



Certificate of Origin

Catalog Number	Product Name	Lot Number	Animal-Free (No animal or human-origin components)
100-19AF	Animal-Free Human RANK Ligand	0318-100-19AF	Yes
100-19	Human RANK Ligand	0318-100-19	Yes

Documentation Date: January 31, 2020

Harmonizing Code: 3822000002

Country of Origin: USA

Manufacture:

Shenandoah Biotechnology
101 Camars Drive
Warwick, PA 18974
USA

This recombinant protein was manufactured at Shenandoah Biotechnology in Warwick, Pennsylvania, USA. It was expressed in *E.coli*, grown in plant-based media, and purified.

This product is supplied carrier free. No materials of animal or human origin were used in the manufacture of this recombinant protein. In addition, no animal-derived materials were used in the manufacture of the raw materials used in the manufacture of the recombinant protein and no viral testing was done.

Type of Manufacture (ie. chemical synthesis, fermentation, biological extraction/purification):

This product is a recombinant protein produced by fermentation in plant-based media and purification protocols.

Sub-Type (If chemical, organic or inorganic? If fermentation, microbial or plant?): Microbial expression

Always non-animal source: Yes. This product is produced with no animal-derived or human-derived raw materials, and during all processing and handling, all equipment and protocols are devoid of animal/human raw material components.

Is there any comingling with other animal materials in manufacturing process: No

Viral Testing: No

Carrier Protein: No

Genetically Modified Organism: This product is derived from a genetically modified organism, in which human, mouse or rat genes have been added to *E.coli*, with the purpose of producing genetically engineered research products.

Expiration Date:

12 months from date of receipt when stored at -20°C to -80°C as supplied.

1 month when stored at 4°C after reconstituting as directed.

3 months when stored at -20°C to -80°C after reconstituting as directed.

X Martin P. Keough, PhD (2020-02-07)

Martin Keough, PhD (YYYY-MM-DD)
Chief Scientific Officer