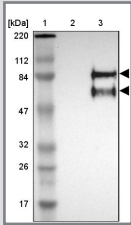
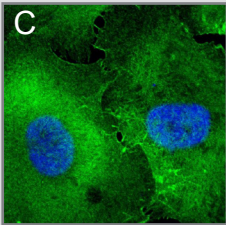
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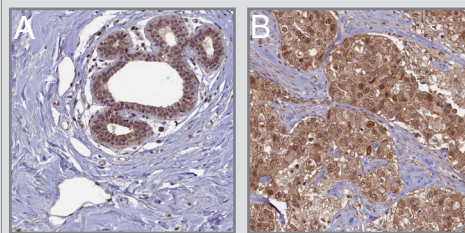
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## CD44

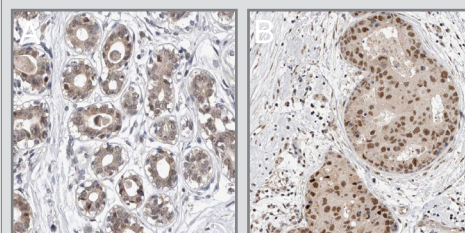
(A) IHC staining of human esophagus tissue using Anti-CD44 (HPA005785) shows strong cytoplasmic and membranous positivity in squamous epithelial cells (in brown). (B) By Western blot analysis, CD44 is detected in the human cell line U-251MG. (C) ICC-IF in the human cell line U-251MG shows positivity in plasma membrane (in green).

## BRCA1



IHC staining with the Anti-BRCA1 antibody (HPA034966) shows positivity in glandular cells in normal human breast tissue (A) and in tumor cells (B) in breast cancer samples using IHC.

## BRCA2



(A) IHC staining using the Anti-BRCA2 antibody (HPA026815) shows positivity in glandular cells in normal human breast tissue (B) In breast cancer tissue, staining of tumor cells is nuclear (in brown).

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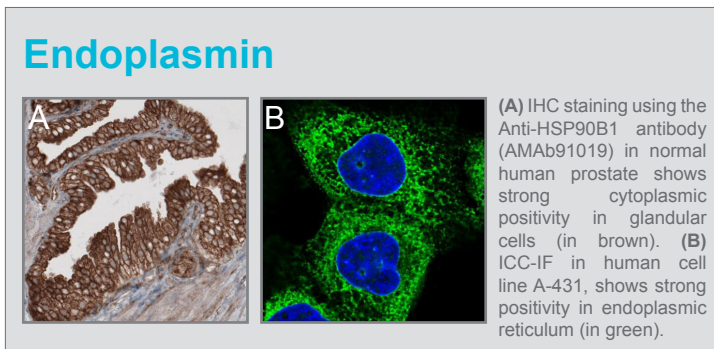
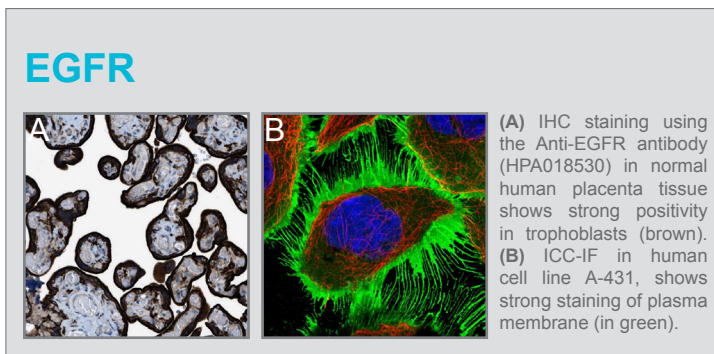
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Target Protein	Product Name	Product Number	Validated Applications
DACH2	Anti-DACH2	<a href="#">HPA000258</a> <sup>50</sup>	IHC
DBC1/KIAA1967	Anti-KIAA1967	<a href="#">HPA019907</a>	IHC*,WB*,ICC-IF
DBC1/KIAA1967	Anti-KIAA1967	<a href="#">HPA019943</a>	IHC*,WB*
DCAF7	Anti-DCAF7	<a href="#">HPA022962</a> <sup>51</sup>	IHC*,WB*
DDX43/CT13	Anti-DDX43	<a href="#">HPA031381</a> <sup>52</sup>	IHC*,WB
Decorin/DCN	Anti-DCN	<a href="#">HPA003315</a> <sup>53-56</sup>	IHC*,WB
DIRAS3	Anti-DIRAS3	<a href="#">HPA028483</a>	IHC,WB*
DIRAS3	Anti-DIRAS3	<a href="#">HPA028557</a>	IHC,ICC-IF
DIRAS3	Anti-DIRAS3	<a href="#">HPA029384</a>	IHC
DKC1	Anti-DKC1	<a href="#">HPA000166</a> <sup>57-59</sup>	IHC,WB
EGFR	Anti-EGFR	<a href="#">AMAb90816</a>	IHC,WB
EGFR	Anti-EGFR	<a href="#">AMAb90819</a>	WB
EGFR	Anti-EGFR	<a href="#">HPA001200</a> <sup>62</sup>	IHC*
EGFR	Anti-EGFR	<a href="#">HPA018530</a> <sup>63,64</sup>	IHC*,WB,ICC-IF
Endoplasmic/ HSP90B1	Anti-HSP90B1	<a href="#">HPA003901</a> <sup>54,65</sup>	IHC,WB*,ICC-IF
Endoplasmic/ HSP90B1	Anti-HSP90B1	<a href="#">AMAb91019</a>	IHC,WB*,ICC-IF
EPSTI1	Anti-EPSTI1	<a href="#">HPA017362</a> <sup>66</sup>	IHC
ERLIN2	Anti-ERLIN2	<a href="#">HPA002025</a> <sup>67,68</sup>	IHC,WB,ICC-IF
ERFF/C1orf64	Anti-C1orf64	<a href="#">HPA026676</a> <sup>69</sup>	IHC,WB*
FAAH	Anti-FAAH	<a href="#">HPA007425</a> <sup>70</sup>	IHC
FGFR2	Anti-FGRF2	<a href="#">HPA035305</a> <sup>71</sup>	IHC
G3BP-2	Anti-G3BP2	<a href="#">HPA018304</a> <sup>72</sup>	IHC*,ICC-IF
GATA3	Anti-GATA3	<a href="#">HPA029731</a>	IHC
GGH	Anti-GGH	<a href="#">HPA025226</a> <sup>70</sup>	IHC,WB*
GOLPH3/MIDAS	Anti-GOLPH3	<a href="#">HPA044564</a> <sup>8</sup>	IHC
GP2	Anti-GP2	<a href="#">HPA016668</a> <sup>73</sup>	IHC*
GPAT2	Anti-GPAT2	<a href="#">HPA036841</a> <sup>74,75</sup>	IHC, ICC-IF

\* Products with enhanced validation for indicated application



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Target Protein	Product Name	Product Number	Validated Applications
Granulin	Anti-GRN	<a href="#">HPA008763</a> <sup>76</sup>	IHC*,ICC-IF
Granulin	Anti-GRN	<a href="#">HPA028747</a> <sup>76</sup>	IHC,ICC-IF
GSTP1	Anti-GSTP1	<a href="#">HPA019869</a> <sup>77</sup>	IHC*,WB*,ICC-IF
HIF-1 alpha/HIF1A	Anti-HIF1A	<a href="#">HPA001275</a> <sup>78-81</sup>	IHC
HJURP	Anti-HJURP	<a href="#">HPA008436</a> <sup>82-85</sup>	IHC,ICC-IF
HMGCL	Anti-HMGCL	<a href="#">HPA004727</a> <sup>2</sup>	IHC*,WB
HMGCR	Anti-HMGCR	<a href="#">HPA008338</a> <sup>86-88</sup>	IHC
HMGCR	Anti-HMGCR	<a href="#">AMAb90619</a>	IHC,WB*
HORMAD1/CT46	Anti-HORMAD1	<a href="#">HPA037850</a> <sup>89</sup>	IHC*
HSD17B14	Anti-HSD17B14	<a href="#">HPA021467</a>	IHC,WB*
IFI30	Anti-IFI30	<a href="#">HPA026650</a> <sup>90</sup>	IHC,WB,ICC-IF
IL3RA	Anti-IL3RA	<a href="#">HPA003539</a> <sup>91</sup>	IHC
KDM5B/CT31	Anti-KDM5B	<a href="#">HPA027179</a> <sup>92-95</sup>	IHC*
KLK3/PSA	Anti-KLK3	<a href="#">HPA000764</a> <sup>96-98</sup>	IHC
LSP1	Anti-LSP1	<a href="#">HPA019693</a> <sup>99</sup>	IHC*,WB
MMP2	Anti-MMP2	<a href="#">HPA001939</a> <sup>45</sup>	IHC,WB*
MRPS7	Anti-MRPS7	<a href="#">HPA022522</a> <sup>8</sup>	IHC,WB,ICC-IF
MRPL40	Anti-MRPL40	<a href="#">HPA006181</a> <sup>8,102</sup>	IHC,WB*,ICC-IF
MRPS15	Anti-MRPS15	<a href="#">HPA028134</a> <sup>8</sup>	IHC*
MRPS22	Anti-MRPS22	<a href="#">HPA006083</a> <sup>8</sup>	IHC*,WB*,ICC-IF
MSX2	Anti-MSX2	<a href="#">HPA005652</a> <sup>68,103,104</sup>	IHC
MUC1/CA15-3	Anti-MUC1	<a href="#">HPA004179</a>	IHC*
MUC1/CA15-3	Anti-MUC1	<a href="#">HPA007235</a>	IHC
MUC1/CA15-3	Anti-MUC1	<a href="#">HPA008855</a> <sup>105</sup>	IHC*
MX1/IFI-78K	Anti-MX1	<a href="#">HPA030917</a> <sup>106</sup>	IHC,WB*
NBN	Anti-NBN	<a href="#">HPA001429</a>	IHC,WB
NFATC2	Anti-NFATC2	<a href="#">HPA008789</a> <sup>107,108</sup>	IHC*,WB,ICC-IF

\* Products with enhanced validation for indicated application

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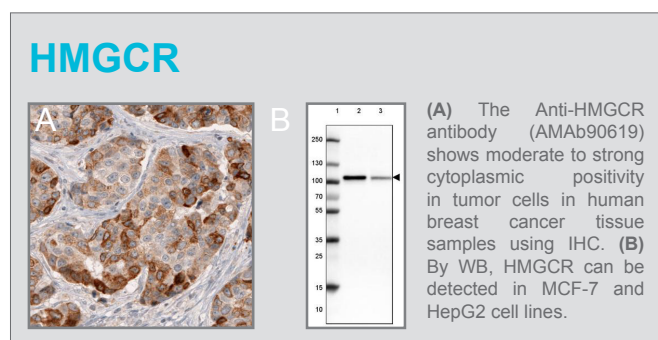
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Target Protein	Product Name	Product Number	Validated Applications
NRF1	Anti-NRF1	<a href="#">HPA029329</a> <sup>8</sup>	IHC,WB*,ICC-IF
NRP1	Anti-NRP1	<a href="#">HPA030278</a> <sup>111</sup>	IHC
OGFOD1	Anti-OGFOD1	<a href="#">HPA003215</a> <sup>25,112-114</sup>	IHC,WB,ICC-IF
P53	Anti-P53	<a href="#">AMAb90956</a> <sup>116</sup>	IHC*,WB*,ICC-IF
Peroxiredoxin-1	Anti-PRDX1	<a href="#">HPA007730</a> <sup>117-119</sup>	IHC,WB*,ICC-IF
PHGDH	Anti-PHGDH	<a href="#">HPA021241</a> <sup>120-123</sup>	IHC,WB*,ICC-IF
PHGDH	Anti-PHGDH	<a href="#">AMAb90786</a>	IHC,WB,ICC-IF
PGD	Anti-PGD	<a href="#">HPA031314</a>	IHC*,WB
PIP/GCDFP	Anti-PIP	<a href="#">HPA009177</a>	IHC,WB
Pirin	Anti-PIR	<a href="#">HPA000697</a> <sup>70</sup>	IHC*,WB,ICC-IF
PKC alpha/PKCA	Anti-PKCA	<a href="#">HPA006563</a>	IHC,WB*,ICC-IF
PKC alpha/PKCA	Anti-PKCA	<a href="#">HPA006564</a>	IHC*,WB*,ICC-IF
PLAT	Anti-PLAT	<a href="#">HPA003412</a>	IHC
POLRMT	Anti-POLRMT	<a href="#">HPA006366</a> <sup>8,124</sup>	IHC,ICC-IF
PPP4R1	Anti-PPP4R1	<a href="#">HPA041089</a> <sup>125,126</sup>	IHC,WB*
PSMC3IP	Anti-PSMC3IP	<a href="#">HPA044439</a> <sup>127</sup>	IHC,WB*
PSMC4/TBP-7	Anti-PSMC4	<a href="#">HPA002044</a> <sup>128</sup>	IHC,WB,ICC-IF
PSPH	Anti-PSPH	<a href="#">HPA020376</a> <sup>129,130</sup>	IHC,WB*
PTMA	Anti-PTMA	<a href="#">HPA047183</a>	IHC,ICC-IF
PTTG1	Anti-PTTG1	<a href="#">HPA008890</a>	IHC
RAP80/UIMC1	Anti-UIMC1	<a href="#">HPA037503</a>	IHC*,WB*,ICC-IF
RAP80/UIMC1	Anti-UIMC1	<a href="#">HPA037504</a>	IHC*,WB,ICC-IF
RBM3	Anti-RBM3	<a href="#">HPA003624</a> <sup>131-132,14</sup>	IHC,WB*,ICC-IF
RBM3	Anti-RBM3	<a href="#">AMAb90655</a> <sup>133-136</sup>	IHC*,WB*,ICC-IF

\* Products with enhanced validation for indicated application

109. Yoo NJ *et al.* Expression of NRF2, a cytoprotective protein, in gastric carcinomas. *APMIS* 2010 Aug; 118(8):613-4.

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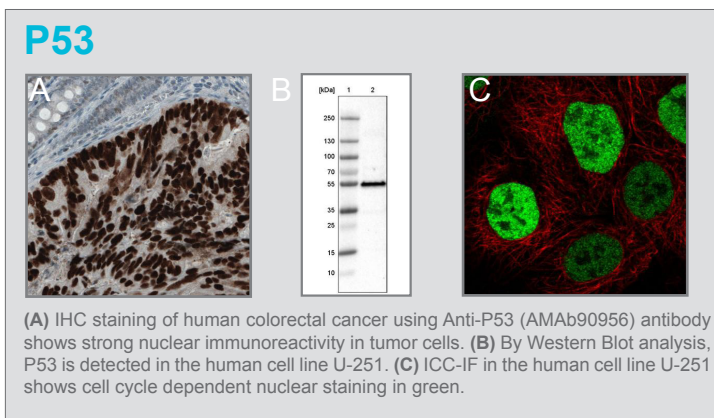
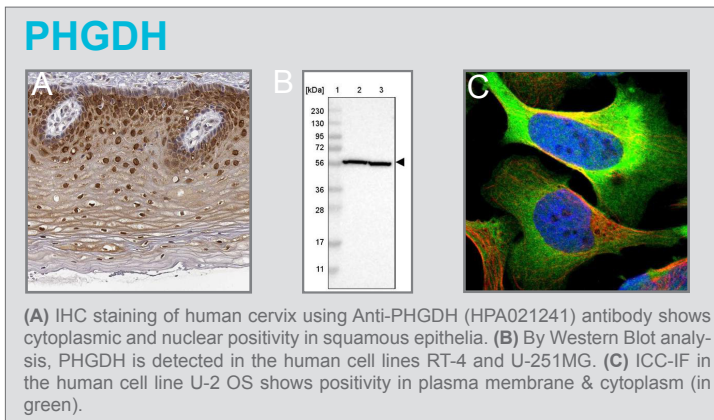
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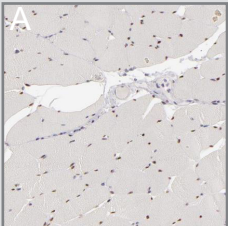
136. Olofsson SE *et al.* Low RBM3 Protein Expression Correlates with Clinical Stage, Prognostic Classification and Increased Risk of Treatment Failure in Testicular Non-Seminomatous Germ Cell Cancer. *PLoS One* 2015; 10(3):e0121300.



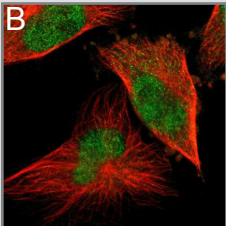
Target Protein	Product Name	Product Number	Validated Applications
RBM47	Anti-RBM47	HPA006347 <sup>137</sup>	IHC*,WB*,ICC-IF
RRBP1	Anti-RRBP1	HPA009026 <sup>138</sup>	IHC*,WB*,ICC-IF
RUNX1	Anti-RUNX1	HPA004176 <sup>139</sup>	IHC*,ICC-IF
RUNX2	Anti-RUNX2	HPA022040 <sup>140-142</sup>	IHC*,WB*,ICC-IF
SAGE1	Anti-SAGE1	HPA003208 <sup>143</sup>	IHC*,ICC-IF
SATB2	Anti-SATB2	HPA001042 <sup>104,14,144,145</sup>	IHC*,WB
SATB2	Anti-SATB2	AMAb90679	IHC,WB,ICC-IF
Septin-11	Anti-SEPT11	HPA003459 <sup>146</sup>	IHC,WB
Septin-2	Anti-SEPT2	HPA018481 <sup>146,147</sup>	IHC,WB*,ICC-IF
SIX1	Anti-SIX1	HPA001893 <sup>148-151</sup>	IHC*,WB*,ICC-IF
SIX1	Anti-SIX1	AMAb90544	IHC,WB*,ICC-IF
SNCG	Anti-SNCG	HPA014404	IHC*,WB
STK11	Anti-STK11	HPA017254 <sup>152</sup>	IHC
SURVivin/BIRC5	Anti-BIRC5	HPA002830	IHC*,WB*
T-STAR/KHDRBS3	Anti-KHDRBS3	HPA000500 <sup>145,153</sup>	IHC,WB

\* Products with enhanced validation for indicated application

### SIX1



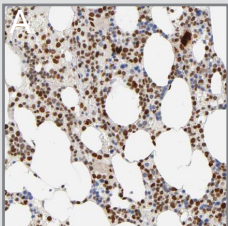
**A**



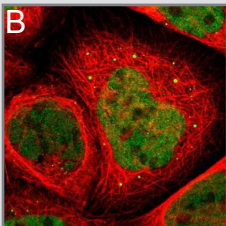
**B**

(A) IHC staining using the Anti-SIX1 antibody (HPA001893) in human skeletal muscle tissue shows nuclear positivity in myocytes. (B) ICC-IF staining in U-251 cell line shows positivity in nucleus (in green).

### RUNX1



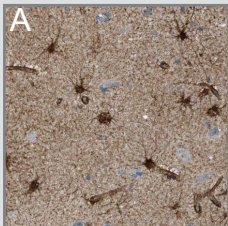
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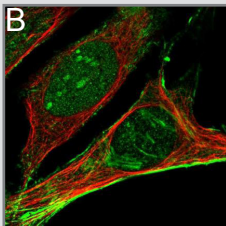
**B**

(A) IHC staining of human bone marrow using Anti-RUNX1 (HPA004176) antibody shows strong nuclear positivity in bone marrow poietic cells. (B) ICC-IF in the human cell line A-431 shows positivity in nucleus and vesicles (in green).

### SEPT2



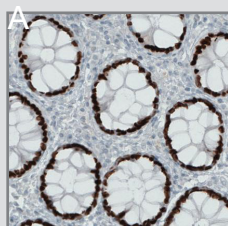
**A**



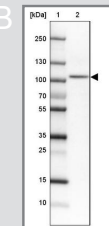
**B**

(A) The Anti-SEPT2 antibody (HPA018481) shows distinct cytoplasmic positivity in astrocytes and endothelial cells in cerebral cortex, using IHC. (B) By ICC-IF in cell line U-2 OS, positivity in nucleus, nucleoli & actin filaments is shown.

### SATB2



**A**



**B**

(A) The Anti-SATB2 antibody (AMAb90679) shows strong nuclear reactivity in glandular cells in human rectum tissue using IHC. (B) By WB, SATB2 can be detected in the human cell line HEL.

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Target Protein	Product Name	Product Number	Validated Applications
Tenascin C/TNC	Anti-TNC	HPA004823 <sup>154-157</sup>	IHC
TFAM/TCF-6	Anti-TFAM	HPA040648 <sup>8</sup>	IHC,WB*,ICC-IF
TFF1	Anti-TFF1	HPA003425 <sup>158-160</sup>	IHC*,WB*
THBD	Anti-THBD	HPA002982	IHC,WB,ICC-IF
THEM2/ACOT13	Anti-ACOT13	HPA019881	IHC,WB,ICC-IF
TIMM9	Anti-TIMM9	HPA002932 <sup>8</sup>	IHC,ICC-IF
TOMM70	Anti-TOMM70A	HPA014589 <sup>8</sup>	IHC*,WB,ICC-IF
TOP2A	Anti-TOP2A	HPA006458 <sup>161,162</sup>	IHC*,WB
TOP2A	Anti-TOP2A	HPA026773	IHC*
UGT8	Anti-UGT8	HPA014405 <sup>163</sup>	IHC
ULBP1	Anti-ULBP1	HPA007547 <sup>164-166</sup>	IHC*
VRK1	Anti-VRK1	HPA000660 <sup>167-170</sup>	IHC*,WB*,ICC-IF
WIPF2	Anti-WIPF2	HPA024467 <sup>171-174</sup>	IHC*,WB*
WIPI1	Anti-WIPI1	HPA007493 <sup>175</sup>	IHC*,WB*
ZEB1	Anti-ZEB1	HPA027524 <sup>176-179</sup>	IHC*,ICC-IF
ZEB1	Anti-ZEB1	AMAb90510 <sup>180,181</sup>	IHC,WB*,ICC-IF
ZEB2	Anti-ZEB2	HPA003456 <sup>104,182-184</sup>	IHC,WB*
ZNF703	Anti-ZNF703	HPA023930 <sup>185</sup>	IHC
ZNF703	Anti-ZNF703	AMAb90510	IHC,WB*,ICC-IF

\* Products with enhanced validation for indicated application

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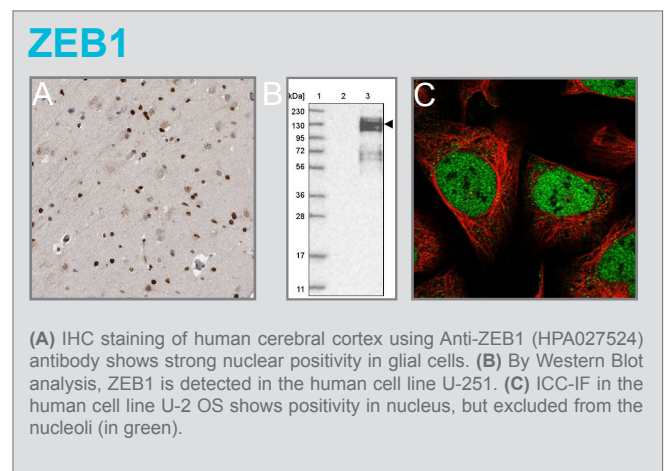
181. Varma S *et al.* Grainyhead-like 2 (GRHL2) distribution reveals novel pathophysiological differences between human idiopathic pulmonary fibrosis and mouse models of pulmonary fibrosis. *Am J Physiol Lung Cell Mol Physiol* 2014 Mar 1; 306(5):L405-L419.

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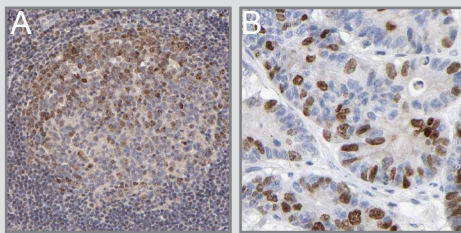
# Antibodies against gene products in MammaPrint, Oncotype, EndoPredict and uPA tests

This section presents antibodies in Atlas Antibodies' product catalog against gene products included in the diagnostic MammaPrint, EndoPredict, Oncotype and uPA tests. MammaPrint is a gene expression profile test based on the Amsterdam 70-gene breast cancer gene signature marketed by Agendia. It is a test to assess the risk that a breast tumor will metastasize to other parts of the body. MammaPrint aims at stratifying patients into "Low Risk" and "High Risk". Oncotype DX (developed by Genomic Health) is the most frequently used gene expression profile in clinical practice in the United States analyzing a panel of 21 genes within a tumor to determine a Recurrence Score.

Target Protein	Product Name	Product Number	Validated Applications
AURKA/STK15	Anti-AURKA	<a href="#">HPA002636</a>	IHC,WB,ICC-IF
AZGP1	Anti-AZGP1	<a href="#">HPA012582</a>	IHC*,WB
BAG1	Anti-BAG1	<a href="#">HPA018121</a>	IHC*
BIRC5/Survivin	Anti-BIRC5	<a href="#">HPA002830</a>	IHC*,WB*
CD68/Macrosialin	Anti-CD68	<a href="#">HPA048982<sup>1</sup></a>	IHC,WB*
CD68/Macrosialin	Anti-CD68	<a href="#">AMAb90874</a>	IHC,WB*
CDCA7	Anti-CDCA7	<a href="#">HPA005565<sup>2,3</sup></a>	ICC-IF
CMC2/C16orf61	Anti-CMC2	<a href="#">HPA006871</a>	IHC
DHCR7	Anti-DHCR7	<a href="#">HPA044280</a>	IHC,ICC-IF
DHX58/LGP2	Anti-DHX58	<a href="#">HPA018670</a>	IHC,WB
DHX58/LGP2	Anti-DHX58	<a href="#">HPA019570</a>	IHC
DTL	Anti-DTL	<a href="#">HPA028016<sup>4</sup></a>	IHC,WB
ECI2/PECI	Anti-ECI2	<a href="#">HPA022130</a>	IHC*,WB*,ICC-IF
ECI2/PECI	Anti-ECI2	<a href="#">HPA031626</a>	IHC*,WB*,ICC-IF
EGLN1/PHD2	Anti-EGLN1	<a href="#">HPA022129<sup>5</sup></a>	IHC,ICC-IF
Estrogen receptor	Anti-ESR1	<a href="#">AMAb90867</a>	IHC,WB*,ICC-IF
Estrogen receptor	Anti-ESR1	<a href="#">HPA000449<sup>6</sup></a>	IHC*,WB*,ICC-IF
Estrogen receptor	Anti-ESR1	<a href="#">HPA000450<sup>6</sup></a>	IHC*,WB*
Exostosin-1	Anti-EXT1	<a href="#">HPA044394<sup>7</sup></a>	IHC
GNAZ	Anti-GNAZ	<a href="#">HPA003011</a>	IHC*,WB*,ICC-IF
GPR126/VIGR	Anti-GPR126	<a href="#">HPA017346</a>	IHC
GPR180	Anti-GPR180	<a href="#">HPA047250</a>	IHC,ICC-IF
GSTM3	Anti-GSTM3	<a href="#">HPA035190</a>	IHC*,WB
GSTM5/GSTM1	Anti-GSTM5	<a href="#">HPA048652</a>	IHC,WB
HER2/ERBB2	Anti-HER2	<a href="#">AMAb90627</a>	IHC,WB
HER2/ERBB2	Anti-HER2	<a href="#">AMAb90628</a>	IHC,WB,ICC-IF

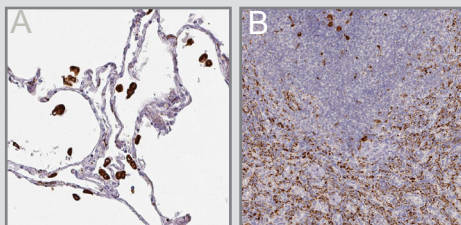
\* Products with enhanced validation for indicated application

## BIRC5/Survivin



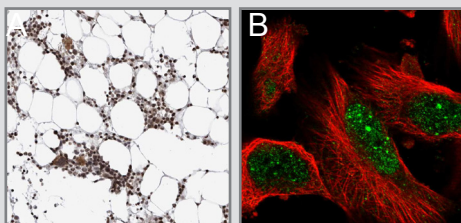
The Anti- BIRC5 antibody (HPA002830) shows nuclear positivity in germinal center cells in human tonsil tissue (A) and in tumor cells in colorectal cancer (B) using IHC.

## CD68/Macrosialin



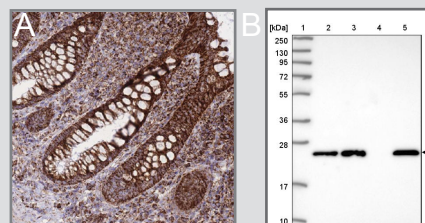
IHC staining of human lung tissue using the Anti-CD68 antibody (HPA048982) shows strong cytoplasmic positivity in macrophages (A) and in hematopoietic tissues, such as spleen (B).

## DTL



(A) IHC staining of human bone marrow using the Anti-DTL antibody (HPA028016) shows strong nuclear positivity in bone marrow poietic cells. (B) By ICC-IF, staining of nucleus in U-251 MG cells is detected.

## GSTM5



(A) The Anti-GSTM5 antibody (HPA048652) shows cytoplasmic positivity in glandular cells in human rectum by IHC. (B) In WB, the antibody detects a band of predicted size in cell lysates of RT-4, U-251 MG, as well as in liver tissue lysate.

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- Algenäs C *et al.* Antibody performance in western blot applications is context-dependent. *Biotechnol J* 2014 Mar; 9(3):435-45.
- Coulson-Thomas VJ *et al.* Heparan Sulfate Regulates Hair Follicle and Sebaceous Gland Morphogenesis and Homeostasis. *J Biol Chem* 2014 Sep 5; 289(36):25211-25226.



Target Protein	Product Name	Product Number	Validated Applications
HER2/ERBB2	Anti-ERBB2	<a href="#">HPA001383</a> <sup>8,9</sup>	IHC,WB,ICC-IF
HRASLS	Anti-HRASLS	<a href="#">HPA051179</a>	IHC,ICC-IF
IL6ST/GP130	Anti-IL6ST	<a href="#">HPA010558</a> <sup>10</sup>	IHC
JHDM1D/KDM7A	Anti-JHDM1D	<a href="#">HPA012114</a>	IHC,ICC-IF
Ki67/MKI67	Anti-MKI67	<a href="#">HPA000451</a> <sup>11,12</sup>	IHC*,ICC-IF
Ki67/MKI67	Anti-MKI67	<a href="#">HPA001164</a> <sup>13</sup>	IHC*,ICC-IF
Ki67/MKI67	Anti-MKI67	<a href="#">AMAb90870</a>	IHC,ICC-IF
LIN9	Anti-LIN9	<a href="#">HPA030241</a>	IHC,ICC-IF
LPCAT1/AYTL2	Anti-LPCAT1	<a href="#">HPA012501</a>	IHC*,WB
LPCAT1/AYTL2	Anti-LPCAT1	<a href="#">HPA022268</a> <sup>14,15</sup>	IHC*,WB*
LYRIC/MTDH	Anti-MTDH	<a href="#">HPA015104</a> <sup>16,17</sup>	IHC,WB*,ICC-IF
LYRIC/MTDH	Anti-MTDH	<a href="#">HPA010932</a> <sup>18</sup>	IHC,WB*,ICC-IF
LYRIC/MTDH	Anti-MTDH	<a href="#">AMAb90762</a>	IHC,WB,ICC-IF
LYRIC/MTDH	Anti-MTDH	<a href="#">AMAb90763</a>	IHC,WB,ICC-IF
Matrix Gla protein	Anti-MGP	<a href="#">HPA013949</a> <sup>19</sup>	IHC
MCM6	Anti-MCM6	<a href="#">HPA004818</a>	IHC*,WB*,ICC-IF
MELK/PK38	Anti-MELK	<a href="#">HPA017214</a>	IHC,WB*
MMP9	Anti-MMP9	<a href="#">HPA001238</a> <sup>20,21</sup>	IHC*,ICC-IF
MMP9	Anti-MMP9	<a href="#">AMAb90804</a>	IHC,WB
MMP9	Anti-MMP9	<a href="#">AMAb90805</a>	IHC,WB
MMP9	Anti-MMP9	<a href="#">AMAb90806</a>	IHC
MS4A7	Anti-MS4A7	<a href="#">HPA017418</a>	IHC,WB

\* Products with enhanced validation for indicated application

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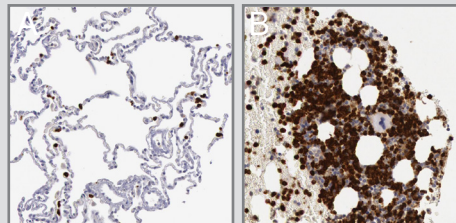
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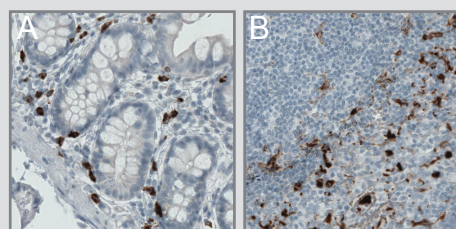
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## MMP9

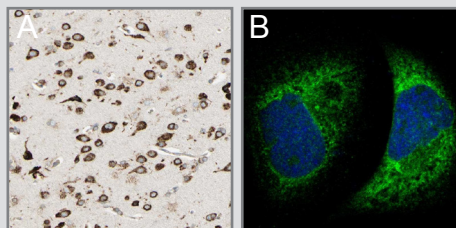


IHC staining of human lung tissue using the Anti-MMP9 antibody (HPA001238) shows strong nuclear positivity in macrophages (A) and in bone marrow poietic cells in bone marrow tissue (B).

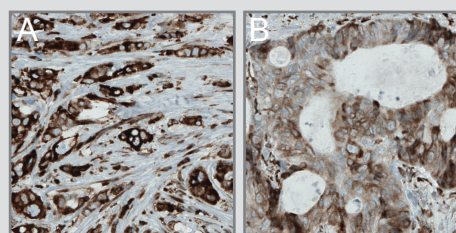


Monoclonal Anti-MMP9 antibodies show strong cytoplasmic positivity in a subset of lymphoid cells in duodenum (AMAb90805) (A) and in human tonsil tissue (AMAb90804) (B).

## LYRIC/MTDH

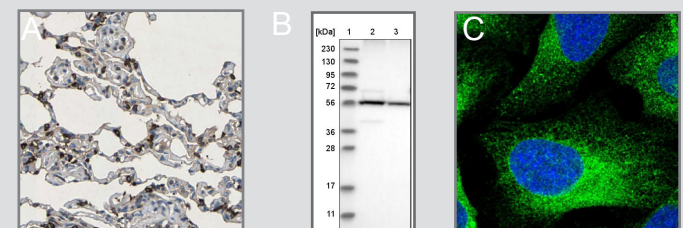


(A) IHC staining using the Anti-MTDH antibody (HPA010932) shows strong cytoplasmic positivity in neuronal cells in human cerebral cortex tissue. (B) In ICC-IF in A-431 cell line, the antibody stains endoplasmic reticulum.



IHC staining using the monoclonal Anti-MTDH antibody (AMAb90762) shows strong cytoplasmic reactivity in tumor cells from breast (A) and colorectal cancer samples (B).

## LPCAT1/AYTL2



(A) IHC staining of human lung using Anti-LPCAT1 (HPA022268) antibody shows strong cytoplasmic positivity in pneumocytes. (B) By Western Blot analysis, LPCAT1 is detected in the human cell lines RT-4 and U-251. (C) ICC-IF in the human cell line U-2 OS shows positivity in endoplasmic reticulum (in green).

Target Protein	Product Name	Product Number	Validated Applications
MYBL2	Anti-MYBL2	<a href="#">HPA030530</a>	IHC
Neuromedin-U	Anti-NMU	<a href="#">HPA025926</a>	IHC
NUSAP1	Anti-NUSAP1	<a href="#">HPA042904</a>	IHC*, ICC-IF
P5C dehydrogenase	Anti-ALDH4A1	<a href="#">HPA006401</a>	IHC*, WB
PITRM1/MP1	Anti-PITRM1	<a href="#">HPA006753</a>	IHC*, WB*, ICC-IF
PITRM1/MP1	Anti-PITRM1	<a href="#">HPA006754</a>	IHC*, WB*
PLAU/UPA	Anti-PLAU	<a href="#">HPA008719</a>	IHC
PRC1	Anti-PRC1	<a href="#">HPA034521</a>	IHC*, WB
Progesteron receptor	Anti-PGR	<a href="#">HPA004751</a> <sup>22</sup>	IHC*
Progesteron receptor	Anti-PGR	<a href="#">HPA008428</a> <sup>23</sup>	IHC*
Progesteron receptor	Anti-PGR	<a href="#">HPA017176</a>	IHC*
QSOX2/QSCN6L1	Anti-QSOX2	<a href="#">HPA012716</a>	IHC, ICC-IF
RBBP8	Anti-RBBP8	<a href="#">HPA039890</a>	IHC
RECQL5	Anti-RECQL5	<a href="#">HPA029971</a> <sup>24</sup>	IHC, WB*, ICC-IF
RTN4RL1/NgR3	Anti-RTN4RL1	<a href="#">HPA044428</a>	IHC
RUNDC1	Anti-RUNDC1	<a href="#">HPA023726</a>	IHC, WB, ICC-IF
SCUBE2/CEGP1	Anti-SCUBE2	<a href="#">HPA006353</a>	IHC
SCUBE2/CEGP1	Anti-SCUBE2	<a href="#">HPA029871</a>	IHC
SCOT/OXCT1	Anti-OXCT1	<a href="#">HPA012047</a> <sup>25</sup>	IHC*, WB*, ICC-IF
SCOT/OXCT1	Anti-OXCT1	<a href="#">HPA061425</a>	IHC*, ICC-IF
SERPINE1/PAI1	Anti-SERPINE1	<a href="#">HPA050039</a> <sup>26</sup>	IHC, ICC-IF
SLC2A3/GLUT3	Anti-SLC2A3	<a href="#">HPA006539</a> <sup>27,28</sup>	IHC, ICC-IF
Stanniocalcin-2	Anti-STC2	<a href="#">HPA045372</a>	IHC, WB*, ICC-IF
TMEM74B/C20orf46	Anti-TMEM74B	<a href="#">HPA045213</a>	IHC, ICC-IF
TSPYL5	Anti-TSPYL5	<a href="#">HPA031347</a>	IHC*, ICC-IF
UCHL5	Anti-UCHL5	<a href="#">HPA005908</a>	IHC
VEGFR-1	Anti-FLT1	<a href="#">AMAb90703</a>	IHC*
VEGFR-1	Anti-FLT1	<a href="#">AMAb90704</a>	IHC*, WB
WISP1	Anti-WISP1	<a href="#">HPA007121</a>	ICC-IF

\* Products with enhanced validation for indicated application

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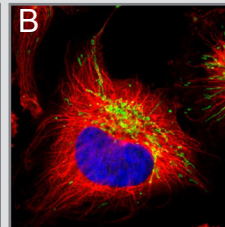
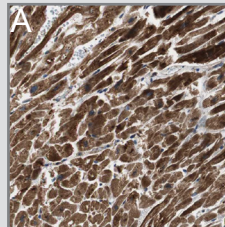
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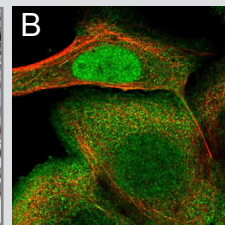
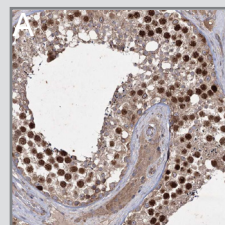
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## PITRM1/MP1



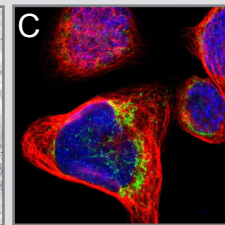
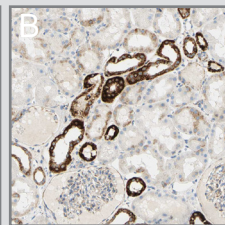
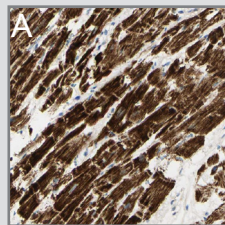
(A) The Anti-PITRM1 antibody (HPA006753) shows strong cytoplasmic positivity in myocytes in human heart muscle using IHC. (B) ICC-IF staining of human cell line U-251 MG shows positivity in mitochondria.

## PRC1



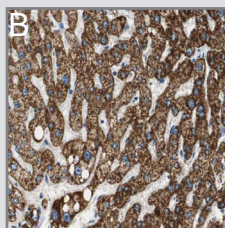
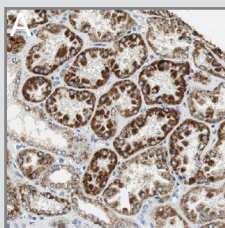
(A) IHC staining of human testis tissue using the Anti-PRC1 antibody (HPA034521) shows strong nuclear positivity in cells of seminiferous ducts. (B) ICC-IF shows staining of nucleus, plasma membrane and microtubules in A-431 cells.

## SCOT/OXCT1



IHC staining of human heart muscle (A) and kidney (B) by Anti-OXCT1 antibody (HPA028016) shows strong cytoplasmic positivity in myocytes and cells in tubules, respectively. (C) ICC-IF shows staining of mitochondria in A431 cells.

## P5C dehydrogenase/ALDH4A1



IHC staining using the Anti-ALDH4A1 antibody (HPA006401) shows strong cytoplasmic positivity with granular pattern in human kidney (A) and liver tissues (B).



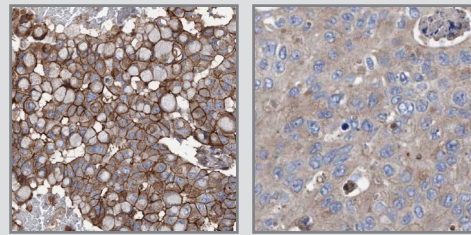
# Antibodies identified in the Human Protein Atlas

- showing differential IHC staining patterns in breast cancer samples

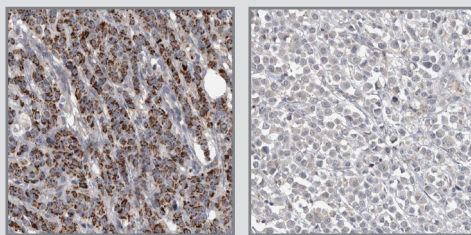
Product Name	Product Number	Validated Applications
Anti-AAMDC	<a href="#">HPA037918</a>	IHC*,WB*,ICC-IF
Anti-AAMDC	<a href="#">HPA037919</a>	IHC*,ICC-IF
Anti-ACSF2	<a href="#">HPA024693</a>	IHC*,WB,ICC-IF
Anti-ADAMTS13	<a href="#">HPA042014</a>	IHC
Anti-ADIRF	<a href="#">HPA026810</a>	IHC,ICC-IF
Anti-AGR3	<a href="#">HPA053942</a>	IHC*,ICC-IF
Anti-AIF1L	<a href="#">HPA020522</a>	IHC*
Anti-AJUBA	<a href="#">HPA006171</a> <sup>1</sup>	IHC,WB,ICC-IF
Anti-ALDH1A3	<a href="#">HPA046271</a> <sup>2</sup>	IHC*,WB*,ICC-IF
Anti-ANKRD46	<a href="#">HPA013758</a>	IHC,WB*,ICC-IF
Anti-ASB6	<a href="#">HPA004341</a>	IHC,WB
Anti-ATF6	<a href="#">HPA005935</a>	IHC
Anti-ATP6V1B2	<a href="#">HPA008147</a>	IHC*,WB*,ICC-IF
Anti-BCL9	<a href="#">HPA020274</a>	IHC*,ICC-IF
Anti-C10orf54	<a href="#">HPA007968</a>	IHC,WB*
Anti-C12orf76	<a href="#">HPA039713</a>	IHC,WB*,ICC-IF
Anti-C17orf85	<a href="#">HPA008959</a> <sup>3</sup>	IHC,ICC-IF
Anti-C2orf68	<a href="#">HPA051143</a>	IHC,ICC-IF
Anti-CCDC170	<a href="#">HPA027185</a>	IHC*,WB*
Anti-CDK6	<a href="#">HPA002637</a>	IHC*,WB*,ICC-IF
Anti-CLDN3	<a href="#">HPA014361</a>	IHC,ICC-IF
Anti-CPNE2	<a href="#">HPA041132</a>	IHC,WB,ICC-IF
Anti-CRABP2	<a href="#">HPA004135</a> <sup>4</sup>	IHC,WB*,ICC-IF
Anti-CTNND2	<a href="#">HPA015077</a>	IHC*
Anti-CXorf67	<a href="#">HPA006128</a>	IHC*,WB*,ICC-IF
Anti-CYP4X1	<a href="#">HPA017661</a>	IHC,WB*
Anti-DACH1	<a href="#">HPA012672</a> <sup>5-7</sup>	IHC,ICC-IF
Anti-DCHS1	<a href="#">HPA050246</a>	IHC
Anti-DCLK1	<a href="#">HPA015655</a>	IHC*,WB
Anti-DOM3Z	<a href="#">HPA046708</a>	IHC,ICC-IF
Anti-ECD	<a href="#">HPA006465</a>	IHC,WB,ICC-IF
Anti-EFHD1	<a href="#">HPA049331</a>	IHC*,ICC-IF
Anti-EPHA6	<a href="#">HPA007397</a>	IHC,WB*,ICC-IF
Anti-FAM189A1	<a href="#">HPA009410</a>	IHC,ICC-IF
Anti-FKBP7	<a href="#">HPA008707</a>	IHC,WB*,ICC-IF
Anti-GABRD	<a href="#">HPA044371</a>	IHC*
Anti-GAK	<a href="#">HPA027463</a>	IHC,ICC-IF

\* Products with enhanced validation for indicated application

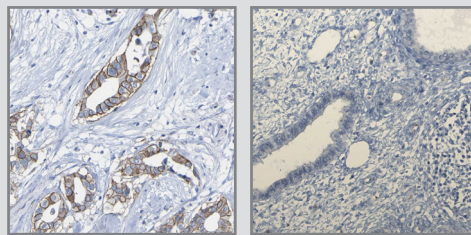
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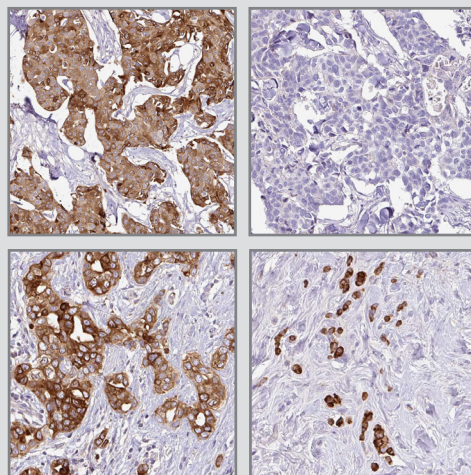
IHC analysis using Anti-KLHL26 antibody (HPA023074) shows a varying membranous/cytoplasmic staining pattern in breast tumor samples from different patients.



The Anti-ACSF2 (HPA024693) antibody shows granular cytoplasmic positivity in breast tumor cells from different patients varying from strong to negative.



The Anti-GCM1 (HPA011343) antibody shows membranous positivity in breast tumor cells (left) while normal breast tissue is negative (right).



The Anti-AGR3 (HPA053942) antibody shows strong cytoplasmic positivity in 3/4 breast cancer patients, while 1 patient is completely negative.

Product Name	Product Number	Validated Applications
Anti-GCM1	<a href="#">HPA011343<sup>8</sup></a>	IHC*,ICC-IF
Anti-GLDC	<a href="#">HPA002318<sup>9</sup></a>	IHC*,WB*
Anti-GLYATL1	<a href="#">HPA039501</a>	IHC,WB
Anti-GTF3A	<a href="#">HPA007990</a>	IHC,ICC-IF
Anti-HIPK2	<a href="#">HPA007611</a>	IHC
Anti-HMGCS1	<a href="#">HPA036913</a>	IHC,WB
Anti-HMGCS2	<a href="#">HPA027423</a>	IHC*,WB*
Anti-HMGCS2	<a href="#">HPA027442</a>	IHC*,WB*,ICC-IF
Anti-IFITM3	<a href="#">HPA004337</a>	IHC,WB*
Anti-IRX2	<a href="#">HPA054669</a>	IHC
Anti-ISYNA1	<a href="#">HPA007931</a>	IHC*,WB,ICC-IF
Anti-ISYNA1	<a href="#">HPA008232</a>	IHC*,WB
Anti-ITGA3	<a href="#">HPA008572</a>	IHC*,WB*
Anti-ITGBL1	<a href="#">HPA005676</a>	IHC
Anti-ITIH6	<a href="#">HPA000506</a>	IHC
Anti-KLHL26	<a href="#">HPA023074</a>	IHC,WB
Anti-KRT31	<a href="#">HPA049550</a>	IHC
Anti-LASP1	<a href="#">HPA012072<sup>10</sup></a>	IHC*,WB,ICC-IF
Anti-LRRIQ4	<a href="#">HPA036706</a>	IHC
Anti-MAGEB1	<a href="#">HPA002820</a>	IHC*
Anti-MANSC4	<a href="#">HPA039454</a>	IHC
Anti-MROH2B	<a href="#">HPA059457</a>	IHC
Anti-MRS2	<a href="#">HPA017642</a>	IHC,WB
Anti-MSTO1	<a href="#">HPA005914</a>	IHC
Anti-MTMR2	<a href="#">HPA049831</a>	IHC,ICC-IF
Anti-MYBBP1A	<a href="#">HPA005466</a>	IHC*,WB,ICC-IF
Anti-NAPEPLD	<a href="#">HPA024338</a>	IHC,WB,ICC-IF
Anti-NASP	<a href="#">HPA028136</a>	IHC*,WB*,ICC-IF
Anti-NFIA	<a href="#">HPA006111<sup>11</sup></a>	IHC*,WB*,ICC-IF
Anti-NIM1	<a href="#">HPA007695</a>	IHC
Anti-NKAIN1	<a href="#">HPA006873</a>	IHC
Anti-NPSR1	<a href="#">HPA007489<sup>12</sup></a>	IHC
Anti-OR2Z1	<a href="#">HPA048760</a>	IHC
Anti-OR9K2	<a href="#">HPA015808</a>	IHC
Anti-OTOP2	<a href="#">HPA024524</a>	IHC
Anti-PDE4C	<a href="#">HPA048975</a>	IHC*
Anti-PEG10	<a href="#">HPA051038</a>	IHC*,ICC-IF
Anti-PHLPP1	<a href="#">HPA020200</a>	IHC
Anti-PHTF2	<a href="#">HPA012312</a>	IHC,ICC-IF
Anti-PKN3	<a href="#">HPA045390</a>	IHC
Anti-PNMA5	<a href="#">HPA044690</a>	IHC*
Anti-PPP1R35	<a href="#">HPA051607</a>	IHC*
Anti-PPR11	<a href="#">HPA023923<sup>13,14</sup></a>	IHC,WB*
Anti-PVALB	<a href="#">HPA048536</a>	IHC*,WB,ICC-IF
Anti-RAB31	<a href="#">HPA019717<sup>15</sup></a>	IHC,WB*
Anti-RAC3	<a href="#">HPA047820</a>	IHC,WB
Anti-RAD18	<a href="#">HPA008752</a>	IHC,WB*,ICC-IF
Anti-REEP1	<a href="#">HPA058061</a>	IHC*
Anti-RIOK2	<a href="#">HPA005681</a>	IHC,ICC-IF
Anti-RPS13	<a href="#">HPA005985</a>	IHC,ICC-IF
Anti-S100A1	<a href="#">HPA006462<sup>16</sup></a>	IHC*,WB
Anti-S100A13	<a href="#">HPA019592<sup>17,18</sup></a>	IHC,WB,ICC-IF
Anti-S100A14	<a href="#">HPA027613</a>	IHC*,WB*,ICC-IF
Anti-S100A7	<a href="#">HPA006997</a>	IHC
Anti-SGK196/POMK	<a href="#">HPA013321</a>	IHC,WB*,ICC-IF
Anti-SH3BGRL	<a href="#">HPA051248</a>	IHC,WB*,ICC-IF
Anti-SHROOM1	<a href="#">HPA037690</a>	IHC

Product Name	Product Number	Validated Applications
Anti-SIMC1	<a href="#">HPA037889</a>	ICC-IF
Anti-SLC16A7	<a href="#">HPA005911</a>	IHC,WB*
Anti-SLC39A6	<a href="#">HPA042377</a>	IHC
Anti-SPAG1	<a href="#">HPA023748</a>	IHC,ICC-IF
Anti-SQLE	<a href="#">HPA018038<sup>19</sup></a>	IHC
Anti-SRPRB	<a href="#">HPA011173</a>	IHC,ICC-IF
Anti-SSSCA1	<a href="#">HPA039789</a>	IHC,WB,ICC-IF
Anti-STAG3	<a href="#">HPA049106</a>	IHC*
Anti-STX7	<a href="#">HPA001467<sup>20</sup></a>	IHC*,WB,ICC-IF
Anti-TACC3	<a href="#">HPA005781<sup>21</sup></a>	IHC,WB*
Anti-TAPBP	<a href="#">HPA007066</a>	IHC
Anti-TBC1D9	<a href="#">HPA000262</a>	IHC
Anti-TGFBI	<a href="#">HPA017019</a>	IHC*,WB
Anti-TMEM222	<a href="#">HPA016579</a>	IHC
Anti-TMEM68	<a href="#">HPA018216</a>	IHC
Anti-TPX2	<a href="#">HPA005487</a>	IHC*,WB,ICC-IF
Anti-TTLL12	<a href="#">HPA003054</a>	IHC,ICC-IF
Anti-UBE20	<a href="#">HPA023605</a>	IHC,WB,ICC-IF
Anti-WFDC2	<a href="#">HPA042302</a>	IHC*,WB,ICC-IF
Anti-ZBTB7B	<a href="#">HPA006811</a>	IHC*,ICC-IF
Anti-ZKSCAN3	<a href="#">HPA009637</a>	IHC
Anti-ZNF131	<a href="#">HPA007023</a>	IHC
Anti-ZNF627	<a href="#">HPA049770</a>	IHC,WB
Anti-ZNF662	<a href="#">HPA039116</a>	IHC,WB

\* Products with enhanced validation for indicated application

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# Finding Cancer Biomarkers

## Breast Cancer

Breast cancer is the second most common cancer and by far the most frequent cancer among women. The incidence of breast cancer is increasing steadily, but without a corresponding increase in mortality. If detected at an early stage, the prognosis is relatively good for a patient living in a developed country, with a general five-year survival rate of approximately 85%.

## Treatments

Cancer, though often denoted as a singular disease, is truly a multitude of diseases. This understanding has evolved over the years, but many patients are not receiving optimal treatment for their disease. For cancer patients to receive a more individualized treatment, there is still a need for new and better ways to stratify patients.

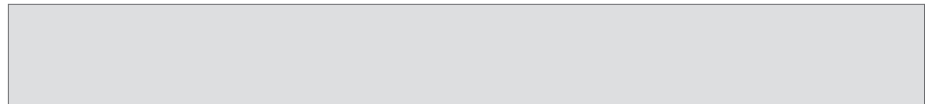
The classical prognostic factors such as stage and grade of the tumor are insufficient for a correct estimation of patient prognosis. Additional information from cancer biomarkers promise to substantially improve this estimation, ultimately leading to a more individualized treatment, thus avoiding both under- and over treatment of patients.

The primary curative treatment for breast cancer patients is surgery, often in combination with adjuvant therapy. However, adjuvant therapy is associated with substantial costs and sometimes severe side effects. Physicians have identified reduction of overtreatment as the major clinical need in breast cancer treatment today. Thus, the stratification of patients into different prognostic categories is of great importance as it may aid physicians in selecting the most appropriate treatment for a given patient.

The majority of breast cancers are hormone receptor responsive, i.e., express the estrogen receptor (ER) and/or the progesteron receptor (PR). Patients with tumors expressing these receptors may receive adjuvant endocrine treatment, such as tamoxifen.

Breast cancers may also express the HER2 protein (human epidermal growth factor receptor 2), and patients with tumors expressing this protein may receive adjuvant therapy with trastuzumab.

Adjuvant treatment may also consist of chemotherapy or radiation therapy.



## RBM3

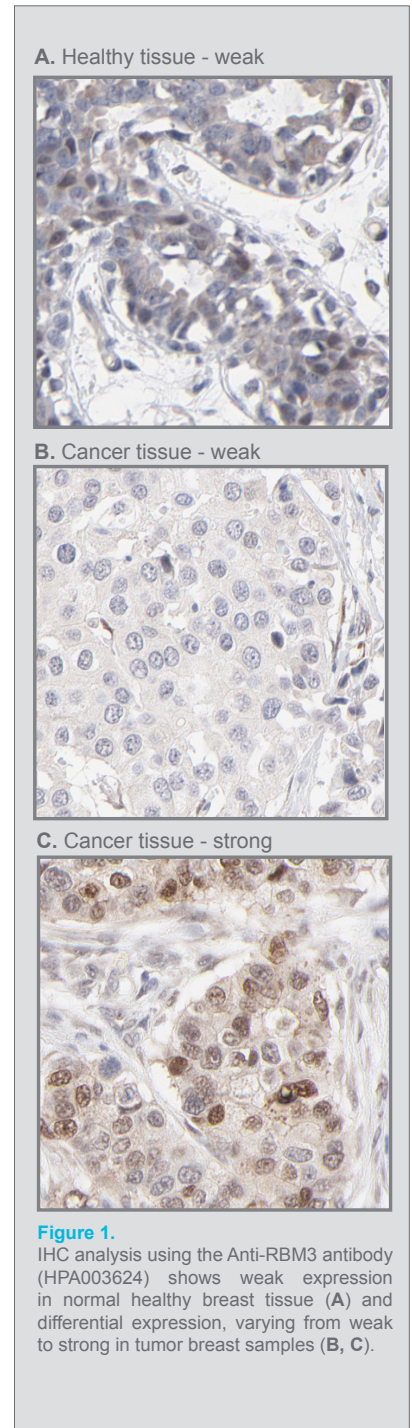
The RNA-binding motif protein 3 (RBM3) is an RNA- and DNA-binding protein, whose function has not been fully elucidated. It has been shown that the protein is expressed as an early event in mild hypothermia, and also in other conditions relating to cellular stress, such as glucose deprivation and hypoxia<sup>1</sup>.

During stress, RBM3 is thought to protect the cells by aiding in maintenance of protein synthesis needed for survival<sup>1</sup>. Recently, it has also been shown that RBM3 attenuates stem cell-like properties in prostate cancer cells<sup>2</sup>.

Through its differential expression pattern in several cancers types, RBM3 is now considered a potential oncology biomarker as reported in the Human Protein Atlas (HPA) project (proteinatlas.org)<sup>3,4</sup>.

The IHC analysis using the Anti-RBM3 antibody HPA003624, showed a weak expression pattern in normal breast tissue, but a stratified pattern in breast cancer tissue (Figure 1).

Researchers further investigated the expression in larger breast cancer cohorts and the expression of RBM3 was shown to be associated with a prolonged survival<sup>5</sup>.



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2. Zeng Y *et al.* (2013) Stress response protein RBM3 attenuates the stem-like properties of prostate cancer cells by interfering with CD44 variant splicing. *Cancer Res.* May 10.

3. Berglund L *et al.* (2008) A gene-centric human protein atlas for expression profiles based on antibodies. *Molecular & Cellular Proteomics* 7:2019-2027.

4. Uhlén M *et al.* (2010) Towards a knowledge-based Human Protein Atlas. *Nat Biotechnol* 28(12):1248-50.

## RBM3 as a prognostic biomarker in breast cancer

After identification of RBM3 as a potential prognostic biomarker, researchers further investigated the RBM3 protein expression in larger breast cancer cohorts<sup>5</sup>. In a cohort of 500 premenopausal women with stage II invasive breast cancer, RBM3 expression was found to be associated with small, low-grade, estrogen receptor (ER)-positive tumors. When analyzing the subset of ER-positive patients, RBM3 was an independent predictor of recurrence free survival (RFS). As shown in Figure 2, patients with tumors expressing high levels of the RBM3 protein have an improved survival compared to patients with tumors expressing low levels of RBM3.

RBM3 protein expression has further been analyzed in many different patient cohorts from various forms of cancer. Levels of RBM3 expression was found to have a significant connection to patient survival in breast<sup>5</sup>, colon<sup>6</sup>, ovarian<sup>7,8</sup>, testicular, urothelial<sup>9</sup>, and prostate<sup>10</sup> cancer as well as in malignant melanoma<sup>11</sup>.

In conclusion, RBM3 is a marker of good prognosis in breast cancer as well as in several other cancers.

## RBM3 antibodies

There are two Anti-RBM3 antibodies in the Atlas Antibodies' product catalog: the Triple A Polyclonal HPA003624 and the PrecisA Monoclonal AMAb90655.

The monoclonal Anti-RBM3 antibody shows excellent specificity in Western Blot analysis of human cell lines, and is routinely used for staining of formalin fixed paraffin embedded tissue in IHC (Figure 3.)

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6. Hjelm B *et al.* (2011) High nuclear RBM3 expression is associated with an improved prognosis in colorectal cancer. *Proteomics Clin Appl.* Dec;5(11-12):624-35

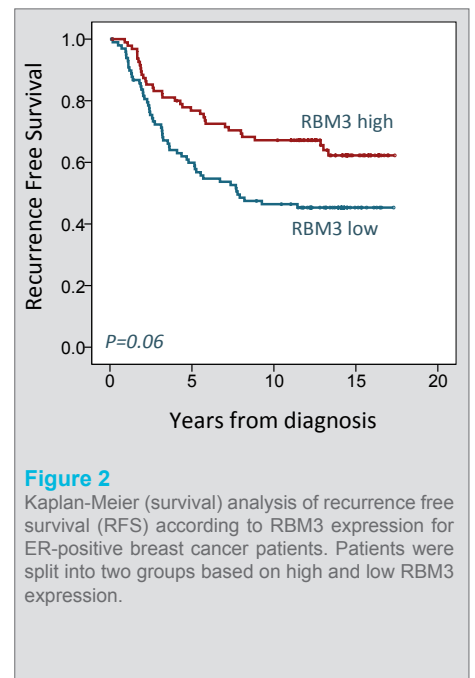
7. Ehlén A *et al.* (2010) Expression of the RNA-binding protein RBM3 is associated with a favourable prognosis and cisplatin sensitivity in epithelial ovarian cancer. *J Transl Med.* Aug 20; 8:78.

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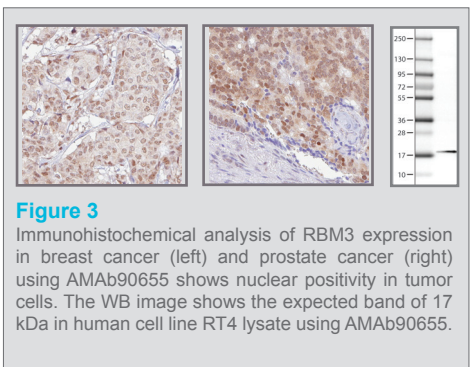
9. Boman K *et al.* (2013) Decreased expression of RNA-binding motif protein 3 correlates with tumour progression and poor prognosis in urothelial bladder cancer. *BMC Urol.* 2013;13:17

10. Jonsson L *et al.* (2011) High RBM3 expression in prostate cancer independently predicts a reduced risk of biochemical recurrence and disease progression. *Diagn Pathol.* Sep 28;6:91.

11. Jonsson L *et al.* (2011) Low RBM3 protein expression correlates with tumour progression and poor prognosis in malignant melanoma: an analysis of 215 cases from the Malmö Diet and Cancer Study. *J Transl Med.* Jul 21;9:114.



**Figure 2** Kaplan-Meier (survival) analysis of recurrence free survival (RFS) according to RBM3 expression for ER-positive breast cancer patients. Patients were split into two groups based on high and low RBM3 expression.



**Figure 3** Immunohistochemical analysis of RBM3 expression in breast cancer (left) and prostate cancer (right) using AMAb90655 shows nuclear positivity in tumor cells. The WB image shows the expected band of 17 kDa in human cell line RT4 lysate using AMAb90655.



## Granulin

Granulins are a family of secreted, glycosylated peptides that are cleaved from a single precursor protein. Cleavage of the signal peptide produces mature granulin which can be further cleaved into a variety of active peptides. These cleavage products are named granulin A, granulin B, granulin C, etc. Both the peptides and intact granulin protein regulate cell growth.

Different members of the granulin protein family may act as inhibitors, stimulators, or have dual actions on cell growth. Granulin family members are important in normal development, wound healing, and tumorigenesis [provided by RefSeq, Jul 2008].

In a paper by Elkabets *et al*, the role of GRN expression in responding tumor instigation was investigated by studying recruitment of GRN-expressing bone marrow cells into responding

tumors in mice<sup>1</sup>. Certain tumors can foster the growth of other tumors or metastatic cells located at distant anatomical sites, which is referred to as tumor instigation.

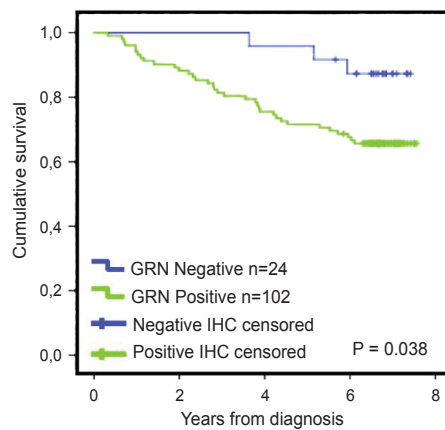
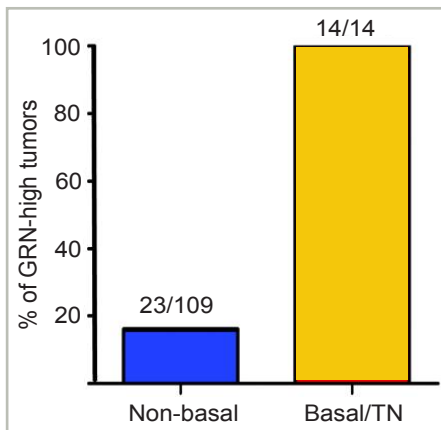
In this study<sup>1</sup>, rigorously growing human breast carcinoma cells were implanted in mice showing that these cells stimulated the outgrowth of otherwise poorly tumorigenic, indolent transformed cells. GRN was identified as the most upregulated gene in the instigating bone marrow cells.

The GRN expressing cells induced resident fibroblasts to express genes that promoted malignant tumor progression. It was speculated whether anticancer therapies might involve targeting GRN, or the activated GRN expressing cells, and thereby disrupting these cell lines of communication that promote cancer progression.

By using the Anti-GRN antibody HPA028747 in the analysis of tumor tissues from a cohort of breast cancer patients, high GRN expression was shown to correlate with the most aggressive triple-negative, basal-like tumor subtype and reduced patient survival (Figure 1).

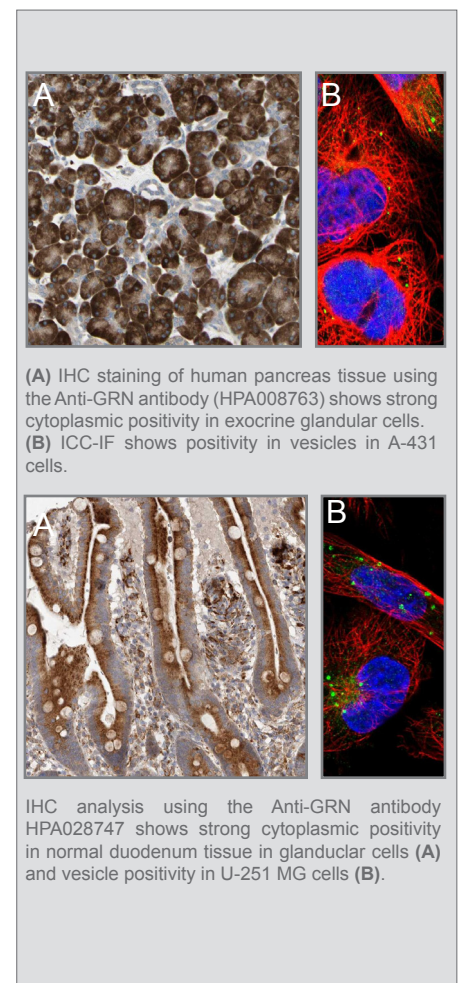
## Granulin antibodies

Atlas Antibodies' product catalog, lists two polyclonal Anti-GRN antibodies: HPA008763 and HPA028747.



**Figure 1**

GRN expression correlates with aggressive tumor subtypes and reduced survival of breast cancer patients using antibody HPA028747. The diagram on the left shows percentage of tumors in each category (Triple-Negative [TN]/basal or nonbasal) displaying high GRN positivity. On the right, the Kaplan-Meier analysis shows correlation between GRN-positive (green) or GRN-negative (blue) expression and survival.



(A) IHC staining of human pancreas tissue using the Anti-GRN antibody (HPA008763) shows strong cytoplasmic positivity in exocrine glandular cells. (B) ICC-IF shows positivity in vesicles in A-431 cells.

IHC analysis using the Anti-GRN antibody HPA028747 shows strong cytoplasmic positivity in normal duodenum tissue in glandular cells (A) and vesicle positivity in U-251 MG cells (B).

1. Elkabets M *et al*. Human tumors instigate granulin-expressing hematopoietic cells that promote malignancy by activating stromal fibroblasts in mice. *J Clin Invest* 2011 Feb 1;121(2):784-99.

## Anillin

Anillin is an actin binding protein that is a subunit of microfilaments, one of the cytoskeleton components. Anillin is expressed in most cells and is involved in basic cell functions, e.g. motility, division and signaling. Studies of anillin expression have shown that it is overexpressed in several human tumors.

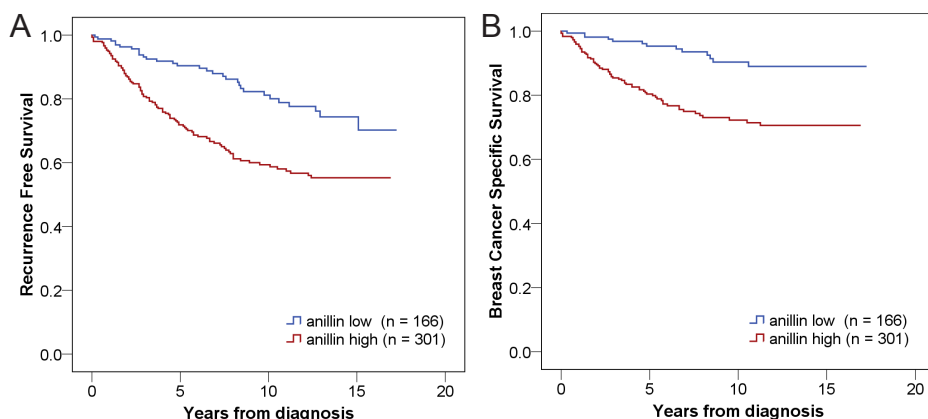
## Anillin as a treatment predictive prognostic biomarker in breast cancer

Anillin expression was analyzed in a patient cohort consisting of 467 samples from patients diagnosed with breast cancer, using the Anti-ANLN antibody HPA005680. Patients with tumors expressing high levels of anillin had a reduced recurrence free survival (RFS) compared to

patients with tumors expressing low levels of anillin (Figure 1A). The same association between anillin expression and reduced survival could be seen when analyzing breast cancer specific survival (BCSS, Figure 1B).

In a study by O'Leary *et al*, the prognostic impact of anillin was confirmed by Cox regression analysis. High anillin expression was associated with reduced BCSS and RFS in univariate- as well as in multivariate analysis, adjusted for tumor size and grade, age at diagnosis, nodal-, ER-, PR-, HER2-, and Ki67 status.

In conclusion, anillin is a marker for poor prognosis in breast cancer.

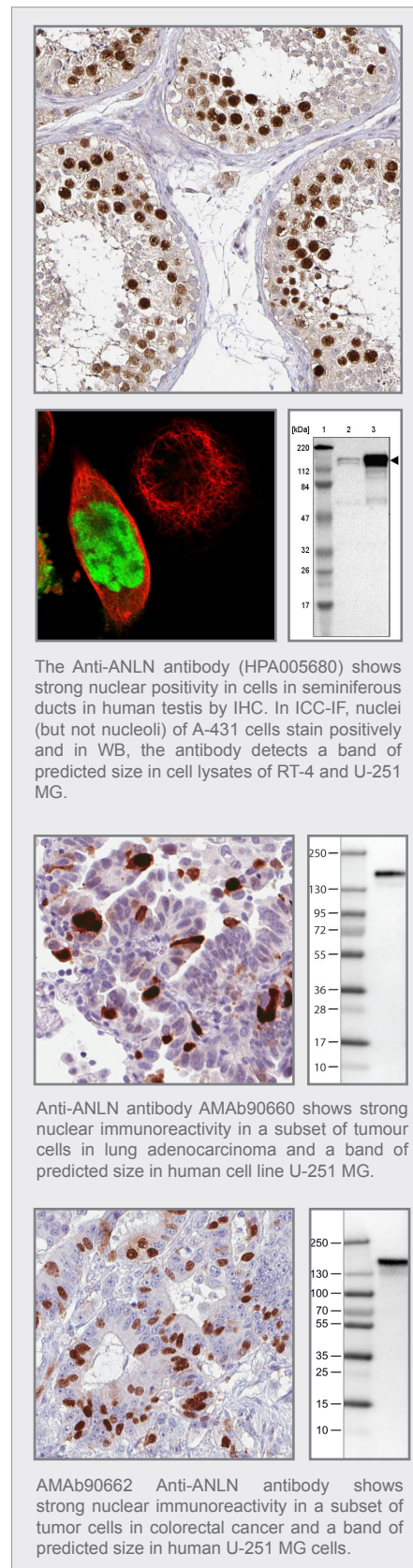


**Figure 1**

Kaplan-Meier (survival) analysis of recurrence free- (A) and breast cancer specific survival (B) according to anillin expression for breast cancer patients. Patients were split into two groups based on high and low anillin expression.

## Anillin antibodies

There are three Anti-ANLN antibodies in Atlas Antibodies product catalog; the Precisa Monoclonals AMAb90660 and AMAb90662 and the Triple A Polyclonal HPA005680.



1. O'Leary PC *et al*. Systematic antibody generation and validation via tissue microarray technology leading to identification of a novel protein prognostic panel in breast cancer. *BMC Cancer*. 2013 Apr 2;13:175.



# Co-Development Program

Research remains at the heart of Atlas Antibodies. We welcome customers to contact us for possible collaborations on both existing and future product offerings.

Atlas Antibodies invite you to participate in our Monoclonal Antibody Development Program. If you are looking for mouse monoclonal antibodies currently not available in our catalog, and if you are interested in developing the antibody together with us, please send in your project proposal to us.

Upon agreement to proceed with a collaboration, Atlas Antibodies will develop and produce the monoclonal antibody using the same procedures as for PrecisA Monoclonals. As part of this procedure, we epitope

map all our clones to obtain unique clones with defined epitopes for final characterization.

The selection of the optimal clones for specific applications is made in collaboration with you. Antibodies will be sent to you for additional characterization in your laboratory, or Atlas Antibodies will make the characterization at our facilities with your expert input and/or material.

Atlas Antibodies cover all other development costs. If the project results in a commercialized product, it will be added to Atlas Antibodies PrecisA Monoclonal product portfolio and available to you.

All antibodies will be used for staining of a multitude of human tissues by the

Human Protein Atlas (HPA) project, and these results will be available on the HPA web portal.

## Benefits of the program

Atlas Antibodies take the full development cost while you get a discounted antibody with proven functionality in your experimental set-up.

For more information and/or requests for participating in the program, you are welcome to contact us at [contact@atlasantibodies.com](mailto:contact@atlasantibodies.com).

We are looking forward to hearing from you.

## Collaboration project for SOX11

PrecisA Monoclonals against SOX11 (AMAb90501 and AMAb90502) were developed in collaboration with Dr Antonio Martinez (Laboratory of Pathology, Hospital Clínic, University of Barcelona, Spain).

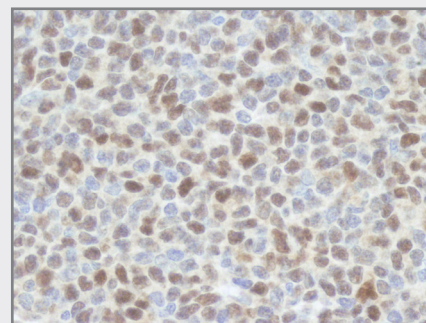
Dr. Martinez is involved in the study of aggressive lymphomas, mechanisms of transformation, progression and prognostic factors. He has collaborated in the description of transcription factors involved in B-cell development and lymphomagenesis with special emphasis in those related in late B-cell differentiation pathways such as IRF4, IRF8, XBP1 and SOX11. His lab has long expertise in the characterization of antibodies for clinical use in hematopathology.

Soldini D *et al.* Assessment of SOX11 Expression in Routine Lymphoma Tissue Sections: Characterization of New Monoclonal Antibodies for Diagnosis of Mantle Cell Lymphoma. *Am J Surg Pathol.* 2013 Oct 18.

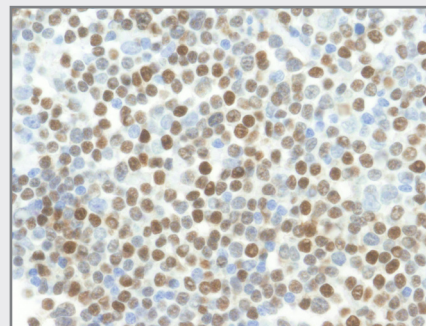
## SOX11

This gene encodes a member of the group C SOX (SRY-related HMG-box) transcription factor family involved in the regulation of embryonic development and in the determination of the cell fate. The encoded protein may act as a transcriptional regulator after forming a protein complex with other proteins. The protein may function in the developing nervous system and play a role in tumorigenesis and adult neurogenesis.

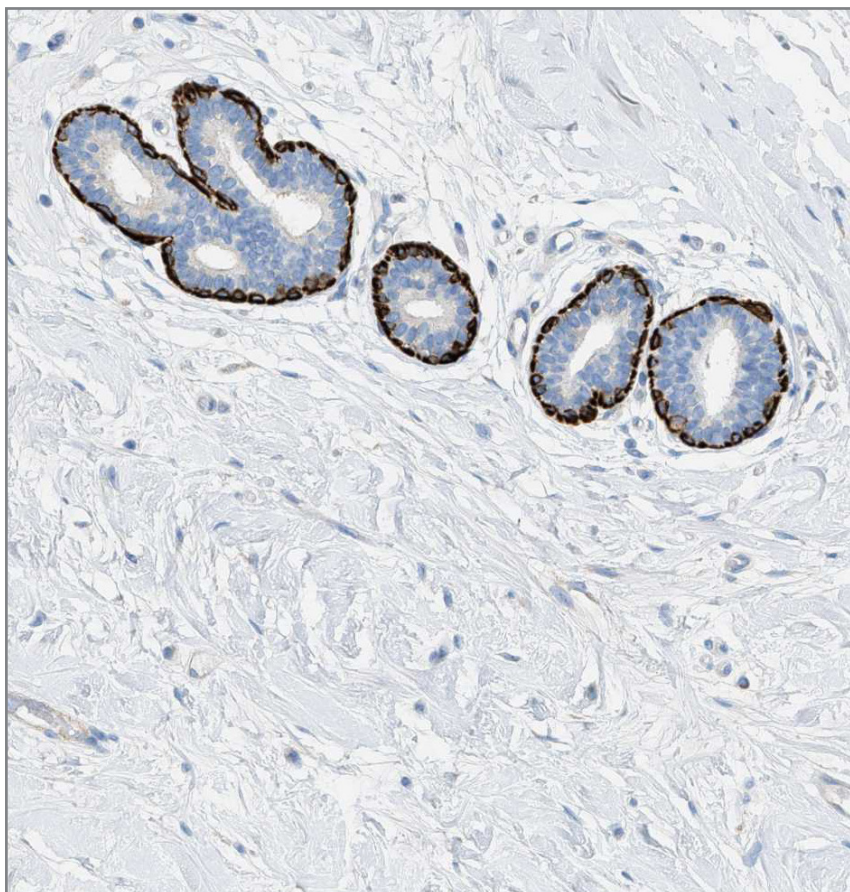
Diseases associated with SOX11 include mantle cell lymphoma (MCL), lymphoblastic lymphoma, Burkitt lymphoma and malignant glioma. The diagnosis of mantle cell lymphoma can be difficult, especially in Cyclin D1 negative cases and the transcription factor SOX11 may serve as an important diagnostic marker. For this purpose, there is a need of a reliable Anti-SOX11 antibody in the clinical setting.



Tonsil involved by a Classical Mantle cell lymphoma, cyclin D1 negative in a 50 yo male. SOX11 staining (AMAb90501, clone CL0142; Atlas Antibodies).



Lymph node involvement by Classical Mantle cell lymphoma positive for Cyclin D1 in a 64 yo male. SOX11 is expressed in virtually all tumor cells. (AMAb90502, clone CL0143; Atlas Antibodies).



*Anti-MYH11 (HPA015310) in human breast tissue.*

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