



**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:

Total Protein S antigen	0.83 IU per ampoule
Free Protein S antigen	0.81 IU per ampoule
Protein S function	0.77 IU per ampoule

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-adenine 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 waterbath 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 manufacturer's 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. Transfer the reconstituted 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.

## 9. REFERENCES

1. Campbell PJ (1974) J Biol Standardization, 2, 249-267

## 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:





<http://www.bipm.org/en/committees/jc/jctlm/>

Derivation of International Units:

[http://www.nibsc.org/standardisation/international\\_standards.aspx](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](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](mailto: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

Physical and Chemical properties				
Physical appearance: Solid	Corrosive:	No		
Stable: Yes	Oxidising:	No		
Hygroscopic: Yes	Irritant:	No		
Flammable: No	Handling:	See caution, Section 2		
Other (specify):	Contains material of human origin			
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](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:** ~90mg

**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\\_standardsrev2004.pdf](http://www.who.int/bloodproducts/publications/TRS932Annex2_Inter_biol_standardsrev2004.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.