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Insulin Zinc Suspension

To view the Notice from the Expert Committee that posted in conjunction with this accelerated revision, please click https://www.uspnf.com/rb-insulin-zinc-suspension-20190401

Insulin zinc

CAS RN®: 8049-62-5.

DEFINITION

Insulin Zinc Suspension is a sterile suspension of Insulin in buffered Water for Injection, modified by the addition of a suitable zinc salt in a manner such that the solid phase of the suspension consists of a mixture of crystalline and amorphous insulin in a ratio of approximately 7 parts of crystals to 3 parts of amorphous material. Its potency, based on the sum of its insulin and desamido insulin components, is NLT 95.0% and NMT 105.0% of the potency stated on the label, expressed in USP Insulin Units/mL.

IDENTIFICATION

Change to read:

• **A.** The retention time of the insulin ▲pork▲ (RB 1-May-2019) peak of *Sample solution A* or *Sample solution B* corresponds to that of ▲▲ (RB 1-May-2019) of the *Identification solution*, as obtained in the *Assay* ▲and no other significant peaks are observed.▲ (RB 1-May-2019) [NOTE—It may be necessary to inject a mixture of *Sample solution* and *Identification solution*.]

ASSAY

Change to read:

• **PROCEDURE**

Solution A: Dissolve 28.4 g of anhydrous sodium sulfate in 1000 mL of water. Pipet 2.7 mL of phosphoric acid into the solution, and adjust with ethanolamine to a pH of 2.3, if necessary.

Mobile phase: Acetonitrile and *Solution A* (26:74). [NOTE—The acetonitrile is warmed to NLT 20° to avoid precipitation.]

System suitability solution: 1.5 mg/mL of ▲▲ (RB 1-May-2019) insulin pork ▲▲ (RB 1-May-2019) in 0.01 N hydrochloric acid. ▲▲ (RB 1-May-2019) Allow to stand at room temperature for NLT 3 days to obtain a solution containing NLT 5% of A-21 desamido insulin.

Identification solution: 0.6 mg/mL of ▲▲ (RB 1-May-2019) USP Insulin Pork RS in 0.01 N hydrochloric acid. [NOTE—The *Identification solution* may be stored at room temperature for up to 12 h or in a refrigerator for up to 48 h.]

Standard solution: 1.5 mg/mL of ▲▲ (RB 1-May-2019) USP Insulin Pork RS in 0.01 N hydrochloric acid. ▲▲ (RB 1-May-2019)

Sample solution A (for Suspension labeled as containing 40 USP Insulin Units/mL)**:** Add 2.5 µL of 9.6 N hydrochloric acid for each milliliter of an accurately measured volume of Suspension. Allow the suspension to clarify, and mix.

Sample solution B (for Suspension labeled as containing 100 USP Insulin Units/mL)**:** Add 2.5 µL of 9.6 N hydrochloric acid for each milliliter of an accurately measured volume of Suspension. Allow the suspension to clarify, and mix. [NOTE—Pooling several package units may be necessary to obtain sufficient volume of the sample.] Pipet 2 mL of this solution into a 5-mL volumetric flask, dilute with 0.01 N hydrochloric acid to volume, and mix.

Chromatographic system

(See *Chromatography ⟨621⟩, System Suitability*.)

Mode: LC

Detector: UV 214 nm

Column: 4.6-mm × 15-cm; packing L1

Column temperature: 40°

Flow rate: 1 mL/min

Injection volume: 20 µL

System suitability

Samples: *System suitability solution* and *Standard solution*

Suitability requirements

Resolution: NLT 2.0 between insulin and A-21 desamido insulin, *System suitability solution*

Tailing factor: NMT 1.8 for the insulin peak, *System suitability solution*

Relative standard deviation: NMT 1.6%, *Standard solution*

Analysis

Samples: *Identification solution*, *Standard solution*, and either *Sample solution A* or *Sample solution B*

Measure the peak responses for insulin and A-21 desamido insulin using the chromatogram of the *Identification solution* to identify the insulin peaks.

▲▲ (RB 1-May-2019) Calculate the potency, in USP Insulin Units/mL, in the portion of Suspension taken:

$$\text{Result} = (\Sigma r_U / \Sigma r_S) \times C_S \times D$$

r_U = sum of the peak responses of insulin and A-21 desamido insulin from the *Sample solution*

r_S = sum of the peak responses of insulin and A-21 desamido insulin from the *Standard solution*

C_S = concentration of ▲▲ (RB 1-May-2019) USP Insulin Pork RS in the *Standard solution* (USP Insulin Units/mL)

D = dilution factor used to prepare the *Sample solution*

▲▲ (RB 1-May-2019)

Acceptance criteria: 95.0%–105.0% of the potency stated on the label, expressed in USP Insulin Units/mL

OTHER COMPONENTS

• **Zinc Determination ⟨591⟩:** 0.12–0.25 mg for every 100 USP Insulin Units

• **Zinc in the Supernatant**

Analysis: Centrifuge a portion of Suspension sufficient for the test and determine the zinc content in the clear supernatant as directed in *Zinc Determination ⟨591⟩*.

Acceptance criteria: Concentration of zinc (mg/mL) is 20%–65% of the zinc concentration in Suspension.

PRODUCT-RELATED SUBSTANCES AND IMPURITIES

• **Physicochemical Analytical Procedures for Insulins ⟨121.1⟩, *Limit of High Molecular Weight Proteins*:** Proceed as directed in the chapter, except for the *Sample solution*. It meets the requirements.

Sample solution: Quantitatively add 4 µL of 6 N hydrochloric acid to each milliliter of an accurately measured volume of Suspension, and mix.

Acceptance criteria: NMT 1.5%

SPECIFIC TESTS

• **Insulin Not Extracted by Buffered Acetone Solution**

Sample solution: Centrifuge a quantity of Suspension representing 1000 USP Insulin Units, and discard the supernatant. Suspend the residue in 8.4 mL of water, quickly add 16.6 mL of buffered acetone TS, shake or stir vigorously, and centrifuge within 3 min after the addition of the buffered acetone TS. Discard the supernatant, repeat the treatment with water and buffered acetone TS, centrifuge, and discard the supernatant. Dissolve the crystalline residue in 5 mL of dilute hydrochloric acid (1 in 100), transfer to a 25-mL flask, and dilute with water to volume.

Analysis: Use an appropriate method to determine the insulin concentration.

Acceptance criteria: Insulin concentration is 63%–77% of the insulin content of an equal amount of Suspension.

• **Insulin in the Supernatant**

Sample solution: Centrifuge 10 mL of Suspension at 1500 × g for 10 min. Use the supernatant.

Analysis: Determine the insulin content of the *Sample solution* by a suitable method.

Acceptance criteria: NMT 1.0 USP Insulin Unit/mL

• **pH ⟨791⟩:** 7.0–7.8

• **Bacterial Endotoxins Test ⟨85⟩:** NMT 80 USP Endotoxin Units per 100 USP Insulin Units

• **Sterility Tests ⟨71⟩, *Test for Sterility of the Product to Be Examined, Membrane Filtration*:** Meets the requirements when tested as directed and the Suspension being filtered immediately after it has been put into a solution using a validated suitable solvent

ADDITIONAL REQUIREMENTS

• **Packaging and Storage:** Preserve in the unopened, multiple-dose container provided by the manufacturer. Do not repackage. Store in a refrigerator, protect from sunlight, and avoid freezing.

Change to read:

• **Labeling:** Label it ▲▲ (RB 1-May-2019) as porcine ▲▲ (RB 1-May-2019) . If the Insulin Zinc Suspension is made from insulin that is purified, label it as such. The Suspension container label states that the Suspension is to be shaken carefully before use. Label it to state that it is to be stored in a refrigerator and that freezing is to be avoided. The label states the potency in USP Insulin Units/mL.

Change to read:

• **USP Reference Standards** ⟨11⟩

▲▲ (RB 1-May-2019)

USP Insulin Pork RS

Auxiliary Information - Please check for your question in the FAQs before contacting USP.

Topic/Question	Contact	Expert Committee
INSULIN ZINC SUSPENSION	Jennifer Tong Sun Senior Scientist II	BIO2 Biologics Monographs 2 - Proteins

Chromatographic Database Information: Chromatographic Database

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