SNAP-ChIP®
Spike-in Controls for Quantitative ChIP
**Sample Normalization & Antibody Profiling for ChIP**

**SNAP-ChIP®** is a multi-use spike-in control for chromatin immunoprecipitation (ChIP) that uses DNA-barcoded recombinant designer nucleosomes (dNucs) for assay quantification and antibody validation.

SNAP-ChIP can easily be added to any ChIP workflow.

**Advantages**

- Determine antibody specificity and target pulldown efficiency
- Monitor experimental variability
- Quantitative recovery of DNA barcodes (via qPCR) provides useful STOP / GO capability before advancing to NGS
- Sample normalization for reliable cross-sample comparisons
- Homogenous, fully defined dNucs are subjected to rigorous quality control for lot-to-lot consistency

**FIGURE 1**

Overview of the SNAP-ChIP® approach: A pool of recombinant dNucs with defined post-translational modifications (PTMs) identified by unique DNA barcodes is added to sample chromatin prior to immunoprecipitation (IP). Capture of the barcoded nucleosomes (on / off target) allows the user to assess antibody specificity, monitor experimental variability, and normalize experiments. Quantitative recovery of barcoded dNucs (via qPCR) provides a useful STOP / GO capability prior to advancing to next-generation sequencing.

SNAP-ChIP spike-ins are adapted from ICeChIP technology (Shah et al. Mol Cell, Vol. 72, Issue 1, 162-177, 2018 and Grzybowski et al. Mol Cell, Vol. 58, Issue 5, 886 - 899, 2015)
Sample Normalization & Antibody Profiling for ChIP

Why should I worry about antibody specificity?

As published in Shah et al., Mol Cell 2018, we tested the performance of 54 “ChIP-grade” commercial antibodies to H3K4 methyl states using both peptide array and SNAP-ChIP®. This study establishes SNAP-ChIP as the new gold standard for ChIP antibody validation.

Here is what we found...

• Peptide arrays fail to predict antibody specificity in ChIP  
• SNAP-ChIP specificity predicts ChIP-seq peak profiles  
• Most commonly used H3K4me3 antibodies (including ENCODE recommended antibodies) are highly cross-reactive to H3K4me2 in SNAP-ChIP  
• Use SNAP-ChIP to validate antibody specificity and monitor antibody performance when it matters — IN YOUR EXPERIMENT

Don’t let non-specific antibodies compromise your research

• Antibody specificity matters. Figure compares ChIP tracks using H3K4me3 antibodies with low (center) or high (bottom) specificity. A highly specific H3K4me2 antibody is shown for reference (top).  
• When using a low specificity antibody, genomic areas reported as containing H3K4me3 are actually a result of a contaminating H3K4me2 signal (gray).  
• Use SNAP-ChIP to validate your antibody and control your ChIP experiments

Do you really know what you are pulling down in your chip?

• Peptide arrays fail to predict antibody specificity in ChIP  
• SNAP-ChIP specificity predicts ChIP-seq peak profiles  
• Most commonly used H3K4me3 antibodies (including ENCODE recommended antibodies) are highly cross-reactive to H3K4me2 in SNAP-ChIP  
• Use SNAP-ChIP to validate antibody specificity and monitor antibody performance when it matters — IN YOUR EXPERIMENT

FIGURE 2

Specificity survey of commercially available antibodies using EpiCypher’s SNAP-ChIP K-MetStat panel (Cat. No. 19-1001).

• While many reagents are not fit-for-purpose, highly specific and efficient antibodies exist and are for the first time identifiable as such using SNAP-ChIP  
• Driven to deliver the best reagents to the field, EpiCypher has screened hundreds of antibodies to identify antibodies that are truly “ChIP-grade”.  
• With EpiCypher’s SNAP-ChIP certified antibodies you no longer need to second guess the performance of your antibody.
Sample Normalization & Antibody Profiling for ChIP

SNAP-ChIP® seamlessly integrates into existing ChIP workflows. Just add SNAP-ChIP® to your protocol.

**Native ChIP Workflow**

- Isolate nuclei from cells
- **SNAP-ChIP spike-in**
- MNase digest to make mononucleosomes
- HAP chromatography to purify nucleosomes

**Cross-linked ChIP Workflow**

- Crosslink cells
- Lyse cells/Enrich chromatin
- Sonicate to shear
- **SNAP-ChIP spike-in**

Immunoprecipitate nucleosomes using antibody against target histone PTM

**Purify DNA**

qPCR to determine antibody specificity & technical variability

STOP / GO DECISION

qPCR

Next Generation Sequencing (NGS)

**Quantitative sample normalization**

**Use barcodes to confirm antibody specificity profile**
SNAP ChIP® spike-in panels

SNAP-ChIP® spike-in panels are composed of a pool of uniquely modified DNA-barcoded dNucs carrying disease-relevant modifications.

Pick your favorite panel

K-MetStat Panel (Catalog No. 19-1001)

OncoStat Panel (Catalog No. 19-2001)

K-AcylStat Panel (Catalog No. 19-3001)

R-MetStat Panel (Catalog No. 19-4001) Coming Soon
SNAP-ChIP® Certified Antibodies

EpiCypher has embarked on a massive effort to identify the highest quality ChIP-certified antibodies using our proprietary SNAP-ChIP® technology.

SNAP-ChIP® certified antibodies set a new higher standard for antibody performance.

We have screened hundreds of antibodies using SNAP-ChIP so you don’t have to. SNAP-ChIP certified antibodies are the highest quality available -- Don’t let faulty antibodies compromise your research.

What is a SNAP-ChIP Certified Antibody?

<table>
<thead>
<tr>
<th>ChIP Metric</th>
<th>Definition</th>
<th>Criteria</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specificity</td>
<td>Percentage of off-target immunoprecipitation relative to the on-target PTM</td>
<td>&lt;20% cross-reactivity</td>
<td>Have confidence that ChIP signal is specific for your target</td>
</tr>
<tr>
<td>Efficiency</td>
<td>Percentage of PTM recovered after immunoprecipitation relative to input</td>
<td>&gt;5% enrichment</td>
<td>High IP efficiency generates greater Signal-to-Noise</td>
</tr>
<tr>
<td>Relative PTM Abundance</td>
<td>SNAP-ChIP spike-in controls are corrected for any differences in loading, whereas PTMs in experimental samples vary relative to each other (e.g. see Peach et. al, Mol. Cell. Proteomics 2012).</td>
<td>Antibodies to low abundance PTMs tolerate less cross-reactivity compared to high abundance PTMs</td>
<td>Providing highest confidence in your ChIP data</td>
</tr>
</tbody>
</table>

SNAP-ChIP® Certified Antibodies

<table>
<thead>
<tr>
<th>Name</th>
<th>Catalog No.</th>
<th>Size</th>
<th>Name</th>
<th>Catalog No.</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>H3K4ac</td>
<td>13-0034</td>
<td>100 μg</td>
<td>H3K36ac</td>
<td>13-0035</td>
<td>100 μg</td>
</tr>
<tr>
<td>H3K4me1</td>
<td>13-0026</td>
<td>100 μg</td>
<td>H3K36me3</td>
<td>13-0031</td>
<td>100 μg</td>
</tr>
<tr>
<td>H3K4me2</td>
<td>13-0027</td>
<td>100 μg</td>
<td>H4K8ac</td>
<td>13-0036</td>
<td>100 μg</td>
</tr>
<tr>
<td>H3K4me3</td>
<td>13-0028</td>
<td>100 μg</td>
<td>H4K12ac</td>
<td>13-0037</td>
<td>100 μg</td>
</tr>
<tr>
<td>H3K9ac</td>
<td>13-0033</td>
<td>100 μg</td>
<td>H4K20ac</td>
<td>13-0039</td>
<td>100 μg</td>
</tr>
<tr>
<td>H3K9me1</td>
<td>13-0029</td>
<td>100 μg</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

For more information, visit [www.epicypher.com/snap-chip-abs/](http://www.epicypher.com/snap-chip-abs/)
Don’t see your PTM of interest? Contact us at info@epicypher.com
Spike-in control to track ChIP experimental variability

**SNAP-ChIP® spike-in controls for reliable sample normalization**

The use of exogenous chromatin (e.g. Drosophila) as spike-in controls has been adopted for ChIP sample normalization. However, these reagents are poorly defined (i.e. contain unknown PTM levels) and highly variable from batch-to-batch, limiting their use for consistent sample normalization.

SNAP-ChIP® spike-ins are homogeneous and fully defined, making them the ideal tool for generating reliable ChIP data. By including in your ChIP experiments, SNAP-ChIP can be used to monitor experimental variation and normalize samples for reliable cross-sample comparisons. **Get results you can trust with SNAP-ChIP.**
### Ordering Information

#### SNAP-ChIP Spike-in Panels

<table>
<thead>
<tr>
<th>Panel</th>
<th>Reactions</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>K-MetStat Panel</strong></td>
<td>10 ChIP</td>
<td>$365</td>
</tr>
<tr>
<td>19-1001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19-1100</td>
<td>100 ChIP</td>
<td>$2799</td>
</tr>
<tr>
<td><strong>OncoStat Panel</strong></td>
<td>10 ChIP</td>
<td>$365</td>
</tr>
<tr>
<td>19-2001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19-2100</td>
<td>100 ChIP</td>
<td>$2799</td>
</tr>
<tr>
<td><strong>K-AcylStat Panel</strong></td>
<td>10 ChIP</td>
<td>$365</td>
</tr>
<tr>
<td>19-3001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19-3100</td>
<td>100 ChIP</td>
<td>$2799</td>
</tr>
</tbody>
</table>

Website: [EpiCypher.com/SNAP-ChIP](https://www.epicypher.com/SNAP-ChIP)

#### SNAP-ChIP Certified Antibodies

<table>
<thead>
<tr>
<th>Antibody</th>
<th>Amount</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>H3K4ac</td>
<td>100 μg</td>
<td>$405.00</td>
</tr>
<tr>
<td>13-0034</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H3K4me1</td>
<td>100 μg</td>
<td>$405.00</td>
</tr>
<tr>
<td>13-0026</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H3K4me2</td>
<td>100 μg</td>
<td>$405.00</td>
</tr>
<tr>
<td>13-0027</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H3K4me3</td>
<td>100 μg</td>
<td>$405.00</td>
</tr>
<tr>
<td>13-0028</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H3K9ac</td>
<td>100 μg</td>
<td>$405.00</td>
</tr>
<tr>
<td>13-0033</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H3K9me1</td>
<td>100 μg</td>
<td>$405.00</td>
</tr>
<tr>
<td>13-0029</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H3K36ac</td>
<td>100 μg</td>
<td>$405.00</td>
</tr>
<tr>
<td>13-0035</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H3K36me3</td>
<td>100 μg</td>
<td>$405.00</td>
</tr>
<tr>
<td>13-0031</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H4K8ac</td>
<td>100 μg</td>
<td>$405.00</td>
</tr>
<tr>
<td>13-0036</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H4K12ac</td>
<td>100 μg</td>
<td>$405.00</td>
</tr>
<tr>
<td>13-0037</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H4K20ac</td>
<td>100 μg</td>
<td>$405.00</td>
</tr>
<tr>
<td>13-0039</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Website: [EpiCypher.com/snap-chip-abs/](https://www.epicypher.com/snap-chip-abs/)

#### SNAP-ChIP Primer Sets and Probe

<table>
<thead>
<tr>
<th>Kit</th>
<th>Reactions</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SNAP-ChIP Dual Labeled Hydrolysis Probe</strong></td>
<td>100 reactions</td>
<td>$95.00</td>
</tr>
<tr>
<td>18-6001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-6005</td>
<td>500 reactions</td>
<td>$395.00</td>
</tr>
<tr>
<td><strong>SNAP-ChIP K-MetStat Full Panel Primer Set</strong></td>
<td>100 reactions</td>
<td>$195.00</td>
</tr>
<tr>
<td>18-6101</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>SNAP-ChIP K-MetStat Mini Panel Primer Set</strong></td>
<td>100 reactions</td>
<td>$95.00</td>
</tr>
<tr>
<td>H3K4 18-6102</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H3K9 18-6103</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H3K27 18-6104</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H3K36 18-6105</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H4K20 18-6106</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>SNAP-ChIP OncoStat Full Panel Primer Set</strong></td>
<td>100 reactions</td>
<td>$195.00</td>
</tr>
<tr>
<td>18-6201</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

EpiCypher.com 855.374.2461 info@epicypher.com @epicypher