WHO International Standard
WHO 2nd INTERNATIONAL STANDARD FOR PROTEIN S, PLASMA, HUMAN
NIBSC code: 03/228
Instructions for use
(Version 3.0, Dated 10/02/2014)

1. INTENDED USE
The 2nd International Standard for Protein S, Plasma, Human, consists of
ampoules (code-labelled 03/228) containing 1 ml aliquots of pooled fresh
human plasma, freeze-dried. This standard has been assigned potencies
for total and free Protein S antigen and for Protein S function.

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

The preparation contains material of human origin, and either the final
product or the source materials, from which it is derived, have been
tested and found negative for HBsAg, anti-HIV and HCV RNA. 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 2nd International Standard was calibrated in an international
collaborative study involving 20 laboratories for Total Protein S antigen,
Free Protein S antigen and Protein S function by assay against the 1st
International Standard (93/590). The standard was established by the
WHO Expert Committee on Biological Standardisation in October 2006.
Details of the collaborative study are available in the WHO document
WHO/BS/06.2046. The following values have been assigned to the 2nd
International Standard:

<table>
<thead>
<tr>
<th>Protein Component</th>
<th>IU/ampoule</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Protein S</td>
<td>0.83</td>
</tr>
<tr>
<td>Free Protein S</td>
<td>0.81</td>
</tr>
<tr>
<td>Protein S function</td>
<td>0.77</td>
</tr>
</tbody>
</table>

Uncertainty: the International Unit of 03/228 is assigned without
uncertainty. The uncertainty of the ampoule content of 03/228 may be
considered to be the coefficient of variation of the ampoule filling, which
was determined to be 0.09 %.

4. CONTENTS
Country of origin of biological material: United Kingdom.
The 2nd International Standard was prepared in February 2004 from a
plasma pool collected from 24 normal healthy donors. Blood was
collected into CPD-adrenaline anticoagulant in plastic packs, at a ratio of 450
ml blood to 63 ml anticoagulant. Each donation underwent leuko-filtration
and centrifugation before storage at -70°C. The units were thawed in a
water bath at 37°C and pooled on the day of filling. The final pool was
buffered by the addition of HEPES (N-[2-Hydroxyethyl]piperazine-N’-[2-
ethanesulfonic acid]) to a final concentration of 39 mmol/L and Glycine to
a final concentration of 0.96 % w/v.

DISTRIBUTION INTO AMPOULES
The pooled plasma was kept at 4°C throughout distribution into
approximately 5,500 ampoules, then freeze-dried and secondary
desiccated according to the requirements for International Biological
Standards (1). The coefficient of variation for the liquid fill was 0.09 % and
the mean fill weight was 1.0063 g (range 1.0042 - 1.0086 g). The final C
of freeze-dried material has a mean dry weight of 0.093 g and mean residual
moisture of 0.064 %.

5. STORAGE
Unopened ampoules should be stored at -20°C or below.
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. Various types of
ampoule breaker are available commercially. To open the ampoule, tap
the ampoule gently to collect material at the bottom (labelled) end and
follow manufactures instructions provided with the ampoule breaker.

7. USE OF MATERIAL
No attempt should be made to weigh out any portion of the freeze-dried
material prior to reconstitution.
Reconstitute the total contents of each ampoule of the Standard with 1.0ml
of distilled water, using gentle shaking. The reconstitutes Standard
to a plastic tube and keep on melting ice. Under these conditions
the standard has been found to be sufficiently stable to be used over a 4 hour
period. Storage of the 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 WHO not to assign expiry dates to international
reference materials. They remain valid with the assigned potency and
status until withdrawn or amended.

Accelerated degradation studies, which involve potency estimation of
ampoules stored at elevated temperatures relative to ampoules stored at
below -150°C, have shown that the material is very stable in unopened
ampoules stored at -20°C. Predicted loss over one year whilst stored at
-20°C is less than 0.1% for all measured parameters. These studies have
shown that when stored at -20°C or below the assigned values will
remain valid until the material is withdrawn or replaced.

Once reconstituted the activity of this preparation is assured for three
hours when stored on melting ice.03/228

9. REFERENCES

10. ACKNOWLEDGEMENTS
The efforts of the participants in the collaborative study, the members of the
Plasma Coagulation Inhibitors sub-committee and the staff of the Centre for
Biological Reference Materials (NIBSC) are gratefully acknowledged.

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:
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>
</tr>
</thead>
<tbody>
<tr>
<td>Physical appearance: Solid</td>
</tr>
<tr>
<td>Stable: Yes</td>
</tr>
<tr>
<td>Hygroscopic: Yes</td>
</tr>
<tr>
<td>Flammable: No</td>
</tr>
<tr>
<td>Other (specify):</td>
</tr>
</tbody>
</table>

Toxicological properties

Effects of inhalation: Not established, avoid inhalation
Effects of ingestion: Not established, avoid ingestion
Effects of skin absorption: Not established, avoid contact with skin

Suggested First Aid

Inhalation: Seek medical advice
Ingestion: Seek medical advice
Contact with eyes: Wash with copious amounts of water. Seek medical advice
Contact with skin: Wash thoroughly with water.

Action on Spillage and Method of Disposal

Spillage of ampoule contents should be taken up with absorbent material wetted with an appropriate disinfectant. Rinse area with an appropriate disinfectant followed by water. Absorbent materials used to treat spillage should be treated as biological waste.

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

<table>
<thead>
<tr>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Country of origin for customs purposes*: United Kingdom</td>
</tr>
<tr>
<td>Net weight: ~90mg</td>
</tr>
<tr>
<td>Toxicity Statement: Toxicity not assessed</td>
</tr>
<tr>
<td>Veterinary certificate or other statement if applicable. Attached: No</td>
</tr>
</tbody>
</table>

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.