

## Protocol

# SpikeTides™ Sets SpikeTides™ Sets– heavy SpikeMix™ SpikeMix™ – heavy

Peptide Sets for relative quantification of Proteins in Mass Spectrometry Based Assays

### Contact us:

InfoLine: +49-30-6392-7878  
Order per fax: +49-30-6392-7888  
or e-mail: [peptide@jpt.com](mailto:peptide@jpt.com)  
www: [www.jpt.com](http://www.jpt.com)

JPT Peptide Technologies GmbH  
Volmerstrasse 5  
12489 Berlin  
GERMANY

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## 1 Introduction

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Quantitative proteomics plays an integral part in both discovery and targeted proteomic analyses. One common approach is to combine stable isotopically labeled peptides as internal standards with liquid chromatography mass spectrometry (LC-MS) to identify and quantitate complex proteins mixtures from cells, tissues or organisms. Utilizing stable isotope-labeled proteotypic peptides in conjunction with a targeted proteomic assay (SRM/MRM/PRM) can provide relative quantification analysis of many proteotypic peptides in a single LC-MS run. In addition, standards can be used for both retention time calibration and data normalization in label-free and data-independent assays.

JPT's unique high-throughput peptide synthesis platform yields small scale, unpurified light and heavy labeled peptides at a fraction of the costs of standard solid phase approaches. Based on this technology, JPT has developed a number of pre-manufactured SpikeMixes™ and SpikeTides™ Sets for rapid quantitative mass spectrometric assay development and relative protein quantification. The peptides of each set are selected to represent proteotypic peptides for a carefully chosen group of proteins. This enables answering complex questions at an unparalleled speed and cost effectiveness.

We offer SpikeTides™ Sets and SpikeMix™ pools as light or stable isotope-labeled (heavy) peptides:

SpikeTides: small scale, unpurified proteotypic peptides with C-terminal lysine or arginine.

SpikeTides L: SpikeTides labeled with stable isotopes (C-terminal Arg U-13C6;U-15N4 or Lys U-13C6;U-15N2).

Quantified SpikeTides™\_TQL for absolute quantification of proteins are also available from JPT upon request.

The described groups of SpikeTides™ can be prepared in two different formats:

- Individual peptides in microtiter plates or micronics tubes (SpikeTides™ Sets).
- Mixtures (pools) of peptides in polypropylene vials (SpikeMix™).

## 2 List of Components

Component	Quantity	Format
Product Information	1	Provided by Email or available as download from <a href="http://www.jpt.com">www.jpt.com</a>

Depending on product specifications:

Product	Product Code	Quantity	Format
<b>Tumor-associated antigens (TAAs)</b>			
SpikeTides™ Set TAA SpikeTides™ Set TAA-heavy	SPT-TAA SPT-TAA-L	252 peptides (3 microtiter plates with 84 peptides each). Peptide amount: approx. 50-150 pm per peptide	96 well format (Greiner Bio-one, PP, #650201)
SpikeMix™ TAA SpikeMix™ TAA-heavy	SPT-TAA-POOL SPT-TAA-POOL-L	252 peptides (mixture in one polypropylene vial). Peptide amount: approx. 50-150 pm per peptide	Polypropylene vial (Sarstedt, #72.664.711)
<b>Cytokines</b>			
SpikeTides™ Set Cytokines (human) SpikeTides™ Set Cytokines (human) - heavy	SPT-CYT SPT-CYT-L	461 peptides (6 microtiter plates). Peptide amount: approx. 50-150 pm per peptide	96 well format (Greiner Bio-one, PP, #650201)
SpikeMix™ Cytokines (human) SpikeMix™ Cytokines (human) - heavy	SPT-CYT-POOL-hum SPT-CYT-POOL-L-hum	461 peptides (mixture in one polypropylene vial). Peptide amount: approx. 50-150 pm per peptide	Polypropylene vial (Sarstedt, #72.664.711)
SpikeMix™ Cytokines (mouse) - heavy	SPT-CYT-POOL-L-mou	383 peptides (mixture in one polypropylene vial). Peptide amount: approx. 50-150 pm per peptide	Polypropylene vial (Sarstedt, #72.664.711)
SpikeMix™ Cytokines (bovine) - heavy	SPT-CYT-POOL-L-bov	224 peptides (mixture in one polypropylene vial). Peptide amount: approx. 50-150 pm per peptide	Polypropylene vial (Sarstedt, #72.664.711)
SpikeMix™ Cytokines (Callitrix jacchus) - heavy	SPT-CYT-POOL-L-cal	119 peptides (mixture in one polypropylene vial). Peptide amount: approx. 50-150 pm per peptide	Polypropylene vial (Sarstedt, #72.664.711)

SpikeMix™ Cytokines (Canis) - heavy	SPT-CYT-POOL-L-can	145 peptides (mixture in one polypropylene vial). Peptide amount: approx. 50-150 pm per peptide	Polypropylene vial (Sarstedt, #72.664.711)
SpikeMix™ Cytokines (Cynomolgus) - heavy	SPT-CYT-POOL-L-cyn	140 peptides (mixture in one polypropylene vial). Peptide amount: approx. 50-150 pm per peptide	Polypropylene vial (Sarstedt, #72.664.711)
SpikeMix™ Cytokines (Guinea pig) - heavy	SPT-CYT-POOL-L-gui	134 peptides (mixture in one polypropylene vial). Peptide amount: approx. 50-150 pm per peptide	Polypropylene vial (Sarstedt, #72.664.711)
SpikeMix™ Cytokines (Ovis aries) - heavy	SPT-CYT-POOL-L-ovi	182 peptides (mixture in one polypropylene vial). Peptide amount: approx. 50-150 pm per peptide	Polypropylene vial (Sarstedt, #72.664.711)
SpikeMix™ Cytokines (Rabbit) - heavy	SPT-CYT-POOL-L-rab	123 peptides (mixture in one polypropylene vial). Peptide amount: approx. 50-150 pm per peptide	Polypropylene vial (Sarstedt, #72.664.711)
SpikeMix™ Cytokines (Rat) - heavy	SPT-CYT-POOL-L-rat	226 peptides (mixture in one polypropylene vial). Peptide amount: approx. 50-150 pm per peptide	Polypropylene vial (Sarstedt, #72.664.711)
SpikeMix™ Cytokines (Rhesus macaque) - heavy	SPT-CYT-POOL-L-rhe	156 peptides (mixture in one polypropylene vial). Peptide amount: approx. 50-150 pm per peptide	Polypropylene vial (Sarstedt, #72.664.711)
SpikeMix™ Cytokines (Xenopus laevis) - heavy	SPT-CYT-POOL-L-xen	54 peptides (mixture in one polypropylene vial). Peptide amount: approx. 50-150 pm per peptide	Polypropylene vial (Sarstedt, #72.664.711)
SpikeMix™ Cytokines (Zebrafish) - heavy	SPT-CYT-POOL-L-zeb	109 peptides (mixture in one polypropylene vial). Peptide amount: approx. 50-150 pm per peptide	Polypropylene vial (Sarstedt, #72.664.711)
<b>Miscellaneous</b>			
SpikeMix™ ABRF (Cross Species Standard)	SPT-ABRF-POOL-L	Approx. 1000 peptides (mixture in one polypropylene vial). SpikeMix™ aliquots provided in	Polypropylene vial (Sarstedt, #72.664.711)

(*) special protocol, see section 5.2		sizes of approx. 1 or 10 pmol per peptide	
SpikeMix™ CEFT (*) special protocol, see section 5.3	SPT-CEFT-POOL-L	32 peptides (mixture in one polypropylene vial). Peptide amount: approx. 50-150 pm per peptide	Polypropylene vial (Sarstedt, #72.664.711)
SpikeMix™ Hormones (human)	SPT-PH-POOL-L-hum	552 peptides (mixture in one polypropylene vial). SpikeMix™ aliquots provided in sizes of approx. 10 or 100 pmol per peptide	Polypropylene vial (Sarstedt, #72.664.711)
<b>Kinase Activation Loops</b>			
SpikeTides™ Set Kinase Activation Loops	SPT-KAL-L	288 phospho- and 178 non-phospho peptides (3+2 microtiter plates). Peptide amount: approx. 10 pm per peptide	96 well format (Greiner Bio-one, PP, #650201)
SpikeMix™ Kinase Activation Loops	SPT-KAL-POOL-L	288 phospho- and 178 non-phospho peptides (mixture in two polypropylene vials). SpikeMix™ aliquots provided in sizes of approx. 10 or 100 pmol per peptide	Polypropylene vial (Sarstedt, #72.664.711)

The data CD-ROM provided contains all required information, esp. peptide sequences and their annotation to associated proteins.

For the SpikeTides™ Sets, the allocation of the peptide sequences to the microtiter plate wells is also included in the data CD-ROM. By default the numbering starts with well A1 in the upper left corner, counting the first 12 peptides up to well A12. Peptide 13 is deposited in well B1 and so on. Row H is left blank for optional controls etc.

The microtiter plate is delivered with a lid as well as an additional sealing mat, keeping environmental air and humidity out of the individual wells. Please see figure 2 for details:



**Figure 2: Left: Microtiter-Plate delivery format, lidded and sealed; Right: individual components: Lid, seal and microtiter-Plate**

## **Make sure to remove the sealing mat before adding solution to the microtiter plate wells !**

Please note that all cysteines of the peptide set have been alkylated with iodoacetamide to maximize compatibility with typical proteomic workflows.

Please note that due to the nature of the targeted proteins, several peptides might be very hydrophilic. Please make sure to adapt your analysis workflow and instrument setup accordingly.

### **3 Storage**

- All SpikeTides™ products should be stored at -20°C.

**PLEASE READ THE ENTIRE PROTOCOL BEFORE STARTING YOUR EXPERIMENTS!**

**PLEASE CONTACT JPT PEPTIDE TECHNOLOGIES' TECHNICAL SERVICES FOR ASSISTANCE IF NECESSARY.**

### **4 Additional Materials required**

- 0.1M ammonium bicarbonate
- Acetonitrile
- Dithiotreitol (DTT)
- Iodoacetamide
- Formic acid

## 5 Experimental protocols

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### 5.1 Standard Protocol

The Spiketides™ peptides can be used directly as spike-in controls for your assay solution.

1. Solubilize the SpikeTides™ peptides in a solution consisting of 80% of 0.1M ammonium bicarbonate and 20% acetonitrile.
2. Add the SpikeTides™ peptides to your sample dissolved in 0.1M ammonium bicarbonate.
3. Add DTT to a final concentration of 12 mM in order to reduce all cysteine residues in your sample. Incubate sample for 30 minutes at 32°C.
4. Alkylate all Cys residues by adding iodoacetamide resulting in a final concentration of 40 mM. Incubate sample for 30 minutes at 25°C in the dark.
5. Add your protease (e.g. trypsin in a 1/100-1/15 enzyme/substrate ratio) and incubate at an appropriate temperature (e.g. RT, 16 hours).
6. Add formic acid to a final pH value of  $\leq 3$  to stop the enzymatic reaction.
7. Optionally dry down the sample and resolubilize in 0.1% formic acid (make sure that the pH value is acidic!).
8. Perform LC-MS analysis.

## 5.2 Special Protocol for SpikeMix™ – ABRF (cross-species standard)

Following instructions from ABRF we recommend the following procedures for handling the SpikeMix™ – ABRF (cross-species standard):

If adding prior to enzymatic digestion

- 1) Dissolve and vortex the mixture of peptides in 70% formic acid.
- 2) Dilute with 0.1M ammonium bicarbonate to a final ratio of 1:6 of 70% formic acid/ 0.1 M ammonium bicarbonate.
- 3) Add the SpikeMix™ to your sample dissolved in 0.1M ammonium bicarbonate.
- 4) Proceed with reduction, alkylation, and enzymatic digestion as described above.

If adding the peptides prior to LC-MS analysis

- 1) Dissolve and vortex the mixture of peptides in 70% formic acid.
- 2) Dilute with 0.1% TFA in water to a final ratio of 1:6 of 70% formic acid/ 0.1% TFA in water.
- 3) Add the SpikeMix™ to your digestion mixture and proceed with a standard LC-MS protocol.

## 5.3 Special Protocol for SpikeMix™ CEFT

For characterization of T-cell stimulating peptides, the SpikeMix™ CEFT positive control pool can be applied. Since these peptides are not derived from proteotypic cleavage, no digestion step is necessary. We recommend the following protocol:

- 1) Dissolve and vortex the mixture of peptides in a solution consisting of 80% water and 20% acetonitrile.
- 2) Add the SpikeMix™ to your mixture of eluted epitope peptides and proceed with a standard LC-MS protocol.