

Store at 2–8 °C

For life science research only. Not for use in diagnostic procedures. FOR IN VITRO USE ONLY.

# M30 CytoDEATH™ Biotin

## 200 tests (Peviva Prod. No. 10750)

Mouse monoclonal antibody (Clone M30)

For the detection of caspase-cleaved keratin 18 neo-epitope M30

### 1. Product Description

Name: M30 CytoDeath™ Biotin  
 Clone: M30  
 Isotype: IgG2b  
 Immunogen: Keratin 18 (K18) fragments purified from supernatant from human carcinoma cell line WiDr CCL218.  
 Epitope: K18 fragment aa284–396

#### 1.1 Formulation

Clear solution. 50 µg of M30 CytoDeath™ Biotin monoclonal antibody provided in 200 µl PBS containing 0.1 % BSA, PEG, sucrose and 0.09 % sodium azide.

#### 1.2 Specificity

M30 CytoDeath™ Biotin antibody is recommended for the detection of the formalin-resistant M30 neo-epitope on human, monkey and bovine caspase-cleaved keratin 18 (K18) cytoskeletal protein. M30 CytoDEATH™ Biotin does not recognise intact K18.

#### 1.3 Recommended applications

- Western blot (WB)
- Immunocytochemistry (ICC)
- Flow cytometry (FACS)
- Immunohistochemistry (IHC) including formalin-fixed and paraffin-embedded tissue sections (PS) and cryostat sections (FS)

#### 1.4 Working solution

M30 CytoDeath™ Biotin is provided in a convenient ready-to-use stock solution. Use a dilution 1:100 in Incubation Buffer (final concentration 2.5 µg/ml).

#### 1.5 Storage and stability

The M30 CytoDeath™ Biotin antibody is provided in a ready-to-use format and is stable at 2–8 °C through the expiration date printed on the label.

Alternatively, it can be stored in aliquots at -20 °C.

The antibody is shipped at ambient temperature.

**Note:** Repeated freezing and thawing should be avoided.

#### 1.6 Quality control

M30 CytoDeath™ Biotin antibody is function tested using immunohistochemistry of formalin-fixed and paraffin-embedded tumor specimen.

### M30 CytoDeath™ – Key advantages

Benefits	Features
Early and specific detection of apoptosis	Detects caspase-cleaved keratin 18; caspase activity is one of the earliest and most common markers for apoptosis.

Benefits	Features
Sustained signal from cells at early to later stages of apoptosis	In contrast to measuring i. e. active caspase-3, where the signal is defined to a limited time window and decreases at late stages of apoptosis, the caspase-generated K18 neo-epitope can still be detected even after apoptotic cells have disintegrated.
Superior sensitivity	The keratin 18 neo-epitope is an accumulating substrate generated by few activated caspase molecules.
Assay is independent of the activation of a single caspase	Keratin 18 is cleaved <i>in vivo</i> by several effector caspases, including caspase-3, 6, 7 and 9.
Clear results	Apoptotic cells are clearly distinguishable from viable cells or necrotic cells.
Apoptosis specific  No false positive results in circumstances of DNA damage	Whereas TUNEL analysis can give rise to false positive results under conditions when DNA double-strand breaks occur, detection of the K18 neo-epitope using the M30 CytoDEATH™ antibody shows superior specificity for apoptotic cells compared to TUNEL.
Specificity for epithelial (i.e. carcinoma or liver tissue) apoptosis	Expression pattern of K18 is restricted to cells of epithelial origin. Lymphoid and neuronal cell apoptosis is not detected by M30 CytoDEATH™ antibody.
Application versatility	The M30 CytoDeath™ antibody has been successfully used in Western blot, immunocytochemistry, flow cytometry and immunohistochemistry, including frozen and formalin-fixed, paraffin-embedded tissue sections.
Recommended for formalin-fixed paraffin-embedded tissue	Recommended for routinely fixed tissue samples. Retrospective studies are possible.

### M30 CytoDeath™ Biotin – additional advantages

Benefits	Features
Added convenience for immunohistochemistry	Two-step tool for the detection of apoptosis in epithelial cells by immunohistochemistry. No additional anti-mouse IgG biotin conjugated secondary antibodies required.

## 2. Background Information

### 2.1 Caspase substrate K18 and apoptosis in epithelial cells

Apoptosis induced by either death-inducing receptors or other stimuli leads to activation of specific caspases [1, 2]. Subsequently, apoptotic cells are eliminated by an intrinsic suicide program, resulting in DNA fragmentation, nuclear condensation, cytoskeletal reorganisation, plasma membrane blebbing and loss of cell adhesion.

Keratin 18 (K18) is a type I intermediate filament protein and the major component of single-layer and glandular epithelial cells. It is expressed in most types of carcinomas such as lung, liver, prostate, breast and colon, and abundantly present in liver cells, whereas K18 is absent in lymphoid and neuronal cells and tissues. During apoptosis after initiation of effector caspases 3, 6, 7 and 9, K18 is cleaved into proteolytic fragments liberating neo-epitopes (NE) at the cleavage sites [3–6].

### 2.2 M30 CytoDeath™ antibody for the specific detection of apoptosis

K18 is cleaved by caspases, liberating a neo-epitope (M30) that is specifically recognised by the M30 CytoDEATH™ monoclonal antibody. Specific proteolytic cleavage of K18 is an event taking place before disruption of membrane asymmetry and induction of DNA strand breaks. Numerous studies confirm that M30 CytoDEATH™ antibody detects only apoptotic but not viable or necrotic cells. Reactivity of M30 CytoDEATH™ antibody in immunohistochemistry correlates to apoptosis measured by TUNEL and shows superior reliability in conditions when DNA double-strand breaks occur independent of apoptosis [7].

The capacity of M30 CytoDeath™ antibody in flow cytometry and immunohistochemistry studies to distinguish between necrotic and apoptotic epithelial cells has been verified in several disease entities. Consequently, M30 CytoDeath™ antibody represents a unique tool for easy and reliable determination of apoptosis from very early until well advanced stages in single cells and tissue sections of epithelial origin [8].

Moreover, there are two M30 CytoDEATH™ antibody-based ELISAs available:

- M30 CytoDeath™ ELISA (PEVIVA Prod. No.: 10900) is suggested to serve as a high-throughput assay for functional screening and *in vitro* characterisation of effective pro-apoptotic drugs using cell culture supernatants, and spheroid or tissue lysates.
- The CE-marked M30 Apoptosense® ELISA (PEVIVA Prod. No: 10010) has been successfully used to determine elevated K18 neo-epitope levels in blood samples from patients as a useful biomarker to monitor response to treatment or disease staging [9–12].

## 3. Procedures and Materials Required

### 3.1 Procedure for immunofluorescence and flow cytometry

#### 3.1.1 Introduction

The use of M30 CytoDeath™ Biotin antibody in immunofluorescence and flow cytometry requires additional secondary reagents conjugated to a fluorochrome.

*Please note:* a fluorescein-conjugated M30 CytoDeath™ antibody is available from PEVIVA (Prod. No: 10800). The M30 CytoDeath™ Fluorescein antibody is recommended for immunofluorescence and flow cytometry applications for convenient one-step apoptosis detection.

The following procedure describes the detection of apoptosis with M30 CytoDeath™ antibody in immunofluorescence and flow cytometry. If using other detection methods or sample material, the conditions may vary and have to be adapted.

#### Additional reagents required

- PBS, Methanol and BSA
- Secondary detection reagents such as streptavidin-fluorescein (i.e. from DAKO)

#### Preparation of working solutions

Incubation Buffer: PBS containing 1 % BSA

Washing Buffer: PBS

#### Preparation of M30 CytoDeath™ Biotin antibody working solution

Dilute the M30 CytoDeath™ Biotin antibody stock solution 1:100 in Incubation Buffer (final concentration 2.5 µg/ml).

**Note:** The antibody solutions should be free of precipitate. If necessary, centrifuge the solution at high speed prior to use.

### 3.1.2 Immunofluorescence and flow cytometry protocol

Step	Action
1	Wash cells in PBS.
2	Fix cells in ice-cold pure methanol at -20 °C for 30 min.
3	Wash cells with Washing Buffer twice.
4	Remove Washing Buffer.
5	Incubate with 100 µl M30 CytoDEATH™ Biotin antibody for 30 min at 15–25 °C.
6	Wash cells with Washing Buffer twice.
7	Incubate with 100 µl fluorescein-conjugated streptavidin for 30 min at 15–25 °C in the dark.
8	Wash cells with Washing Buffer twice.
7	Examine the cells on a slide under the fluorescence microscope, or, dilute cells in 0.5 ml PBS and store samples in the dark until analysis by flow cytometry.

### 3.2 Procedure for immunohistochemistry

#### 3.2.1 Introduction

The following procedure describes the detection of apoptosis with M30 CytoDeath™ Biotin antibody in a two step method in immunohistochemistry (paraffin-embedded tissue) for maximal sensitivity. If using other detection methods or sample material, the conditions may vary and have to be adapted.

#### 3.2.2 Recommended reagents

For preparation of samples:

- Xylo
- Ethanol 96 %
- Ethanol 70 %
- Methanol/ H<sub>2</sub>O<sub>2</sub> (3 %)
- Citric acid
- NaOH, 1 M
- Hematoxylin (i.e. from Merck)
- Mounting medium (i.e. Kaiser's glycerine gelatine from Merck)

For the immunohistochemistry procedure:

- Streptavidin-POD (i.e. from DAKO)
- DAB or AEC substrate (i.e. from Zymed)
- PBS
- BSA

#### Preparation of working solutions

The following table lists the working solutions needed to perform the immunohistochemistry staining procedure.

Working Solution	Composition	Stability/storage	Use
Washing Buffer	PBS	4 weeks at 2–8 °C	Washing step
Incubation Buffer	PBS containing 1 % BSA	4 weeks at 2–8 °C	Preparation of antibody working solution
Citric Acid Buffer (0.01 M)	2 g/l citric acid, pH 6.0 adjusted with 1 M NaOH	4 weeks at 2–8 °C	Antigen retrieval

#### Preparation of M30 CytoDeath™ Biotin antibody working solution

Dilute the M30 CytoDeath™ Biotin antibody stock solution 1:100 in Incubation Buffer (final concentration 2.5 µg/ml).

**Note:** The antibody solutions should be free of precipitate. If necessary, centrifuge the solution at high speed prior to use.

#### Preparation of sample material

Before starting the immunohistochemical protocol, dewax paraffin-embedded tissue sections as described in the following table.

Step	Action
1	Place paraffin-embedded sections into an incubator at 37 °C over night to air-dry.
2	To dewax formalin-fixed, paraffin-embedded tissue sections, process the sections as follows: <ul style="list-style-type: none"><li>• 2 coplin jars of xylol (2 – 5 min),</li><li>• 2 coplin jars of ethanol (96 %)</li><li>• 1 coplin jar of ethanol (70 %)</li><li>• 1 coplin jar of methanol/H<sub>2</sub>O<sub>2</sub> (3 %) for 10 min at 15 – 25 °C.</li></ul>
3	Rinse 10 min in PBS.

**Note:** The sections should not be allowed to dry during this procedure.

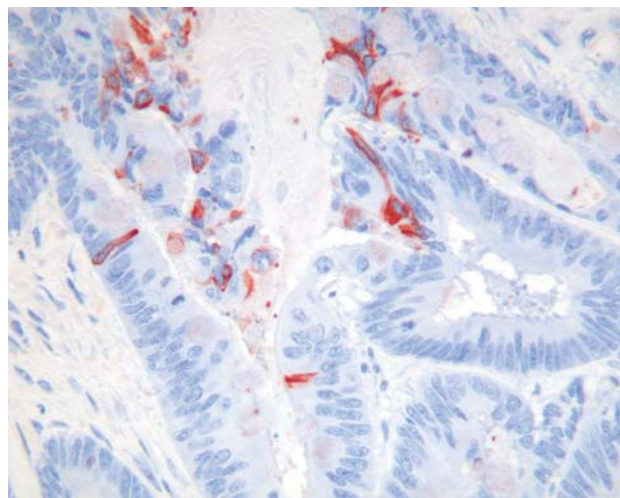
#### 3.2.3 Immunohistochemistry protocol

**Note:** For optimal results it is highly recommended to follow the below mentioned method for antigen retrieval.

Step	Action
1	<ul style="list-style-type: none"><li>• Prewarm citric acid buffer (0.01 M, pH 6.0) by incubation in a microwave oven at 750 W until the solution boils.</li><li>• When the solution is boiling, turn the setting of the microwave oven to “keep warm” (about 100 W).</li><li>• Place tissue section slides in a slide rack and put them into the heated citric acid solution (approx. 90°C).</li><li>• Incubate at this setting for 20 min.</li></ul> <p><b>Note:</b> For optimal morphology it is recommended to keep the solution shortly below the boiling point to avoid gas formation under the sections.</p>
2	Rinse 3 × in PBS and incubate 10 min in a separate jar of PBS to cool down.
3	Remove Incubation Buffer and add 100 µl M30 CytoDEATH™ Biotin antibody working solution. Incubate for 30 min at 15 – 25 °C in a humid chamber.
4	Wash slides in Washing Buffer (use 3 separate jars and dip 3 × into each jar).
5	Cover the section with 100 µl of streptavidin-POD according to your established optimised procedure for the reagent from your selected supplier, or use DAKO reagent at 1:600 dilution. Incubate for 30 min at 15 – 25 °C in a humid chamber.
6	Wash slides in Washing Buffer (use 3 separate jars and dip 3 × into each jar).
9	Incubate slides in a freshly prepared substrate solution (i. e. AEC) at 15 – 25 °C until a clearly visible colour develops (1 – 5 min). A negative control should not show any development of colour during the incubation period.
10	Stop the reaction by extensive rinsing in double distilled water.
11	Subsequently, counterstain the preparation with hematoxylin and mount the section (i. e. Kaiser’s glycerine gelatine when using AEC).

## 4. Results

### Immunocytochemistry



**Figure:** Detection of apoptosis in a formalin-fixed and paraffin-embedded tissue section from a human colon cancer showing confined cytoplasmic staining for K18-Asp396-NE (caspase-cleaved K18) using M30 CytoDEATH™ Biotin. Secondary detection with streptavidin-POD and AEC as substrate, counterstained with hematoxylin.

## 5. Appendix

K18 positive cell lines and tissues successfully analyzed with the M30 CytoDeath™ antibody:

#### Human epithelial cell lines:

Breast cancer: MDA-MB-231, MCF-7, HBL100  
Colon cancer: WiDr, HCT 116, HT29, SW620  
Cervical cancer: HeLa  
Kidney cancer: ACHN, A498  
Head & neck cancer: SCC9, SCC25, FaDu  
Prostate cancer: PC-3, LNCaP, DU 145  
Bladder cancer: RT4, J82

#### Human epithelial tissues:

Breast, lung, liver, colon, pancreas, intestine, kidney, salivary gland, trophoblast, endometrium, bladder, oral epithelium.

## 6. PEVIVA Products

M30 CytoDEATH™	Prod. No. 10700
M30 CytoDEATH™ Biotin	Prod. No. 10750
M30 CytoDEATH™ Fluorescein	Prod. No. 10800
M30 CytoDEATH™ Orange	Prod. No. 10830

#### Keratin 18 antibodies

M5 Keratin 18 mAb	Prod. No. 10600
M6 Keratin 18 mAb	Prod. No. 10650

#### ELISA kits

M30 Apoptosense® ELISA	Prod. No. 10011
M65® ELISA	Prod. No. 10020
M65 EpiDeath® ELISA	Prod. No. 10040
M30 CytoDeath™ ELISA	Prod. No. 10900

## 7. References

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3. Caulin C, Salvesen GS, Oshima G. (1997) Caspase Cleavage of keratin 18 and reorganization of intermediate filaments during epithelial cell Apoptosis. *J Cell Biol.* 138: 1379-1394.
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9. Bivén K, Erdal H, Hägg M, Ueno T, Zhou R, Lynch M, Rowley B, Wood J, Zhang C, Toi M, Shoshan MC, Linder S. (2003). A novel assay for discovery and characterization of pro-apoptotic drugs and for monitoring apoptosis in patient sera. *Apoptosis* 8: 263-268.
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## 8. M30 CytoDeath™ Application References

### Western blot (WB)

Leers MP, Kölgen W, Björklund V, Bergman T, Tribbick G, Persson B, Björklund P, Ramaekers FCS, Björklund B, Nap M, Jörnvall H, Schutte B. (1999) Immunocytochemical detection and mapping of a Cytokeratin 18 neo-epitope exposed during early apoptosis. *J Pathol.* 187: 567-572.

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### Immunocytochemistry (ICC)

MacFarlane M, Merrison W, Dinsdale D, Cohen GM. (2000) Active caspases and cleaved cytokeratins are sequestered into cytoplasmic inclusions in TRAIL-induced apoptosis. *J Cell Biol.* 148: 1239-1254.

Barrett KL, Willingham JM, Garvin AJ, Willingham MC. (2001) Advances in cyto-chemical methods for detection of apoptosis. *J Histochem Cytochem* 49: 821-32.

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### Flow cytometry (FACS)

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Morsi HM, Leers MP, Radespiel-Troger M, Björklund V, Kabarity HE, Nap M, Jäger W. (2000) Apoptosis, bcl-2 expression, and proliferation in benign and malignant endometrial epithelium: An approach using multiparameter flow cytometry. *Gynecol. Oncol.* 77, 11-7.

### Immunohistochemistry (IHC)

Morsi HM, Leers MP, Jäger W, Björklund V, Radespiel-Troger M, el Kabarity H, Nap M and Lang N. (2000) The patterns of expression of an apoptosis-related K18 neoepitope, the bcl-2 proto-oncogene, and the Ki67 proliferation marker in normal, hyperplastic, and malignant endometrium. *Int J. Gynecol. Pathol.* 19: 118-126.

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