WHO International Standard
6th International Standard for Unfractionated Heparin
NIBSC code: 07/328
Instructions for use
(Version 2.0, Dated 12/07/2013)

1. INTENDED USE
The 6th International Standard for Unfractionated Heparin, consists of ampoules, coded 07/328, containing aliquots of freeze-dried heparin prepared from porcine mucosa. This preparation was established as the 6th International Standard for Unfractionated Heparin, by the Expert Committee on Biological Standardisation of the World Health Organisation in 2009, with labelled potency of 2145 IU/ampoule.

2. CAUTION
This preparation is not for administration to humans or animals in the human food chain.

The material is not of human or bovine origin. As with all materials of biological origin, this preparation should be regarded as potentially hazardous to health. It should be used and discarded according to your own laboratory's safety procedures. Such safety procedures should include the wearing of protective gloves and avoiding the generation of aerosols. Care should be exercised in opening ampoules or vials, to avoid cuts.

3. UNITAGE
The standard was calibrated by 33 laboratories in 18 countries against the 5th International Standard for Unfractionated Heparin (97/578). Twelve different methods were employed in the study: anti-Xa chromogenic assay using purified antithrombin, anti-IIa chromogenic assay using purified antithrombin, anti-Xa chromogenic assay using human plasma, anti-IIa chromogenic assay using human plasma, anti-Xa clotting assay, activated partial thromboplastin time (APTT), the European Pharmacopeial (EP) assay, the United States Pharmacopeial (USP) sheep plasma assay*, the Chinese Pharmacopeial (CP) assay, the Japanese Pharmacopeial (JP) assay, Thrombin Time and Prothrombinase induced clotting time. A total of 690 assays were carried out. The potency of 2145 IU/ampoule was assigned by taking the geometric mean of all the valid assay results. The details of the collaborative study is documented in WHOBS 09.2124.

Uncertainty: the assigned unitage does not carry an uncertainty associated with its calibration. The uncertainty may therefore be considered to be the variance of the ampoule content and was determined to be ±0.12%.

*The USP sheep plasma assay was the official USP potency assay for Heparin Sodium and Heparin Calcium until the end of September 2009. The current USP potency assay for Heparin Sodium and Heparin Calcium is an anti-IIa chromogenic assay using purified antithrombin and 9 participants carried out this current USP anti-IIa chromogenic assay.

4. CONTENTS
Country of origin of biological material: USA.
The bulk starting material consisted of a single batch of porcine mucosal sodium heparin. 275.0 g of dried powder were dissolved in 26 L of sterile distilled water. The solution was distributed at room temperature into 24,000 ampoules, coded 07/328. The contents of the ampoules were then freeze-dried under conditions normally used for international biological standards (1).

The mean weight of the liquid content of 99 checkweight samples was 1.0050g, with coefficient of variation 0.12%. The mean weights of the freeze dried plug was 10.7 ± 0.39 mg (mean of 6 estimates).

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WHO International Laboratory for Biological Standards, UK Official Medicines Control Laboratory

5. STORAGE
Unopened ampoules should be stored at 0 - below -20°C. Please note: because of the inherent stability of lyophilized material, NIBSC may ship these materials at ambient temperature.

6. DIRECTIONS FOR OPENING
DIN ampoules have an 'easy-open' coloured stress point, where the narrow ampoule stem joins the wider ampoule body. Tap the ampoule gently to collect the material at the bottom (labeled) end. Ensure that the disposable ampoule safety breaker provided is pushed down on the stem of the ampoule and against the shoulder of the ampoule body. Hold the body of the ampoule in one hand and the disposable ampoule breaker covering the ampoule stem between the thumb and first finger of the other hand. Apply a bending force to open the ampoule at the coloured stress point, primarily using the hand holding the plastic collar.
Care should be taken to avoid cuts and projectile glass fragments that might enter the eyes, for example, by the use of suitable glasses and an eye shield. Take care that no material is lost from the ampoule and no glass falls into the ampoule. Within the ampoule is dry nitrogen gas at slightly less than atmospheric pressure. A new disposable ampoule breaker is provided with each DIN ampoule.

7. USE OF MATERIAL
No attempt should be made to weigh out any portion of the freeze-dried material prior to reconstitution.
Allow ampoules to warm to room temperature. Open ampoule as directed, taking care to ensure that all material is in the lower part of the ampoule. Reconstitute with 1.0 ml of distilled water. Heparin is very stable and aliquots of the reconstituted solution, at a suitable concentration (eg 10 IU/ml) could be stored frozen at -40°C or below for subsequent use. Storage of reconstituted Standard under different conditions must be validated locally by users.

8. STABILITY
Reference materials are held at NIBSC within assured, temperature-controlled storage facilities. Reference Materials should be stored on receipt as indicated on the label.
NIBSC follows the policy of WHO with respect to its reference materials. It is the policy of the WHO not to assign an expiry date to their international reference materials. They remain valid with the assigned potency and status until withdrawn or amended.

Accelerated degradation studies, which involves potency estimation of ampoules stored at elevated temperatures relative to ampoules stored at -150°C, have shown that the 6th International Standard is very stable in unopened ampoules stored at -20°C. No loss of activity was observed even when the material has been stored at +45°C for 5 years. The accelerated degradation study and real time monitoring will continue for the lifetime of the standard.

9. REFERENCES

10. ACKNOWLEDGEMENTS
All participants in the international collaborative study and the support of the Scientific and Standardisation Committee of the International Society on
We are also grateful to the following manufacturers for their kind donation of heparin samples:

- Leo Pharmaceutical Products Ltd, 55 Industriparken, DK-2750 Ballerup, Denmark
- Scientific Protein Laboratories, 700 E Main Street, Waunakee, 53597-0158 USA
- Bioiberica, SA, Plaza Francesc Macià, 7 Barcelona 08029, Spain
- Opocrin SPA, 3, V. Pacinotti 41043 Corlo di Formaigine (MO), Italy
- NV Organon (Schering-Plough), P O Box 20 5340 BH Oss, Kloosterstraat 6 5349 AB Oss, The Netherlands

11. FURTHER INFORMATION
Further information can be obtained as follows:
This material: enquiries@nibsc.org
WHO Biological Standards:
http://www.who.int/biologicals/en/
JCTLM Higher order reference materials:
http://www.bipm.org/en/committees/jc/jctlm/
Derivation of International Units:
http://www.nibsc.org/standardisation/international_standards.aspx
Ordering standards from NIBSC:
http://www.nibsc.org/products/ordering.aspx
NIBSC Terms & Conditions:
http://www.nibsc.org/terms_and_conditions.aspx

12. CUSTOMER FEEDBACK
Customers are encouraged to provide feedback on the suitability or use of the material provided or other aspects of our service. Please send any comments to enquiries@nibsc.org

13. CITATION
In all publications, including data sheets, in which this material is referenced, it is important that the preparation's title, its status, the NIBSC code number, and the name and address of NIBSC are cited and cited correctly.

14. MATERIAL SAFETY SHEET
Classification in accordance with Directive 2000/54/EC, Regulation (EC) No 1272/2008: Not applicable or not classified

<table>
<thead>
<tr>
<th>Physical and Chemical properties</th>
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<tbody>
<tr>
<td>Physical appearance: White freeze-dried solid</td>
<td>Corrosive: No</td>
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<tr>
<td>Stable: Yes</td>
<td>Oxidising: No</td>
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<tr>
<td>Hygroscopic: Yes</td>
<td>Irritant: Yes</td>
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<tr>
<td>Flammable: No</td>
<td>Handling: See caution, Section 2</td>
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<tr>
<td>Other (specify): Contains material of porcine origin</td>
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<table>
<thead>
<tr>
<th>Toxicological properties</th>
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<tbody>
<tr>
<td>Effects of inhalation: Not established, avoid inhalation</td>
<td></td>
</tr>
<tr>
<td>Effects of ingestion: Not established, avoid ingestion</td>
<td></td>
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<tr>
<td>Effects of skin absorption: Not established, avoid contact with skin</td>
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</tbody>
</table>

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<tr>
<th>Suggested First Aid</th>
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<tbody>
<tr>
<td>Inhalation: Seek medical advice</td>
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<tr>
<td>Ingestion: Seek medical advice</td>
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</tbody>
</table>

15. LIABILITY AND LOSS
In the event that this document is translated into another language, the English language version shall prevail in the event of any inconsistencies between the documents. Unless expressly stated otherwise by NIBSC, NIBSC’s Standard Terms and Conditions for the Supply of Materials (available at http://www.nibsc.org/About_Us/Terms_and_Conditions.aspx or upon request by the Recipient) (“Conditions”) apply to the exclusion of all other terms and are hereby incorporated into this document by reference. The Recipient’s attention is drawn in particular to the provisions of clause 11 of the Conditions.

16. INFORMATION FOR CUSTOMS USE ONLY
Country of origin for customs purposes*: United Kingdom
* Defined as the country where the goods have been produced and/or sufficiently processed to be classed as originating from the country of supply, for example a change of state such as freeze-drying.

Net weight: 10.7 mg
Toxicity Statement: Toxicity not assessed
Veterinary certificate or other statement if applicable. Attached: No

17. CERTIFICATE OF ANALYSIS
NIBSC does not provide a Certificate of Analysis for WHO Biological Reference Materials because they are internationally recognised primary reference materials fully described in the instructions for use. The reference materials are established according to the WHO Recommendations for the preparation, characterization and establishment of international and other biological reference standards http://www.who.int/bloodproducts/publications/TRS932Annex2_Inter_biol_efstandardsrev2004.pdf (revised 2004). They are officially endorsed by the WHO Expert Committee on Biological Standardization (ECBS) based on the report of the international collaborative study which established their suitability for the intended use.