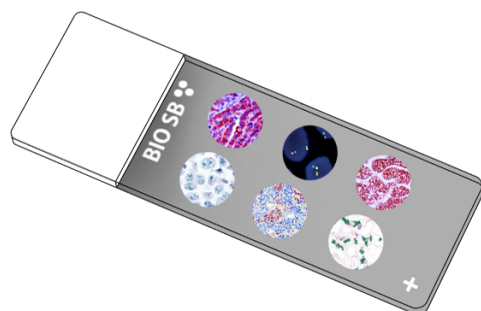


## Fumarate Hydratase/Fumarase

### Control Slides



#### Intended Use

For In Vitro Diagnostic Use.

#### Summary and Explanation

Fumarate hydratase, or fumarase, is encoded by the FH gene, which is an enzymatic component of the tricarboxylic acid cycle, or Krebs cycle, where it catalyzes the formation of L-malate from fumarate. Mutations in the FH gene can cause FH deficiency and lead to progressive encephalopathy. It was discovered that succinate dehydrogenase and FH are tumour suppressors and they are associated with metabolic dysfunction and tumorigenesis, providing biochemical evidence to explain enhanced glycolysis in tumours. Hereditary Leiomyomatosis and Renal Cell Cancer is an autosomal dominant heritable syndrome with predisposition to development of Renal Cell Carcinoma and Smooth Muscle Tumors of the skin and uterus. Cells of individuals with Hereditary Leiomyomatosis and Renal Cell Cancer had lower FH enzyme activity than cells from normal controls, making FH enzyme activity testing a useful method for diagnosis and screening. Loss-of-function mutations of FH predisposes individuals to the autosomal dominant syndrome of Multiple Cutaneous and Uterine Leiomyomatosis. Biallelic inactivation / mutations of FH are seen in 85% of Hereditary Leiomyomatosis and Renal Cell Carcinoma cases, 100% of Renal Cell Carcinoma with germline FH mutations, 19% of Papillary Renal Cell Carcinoma (Type II) have FH deficiency and 90% of FH deficiency Renal Cell Carcinoma have FH mutations, 1% of unselected Leiomyomas, 2.6% of Leiomyomas in patients < 40 years old and 37- 52% of Leiomyoma with bizarre nuclei.

#### Presentation

Five slides of Fumarate Hydratase/Fumarase positive tissues, each mounted on Hydrophilic Plus Slides, provided in a plastic mailer.

Catalog No.	Quantity
BSB-9188-CS	5 slides
BSB-3726-CS	5 slides

**Storage** Store at 20-25°C

#### Precautions

1. For professional users only. Results should be interpreted by a qualified medical professional.
2. Ensure proper handling procedures are used with this reagent.
3. Always wear personal protective equipment such as a laboratory coat, goggles, and gloves when handling reagents.
4. Dispose of unused solution with copious amounts of water.
5. Follow safety precautions of the heating device used for epitope retrieval (TintoRetriever Pressure Cooker or similar).
8. For additional safety information, refer to Safety Data Sheet for this product.
9. For complete recommendations for handling biological specimens, please refer to the CDC document, "Guidelines for Safe Work Practices in Human and Animal Medical Diagnostic Laboratories" (see References in this document).

#### Stability

**This product is stable up to the expiration date on the product label.**

Do not use after expiration date listed on package label.

#### IHC Protocol

1. Subject tissues to heat induced epitope retrieval (HIER) using a suitable retrieval solution such as ImmunoDNA Retriever with Citrate (BSB 0020-BSB 0023) or EDTA (BSB 0030-BSB 0033).

2. Any of three heating methods may be used:

##### a. TintoRetriever Pressure Cooker or Equivalent

Place tissues/slides in a staining dish or coplin jar containing the ImmunoDNA Retriever with Citrate or EDTA and place on trivet in the pressure cooker. Add 1-2 inches of distilled water to the pressure cooker and turn heat to high. Incubate for 15 minutes. Open and immediately transfer slides to room temperature.

##### b. TintoRetriever PT Module or Water Bath Method

Place tissues/slides in a pre-warmed staining dish or coplin jar containing the ImmunoDNA Retriever with Citrate or EDTA at 95°-99° C. Incubate for 30-60 minutes.

##### c. Conventional Steamer Method

Place tissues/slides in a pre-warmed staining dish or coplin jar containing the ImmunoDNA Retriever with Citrate or EDTA in a steamer, cover and steam for 30-60 minutes.

3. After heat treatment, transfer slides in ImmunoDNA Retriever with Citrate or EDTA to room temperature and let stand for 15-20 minutes.
4. For manual staining, perform antibody incubation at ambient temperature. For automated staining methods, perform antibody incubation according to instrument manufacturer's instructions.
5. Wash slides with ImmunoDNA washer or DI water.
6. Continue IHC staining protocol. Wash slides between each step with ImmunoDNA washer solution.

### Abbreviated Immunohistochemical Protocol

Step	ImmunoDetector AP/HRP	PolyDetector AP/HRP	PolyDetector Plus HRP
Peroxidase/AP Blocker	5 min.	5 min.	5 min.
Primary Antibody	30-60 min.	30-60 min.	30-60 min.
1st Step Detection	10 min.	30-45 min.	15 min.
2nd Step Detection	10 min.	Not Applicable	15 min.
Substrate- Chromogen	5-10 min.	5-10 min.	5-10 min.
Counterstain / Coverslip	Varies	Varies	Varies

### Abbreviated IF Protocol

Step	Incubation Time
Rinse slides in IF wash buffer	5 minutes
Drain and wipe excess IF wash buffer off slide	
Conduct remaining steps in the dark	
Apply Antibody	30-60 minutes
Rinse with 3 changes of IF wash buffer	3x15 minutes each
Coverslip with IF mounting medium	

### Mounting Protocols

For detailed instructions using biodegradable permanent mounting media such as XyGreen PermaMunter (BSB 0169-0174) or organic solvent based resin such as PermaMunter (BSB 0094-0097), refer to PI0174 or PI0097.

### Product Limitations

Due to inherent variability present in immunohistochemical procedures (including fixation time of tissues, dilution factor of antibody, retrieval method utilized, and incubation time), optimal performance should be established through the use of positive and negative controls. Results should be interpreted by a qualified medical professional.

### References

1. GeneCards. FH Gene (Protein Coding). <https://www.genecards.org/cgi-bin/carddisp.pl?gene=FH2>. Thompson CB. Metabolic enzymes as oncogenes or tumor suppressors. N Engl J Med. 2009;360(8):813-815. doi:10.1056/NEJMe08102133. Pithukpakorn M, Wei MH, Toure O, et al. Fumarate hydratase enzyme activity in lymphoblastoid cells and fibroblasts of individuals in families with hereditary leiomyomatosis and renal cell cancer. J Med Genet. 2006;43(9):755-762. doi:10.1136/jmg.2006.0410874. Alam NA, Olpin S, Leigh IM. Fumarate hydratase mutations and predisposition to cutaneous leiomyomas, uterine leiomyomas and renal cancer. Br J Dermatol. 2005;153(1):11-17. doi:10.1111/j.1365-2133.2005.06678.x5. Wei JJ. Fumarate Hydratase (FH), S-(2-succino) cysteine (2SC). <https://www.pathologyoutlines.com/topic/stainsFH2SC.html>. U.S. Department of Health and Human Services: Centers for Disease Control and Prevention. Guidelines for Safe Work Practices in Human and Animal Medical Diagnostic Laboratories. Supplement / Vol. 61, January 6, 2012. <https://www.cdc.gov/mmwr/pdf/other/su6101.pdf>

### Symbol Key / Légende des symboles/Erläuterung der Symbole

<b>EC REP</b> QAdvis EAR AB Ideon Science Park Scheelevägen 17 SE-223 70 Lund, Sweden	 Storage Temperature Limites de température Zulässiger Temperaturbereich	 Manufacturer Fabricant Hersteller	<b>REF</b> Catalog Number Référence du catalogue Bestellnummer
<b>IVD</b> In Vitro Diagnostic Medical Device Dispositif médical de diagnostic in vitro In-Vitro-Diagnostikum	 Read Instructions for Use Consulter les instructions d'utilisation Gebrauchsanweisung beachten	 Expiration Date Utiliser jusque Verwendbar bis	<b>LOT</b> Lot Number Code du lot Chargenbezeichnung