Biological Substances

International Standards and Reference Reagents

1990

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Contents

Introduction

The primary purpose underlying the establishment of International Biological Standards and International Biological Reference Reagents is to provide a means of ensuring uniformity throughout the world in the designation of the potency, activity, or specificity of preparations that are used in the prophylaxis, therapy, or diagnosis of human and some animal diseases, and that cannot be expressed directly in terms of chemical and physical quantities. For this purpose, International Units have been assigned, wherever necessary, to biological substances.[1]

The International Unit (IU) for a specific substance has been defined, in the past, as the biological activity contained in a defined weight of the current International Standard for that substance. However, difficulties have been experienced when attempting to weigh small amounts of materials with great accuracy, particularly hygroscopic powders. In this connection the thirtieth report of the WHO Expert Committee on Biological Standardization,[2] which met in November 1978, stated:

> "The problem may be largely avoided by distributing an international standard in freeze-dried form and assigning a defined number of international units per ampoule, thus making it unnecessary to weigh quantities of the standard preparation. The total contents of the ampoule are removed with an appropriate solvent and the final volume is accurately adjusted."

For most standards established by the Committee, the unitage has therefore been defined on the basis of the total contents of the ampoule, rather than on the basis of weight, and is shown in this way in the present edition of *Biological substances.*

For standards containing 50 mg or more of material (e.g., standards for many antibiotics and the human, bovine and porcine insulins), it has not been possible to depart from a definition of the International Unit on the basis of weight.

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[1] WHO Technical Report Series, No. 486, 1972, pp. 7-8.
[2] WHO Technical Report Series, No. 638, 1979, pp. 7-8.

The standard is the material as it exists in the ampoules; the "material" thus includes the active ingredients together with all the other constituents that may be present (moisture, carrier, buffer salts, etc., according to the form in which the standard is available). The World Health Assembly has recommended[3] that Member States of the Organization give official recognition to existing international standards and units.

A secondary purpose of these standards is the facilitation of work out of which clinical application may arise.

At the thirty-fourth meeting of the WHO Expert Committee on Biological Standardization in 1983,[4] it was agreed that International Reference Preparations to which an activity had been assigned in the form of International Units should be considered functionally to be international standards. The question of whether it would be desirable to rename the international biological reference preparations already established as international biological standards was discussed, and it was agreed that to do so would probably cause confusion because of the extensive scientific literature in which the existing names had been used.

At its thirty-seventh meeting, in 1986,[5] the WHO Expert Committee on Biological Standardization decided that, in the future, new or replacement International Biological Reference Materials would be established either as International Standards or as International Reference Reagents.

The main custodians of International Biological Standards are the International Laboratories for Biological Standards at the State Serum Institute, Copenhagen, Denmark, at the National Institute for Biological Standards and Control, Potters Bar, Hertfordshire, England, at the Central Veterinary Laboratory, Weybridge, Surrey, England, and at the Central Laboratory of the Red Cross Blood Transfusion Service, Amsterdam, Netherlands; another custodian laboratory is the Anti-Viral Research Branch of the National Institute of Allergy and Infectious Diseases, Bethesda, MD, USA. They distribute samples of these standards, free of charge, to national control laboratories for biological products[6] and, with small handling charges, to other organizations such as manufacturers and hospital laboratories. These preparations are intended for use in the calibration of the activity of national or working

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[3] *WHO handbook of resolutions and decisions. Volume II, 1973-1984.* Geneva, World Health Organization, 1985, p. 135 (resolution WHA37.27).
[4] WHO Technical Report Series, No. 700, 1984, pp. 7-8.
[5] WHO Technical Report Series, No. 760, 1987, p. 15.
[6] WHO Technical Report Series, No. 463, 1971, p. 8.

standards and for the expression of their biological activity in International Units; in almost all cases such samples are made for use in laboratory assays only and should not be administered to human beings.

International Biological Reference Reagents are established for the purpose of providing biological diagnostic reagents of high specificity for the identification of microorganisms or their products, as well as other reagents used to calibrate certain reference materials used in the assay of a variety of biological substances; international units are not assigned to them.

Requests for international reference materials should be addressed directly to the custodian laboratories, together with a statement of intended use. Address, telephone, fax and telex numbers of WHO custodian laboratories are as follows:

International Laboratories for Biological Standards

- Central Laboratory, Netherlands Red Cross Blood Transfusion Service, Plesmanlaan 125, Amsterdam, Netherlands (Tel. (20) 512 9222; Telex 13159 BLOOD NL; Fax (20) 512 3332).
- Central Veterinary Laboratory, New Haw, Weybridge, Surrey KT15 3NB, England (Tel. (9323) 41111; Telex 262318; Fax (9323) 47046).
- National Institute for Biological Standards and Control,[7] South Mimms, Potters Bar, Herts. EN6 3QG, England (Tel (707) 54753/54763; Telex 21911 NIBSAC G; Fax (707) 46730).
- Statens Seruminstitut, 80 Amager Boulevard, 2300 Copenhagen S, Denmark (Tel. (45) 31 95 2817; Telex 31316 SERUM DK; Fax (45) 31 95 5822).

Other laboratories

- Anti-Viral Research Branch, National Institute of Allergy and Infectious Diseases, National Institutes of Health, Bethesda, MD 20892, USA (Tel. (301) 496 9088; Telex 248232; Fax (301) 496 8030).
- Centers for Disease Control, Atlanta, GA 30333, USA (Tel. (404) 639 3355; Telex 549571 CDC ATL; Fax (404) 639 3037/3296).

[7] The NIBSC has its own catalogue, which is available on request.

- Rijksinstituut voor Volksgezondheid en Milieuhygiene, Postbus 1, 3720 BA, Bilthoven, Netherlands
  (Tel. (30) 749111; Telex 47215 RIVM NL; Fax (30) 742971).
- WHO/FAO Collaborating Centre for Reference and Research on Leptospirosis, Laboratory of Tropical Hygiene, Royal Tropical Institute, Meibergdreef 39, 1105 AZ Amsterdam, Netherlands
  (Tel. (20) 566 5438; Telex 15080 KIT NL; Fax (20) 668 4579).

The list printed on the following pages has been revised to show all the changes made since the publication of the previous edition in 1987, including those contained in the thirty-seventh, thirty-eighth,[8] thirty-ninth[9] and fortieth[10] reports of the WHO Expert Committee on Biological Standardization.

This list is brought up to date every few years. Any changes between revisions are listed in annexes to the reports of the WHO Expert Committee on Biological Standardization.

[8] WHO Technical Report Series, No. 771, 1988.
[9] WHO Technical Report Series, No. 786, 1989.
[10] WHO Technical Report Series, No. 800, 1990.

International Biological Standards

Important

Wherever possible, the biological activity of a substance has been expressed as the total number of international units per ampoule. In these cases the entire contents of the ampoule should be removed with an appropriate solvent and the final volume accurately adjusted. It is neither necessary nor advisable to weigh the entire material, or a portion of it, contained in the ampoule.

In other cases, where the weight definition of the unit has been unavoidable, the material should be weighed with particular care, especially as some of the reference materials are hygroscopic.

Allergens

Held and distributed by
International Laboratory for Biological Standards, National Institute for Biological Standards and Control, Potters Bar

Preparation	IU per ampoule	Form in which available
Birch pollen (*Betula verrucosa*) extract	100 000	Ampoules containing about 1g of lyophilized extract of birch pollen
Dog (*Canis domesticus*) hair and dander extract	100 000	Ampoules containing about 2.36 mg of lyophilized dog hair and dander extract
House-dust mite (*Dermatophagoides pteronyssinus*) extract	100 000	Ampoules containing the freeze-dried residue of 1 ml of house-dust mite extract
Short ragweed pollen (*Ambrosia elatior*) extract	100 000	Ampoules containing the freeze-dried residue of 0.3 ml aqueous extract of defatted short ragweed pollen
Timothy grass pollen (*Phleum pratense*) extract	100 000	Ampoules containing the freeze-dried residue of 1 ml aqueous extract of Timothy grass pollen

Years of establishment (in brackets, weight of previous standard containing one IU)	References (WHO/BS refers to unpublished working documents of the WHO Expert Committee on Biological Standardization)
1st Standard 1986	WHO Technical Report Series, 1987, **760**, 19; WHO/BS 1512
1st Standard 1986	WHO Technical Report Series, 1987, **760**, 19; 1989, **786**, 27; WHO/BS 1513, 1547
1st Standard 1984	WHO Technical Report Series, 1985, **725**, 16; WHO/BS 1417
1st Standard 1983	WHO Technical Report Series, 1985, **626**, 16; 1984, **700**, 16
1st Standard 1983	WHO Technical Report Series, 1978, **626**, 16; 1984, **700**, 17

Antibiotics I

Held and distributed by
International Laboratory for Biological Standards, National Institute for Biological Standards and Control, Potters Bar

Preparation	IU per ampoule	Form in which available
Amikacin	50 600	Ampoules containing approximately 50.9 mg of amikacin base
Amphotericin B	—	Ampoules containing approximately 50 mg of amphotericin B (940 IU per mg)
Bacitracin	—	Ampoules containing approximately 100 mg of zinc bacitracin (74 IU per mg)
Bleomycin complex A_2/B_2 (INN[1] = bleomycin)	8910	Ampoules containing 5 mg of bleomycin complex
Candicidin	—	Ampoules containing approximately 50 mg of candicidin (2098 IU per mg)
Capreomycin	—	Ampoules containing approximately 80 mg of capreomycin sulfate (920 IU per mg)
Chlortetracycline	—	Ampoules containing approximately 75 mg of chlortetracycline hydrochloride (1000 IU per mg)
Colistin	—	Ampoules containing approximately 75 mg of colistin sulfate (20 500 IU per mg)
Colistin methane sulfonate[2] (INN = colistimethate sodium)	—	Ampoules containing approximately 75 mg of colistin methane sulfonate (12 700 IU per mg)

[1] INN = International Nonproprietary Name
[2] In some countries this antibiotic is known as "colistin sulphomethate" or "colistimethate".

Years of establishment (in brackets, weight of previous standard containing one IU)	References (WHO/BS refers to unpublished working documents of the WHO Expert Committee on Biological Standardization)
1st Standard 1983	WHO Technical Report Series, 1978, **626**, 12; 1979, **638**, 12; 1981, **658**, 12; 1982, **673**, 16; 1983, **687**, 16; 1984, **700**, 12; WHO/BS 1173, 1224, 1274, 1316, 1355, 1398
1st Standard 1963	*Bull. World Health Organ.*, 1972, **47**, 343; WHO Technical Report Series, 1959, **172**, 8; 1960, **187**, 5; 1963, **259**, 10; 1964, **274**, 8; WHO/BS 450, 478, 592, 648
1st Standard 1953 (0.0182 mg) *2nd Standard* 1964	*Bull. World Health Organ.*, 1953, **9**, 861; 1964, **31**, 101; WHO Technical Report Series, 1951, **36**, 9; 1952, **56**, 12; 1953, **68**, 16; 1954, **86**, 15; 1960, **187**, 6; 1963, **259**, 8; 1964, **293**, 8; WHO/BS 122, 144, 236, 481, 593, 642, 642 Add. 1, 681
1st Reference Preparation 1980	WHO Technical Report Series, 1977, **610**, 16; 1978, **626**, 11; 1979, **638**, 13; 1981, **658**, 13; WHO/BS 1196, 1276; *J. biol. Stand.*, 1981, **9**, 253
1st Reference Preparation 1978	WHO Technical Report Series, 1968, **384**, 12; 1969, **413**, 13; 1971, **463**, 12; 1976, **594**, 9; 1977, **610**, 16; 1978, **626**, 11; 1979, **638**, 11; WHO/BS 913, 1011, 1108, 1131, 1171, 1193
1st Reference Preparation 1967	*Bull. World Health Organ.*, 1972, **47**, 343; WHO Technical Report Series, 1964, **293**, 11; 1968, **384**, 10; WHO/BS 731, 759, 884
1st Standard 1953 (0.001 mg) *2nd Standard* 1969	*Bull. World Health Organ.*, 1953, **9**, 851; 1972, **47**, 635; WHO Technical Report Series, 1951, **36**, 9; 1952, **56**, 12; 1953, **68**, 16; 1954, **86**, 14; 1967, **361**, 10; 1969, **413**, 11; 1970, **444**, 8; WHO/BS 122, 143, 245, 857, 983
1st Standard 1968	*Bull. World Health Organ.*, 1973, **48**, 65; WHO Technical Report Series, 1961, **222**, 9; 1964, **274**, 8; 1964, **293**, 9; 1966, **329**, 7; 1967, **361**, 11; 1969, **413**, 11; WHO/BS 530, 647, 724, 764, 923
1st Reference Preparation 1966	*Bull. World Health Organ.*, 1973, **48**, 75; WHO Technical Report Series, 1964, **274**, 8; 1964, **293**, 10; 1966, **329**, 7; 1967, **361**, 11; 1969, **413**, 11; WHO/BS 725, 764, 828, 924

Antibiotics I (contd)

Held and distributed by
International Laboratory for Biological Standards, National Institute for Biological Standards and Control, Potters Bar

Preparation	IU per ampoule	Form in which available
Demethylchlortetracycline (INN = demeclocycline)	—	Ampoules containing approximately 80 mg of demethylchlortetracycline hydrochloride (1000 IU per mg)
Dihydrostreptomycin	—	Ampoules containing approximately 200 mg of dihydrostreptomycin sulfate (820 IU per mg)
Doxycycline	—	Ampoules containing approximately 75 mg of doxycycline hydrochloride hemiethanolate hemihydrate (870 IU per mg)
Erythromycin	—	Ampoules containing approximately 75 mg of erythromycin A base (920 IU per mg)
Gentamycin (INN = gentamicin)	—	Ampoules containing approximately 50 mg of gentamycin sulfate (641 IU per mg)
Gramicidin	—	Ampoules containing approximately 55 mg of gramicidin (1000 IU per mg)
Kanamycin	10 345	Ampoules containing approximately 12.7 mg of kanamycin sulfate
Lymecycline	—	Ampoules containing approximately 100 mg of lymecycline (948 IU per mg)
Methacycline (INN = metacycline)	—	Ampoules containing approximately 50 mg of methacycline hydrochloride (924 IU per mg)
Minocycline	—	Ampoules containing approximately 75 mg of minocycline hydrochloride (863 IU per mg)

Years of establishment (in brackets, weight of previous standard containing one IU)	References (WHO/BS refers to unpublished working documents of the WHO Expert Committee on Biological Standardization)
1st Reference Preparation 1962	*Bull. World Health Organ.*, 1972, **47**, 343; WHO Technical Report Series, 1961, **222**, 9; 1963, **259**, 9; WHO/BS 530, 592
1st Standard 1953 (0.001316 mg) *2nd Standard* 1966	*Bull. World Health Organ.*, 1954, **10**, 901; 1966, **34**, 429; WHO Technical Report Series, 1950, **2**, 11; 1951, **36**, 9; 1952, **56**, 11; 1953, **68**, 17; 1954, **86**, 15; 1963, **259**, 9; 1964, **274**, 7; 1967, **361**, 8; WHO/BS 67, 122, 146, 241, 242, 592, 638, 829
1st Reference Preparation 1973	WHO Technical Report Series, 1970, **444**, 11; 1972, **486**, 9; 1973, **530**, 5; 1976, **594**, 8; WHO/BS 1012, 1050, 1099
1st Standard 1957 (0.001053 mg) *2nd Standard* 1978	*Bull. World Health Organ.*, 1957, **17**, 527; WHO Technical Report Series, 1955, **96**, 12; 1956, **108**, 13; 1957, **127**, 13; 1958, **147**, 6; 1978, **626**, 10; 1979, **638**, 12; 1983, **687**, 18; 1984, **700**, 12; WHO/BS 263, 322, 368, 397, 397 Annex 1, 1228, 1413; *J. biol. Stand.*, 1981, **9**, 209
1st Reference Preparation 1968	*Bull. World Health Organ.*, 1972, **47**, 343; WHO Technical Report Series, 1964, **293**, 11; 1966, **329**, 9; 1967, **361**, 12; 1969, **413**, 12; WHO/BS 763, 925
1st Reference Preparation 1966	*Bull. World Health Organ.*, 1967, **36**, 447; WHO Technical Report Series, 1960, **187**, 6; 1961, **222**, 9; 1964, **293**, 7; 1967, **361**, 8; WHO/BS 493, 682, 858
1st Reference Preparation 1964 *1st Standard* 1986	*Bull. World Health Organ.*, 1972, **47**, 343; WHO Technical Report Series, 1959, **172**, 8; 1960, **187**, 6; 1963, **259**, 10; 1964, **274**, 9; 1964, **293**, 8; 1985, **725**, 15; 1987, **760**, 17; WHO/BS 450, 478, 592, 648, 687, 1515
1st Reference Preparation 1968 (0.0010548 mg) *2nd Reference Preparation* 1971	*Bull. World Health Organ.*, 1972, **47**, 343; 1973, **48**, 81; WHO Technical Report Series, 1967, **361**, 12; 1968, **384**, 11; 1969, **413**, 12; 1971, **463**, 11; 1972, **486**, 9; WHO/BS 886, 921, 1010, 1048
1st Reference Preparation 1969	*Bull. World Health Organ.*, 1972, **47**, 343; WHO Technical Report Series, 1967, **361**, 12; 1968, **384**, 12; 1969, **413**, 12; 1970, **444**, 8; 1971, **463**, 10; WHO/BS 886, 922, 994
1st Reference Preparation 1975	WHO Technical Report Series, 1971, **463**, 12; 1972, **486**, 10; 1973, **530**, 6; 1976, **594**, 10; WHO/BS 1051, 1104

Antibiotics I (contd)

Held and distributed by
International Laboratory for Biological Standards, National Institute for Biological Standards and Control, Potters Bar

Preparation	IU per ampoule	Form in which available
Neomycin	—	Ampoules containing approximately 50 mg of neomycin sulfate (775 IU per mg)
Neomycin B (INN = framycetin)	—	Ampoules containing approximately 25 mg of neomycin B sulfate (670 IU per mg)
Netilmicin	4810	Ampoules containing approximately 7.551 mg of netilmicin sulfate
Novobiocin	—	Ampoules containing approximately 100 mg of novobiocin acid (970 IU per mg)
Nystatin	—	Ampoules containing approximately 100 mg of nystatin (4855 IU per mg)
Oleandomycin	—	Ampoules containing approximately 75 mg of oleandomycin chloroform adduct (850 IU per mg)
Oxytetracycline	—	Ampoules containing approximately 100 mg of oxytetracycline base dihydrate (880 IU per mg)
Paromomycin	—	Ampoules containing approximately 75 mg of paromomycin sulfate (750 IU per mg)
Polymyxin B	—	Ampoules containing approximately 75 mg of purified polymyxin B sulfate (8403 IU per mg)

Years of establishment (in brackets, weight of previous standard containing one IU)	References (WHO/BS refers to unpublished working documents of the WHO Expert Committee on Biological Standardization)
1st Reference Preparation 1958 (0.00147 mg) *2nd Reference Preparation* 1974	WHO Technical Report Series, 1955, **96**, 13; 1957, **127**, 13; 1958, **147**, 6; 1959, **172**, 6; 1963, **259**, 7; 1971, **463**, 11; 1973, **530**, 6; 1976, **594**, 8; WHO/BS 263, 347, 398, 428, 491, 1001, 1063, 1097; *J. biol. Stand.*, 1979, **7**, 227
1st Reference Preparation 1970	WHO Technical Report Series, 1959, **172**, 6; 1960, **187**, 6; 1961, **222**, 7; 1963, **259**, 7; 1969, **413**, 13; 1971, **463**, 10; WHO/BS 491, 522, 929, 993, 1000, 1000 Corr. 1, 1098; *J. biol. Stand.*, 1979, **7**, 239
1st Standard 1989	WHO Technical Report Series, 1984, **700**, 13; 1985, **725**, 14; 1987, **760**, 17; 1990, **800**, 15; WHO/BS 1445, 1516, 1628
1st Standard 1965	*Bull. World Health Organ.*, 1966, **34**, 285; WHO Technical Report Series, 1957, **127**, 14; 1958, **147**, 6; 1959, **172**, 7; 1960, **187**, 7; 1961, **222**, 7; 1963, **259**, 7; 1964, **274**, 6; 1966, **329**, 6; WHO/BS 347, 394, 431, 472, 521, 595, 638, 766
1st Standard 1963 (0.000333 mg) *2nd Standard* 1982	*Bull. World Health Organ.*, 1963, **29**, 87; WHO Technical Report Series, 1957, **127**, 14; 1958, **147**, 8; 1959, **172**, 7; 1960, **187**, 7; 1961, **222**, 7; 1963, **259**, 8; 1964, **274**, 7; 1964, **293**, 7; 1966, **329**, 6; 1982, **673**, 18; 1983, **687**, 17; WHO/BS 347, 429, 476, 524, 580, 646, 777, 1320, 1350
1st Standard 1964	*Bull. World Health Organ.*, 1965, **33**, 227; WHO Technical Report Series, 1958, **147**, 8; 1959, **172**, 7; 1960, **187**, 7; 1961, **222**, 8; 1964, **293**, 7; WHO/BS 430, 477, 521, 714
1st Standard 1955 (0.00111 mg) *2nd Standard* 1966	*Bull. World Health Organ.*, 1955, **13**, 903; 1967, **36**, 963; WHO Technical Report Series, 1951, **36**, 9; 1952, **56**, 12; 1953, **68**, 16; 1954, **86**, 16; 1955, **96**, 12; 1956, **108**, 14; 1964, **274**, 9; 1964, **293**, 9; 1967, **361**, 9; 1976, **594**, 11; WHO/BS 122, 145, 211, 285, 307, 649, 684, 831, 832, 1118
1st Reference Preparation 1965	*Bull. World Health Organ.*, 1972, **47**, 343; WHO Technical Report Series, 1964, **274**, 10; 1964, **293**, 9; 1966, **329**, 6; 1967, **361**, 9; WHO/BS 638, 688, 761, 822
1st Standard 1955 (0.000127 mg) *2nd Standard* 1969	*Bull. World Health Organ.*, 1973, **48**, 85; WHO Technical Report Series, 1955, **96**, 12; 1956, **108**, 14; 1969, **413**, 13; 1970, **444**, 8; WHO/BS 263, 326, 926, 990

Antibiotics I (contd)

Held and distributed by
International Laboratory for Biological Standards, National Institute for Biological Standards and Control, Potters Bar

Preparation	IU per ampoule	Form in which available
Rifamycin SV (INN = rifamycin)	—	Ampoules containing approximately 100 mg of sodium rifamycin SV (887 IU per mg)
Rolitetracycline	—	Ampoules containing approximately 100 mg of rolitetracycline (996 IU per mg)
Sisomicin	35 200	Ampoules containing approximately 56.5 mg of sisomicin sulfate
Spectinomycin	—	Ampoules containing approximately 75 mg of spectinomycin dihydrochloride pentahydrate (671 IU per mg)
Spiramycin	—	Ampoules containing approximately 50 mg of spiramycin base (3200 IU per mg)
Streptomycin	78 500	Ampoules containing 100 mg of streptomycin sulfate
Tetracycline	—	Ampoules containing approximately 75 mg of tetracycline hydrochloride (982 IU per mg)
Tobramycin	9800	Ampoules containing approximately 10.2 mg of tobramycin
Triacetyloleandomycin (INN = troleandomycin)	—	Ampoules containing approximately 100 mg of triacetyloleandomycin (833 IU per mg)

Years of establishment (in brackets, weight of previous standard containing one IU)	References (WHO/BS refers to unpublished working documents of the WHO Expert Committee on Biological Standardization)
1st Reference Preparation 1967	*Bull. World Health Organ.*, 1972, **47**, 343; WHO Technical Report Series, 1964, **293**, 11; 1966, **329**, 9; 1967, **361**, 11; 1968, **384**, 10; WHO/BS 763, 827, 885
1st Standard 1968	*Bull. World Health Organ.*, 1973, **48**, 229; WHO Technical Report Series, 1964, **274**, 10; 1964, **293**, 9; 1966, **329**, 7; 1969, **413**, 10; WHO/BS 685, 760, 952
1st Standard 1984	WHO Technical Report Series, 1978, **626**, 12; 1979, **638**, 12; 1981, **658**, 12; 1982, **673**, 17; 1983, **687**, 17; 1984, **700**, 13; 1985, **725**, 14; WHO/BS 1174, 1194, 1275, 1317, 1356, 1434
1st Reference Preparation 1975	WHO Technical Report Series, 1972, **486**, 11; 1976, **594**, 11; 1977, **610**, 16; WHO/BS 1047, 1103
1st Reference Preparation 1962	*Bull. World Health Organ.*, 1972, **47**, 343; WHO Technical Report Series, 1961, **222**, 9; 1963, **259**, 8; 1964, **293**, 8; WHO/BS 347, 530, 596, 692
1st Standard 1950 (0.001282 mg) 2nd Standard 1958 *3rd Standard* 1980	*Bull. World Health Organ.*, 1947/48, **1**, 13; 1959, **20**, 1223; WHO Technical Report Series, 1950, **2**, 11; 1951, **36**, 9; 1956, **108**, 15; 1957, **127**, 12; 1958, **147**, 5; 1959, **172**, 6; 1978, **626**, 10; 1979, **638**, 12; 1981, **658**, 12; WHO/BS 11, 67, 76, 314, 369, 393, 421, 1168, 1273; *J. biol. Stand.*, 1981, **9**, 227
1st Standard 1957 (0.00101 mg) *2nd Standard* 1970	*Bull. World Health Organ.*, 1957, **17**, 521; 1973, **48**, 99; WHO Technical Report Series, 1955, **96**, 12; 1956, **108**, 15; 1957, **127**, 13; 1958, **147**, 6; 1970, **444**, 9; 1971, **463**, 11; 1972, **486**, 10; 1976, **594**, 11; WHO/BS 263, 323, 370, 396, 396 Annex 1, 982, 1014, 1118
1st Reference Preparation 1980 *2nd Standard* 1985	WHO Technical Report Series, 1976, **594**, 12; 1977, **610**, 17; 1978, **626**, 13; 1981, **658**, 13; 1982, **673**, 17; 1983, **687**, 18; 1984, **700**, 13; 1985, **725**, 15; 1987, **745**, 12; WHO/BS 1102, 1132, 1195, 1271, 1272, 1318, 1357, 1414, 1451, 1504
1st Reference Preparation 1962	*Bull. World Health Organ.*, 1972, **47**, 343; WHO Technical Report Series, 1963, **259**, 10; WHO/BS 521, 592

Antibiotics I (contd)

Held and distributed by
International Laboratory for Biological Standards, National Institute for Biological Standards and Control, Potters Bar

Preparation	IU per ampoule	Form in which available
Vancomycin	—	Ampoules containing approximately 50 mg of vancomycin sulfate (1007 IU per mg)
Viomycin	—	Ampoules containing approximately 100 mg of viomycin sulfate (814 IU per mg)

Antibiotics II

Held and distributed by
International Laboratory for Biological Standards, Central Veterinary Laboratory, Weybridge

Preparation	IU per ampoule	Form in which available
Hygromycin B	—	Ampoules containing 40 mg of hygromycin B (1120 IU per mg)
Nisin	—	Ampoules containing 85 mg of nisin (1000 IU per mg)
Tylosin	—	Ampoules containing 40 mg of tylosin base (1000 IU per mg)

Years of establishment (in brackets, weight of previous standard containing one IU)	References (WHO/BS refers to unpublished working documents of the WHO Expert Committee on Biological Standardization)
1st Standard 1963	*Bull. World Health Organ.*, 1972, **47**, 343; WHO Technical Report Series, 1959, **172**, 8; 1960, **187**, 9; 1963, **259**, 10; 1964, **274**, 8; WHO/BS 450, 478, 592, 648
1st Reference Preparation 1959 (0.00137 mg) *2nd Reference Preparation* 1969	*Bull. World Health Organ.*, 1973, **48**, 219; WHO Technical Report Series, 1955, **96**, 13; 1960, **187**, 9; 1963, **259**, 10; 1964, **274**, 9; 1964, **293**, 8; 1967, **361**, 8; 1969, **413**, 10; 1970, **444**, 7; WHO/BS 263, 493, 592, 648, 683, 859, 919, 919 Corr. 1, 984

Years of establishment (in brackets, weight of previous standard containing one IU)	References (WHO/BS refers to unpublished working documents of the WHO Expert Committee on Biological Standardization)
1st Standard 1966	*Bull. World Health Organ.*, 1966, **35**, 933; WHO Technical Report Series, 1964, **274**, 10; 1964, **293**, 10; 1966, **329**, 8; 1967, **361**, 10; WHO/BS 667, 698, 786, 812
1st Reference Preparation 1969	WHO Technical Report Series, 1968, **384**, 12; 1969, **413**, 14; 1970, **444**, 9; WHO/BS 940, 960, 960 Corr. 1, 960 Add. 1
1st Standard 1966	*Bull. World Health Organ.*, 1966, **35**, 921; WHO Technical Report Series, 1964, **274**, 10; 1964, **293**, 10; 1966, **329**, 8; 1967, **361**, 10; WHO/BS 667, 698, 785, 812

Antibodies I

Held and distributed by
International Laboratory for Biological Standards, Statens Seruminstitut, Copenhagen

Preparation	IU per ampoule	Form in which available
Anti-dysentery serum (Shiga), equine	—	Bottles containing 10 ml of a solution of dried hyperimmune horse serum in saline containing 66% v/v of glycerol (200 IU per ml)
Anti-measles serum, human	10	Ampoules containing 93.8 mg of dried human serum
Anti-poliovirus serum (type 1), monkey	10	Ampoules containing 107.8 mg of dried hyperimmune monkey serum
Anti-poliovirus serum (type 2), monkey	10	Ampoules containing 104.6 mg of dried hyperimmune monkey serum
Anti-poliovirus serum (type 3), monkey	10	Ampoules containing 104.8 mg of dried hyperimmune monkey serum
Anti-Q-fever serum, bovine	1000	Ampoules containing 101.7 mg of dried bovine serum (± 12%)
Anti-rabies immunoglobulin, human	59	Ampoules containing the lyophilized residue of 0.5 ml of an 11% solution of immunoglobulin in glycine buffer
Anti-rubella serum, human	1000	Ampoules containing 145.95 mg of freeze-dried human immunoglobulin
Anti-smallpox serum, human	1000	Ampoules containing 84.3 mg of freeze-dried pooled human serum

Years of establishment (in brackets, weight of previous standard containing one IU)	References (WHO/BS refers to unpublished working documents of the WHO Expert Committee on Biological Standardization)
1st Standard 1928	*Bull. World Health Organ.*, 1951, **4**, 111; *Bull. Health Organ. L.o.N.*, 1935, **4**, 508; 1945/46, **12**, 20; WHO Technical Report Series, 1953, **68**, 19; WHO/BS 169
1st Reference Preparation 1964	WHO Technical Report Series, 1961, **222**, 19; 1963, **259**, 21; 1964, **274**, 19; 1964, **293**, 18; WHO/BS 539, 544, 561, 614, 630, 680 Rev. 1
1st Standard 1962	*Bull. World Health Organ.*, 1962, **26**, 341; 1963, **29**, 711; WHO Technical Report Series, 1956, **108**, 10; 1957, **127**, 11; 1958, **147**, 16; 1959, **172**, 15; 1960, **187**, 16; 1961, **222**, 19; 1963, **259**, 22; 1982, **673**, 19; WHO/BS 313, 361, 363, 385, 433, 444, 475, 483, 516, 564, 1312
1st Standard 1962	*Bull. World Health Organ.*, 1962, **26**, 341; 1963, **29**, 711; WHO Technical Report Series, 1956, **108**, 10; 1957, **127**, 11; 1958, **147**, 16; 1959, **172**, 15; 1960, **187**, 16; 1961, **222**, 19; 1963, **259**, 22; 1982, **673**, 19; WHO/BS 313, 361, 363, 385, 433, 444, 475, 483, 516, 564, 1312
1st Standard 1962	*Bull. World Health Organ.*, 1962, **26**, 341; 1963, **29**, 711; WHO Technical Report Series, 1956, **108**, 10; 1957, **127**, 11; 1958, **147**, 16; 1959, **172**, 15; 1960, **187**, 16; 1961, **222**, 19; 1963, **259**, 22; 1982, **673**, 19; WHO/BS 313, 361, 363, 385, 433, 444, 475, 483, 516, 564, 1312
1st Standard 1953	*Bull. World Health Organ.*, 1955, **13**, 807; WHO Technical Report Series, 1954, **86**, 10; 1955, **96**, 9; WHO/BS 177, 230, 276, 276 Add. 1, 296
1st Standard 1984	WHO Technical Report Series, 1985, **725**, 17; WHO/BS 1433
1st Reference Preparation 1966[1] *2nd Reference Preparation* 1970	WHO Technical Report Series, 1966, **329**, 18; 1967, **361**, 21; 1968, **384**, 19; 1971, **463**, 18; 1982, **673**, 20; 1983, **687**, 19; WHO/BS 751, 758, 866, 891, 996, 996 Corr. 1, 1302, 1358
1st Standard 1965	*Bull. World Health Organ.*, 1970, **42**, 515; WHO Technical Report Series, 1959, **180**, 5; 1960, **187**, 17; 1963, **259**, 25; 1964, **274**, 22; 1966, **329**, 18; 1967, **361**, 21; 1968, **384**, 17; WHO/BS 454, 636, 732, 768, 898

[1] No units were assigned to this preparation.

Antibodies I (contd)

Held and distributed by
International Laboratory for Biological Standards, Statens Seruminstitut, Copenhagen

Preparation	IU per ampoule	Form in which available
Anti-staphylococcal P-V leucocidin serum, equine	150	Ampoules containing 53.5 mg of freeze-dried horse serum
Anti-streptolysin O, human	2160	Ampoules containing 46 mg of dried human serum; distributed as a 10 ml solution containing 10 IU per ml
Anti-toxoplasma serum, human	2000	Ampoules containing 175.8 mg of freeze-dried pooled human serum
Anti-typhoid serum, equine	—	Ampoules containing the lyophilized residue of 5 ml of hyperimmune horse serum
Anti-yellow fever serum, monkey	143	Ampoules containing approximately 71.5 mg of dried monkey serum
Cholera antitoxin, goat	2200	Ampoules containing the lyophilized residue of 0.5 ml of immune goat serum
Clostridium botulinum Type A antitoxin, equine	500	Ampoules containing 68.0 mg of dried hyperimmune horse serum
Clostridium botulinum Type B antitoxin, equine	31	Ampoules containing 3.6 mg of dried pepsin-treated and fractionated hyperimmune horse serum
Clostridium botulinum Type C antitoxin, equine	1000	Ampoules containing 80.0 mg of dried hyperimmune horse serum

Years of establishment (in brackets, weight of previous standard containing one IU)	References (WHO/BS refers to unpublished working documents of the WHO Expert Committee on Biological Standardization)
1st Reference Preparation 1965	*Bull. World Health Organ.*, 1969, **40**, 593; WHO Technical Report Series, 1960, **187**, 19; 1961, **222**, 22; 1963, **259**, 25; 1964, **274**, 22; 1964, **293**, 20; 1966, **329**, 19; 1967, **361**, 22; WHO/BS 540, 603, 635, 693, 769, 816
1st Standard 1959	*Bull. World Health Organ.*, 1961, **24**, 271; WHO Technical Report Series, 1957, **127**, 9; 1958, **147**, 15; 1959, **172**, 16; 1960, **187**, 16; 1961, **222**, 19; 1982, **673**, 20; WHO/BS 402, 443, 482 Rev. 1, 482 Rev. 1 Corr. 1, 517, 517 Corr. 1, 1301
1st Standard 1967 *2nd Standard* 1980	WHO Technical Report Series, 1959, **172**, 16; 1960, **187**, 17; 1961, **222**, 20; 1963, **259**, 21; 1964, **293**, 18; 1968, **384**, 18; 1969, **413**, 22; 1981, **658**, 14; WHO/BS 447, 496, 538, 609, 629, 849, 890, 890 Corr. 1, 939, 1277
1st Reference Preparation 1952	*Bull. World Health Organ.*, 1950, **2**, 643; 1954, **10**, 911; WHO Technical Report Series, 1950, **2**, 6; 1953, **68**, 10; 1954, **86**, 13; 1955, **96**, 11; 1957, **127**, 11; 1958, **147**, 16; WHO/BS 53, 182, 218, 226, 415
1st Reference Preparation 1962	*Bull. World Health Organ.*, 1965, **33**, 243; WHO Technical Report Series, 1958, **147**, 17; 1959, **172**, 16; 1960, **187**, 18; 1961, **222**, 20; 1963, **259**, 23; WHO/BS 416, 438, 464, 464 Add. 1, 506, 514, 545, 545 Corr. 1, 545 Add. 1, 587
1st Standard 1984	WHO Technical Report Series, 1985, **725**, 15; WHO/BS 1438
1st Standard 1963	*Bull. World Health Organ.*, 1963, **29**, 701; WHO Technical Report Series, 1960, **187**, 18; 1963, **259**, 25; 1964, **274**, 20; WHO/BS 485, 582
1st Standard 1963 *2nd Standard* 1985	*Bull. World Health Organ.*, 1963, **29**, 701; WHO Technical Report Series, 1960, **187**, 18; 1963, **259**, 25; 1964, **274**, 20; 1976, **594**, 16; 1977, **610**, 19; 1981, **658**, 14; 1982, **673**, 18; 1983, **687**, 19; 1984, **700**, 14; 1985, **725**, 15; 1987, **745**, 13; WHO/BS 485, 582, 1107, 1139, 1161, 1289, 1300, 1352, 1409, 1435, 1469
1st Standard 1963	*Bull. World Health Organ.*, 1963, **29**, 701; WHO Technical Report Series, 1960, **187**, 18; 1963, **259**, 25; 1964, **274**, 20; WHO/BS 485, 582

Antibodies I (contd)

Held and distributed by
International Laboratory for Biological Standards, Statens Seruminstitut, Copenhagen

Preparation	IU per ampoule	Form in which available
Clostridium botulinum Type D antitoxin, equine	1000	Ampoules containing 12.1 mg of dried hyperimmune horse serum
Clostridium botulinum Type E antitoxin, equine	1000	Ampoules containing 69.1 mg of dried hyperimmune horse serum
Clostridium botulinum Type F antitoxin, rabbit	4	Ampoules containing 29.32 mg of dried hyperimmune rabbit serum
Diphtheria antitoxin, equine	—	Ampoules containing approximately 476 mg of dried hyperimmune horse serum; distributed in bottles, in the form of 10 ml of a solution of the dried serum in 66% v/v of glycerol (10 IU per ml)
Gas-gangrene antitoxin (*Clostridium histolyticum*), equine	50	Ampoules containing 10.0 mg of freeze-dried hyperimmune horse serum
Gas-gangrene antitoxin (*Clostridium novyi*),[1] equine	1100	Ampoules containing 91 mg of dried hyperimmune horse serum
Gas-gangrene antitoxin (*Clostridium septicum*), equine	500	Ampoules containing 59 mg of a dried 1:3 dilution of hyperimmune horse serum in phosphate-buffered saline
Gas-gangrene antitoxin (*Clostridium sordellii*), equine	—	Bottles containing 10 ml of a solution of dried hyperimmune horse serum in saline containing 66% v/v of glycerol (20 IU per ml)

[1] Valid equivalent for *Clostridium oedematiens,* which the International Committee on Systematic Bacteriology has declared invalid (*Int. J. System. Bacteriol.,* 1980, **30**, 225).

Years of establishment (in brackets, weight of previous standard containing one IU)	References (WHO/BS refers to unpublished working documents of the WHO Expert Committee on Biological Standardization)
1st Standard 1963	*Bull. World Health Organ.*, 1963, **29**, 701; WHO Technical Report Series, 1960, **187**, 18; 1963, **259**, 25; 1964, **274**, 20; WHO/BS 485, 582
1st Standard 1963	*Bull. World Health Organ.*, 1963, **29**, 701; WHO Technical Report Series, 1960, **187**, 18; 1963, **259**, 25; 1964, **274**, 20; WHO/BS 485, 582
1st Standard 1965	WHO Technical Report Series, 1964, **274**, 20; 1964, **293**, 19; 1966, **329**, 17; WHO/BS 666, 702, 750, 750 Corr. 1
1st Standard 1934[1]	*Bull. Health Organ. L.o.N.*, 1935, **4**, 505; 1938, **7**, 711, 853; 1945/46, **12**, 12; WHO/BS 68, 77
1st Standard 1935 (0.3575 mg) 2nd Standard 1951 (0.2 mg) *3rd Standard* 1971	*Bull. Health Organ. L.o.N.*, 1936, **5**, 576, 659; 1945/46, **12**, 21; WHO Technical Report Series, 1951, **36**, 5; 1952, **56**, 17; 1971, **463**, 19; 1972, **486**, 17; 1973, **530**, 11, 12; WHO/BS 91, 131, 995, 1034, 1055 Rev. 1
1st Standard 1934 (0.2681 mg) 2nd Standard 1952 (0.1135 mg) *3rd Standard* 1966	*Bull. Health Organ. L.o.N.*, 1935, **4**, 3, 42, 511; 1942/43, **10**, 97; 1945/46, **12**, 26; WHO Technical Report Series, 1953, **68**, 11; 1966, **329**, 19; 1967, **361**, 22; 1973, **530**, 11; WHO/BS 756, 803
1st Standard 1934 (0.2377 mg) 2nd Standard 1947 (0.0974 mg) *3rd Standard* 1957	*Bull. World Health Organ.*, 1947/48, **1**, 9; *Bull. Health Organ. L.o.N.*, 1935, **4**, 1, 13, 511; 1938, **7**, 699, 815; 1942/43, **10**, 97; 1945/46, **12**, 26; WHO Technical Report Series, 1956, **108**, 7; 1957, **127**, 9; 1958, **147**, 15; 1973, **530**, 11; WHO/BS 318, 367, 384
1st Standard 1938	*Bull. Health Organ. L.o.N.*, 1938, **7**, 698, 807; 1939, **8**, 856; 1945/46, **12**, 21; WHO Technical Report Series, 1973, **530**, 11

[1] The history of the standard is not entirely clear. Apparently (*Bull. Health Organ. L.o.N.*, 1935) a standard existed from 1922 but there is no information on the way in which it was defined. The present standard was prepared in Copenhagen in 1934 and is the first one with a clearly defined unitage.

Antibodies I (contd)

Held and distributed by
International Laboratory for Biological Standards, Statens Seruminstitut, Copenhagen

Preparation	IU per ampoule	Form in which available
Gas-gangrene antitoxin (*Clostridium perfringens* alpha antitoxin),[1] equine	270	Ampoules containing 90.35 mg of dried hyperimmune horse serum
Naja antivenin, equine	300	Ampoules containing 807 mg of purified, dried, polyvalent (*Naja* and *Hemachatus* species) horse serum
Scarlet fever streptococcus antitoxin, equine	10 000	Ampoules containing 490 mg of dried hyperimmune horse serum
Staphylococcus α antitoxin, equine	220	Ampoules containing 93.7 mg of freeze-dried hyperimmune horse serum
Syphilitic serum, human	49	Ampoules containing 177.4 mg of dried human serum
Tetanus antitoxin, equine	1400	Ampoules containing 47 mg of freeze-dried hyperimmune horse serum (1400 IU per ampoule)

[1] Valid equivalent for *Clostridium welchii (perfringens)* type A antitoxin — see footnote, p. 26.

Years of establishment (in brackets, weight of previous standard containing one IU)	References (WHO/BS refers to unpublished working documents of the WHO Expert Committee on Biological Standardization)
1st Standard 1931 (0.3220 mg) 2nd Standard 1935 (0.2660 mg) 3rd Standard 1943 (0.3477 mg) 4th Standard 1953 (0.1132 mg) *5th Standard* 1963	*Bull. World Health Organ.*, 1947/48, **1**, 9; 1963, **29**, 729, 737; *Bull. Health Organ. L.o.N.*, 1935, **4**, 510; 1938, **7**, 695, 802, 818; 1939, **8**, 797; 1942/43, **10**, 97; 1945/46, **12**, 22; WHO Technical Report Series, 1955, **96**, 7; 1956, **108**, 7; 1963, **259**, 24; 1964, **274**, 20; 1973, **530**, 11; WHO/BS 281, 495, 547 Rev. 1, 1296
1st Standard 1964	WHO Technical Report Series, 1957, **127**, 9; 1960, **187**, 19; 1961, **222**, 21; 1963, **259**, 23; 1964, **274**, 21; 1964, **293**, 19; 1966, **329**, 18; 1967, **361**, 24; 1970, **444**, 19; 1971, **463**, 19; 1981, **658**, 15; 1983, **687**, 20; WHO/BS 316, 317, 333, 334, 364, 373, 471, 501, 502, 502 Add. 1, 503, 541, 604, 604 Corr. 1, 622, 708, 708 Corr. 1, Corr. 2, Corr. 3, 742, 753, 862, 862 Corr. 1, 862 Add. 1, 972, 972 Corr. 1, 1016, 1291, 1292, 1377
1st Standard 1952	WHO Technical Report Series, 1953, **68**, 11; WHO/BS 38, 60, 84, 150, 225
1st Standard 1934 (0.5000 mg) 2nd Standard 1938 (0.2376 mg) *3rd Standard* 1982	*Bull. Health Organ. L.o.N.*, 1935, **4**, 6, 68, 514; 1938, **7**, 702, 845; 1945/46, **12**, 32; WHO Technical Report Series, 1983, **687**, 20; WHO/BS 1345
1st Standard 1958	*Bull. World Health Organ.*, 1961, **24**, 257; WHO Technical Report Series, 1952, **56**, 8; 1954, **86**, 11; 1955, **96**, 11; 1956, **108**, 12; 1957, **127**, 11; 1958, **147**, 16; 1959, **172**, 15; 1960, **187**, 20; 1961, **222**, 21; 1972, **486**, 18; WHO/BS 239, 289 Rev. 1, 304, 341, 360, 379, 380 Rev. 1, 439, 465, 509, 1039
1st Standard 1928 (0.3094 mg) *2nd Standard* 1969	*Bull. World Health Organ.*, 1949, **2**, 59; 1970, **42**, 523; *Bull. Health Organ. L.o.N.*, 1935, **4**, 506; 1936, **5**, 702; 1938, **7**, 684, 713, 733, 739, 770, 776, 783; 1940/41, **9**, 447, 452; 1942/43, **10**, 104, 113; 1945/46, **12**, 14; WHO Technical Report Series, 1950, **2**, 6; 1953, **68**, 19; 1967, **361**, 20; 1970, **444**, 17; WHO/BS 37, 44, 169, 845 Rev. 1, 964

Antibodies II

Held and distributed by
International Laboratory for Biological Standards, Central Veterinary Laboratory, Weybridge

Preparation	IU per ampoule	Form in which available
Anti-*Brucella abortus* serum, bovine	1000 (aggl.) 1000 (CF)	Ampoules containing 95.52 mg of freeze-dried bovine serum (1000 IU of agglutinating activity and 1000 IU complement-fixing activity per ampoule)
Anti-*Brucella ovis* serum, ovine	1000	Ampoules containing the lyophilized residue of 1.07 g sheep anti-brucella ovis serum
Anti-canine distemper serum	1000	Ampoules containing 89.7 mg of freeze-dried hyperimmune horse serum
Anti-canine hepatitis serum	1000	Ampoules containing 79.6 mg of freeze-dried hyperimmune horse serum
Anti-*Mycoplasma gallisepticum* serum	1000	Ampoules containing 55.6 mg of freeze-dried chicken serum
Anti-Newcastle disease serum	320	Ampoules containing 55.5 mg of freeze-dried chicken serum
Anti-*Salmonella pullorum* serum (Standard Form S)	1000	Ampoules containing 83.8 mg of freeze-dried goat serum prepared against a standard English field strain (strain 11)
Anti-*Salmonella pullorum* serum (Variant Form V)	1000	Ampoules containing 81.4 mg of freeze-dried goat serum prepared against an American variant strain
Anti-swine fever serum	1000	Ampoules containing 889.5 mg of freeze-dried pig serum

Years of establishment (in brackets, weight of previous standard containing one IU)	References (WHO/BS refers to unpublished working documents of the WHO Expert Committee on Biological Standardization)
1st Standard 1952 (0.091 mg) *2nd Standard* 1967	*Bull. World Health Organ.*, 1954, **10**, 927; 1969, **40**, 129; WHO Technical Report Series, 1951, **37**, 19; 1952, **56**, 16; 1953, **68**, 9; 1954, **86**, 6; 1966, **329**, 17; 1967, **361**, 20; 1968, **384**, 16; 1969, **413**, 21; 1971, **463**, 22; 1976, **594**, 18; WHO/BS 128, 162, 223, 224, 228, 747, 811, 893, 893 Add. 1, 937, 959, 1008, 1008 Add. 1, 1124
1st Standard 1985	WHO Technical Report Series, 1987, **745**, 13; WHO/BS 1485
1st Standard 1967	*Bull. World Health Organ.*, 1968, **39**, 917; WHO Technical Report Series, 1964, **274**, 23; 1964, **293**, 20; 1967, **361**, 25; 1968, **384**, 18; WHO/BS 641, 700, 840, 881, 881 Add. 1.
1st Standard 1967	*Bull. World Health Organ.*, 1968, **39**, 909; WHO Technical Report Series, 1964, **274**, 23; 1964, **293**, 20; 1967, **361**, 25; 1968, **384**, 19; WHO/BS 641, 700, 841, 880, 880 Add. 1
1st Reference Preparation 1969	*Bull. World Health Organ.*, 1971, **45**, 219; WHO Technical Report Series, 1968, **384**, 19; 1969, **413**, 21; 1970, **444**, 16; WHO/BS 917, 961, 961 Add. 1
1st Reference Preparation 1966	*Bull. World Health Organ.*, 1968, **38**, 925; WHO Technical Report Series, 1964, **274**, 22; 1966, **329**, 17; 1967, **361**, 20; 1968, **384**, 17; 1969, **413**, 22; WHO/BS 640, 700, 842, 878, 935
1st Standard 1973	WHO Technical Report Series, 1968, **384**, 19; 1970, **444**, 17; 1972, **486**, 18; 1973, **530**, 12; WHO/BS 874, 941, 976, 1045, 1066, 1066 Corr. 1
1st Standard 1973	WHO Technical Report Series, 1968, **384**, 19; 1970, **444**, 17; 1972, **486**, 18; 1973, **530**, 12; WHO/BS 874, 941, 976, 1045, 1066, 1066 Corr. 1
1st Standard 1963	WHO Technical Report Series, 1960, **187**, 21; 1961, **222**, 19; 1963, **259**, 22; 1964, **274**, 19; WHO/BS 487, 573, 627, 627 Add. 1, 675

Antibodies II (contd)

Held and distributed by
International Laboratory for Biological Standards, Central Veterinary Laboratory, Weybridge

Preparation	IU per ampoule	Form in which available
Clostridium perfringens beta[1] antitoxin	5000	Ampoules containing 68.5 mg of dried hyperimmune horse serum
Clostridium perfringens epsilon[1] antitoxin	1020	Ampoules containing the lyophilized residue of 1.02 g of dried hyperimmune horse serum
Swine erysipelas serum (anti-N)	328	Ampoules containing 87.9 mg of dried hyperimmune horse serum

[1] Valid equivalents for *Clostridium welchii (perfringens)* types B and D antitoxins which the International Committee on Systematic Bacteriology has declared invalid (*Int. J. System. Bacteriol.*, 1980, **30**, 225).

Antigens I

Held and distributed by
International Laboratory for Biological Standards, Statens Seruminstitut, Copenhagen

Preparation	IU per ampoule	Form in which available
BCG vaccine		Ampoules containing dried BCG vaccine derived from 2.5 mg (semi-dry weight) of bacillary mass of BCG and 5 mg of sodium glutamate (total weight of dried material 5.72 mg per ampoule)
Cardiolipin		Ampoules containing 4 ml of a solution of purified cardiolipin in ethanol (6.0 mg of cardiolipin per ml, as calculated from the phosphorus content)

Years of establishment (in brackets, weight of previous standard containing one IU)	References (WHO/BS refers to unpublished working documents of the WHO Expert Committee on Biological Standardization)
1st Standard 1954	*Bull. World Health Organ.*, 1956, **14**, 557; WHO Technical Report Series, 1954, **86**, 7; 1955, **96**, 6; 1956, **108**, 7; 1957, **127**, 8; 1982, **673**, 19; WHO/BS 281, 283, 298, 303, 343, 695, 1296
1st Standard 1954 *2nd Standard* 1985	*Bull. World Health Organ.*, 1956, **14**, 557; WHO Technical Report Series, 1955, **96**, 6; 1956, **108**, 7; 1957, **127**, 8; 1982, **673**, 19; 1987, **745**, 14; WHO/BS 283, 298, 303, 343, 695, 1296, 1484
1st Standard 1954	WHO Technical Report Series, 1954, **86**, 11; 1955, **96**, 10; 1956, **108**, 12; WHO/BS 246, 297, 300, 670

Years of establishment (in brackets, weight of previous standard containing one IU)	References (WHO/BS refers to unpublished working documents of the WHO Expert Committee on Biological Standardization)
1st Reference Preparation 1965	*Bull. World Health Organ.*, 1947/48, **1**, 11; 1966, **35**, 645; WHO Technical Report Series, 1950, **2**, 7; 1960, **187**, 12; 1961, **222**, 12; 1963, **259**, 14; 1964, **274**, 14; 1964, **293**, 15; 1966, **329**, 13; 1967, **361**, 16; 1969, **413**, 19; 1970, **444**, 12; 1979, **638**, 16; 1983, **687**, 22; WHO/BS 45, 455, 513, 588, 590, 590 Corr. 1, 652, 802, 956, 956 Add. 1, 1206, 1387
1st Reference Preparation 1951 2nd Reference Preparation 1953 3rd Reference Preparation 1958 *4th Reference Preparation* 1967	*Bull. World Health Organ.*, 1951, **4**, 151; 1959, **20**, 1193; WHO Technical Report Series, 1951, **36**, 14; 1952, **56**, 8; 1953, **68**, 9; 1954, **86**, 11; 1955, **96**, 11; 1956, **108**, 12; 1957, **127**, 8; 1958, **147**, 14; 1959, **172**, 14; 1964, **293**, 17; 1966, **329**, 16; 1967, **361**, 19; 1968, **384**, 15; *Cardiolipin antigens*, 1955 (WHO Monograph Series, No. 6); WHO/BS 72, 97, 117, 238, 278, 278 Add. 1, 305, 360, 414, 420, 697, 771, 848, 889

Antigens I (contd)

Held and distributed by
International Laboratory for Biological Standards, Statens Seruminstitut, Copenhagen

Preparation	IU per ampoule	Form in which available
Cholera vaccine (Inaba)	—	Ampoules containing freeze-dried material from 5 ml of monovalent vaccine (4×10^{10} organisms per ampoule)
Cholera vaccine (Ogawa)	—	Ampoules containing freeze-dried material from 5 ml of monovalent vaccine (4×10^{10} organisms per ampoule)
Diphtheria toxoid, adsorbed	132	Ampoules containing 75 mg of diphtheria toxoid adsorbed on aluminium hydroxide (1.0 mg Al/ampoule) plus polygeline (26 mg per ampoule)
Diphtheria toxoid, plain	200	Ampoules containing 21 mg of formalin-treated diphtheria toxoid, freeze-dried
Diphtheria (Schick) test toxin	900	Ampoules containing 0.005 mg of purified diphtheria toxin plus 1 mg of bovine albumin and 2.74 mg of phosphate buffer salts

Years of establishment (in brackets, weight of previous standard containing one IU)	References (WHO/BS refers to unpublished working documents of the WHO Expert Committee on Biological Standardization)
1st Reference Preparation 1953 *2nd Reference Preparation* 1971	*Bull. World Health Organ.*, 1950, **3**, 43; 1955, **12**, 945; WHO Technical Report Series, 1950, **2**, 4; 1951, **36**, 2; 1952, **56**, 4; 1953, **68**, 8; 1954, **86**, 7; 1957, **127**, 6; 1958, **147**, 12; 1959, **172**, 12; 1959, **179**, 43; 1960, **187**, 12; 1963, **259**, 18; 1964, **293**, 16; 1966, **329**, 15; 1967, **361**, 18; 1968, **384**, 14; 1969, **413**, 19, 21; 1970, **444**, 14; 1972, **486**, 13; 1973, **530**, 10; WHO/BS 23, 36, 41, 52, 69, 82, 87, 87 Add. 1, 107, 130, 222, 255, 342, 410, 676, 755, 774, 778, 863, 863 Corr. 1, 869, 892, 892 Corr. 1, 903, 904, 910, 965, 1032 Rev. 1
1st Reference Preparation 1953 *2nd Reference Preparation* 1971	*Bull. World Health Organ.*, 1950, **3**, 43; 1955, **12**, 945; WHO Technical Report Series, 1950, **2**, 4; 1951, **36**, 2; 1952, **56**, 4; 1953, **68**, 8; 1954, **86**, 7; 1957, **127**, 6; 1958, **147**, 12; 1959, **172**, 12; 1959, **179**, 43; 1960, **187**, 12; 1963, **259**, 18; 1964, **293**, 16; 1966, **329**, 15; 1967, **361**, 18; 1968, **384**, 14; 1969, **413**, 19, 21; 1970, **444**, 14; 1972, **486**, 13; 1973, **530**, 10; WHO/BS 23, 36, 41, 52, 69, 82, 87, 87 Add. 1, 107, 130, 222, 255, 342, 410, 676, 755, 774, 778, 863, 863 Corr. 1, 869, 892, 892 Corr. 1, 903, 904, 910, 965, 1032 Rev. 1
1st Standard 1955 (0.75 mg) *2nd Standard* 1978	*Bull. World Health Organ.*, 1949, **2**, 49; 1953, **9**, 829, 843; 1954, **10**, 951, 983; 1955, **12**, 751; 1955, **13**, 473; WHO Technical Report Series, 1951, **36**, 5; 1952, **56**, 5; 1953, **61**, 8–20; 1954, **86**, 8; 1955, **96**, 7; 1956, **108**, 8; 1976, **594**, 15; 1977, **610**, 17; 1979, **638**, 20; WHO/BS 4, 13, 19, 32, 48, 68, 77, 79, 83, 86, 102, 108, 113, 191, 193, 214, 215, 248, 288, 330, 331, 1105, 1135, 1203
1st Standard 1951 (0.50 mg) *2nd Standard* 1975	*Bull. World Health Organ.*, 1947/48, **1**, 11; 1949, **2**, 49; 1953, **9**, 829, 843; 1955, **12**, 751; 1972, **46**, 263; WHO Technical Report Series, 1950, **2**, 5; 1951, **36**, 5; 1952, **56**, 4; 1953, **61**, 8–20; 1956, **108**, 8; 1970, **444**, 14; 1972, **486**, 14; 1973, **530**, 9; 1976, **594**, 15; WHO/BS 4, 13, 19, 32, 48, 68, 77, 79, 83, 86, 102, 108, 113, 191, 193, 214, 215, 248, 288, 330, 331, 1033 Rev. 1, 1060, 1075
1st Standard 1954	WHO Technical Report Series, 1953, **68**, 7; 1954, **86**, 8; 1955, **96**, 7; WHO/BS 229, 247, 274, 275, 275 Add. 1 and 2

Antigens I (contd)

Held and distributed by
International Laboratory for Biological Standards, Statens Seruminstitut, Copenhagen

Preparation	IU per ampoule	Form in which available
Lecithin (egg)	—	Ampoules containing 4 ml or 16 ml of a solution of purified egg lecithin in ethanol (29.60 mg of lecithin per ml as calculated from the dry weight estimate)
Pertussis vaccine	46	Ampoules containing 25 mg of freeze-dried vaccine
Poliomyelitis vaccine (inactivated)	—	Ampoules containing 10 ml of trivalent inactivated poliomyelitis vaccine, frozen
Rabies vaccine	7.8	Ampoules containing approximately 49.45 mg of freeze-dried rabies vaccine prepared in human diploid cells and inactivated with propiolactone
Smallpox vaccine	—	Ampoules containing 14 mg of freeze-dried smallpox vaccine

Years of establishment (in brackets, weight of previous standard containing one IU)	References (WHO/BS refers to unpublished working documents of the WHO Expert Committee on Biological Standardization)
1st Reference Preparation 1951 2nd Reference Preparation 1953 3rd Reference Preparation 1959 *4th Reference Preparation* 1970	*Bull. World Health Organ.*, 1951, **4**, 151; 1955, **13**, 323; 1956, **14**, 567, 577; 1961, **24**, 265; WHO Technical Report Series, 1952, **56**, 8; 1953, **68**, 9; 1954, **86**, 11; 1955, **96**, 11; 1956, **108**, 12; 1957, **127**, 8; 1959, **172**, 14; 1960, **187**, 13; 1964, **293**, 18; 1966, **329**, 16; 1968, **384**, 15; 1971, **463**, 16; *Cardiolipin antigens*, 1955 (WHO Monograph Series No. 6); WHO/BS 72, 97, 238, 278, 278 Add. 1, 305, 360, 440, 456, 697, 771, 889, 1004, 1004 Corr. 1
1st Standard 1957 *2nd Standard* 1980	*Bull. World Health Organ.*, 1947/48, **1**, 12; 1971, **44**, 673; WHO Technical Report Series, 1951, **36**, 4; 1952, **56**, 4; 1953, **61**, 22–36; 1953, **68**, 7; 1954, **86**, 9; 1955, **96**, 9; 1956, **108**, 9; 1957, **127**, 5; 1958, **147**, 11; 1963, **259**, 19; 1964, **274**, 18; 1964, **293**, 17; 1971, **463**, 15; 1972, **486**, 14; 1978, **626**, 15; 1979, **638**, 19; 1981, **658**, 18; WHO/BS 5, 54, 62, 81, 88, 96, 123, 203, 216, 251, 259, 282, 287, 302, 338, 408, 606, 611, 618, 704, 1212, 1288
1st Reference Preparation 1962	WHO Technical Report Series, 1954, **86**, 10; 1955, **96**, 9; 1956, **108**, 10; 1958, **147**, 13; 1959, **172**, 11; 1959, **178**, 6, 18; 1961, **222**, 13; 1963, **259**, 15; 1964, **274**, 16; 1964, **293**, 15; WHO/BS 234, 235, 260, 313, 321, 376, 376 Annex 1, 449, 459, 460, 466, 466 Add. 1 and 2, 537, 563, 565, 583, 613, 616, 673, 674
1st Reference Preparation 1960[1] 2nd Reference Preparation 1965[1] 3rd Reference Preparation 1978 (4.945 mg) *1st Standard* 1983	WHO Technical Report Series, 1955, **96**, 10; 1957, **127**, 7; 1958, **147**, 12; 1960, **187**, 14; 1960, **201**, 6–9; 1961, **222**, 15; 1963, **259**, 16; 1964, **274**, 16; 1964, **293**, 16; 1966, **321**, 16; 1966, **329**, 15; 1967, **361**, 17; 1968, **384**, 14; 1969, **413**, 19; 1970, **444**, 14; 1972, **486**, 15; 1979, **638**, 15; 1982, **673**, 22; 1983, **687**, 21; 1984, **700**, 15; WHO/BS 372, 411, 411 Add. 1, 490, 507, 507 Corr. 1, 602, 653, 705, 794, 844, Rev. 1, 894, 894 Corr. 1, 936, 945, 971, 971 Corr. 1, 1040, 1201, 1332, 1386, 1422
1st Reference Preparation 1962	*Bull. World Health Organ.*, 1947/48, **1**, 12; 1963, **29**, 299, 745; WHO Technical Report Series, 1950, **2**, 5; 1951, **36**, 4; 1957, **127**, 7; 1958, **147**, 13; 1960, **187**, 14; 1961, **222**, 16; 1963, **259**, 17; WHO/BS 14, 73, 105, 371, 381, 383, 417, 442, 461, 467, 500, 536, 536 Add. 1, 546

[1] No units were assigned to these preparations.

Antigens I (contd)

Held and distributed by
International Laboratory for Biological Standards, Statens Seruminstitut, Copenhagen

Preparation	IU per ampoule	Form in which available
Tetanus toxoid, adsorbed	340	Ampoules containing 27.5 mg of a dried mixture of tetanus toxoid (90 Lf/ampoule) adsorbed to aluminium hydroxide (1 mg Al^{3+}/ampoule) and 22.5 mg of haemacel
Tetanus toxoid, plain	833	Ampoules containing 25 mg of alcohol-purified tetanus toxoid plain plus glycine
Tuberculin, old	—	Ampoules containing 2 ml of old tuberculin (90 000 IU per ml) derived from cultures of *Mycobacterium tuberculosis*
Tuberculin, purified protein derivative (PPD), avian	500 000	Ampoules containing 10 mg of PPD derived from cultures of *Mycobacterium avium*
Tuberculin, purified protein derivative (PPD), mammalian	5000	Ampoules containing 10 mg of PPD derived from cultures of *Mycobacterium tuberculosis*
Typhoid vaccine (acetone-inactivated)	—	Ampoules containing 11 mg of dried vaccine (*S. typhi*)

Years of establishment (in brackets, weight of previous standard containing one IU)	References (WHO/BS refers to unpublished working documents of the WHO Expert Committee on Biological Standardization)
1st Standard 1965 *2nd Standard* 1981	*Bull. World Health Organ.*, 1972, **46**, 53, 263; WHO Technical Report Series, 1952, **56**, 6; 1954, **86**, 12; 1959, **172**, 14; 1960, **187**, 15; 1961, **222**, 16; 1963, **259**, 18; 1964, **293**, 17; 1966, **329**, 16; 1967, **361**, 18; 1977, **610**, 17; 1978, **626**, 15; 1982, **673**, 21; 1984, **700**, 15; WHO/BS 452, 468, 469, 510, 586, 639, 788, 839, 1137, 1278, 1311, 1395
1st Standard 1951	*Bull. World Health Organ.*, 1947/48, **1**, 11; 1953, **9**, 837, 843; 1955, **12**, 761; WHO Technical Report Series, 1951, **36**, 5; 1952, **56**, 5; 1954, **86**, 12; WHO/BS 25, 37, 48, 68, 83, 92, 125, 125 Add. 1 and 2, 192, 194, 214, 382
1st Standard 1931 (0.0100 μl) 2nd Standard 1935 (0.0100 μl) *3rd Standard* 1965	WHO Official Records, 1948, **11**, 10; *Bull. World Health Organ.*, 1947/48, **1**, 11; 1952, **7**, 171; 1954, **10**, 989; 1955, **12**, 179; *Bull. Health Organ. L.o.N.*, 1935, **4**, 475, 514; WHO Technical Report Series, 1961, **222**, 14; 1963, **259**, 16; 1964, **274**, 16; 1964, **293**, 16; 1966, **329**, 14; 1967, **361**, 16; 1968, **384**, 13; 1970, **444**, 13; WHO/BS 3, 16, 28, 64, 120, 581, 591, 597, 617, 696, 776, 779, 867, 968
1st Standard 1954	WHO Technical Report Series, 1952, **56**, 7; 1953, **68**, 6; 1954, **86**, 12; 1955, **96**, 11; 1960, **187**, 14; 1961, **222**, 15; 1963, **259**, 16; WHO/BS 126, 181, 227, 293, 293 Add. 1 and 2, 504, 504 Add. 1, 576
1st Standard 1951	*Bull. World Health Organ.*, 1947/48, **1**, 11; 1952, **7**, 171; 1954, **10**, 989; 1955, **12**, 179; 1958, **19**, 759; WHO Technical Report Series, 1950, **2**, 7; 1951, **36**, 13; 1952, **56**, 6; 1953, **68**, 5; 1960, **187**, 13; 1961, **222**, 14; 1964, **293**, 16; 1967, **361**, 17; 1968, **384**, 13; 1982, **673**, 22; 1983, **687**, 22; 1984, **700**, 16; WHO/BS 3, 16, 28, 59, 64, 106, 120, 127, 173, 181, 488, 525, 581, 591, 597, 1306, 1353, 1408
1st Reference Preparation 1962	*Bull. World Health Organ.*,1964, **31**, 761; 1967, **37**, 575; WHO Technical Report Series, 1954, **86**, 13; 1955, **96**, 12; 1957, **127**, 6; 1958, **147**, 11; 1960, **187**, 15; 1961, **222**, 17; 1963, **259**, 17; 1964, **274**, 17; 1966, **329**, 15; 1967, **361**, 18; 1969, **413**, 19; 1972, **486**, 15; WHO/BS 182, 217, 291, 301, 340, 378, 409, 441, 505, 515, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 578, 620, 709, 740, 744, 775, 838, 861, 872, 906

Antigens I (contd)

Held and distributed by
International Laboratory for Biological Standards, Statens Seruminstitut, Copenhagen

Preparation	IU per ampoule	Form in which available
Typhoid vaccine (heat-phenol-inactivated)	—	Ampoules containing 34 mg of freeze-dried vaccine (*S. typhi*)

Antigens II

Held and distributed by
International Laboratory for Biological Standards, Central Veterinary Laboratory, Weybridge

Preparation	IU per ampoule	Form in which available
Anthrax spore vaccine	1.0	Ampoules containing a freeze-dried spore suspension of *Bacillus anthracis* strain 34 F2 (approximately 10^8 culturable spores per ampoule)
Clostridium novyi[1] alpha toxoid	—	Ampoules containing 53.4 mg of freeze-dried toxoid
Clostridium perfringens beta toxoid[2]	—	Ampoules of freeze-dried toxoid
Clostridium perfringens epsilon toxoid[2]	—	Ampoules of freeze-dried toxoid
Newcastle disease vaccine (inactivated)	525	Ampoules containing 525 mg of freeze-dried vaccine derived from formaldehyde-treated allantoic fluid of eggs infected with strains of Newcastle disease virus, adsorbed on aluminium hydroxide

[1] See footnote, p. 26
[2] Valid equivalents for *Clostridium welchii* (*perfringens*) types B and D toxoids which the International Committee on Systematic Bacteriology has declared invalid (*Int. J. System. Bacteriol.*, 1980, **30**, 225).

Years of establishment (in brackets, weight of previous standard containing one IU)	References (WHO/BS refers to unpublished working documents of the WHO Expert Committee on Biological Standardization)
1st Reference Preparation 1962	*Bull. World Health Organ.*, 1964, **31**, 761; 1967, **37**, 575; WHO Technical Report Series, 1954, **86**, 13; 1955, **96**, 12; 1956, **108**, 12; 1957, **127**, 6; 1958, **147**, 11; 1960, **187**, 15; 1961, **222**, 17; 1963, **259**, 17; 1966, **329**, 15; 1969, **413**, 19; WHO/BS 182, 217, 291, 301, 340, 378, 409, 441, 505, 515, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 578, 620, 709, 740, 744, 775, 838, 861, 872, 906

Years of establishment (in brackets, weight of previous standard containing one IU)	References (WHO/BS refers to unpublished working documents of the WHO Expert Committee on Biological Standardization)
1st Reference Preparation 1978	WHO Technical Report Series, 1967, **361**, 16; 1968, **384**, 16; 1969, **413**, 18; 1979, **638**, 16; WHO/BS 916, 978 Rev. 1, 1198
1st Reference Preparation 1966	WHO Technical Report Series, 1960, **187**, 21; 1961, **222**, 12; 1963, **259**, 19; 1964, **274**, 17; 1964, **293**, 17; 1966, **329**, 16; 1967, **361**, 19; 1970, **444**, 16; 1971, **463**, 16; WHO/BS 487, 569, 625, 691, 800, 819, 1022
1st Reference Preparation 1975	WHO Technical Report Series, 1964, **274**, 18; 1971, **463**, 17; 1972, **486**, 13; 1976, **594**, 14; 1979, **638**, 15; WHO/BS 641, 1007, 1044, 1122, 1197, 1296
1st Reference Preparation 1975	WHO Technical Report Series, 1964, **274**, 18; 1971, **463**, 17; 1972, **486**, 13; 1976, **594**, 14; 1979, **638**, 15; WHO/BS 641, 1007, 1044, 1122, 1197, 1296
1st Standard 1963	WHO Technical Report Series, 1960, **187**, 20; 1961, **222**, 13; 1963, **259**, 14; 1964, **274**, 15; WHO/BS 528, 528 Add. 1, 571, 571 Add. 1, 626, 671, 873

Antigens II (contd)

Held and distributed by
International Laboratory for Biological Standards, Central Veterinary Laboratory, Weybridge

Preparation	IU per ampoule	Form in which available
Newcastle disease vaccine (live)	—	Ampoules containing 109.5 mg of freeze-dried allantoic fluid derived from eggs infected with the virus (Hitchner B_1 strain)
Swine erysipelas vaccine	1000	Ampoules containing 499 mg of dried vaccine derived from formaldehyde-treated *Erysipelothrix rhusiopathiae* type B, adsorbed on aluminium hydroxide
Tuberculin, purified protein derivative (PPD), bovine	58 500	Ampoules containing approximately 1.8 mg of PPD derived from cultures of *Mycobacterium bovis*

Antigens III

Held and distributed by
International Laboratory for Biological Standards, National Institute for Biological Standards and Control, Potters Bar

Preparation	IU per ampoule	Form in which available
Hepatitis B surface antigen *ad* subtype	100	Ampoules containing the lyophilized residue of a dilution in PBS, BSA and Na azide of HBsAg positive serum

Years of establishment (in brackets, weight of previous standard containing one IU)	References (WHO/BS refers to unpublished working documents of the WHO Expert Committee on Biological Standardization)
1st Reference Preparation 1967	*Bull. World Health Organ.*,1968, **39**, 465; WHO Technical Report Series, 1960, **187**, 20; 1961, **222**, 13; 1964, **274**, 15; 1966, **329**, 16; 1968, **384**, 14; 1969, **413**, 20; 1981, **658**, 17; WHO/BS 528, 528 Add. 1, 730, 746, 860, 873, 882, 942, 1247, 1248
1st Standard 1959	WHO Technical Report Series, 1956, **108**, 12; 1957, **127**, 7; 1958, **147**, 13; 1959, **172**, 13; 1960, **187**, 20; 1961, **222**, 16; WHO/BS 344, 377, 435, 436, 486, 486 Add. 1, 512, 512 Corr. 1, 672
1st Standard 1986	WHO Technical Report Series, 1983, **687**, 22; 1987, **760**, 20; WHO/BS 1373, 1518, 1518 Add. 1

Years of establishment (in brackets, weight of previous standard containing one IU)	References (WHO/BS refers to unpublished working documents of the WHO Expert Committee on Biological Standardization)
1st Standard 1985	WHO Technical Report Series, 1987, **745**, 18; WHO/BS 1476 Rev. 1

Blood products and related substances I

Held and distributed by
International Laboratory for Biological Standards, Statens Seruminstitut, Copenhagen

Preparation	IU per ampoule	Form in which available
Alphafetoprotein, human	100 000	Ampoules containing 139.91 mg of freeze-dried cord serum
Pregnancy-specific β_1 glycoprotein	0.075	Ampoules containing 45.16 mg of freeze-dried purified serum from pregnant women
β_2 Microglobulin	100	Ampoules containing the lyophilized residue of 1 ml of a pool of normal human serum

Blood products and related substances II

Held and distributed by
International Laboratory for Biological Standards, National Institute for Biological Standards and Control, Potters Bar

Preparation	IU per ampoule	Form in which available
Ancrod	55	Ampoules containing 16.90 mg of purified ancrod in lactose and human serum albumin
Anti-D immunoglobulin, human	300	Ampoules containing 14.76 mg of human immunoglobulin (60 μg of anti-D immunoglobulin)
Antithrombin III, plasma	0.9	Ampoules containing the freeze-dried residue of 1 ml of human plasma
Blood coagulation factors II, IX, X, concentrate, human	10.8 II 10.7 IX 9.8 X	Ampoules containing freeze-dried plasma concentrate
Blood coagulation factor VIII:C, concentrate, human	6.3	Intermediate purity concentrate
Blood coagulation factors II, VII, IX, X, plasma, human	0.83 II 0.91 VII 0.80 IX 0.81 X	Ampoules containing freeze-dried plasma

Years of establishment (in brackets, weight of previous standard containing one IU)	References (WHO/BS refers to unpublished working documents of the WHO Expert Committee on Biological Standardization)
1st Standard 1975	WHO Technical Report Series, 1976, **594**, 14; WHO/BS 1121
1st Reference Preparation 1982	WHO Technical Report Series, 1983, **687**, 26; WHO/BS 1346
1st Standard 1985	WHO Technical Report Series, 1985, **725**, 19; 1987, **745**, 21; WHO/BS 1501

Years of establishment (in brackets, weight of previous standard containing one IU)	References (WHO/BS refers to unpublished working documents of the WHO Expert Committee on Biological Standardization)
1st Reference Preparation 1976	WHO Technical Report Series, 1977, **610**, 15, 35; WHO/BS 1130
1st Reference Preparation 1976	WHO Technical Report Series, 1972, **486**, 16; 1976, **594**, 17; 1977, **610**, 11, 29; 1979, **638**, 20; WHO/BS 1053, 1111, 1186, 1236; BLG/BLOOD/76.8
1st Reference Preparation 1978	WHO Technical Report Series, 1977, **610**, 32; 1978, **626**, 17; 1979, **638**, 21; WHO/BS 1151, 1185
1st Standard 1987	WHO Technical Report Series, 1987, **760**, 21; 1988, **771**, 23; WHO/BS 1532, 1563
1st Standard 1970 2nd Standard 1976 (12.745 mg) 3rd Standard 1982 *4th Standard* 1989	*Bull. World Health Organ.*,1971, **45**, 337; WHO Technical Report Series, 1966, **329**, 11; 1967, **361**, 13; 1969, **413**, 18; 1971, **463**, 14; 1977, **610**, 12, 30; 1978, **626**, 17; 1981, **658**, 19; 1982, **673**, 25; 1983, **687**, 24; 1990, **800**, 19; WHO/BS 865, 934, 999, 1130, 1150, 1267, 1341, 1359, 1621
1st Standard 1986	WHO Technical Report Series, 1987, **745**, 20; 1987, **760**, 21; WHO/BS 1532

Blood products and related substances II (contd)

Held and distributed by
International Laboratory for Biological Standards, National Institute for Biological Standards and Control, Potters Bar

Preparation	IU per ampoule	Form in which available
Blood coagulation factor VIII and von Willebrand factor, plasma	0.60 (VIII clotting activity) 0.91 (VIII antigen) 0.91 (von Willebrand antigen) 0.84 (von Willebrand ristocetin cofactor activity)	Ampoules containing freeze-dried plasma
Heparin, low molecular weight	1680	Ampoules containing lyophilized low molecular weight heparin
Heparin, porcine	1780	Ampoules containing freeze-dried heparin from porcine intestinal mucosa
Human serum immunoglobulin E (IgE)	5000	Ampoules containing approximately 75 mg of the freeze-dried residue from citrated human plasma
Human serum immunoglobulins G, A, and M (IgG, IgA, and IgM)	100 (of each)	Ampoules containing approximately 81 mg of the freeze-dried residue from diluted pooled human serum (100 IU IgG, 100 IU IgA, and 100 IU IgM per ampoule)
Liver ferritin, human	—	Ampoules containing 9.7 μg of liver ferritin
Plasmin, human (INN = fibrinolysin)	10	Ampoules containing approximately 1.0 ml of a solution of partially purified plasmin in 50% glycerol
Platelet factor 4 (PF 4)	400	Ampoules containing the lyophilized residue of 1 ml of a solution of purified PF 4 dissolved in 0.6 mol/litre sodium chloride and 10 mmol/litre Tris containing 2.0 mg/ml of BSA

Years of establishment (in brackets, weight of previous standard containing one IU)	References (WHO/BS refers to unpublished working documents of the WHO Expert Committee on Biological Standardization)
1st Reference Preparation 1982 *2nd Standard* 1988	WHO Technical Report Series, 1983, **687**, 23; 1989, **786**, 20; WHO/BS 1349, 1598
1st Standard 1986	WHO Technical Report Series, 1987, **745**, 20; 1987, **760**, 22; 1990, **800**, 19; WHO/BS 1541
1st Standard 1942 (0.0077 mg) 2nd Standard 1958 (0.0077 mg) 3rd Standard 1973 (0.0058 mg) *4th Standard* 1983	*Bull. World Health Organ.*,1947/48, **1**, 9; 1959, **20**, 1201; 1970, **42**, 129; *Bull. Health Organ. L.o.N.*, 1942/43, **10**, 144, 151; 1945/46, **12**, 46; WHO Technical Report Series, 1956, **108**, 18; 1957, **127**, 17; 1958, **147**, 10; 1959, **172**, 11; 1964, **274**, 13; 1964, **293**, 13; 1966, **329**, 10; 1967, **361**, 13; 1969, **413**, 17; 1973, **530**, 7; 1984, **700**, 18; 1987, **745**, 20; WHO/BS 314, 353, 390, 424, 655, 733, 795, 823, 928, 1065, 1065 Corr. 1, 1421
1st Reference Preparation 1973 *2nd Reference Preparation* 1980	*Bull. World Health Organ.*, 1970, **43**, 609; 1973, **49**, 320; WHO Technical Report Series, 1971, **463**, 21; 1973, **530**, 10; 1981, **658**, 21; WHO/BS 1019, 1240
1st Reference Preparation 1971	*Bull. World Health Organ.*, 1968, **39**, 992; 1970, **42**, 535; 1972, **46**, 67; WHO Technical Report Series, 1969, **413**, 23; 1971, **463**, 20; WHO/BS 1019
1st Standard 1984	WHO Technical Report Series, 1985, **725**, 25; WHO/BS 1457
1st Reference Preparation 1976 (0.125 ml) *2nd Reference Preparation* 1982	WHO Technical Report Series, 1977, **610**, 13, 34; 1981, **658**, 19; 1982, **673**, 24; 1983, **687**, 23; WHO/BS 1130, 1258, 1340, 1378
1st Standard 1984	WHO Technical Report Series, 1985, **725**, 18; WHO/BS 1455

Blood products and related substances II (contd)

Held and distributed by
International Laboratory for Biological Standards, National Institute for Biological Standards and Control, Potters Bar

Preparation	IU per ampoule	Form in which available
Prekallikrein activator	85	Ampoules containing the lyophilized residue of 1 ml of an unspecified concentration of prekallikrein activator in HSA
Protein C, human	0.82	Ampoules containing lyophilized plasma
Streptodornase	2400	Ampoules containing approximately 1 mg of extract of streptodornase and streptokinase with 5 mg of lactose, freeze-dried
Streptokinase	700	Ampoules containing lyophilized streptokinase
Thrombin, human	100	Ampoules containing approximately 3.5 mg of partially purified, freeze-dried human thrombin and 5 mg of sucrose
β-Thromboglobulin (β-TG)	500	Ampoules containing the lyophilized residue of 1 ml of purified β-TG dissolved in 0.05 mol/litre phosphate buffer containing 2 mg/ml of BSA
Tissue plasminogen activator (t-PA), human	850	Ampoules containing the lyophilized residue of a solution of a highly purified t-PA derived from a human melanoma cell culture
Urokinase, human	4800	Ampoules containing approximately 1.4 mg of partially purified, freeze-dried, urokinase from human urine, with 5 mg of lactose
Urokinase, high molecular weight	4300	Ampoules containing lyophilized urokinase (high molecular weight)

Years of establishment (in brackets, weight of previous standard containing one IU)	References (WHO/BS refers to unpublished working documents of the WHO Expert Committee on Biological Standardization)
1st Standard 1984	WHO Technical Report Series, 1985, **725**, 18; WHO/BS 1454
1st Standard 1987	WHO Technical Report Series, 1988, **771**, 23; WHO/BS 1561
1st Standard 1964	*Bull. World Health Organ.*, 1965, **33**, 235; WHO Technical Report Series, 1960, **187**, 11; 1961, **222**, 11; 1963, **259**, 13; 1964, **274**, 14; 1964, **293**, 14; 1966, **329**, 11; WHO/BS 479, 599, 634, 716, 796
2nd Standard 1989	WHO Technical Report Series, 1990, **800**, 18; WHO/BS 1623
1st Standard 1975	WHO Technical Report Series, 1951, **36**, 11; 1952, **56**, 13; 1953, **68**, 15; 1973, **530**, 8; 1976, **594**, 12; WHO/BS 161, 1069, 1096
1st Standard 1984	WHO Technical Report Series, 1985, **725**, 18; WHO/BS 1455
1st Standard 1984 *2nd Standard* 1987	WHO Technical Report Series, 1985, **725**, 19; 1988, **771**, 24; WHO/BS 1456, 1562
1st Reference Preparation 1968	WHO Technical Report Series, 1964, **293**, 14; 1966, **329**, 11; 1967, **361**, 13; 1969, **413**, 18; WHO/BS 637, 734, 797, 815, 865, 927
1st Standard 1989	WHO Technical Report Series, 1990, **800**, 18; WHO/BS 1622

Blood products and related substances III

Held and distributed by
International Laboratory for Biological Standards, Central Laboratory, Netherlands Red Cross Blood Transfusion Service, Amsterdam

Preparation	IU per ampoule	Form in which available
Anti-A blood-typing serum, human	470	Ampoules containing approximately 99.9 mg of dried material derived from 1 ml of human serum
Anti-B blood-typing serum, human	860	Ampoules containing approximately 83.0 mg of dried material derived from 1 ml of human serum
Anti-A,B blood-typing serum, human	400 anti-A 240 anti-B	Ampoules containing approximately 93.3 mg of dried material derived from 1 ml of human serum
Anti-C complete blood-typing serum, human	100	Ampoules containing 66.3 mg of the lyophilized residue of a pool of sera to which Na_2 EDTA, NaN_3 and potentiating medium had been added
Anti-c incomplete blood-typing serum, human	64	Ampoules containing 39.0 mg of freeze-dried human anti-c blood-typing serum diluted in AB serum
Anti-double-stranded DNA serum	100	Ampoules containing the lyophilized residue of 1 ml of serum from a patient with systemic lupus erythematosus
Anti-E complete blood-typing serum, human	100	Ampoules containing 66.9 mg of the lyophilized residue of a pool of sera to which Na_2 EDTA and NaN_3 had been added
Anti-Rh_0 (anti-D) incomplete blood-typing serum, human	32	Ampoules containing approximately 30 mg of dried material derived from 0.5 ml of pooled human serum

Years of establishment (in brackets, weight of previous standard containing one IU)	References (WHO/BS refers to unpublished working documents of the WHO Expert Committee on Biological Standardization)
1st Standard 1950 *2nd Standard* 1981	*Bull. World Health Organ.*, 1947/48, **1**, 13; 1949, **2**, 215; 1950, **3**, 301; WHO Technical Report Series, 1950, **2**, 12; 1951, **36**, 10; 1967, **361**, 23; 1968, **384**, 17; 1981, **658**, 20; 1982, **673**, 25; WHO/BS 42, 49, 74, 804, 883, 1130, 1285, 1309
1st Standard 1950 2nd Standard 1980 *3rd Standard* 1981	*Bull. World Health Organ.*, 1947/48, **1**, 13; 1949, **2**, 215; 1950, **3**, 301; WHO Technical Report Series, 1950, **2**, 12; 1951, **36**, 10; 1977, **610**, 10; 1978, **626**, 17; 1979, **638**, 21; 1981, **658**, 19; 1982, **673**, 25; WHO/BS 42, 49, 74, 895, 1130, 1309
1st Standard 1981	WHO Technical Report Series, 1977, **610**, 10; 1978, **626**, 17; 1979, **638**, 21; 1981, **658**, 20; 1982, **673**, 25; WHO/BS 1175, 1204, 1309
1st Standard 1984	WHO Technical Report Series, 1985, **725**, 16; WHO/BS 1424
1st Standard 1976	WHO Technical Report Series, 1967, **361**, 23; 1972, **486**, 16; 1977, **610**, 11, 26; WHO/BS 830, 1038
1st Standard 1985	WHO Technical Report Series, 1987, **745**, 18; WHO/BS 1491
1st Standard 1984	WHO Technical Report Series, 1985, **725**, 16; WHO/BS 1424
1st Standard 1966	*Bull. World Health Organ.*, 1947/48, **1**, 13; 1949, **2**, 15; 1967, **36**, 435; WHO Technical Report Series, 1950, **2**, 12; 1951, **36**, 10; 1953, **68**, 11; 1954, **86**, 6; 1955, **96**, 5; 1956, **108**, 6; 1957, **127**, 10; 1958, **147**, 15; 1960, **187**, 18; 1964, **293**, 21; 1966, **329**, 20; 1967, **361**, 22; 1969, **413**, 22; WHO/BS 46, 165, 213, 328, 366, 407, 453 Rev. 1, 453 Rev. 1 Add. 1, 726, 783, 810, 810 Corr. 1

Blood products and related substances III (contd)

Held and distributed by
International Laboratory for Biological Standards, Central Laboratory, Netherlands Red Cross Blood Transfusion Service, Amsterdam

Preparation	IU per ampoule	Form in which available
Anti-nuclear-factor serum (homogeneous),[1] human	100	Ampoules containing approximately 19 mg of the freeze-dried residue of 0.2 ml of pooled human serum (18.6 mg ± 5.8%)
Hepatitis A immunoglobulin	100	Ampoules containing anti-hepatitis A immunoglobulin (fractionated plasma, freeze-dried)
Hepatitis B immunoglobulin	50	Ampoules containing anti-hepatitis B immunoglobulin (fractionated plasma, freeze-dried)
FITC-conjugated sheep anti-human Ig	100	Ampoules containing 5.94 mg of sheep anti-human Ig, freeze-dried
FITC-conjugated sheep anti-human IgM	100	Ampoules containing 4.47 mg of freeze-dried sheep anti-human IgM
FITC-conjugated sheep anti-human IgG (anti-γ chain)	100	Ampoules containing 9.23 mg of freeze-dried sheep anti-human IgG, anti-γ chain
Horseradish peroxidase-conjugated sheep anti-human IgG (H and L chains)	—	Ampoules containing 0.26 mg of sheep anti-human IgG plus about 31 mg of a mixture of other proteins and lactose
Human serum complement components C1q, C4, C5, factor B, and whole functional complement CH50	100 (of each)	Ampoules containing 110.7 mg of freeze-dried residue of 1.3 ml of human serum
Human serum proteins, for immunoassay: albumin; alpha-1-antitrypsin; alpha-2-macroglobulin; ceruloplasmin; complement C3; transferrin	100 (of each)	Ampoules containing 111.4 mg of dried material derived from 1.3 ml of human serum
Rheumatoid arthritis serum, human	100	Ampoules containing 17.1 mg of freeze-dried pooled human serum

[1] Serum from the same batch of material as this international reference preparation is available from the National Institute for Biological Standards and Control, Potters Bar.

Years of establishment (in brackets, weight of previous standard containing one IU)	References (WHO/BS refers to unpublished working documents of the WHO Expert Committee on Biological Standardization)
1st Reference Preparation 1970	WHO Technical Report Series, 1969, **413**, 22; 1971, **463**, 21; WHO/BS 868, 949, 1005
1st Reference Preparation 1981	WHO Technical Report Series, 1978, **626**, 18; 1979, **638**, 22; 1981, **658**, 21; 1982, **673**, 21; WHO/BS 1215, 1252, 1339
1st Reference Preparation 1977	WHO Technical Report Series, 1977, **610**, 12, 38; 1978, **626**, 18; WHO/BS 1164
1st Standard 1976	WHO Technical Report Series, 1977, **610**, 15; WHO/BS 1127
1st Standard 1977	WHO Technical Report Series, 1978, **626**, 19; WHO/BS 1143
1st Standard 1981	WHO Technical Report Series, 1982, **673**, 26; WHO/BS 1297
1st Reference Preparation 1982	WHO Technical Report Series, 1983, **687**, 25
1st Reference Preparation 1980 *and* 1982	WHO Technical Report Series, 1981, **658**, 21; 1983, **687**, 26; WHO/BS 1281
1st Reference Preparation 1977	WHO Technical Report Series, 1978, **626**, 19; WHO/BS 1155
1st Reference Preparation 1970	*Bull. World Health Organ.*, 1970, **42**, 311; WHO Technical Report Series, 1963, **259**, 24; 1964, **274**, 21; 1964, **293**, 20; 1966, **329**, 20; 1969, **413**, 22; 1970, **444**, 19; 1971, **463**, 18; WHO/BS 574, 654, 658, 694, 713, 770, 938, 1067

Blood products and related substances III (contd)

Held and distributed by
International Laboratory for Biological Standards, Central Laboratory, Netherlands Red Cross Blood Transfusion Service, Amsterdam

Preparation	IU per ampoule	Form in which available
Thromboplastin, bovine, combined	—	Ampoules containing freeze-dried bovine brain thromboplastin (international sensitivity index, 1.0)
Thromboplastin, human, plain	—	Ampoules containing freeze-dried human brain thromboplastin (international sensitivity index, 1.1)
Thromboplastin, rabbit, plain	—	Ampoules containing freeze-dried rabbit brain suspension (international sensitivity index, 1.4)
Varicella zoster immunoglobulin	50	Ampoules containing lyophilized residue of a solution of varicella zoster immunoglobulin

Blood products and related substances IV

Held and distributed by
Rijksinstituut voor Volksgezondheid en Milieuhygiene, Bilthoven

Preparation	IU per ampoule	Form in which available
Haemiglobincyanide reference preparation	—	Ampoules containing 10 ml of haemiglobincyanide solution

Years of establishment (in brackets, weight of previous standard containing one IU)	References (WHO/BS refers to unpublished working documents of the WHO Expert Committee on Biological Standardization)
1st Reference Preparation 1978 *2nd Reference Preparation* 1983	WHO Technical Report Series, 1977, **610**, 14; 1979, **638**, 23; 1983, **687**, 25; 1984, **700**, 18; WHO/BS 1130, 1210, 1379, 1393
1st Reference Preparation 1976 *2nd Reference Preparation* 1983	WHO Technical Report Series, 1977, **610**, 14; 1979, **638**, 23; 1983, **687**, 25; 1984, **700**, 19; WHO/BS 1130, 1379, 1419
1st Reference Preparation 1978 *2nd Reference Preparation* 1982	WHO Technical Report Series, 1977, **610**, 14; 1979, **638**, 23; 1983, **687**, 25; WHO/BS 1130, 1210, 1348
1st Standard 1987	WHO Technical Report Series, 1985, **725**, 17; 1988, **771**, 19; WHO/BS 1565

Years of establishment (in brackets, weight of previous standard containing one IU)	References (WHO/BS refers to unpublished working documents of the WHO Expert Committee on Biological Standardization)
1st Reference Preparation 1967 2nd Reference Preparation 1980 3rd Reference Preparation 1981 4th Reference Preparation 1983 *5th Standard* 1985	WHO Technical Report Series, 1966, **329**, 12; 1968, **384**, 12; 1981, **658**, 22; 1982, **673**, 24; 1987, **745**, 27; WHO/BS 789, 900, 1026, 1243, 1243 Add. 1, 1298

Cytokines I

Held and distributed by
International Laboratory for Biological Standards, National Institute for Biological Standards and Control, Potters Bar

Preparation	IU per ampoule	Form in which available
Interferon, chick	80	Ampoules containing an unspecified amount of freeze-dried chick interferon
Interferon, human, recombinant, alpha-1 (alpha-D) (rHuIFN-$\alpha_1(\alpha D)$) (INN = interferon alfa-1)	8000	Ampoules containing an unspecified amount of freeze-dried rHuIFN-$\alpha_1(\alpha D)$
Interferon, human, recombinant, alpha-2 (alpha-2b) (rHuIFN-$\alpha_2(\alpha_{2b})$) (INN = interferon alfa-2)	17 000	Ampoules containing an unspecified amount of freeze-dried rHuIFN-$\alpha_2(\alpha_{2b})$
Interleukin-1, alpha ($IL_1\alpha$)	117 000	Ampoules containing 1.17 μg of freeze-dried $IL_1\alpha$, 3 mg of trehalose and 0.5 mg of HSA
Interleukin-1, beta ($IL_1\beta$)	100 000	Ampoules containing 1.0 μg of freeze-dried $IL_1\beta$, 3 mg of trehalose and 0.5 mg of HSA
Interleukin-2, human (IL_2)	100	Ampoules containing an unspecified amount of freeze-dried IL_2, 5 mg of HSA and 2.5 mg of trehalose

Cytokines II

Held and distributed by
Anti-Viral Research Branch, National Institute of Allergy and Infectious Diseases, National Institutes of Health, Bethesda

Preparation	IU per ampoule	Form in which available
Interferon, human (HuIFN-γ) (INN = interferon gamma)	4000	Ampoules containing the lyophilized residue of 1 ml of a solution of purified HuIFN-γ, induced in human leukocytes by staphylococcal enterotoxin A, in a 0.1 mol/litre potassium phosphate, pH7, and 30 mg/ml HSA diluent
Interferon, human, fibroblast, beta (HuIFN-β) (INN = interferon beta)	15 000	Ampoules of freeze-dried HuIFN-β

Years of establishment (in brackets, weight of previous standard containing one IU)	References (WHO/BS refers to unpublished working documents of the WHO Expert Committee on Biological Standardization)
1st Reference Preparation 1978	WHO Technical Report Series, 1967, **361**, 25; 1969, **413**, 23; 1979, **638**, 31; WHO/BS 817, 1190, 1225
1st Standard 1987	WHO Technical Report Series, 1988, **771**, 30; WHO/BS 1552
1st Standard 1987	WHO Technical Report Series, 1988, **771**, 30; WHO/BS 1552
1st Standard 1989	WHO Technical Report Series, 1987, **745**, 26; 1989, **786**, 25; 1990, **800**, 22
1st Standard 1989	WHO Technical Report Series, 1987, **745**, 26; 1989, **786**, 25; 1990, **800**, 23
1st Standard 1987	WHO Technical Report Series, 1988, **771**, 28; WHO/BS 1559

Years of establishment (in brackets, weight of previous standard containing one IU)	References (WHO/BS refers to unpublished working documents of the WHO Expert Committee on Biological Standardization)
1st Standard 1984	WHO Technical Report Series, 1983, **687**, 30; 1985, **725**, 24; WHO/BS 1383, 1432
1st Reference Preparation 1978 *2nd Standard* 1987	WHO Technical Report Series, 1967, **361**, 25; 1969, **413**, 23; 1979, **638**, 31; 1982, **676**; 1983, **687**, 30; 1988, **771**, 29; WHO/BS 817, 1190, 1225, 1383, 1552

Cytokines II (contd)

Held and distributed by
Anti-Viral Research Branch, National Institute of Allergy and Infectious Diseases, National Institutes of Health, Bethesda

Preparation	IU per ampoule	Form in which available
Interferon, human, leukocyte (HuIFN-α(Le)) (INN = interferon alfa)	12 000	Ampoules containing the lyophilized residue of 1 ml of a solution of purified HuIFN-α(Le) prepared from human leukocytes infected with Sendai virus in a 0.1 mol/litre sodium phosphate, pH7, and 5 mg/ml HSA diluent
Interferon, human, lymphoblastoid (Namalwa) (HuIFN-α(Ly)) (INN = interferon alfa)	25 000	Ampoules containing the lyophilized residue of 1 ml of a solution of 13.5 mg of purified HuIFN-α(Ly) from Namalwa cells infected with Sendai virus, in a 0.1 mol/litre sodium phosphate, pH7, and 5 mg/ml HSA diluent
Interferon, human, rDNA (HuIFN-α_2(αA)) (INN = interferon alfa-2a)	9000	Ampoules containing the lyophilized residue of 1 ml of purified HuIFN-α_2(αA) prepared from rDNA *Escherichia coli*, in a 9 mg/ml sodium chloride and pH6.9, 5 mg/ml HSA, diluent
Interferon, human, recombinant, beta ser-17 (rHuIFN-$\beta_{ser\ 17}$) (INN = interferon beta-1a)	6000	Ampoules containing the lyophilized residue of rHuIFN-$\beta_{ser\ 17}$ prepared from rDNA *Escherichia coli*
Interferon, murine, alpha (MuIFN-α) (INN = interferon alfa, murine)	16 000	Ampoules of freeze-dried MuIFN-α
Interferon, murine, beta (MuIFN-β) (INN = interferon beta, murine)	15 000	Ampoules of freeze-dried MuIFN-β
Interferon, murine, gamma (MuIFN-γ) (INN = interferon gamma, murine)	1000	Ampoules of freeze-dried MuIFN-γ
Interferon, rabbit	10 000	Ampoules of freeze-dried rabbit interferon

Years of establishment (in brackets, weight of previous standard containing one IU)	References (WHO/BS refers to unpublished working documents of the WHO Expert Committee on Biological Standardization)
1st Reference Preparation 1978 *1st Working Standard* 1984	WHO Technical Report Series, 1967, **361**, 25; 1969, **413**, 23; 1979, **638**, 31; 1982, **676**; 1983, **687**, 30; 1985, **725**, 24; WHO/BS 817, 1190, 1225, 1383, 1432
1st Standard 1984	WHO Technical Report Series, 1983, **687**, 30; 1985, **725**, 24; WHO/BS 1383, 1432
1st Standard 1984	WHO Technical Report Series, 1983, **687**, 30; 1985, **725**, 24; WHO/BS 1383, 1432
1st Standard 1987	WHO Technical Report Series, 1988, **771**, 30; WHO/BS 1552
1st Standard 1987	WHO Technical Report Series, 1988, **771**, 31; WHO/BS 1552
1st Standard 1987	WHO Technical Report Series, 1988, **771**, 31; WHO/BS 1552
1st Standard 1987	WHO Technical Report Series, 1988, **771**, 31; WHO/BS 1552
1st Reference Preparation 1978	WHO Technical Report Series, 1967, **361**, 25; 1969, **413**, 23; 1979, **638**, 31; WHO/BS 817, 1190, 1225

Endocrinological and related substances I

Held and distributed by
International Laboratory for Biological Standards, National Institute for Biological Standards and Control, Potters Bar

Preparation	IU per ampoule	Form in which available
Arginine vasopressin, for bioassay (INN = argipressin)	8.2	Ampoules containing approximately 20 μg of freeze-dried synthetic arginine vasopressin peptide acetate with 5 mg of human albumin and citric acid
Atrial natriuretic factor, human	2.5	Ampoules containing 2.5 μg of lyophilized human atrial natriuretic factor
Calcitonin, eel	88	Ampoules containing lyophilized eel calcitonin, with mannitol and albumin
Calcitonin, human, for bioassay	1.0	Ampoules containing approximately 8.5 μg of freeze-dried synthetic human calcitonin peptide, with 5 mg of mannitol
Calcitonin, porcine, for bioassay	1.0	Ampoules containing approximately 10 μg of freeze-dried purified porcine calcitonin, with 5 mg of mannitol
Calcitonin, salmon	128	Ampoules containing approximately 20 μg of freeze-dried purified synthetic salmon calcitonin, with 2 mg of mannitol
Chorionic gonadotrophin, human	650	Ampoules containing approximately 70 μg of freeze-dried highly purified human chorionic gonadotrophin, with 5 mg of human albumin
Chorionic gonadotrophin, alpha subunit, human, for immunoassay (hCGα)	70	Ampoules containing approximately 70 μg of freeze-dried highly purified chorionic gonadotrophin, alpha subunit, with 5 mg of human albumin
Chorionic gonadotrophin, beta subunit, human, for immunoassay (hCGβ)	70	Ampoules containing approximately 70 μg of freeze-dried highly purified chorionic gonadotrophin, beta subunit, with 5 mg of human albumin

Years of establishment (in brackets, weight of previous standard containing one IU)	References (WHO/BS refers to unpublished working documents of the WHO Expert Committee on Biological Standardization)
1st Standard 1978	WHO Technical Report Series, 1975, **565**, 8; 1979, **638**, 23; WHO/BS 1077, 1229
1st Standard 1987	WHO Technical Report Series, 1987, **745**, 24; 1988, **771**, 28; WHO/BS 1578
1st Standard 1989	WHO Technical Report Series, 1989, **786**, 25; 1990, **800**, 22; WHO/BS 1620
1st Reference Preparation 1978	WHO Technical Report Series, 1975, **565**, 8; 1979, **638**, 28; WHO/BS 1077, 1229
1st Reference Preparation 1974	WHO Technical Report Series, 1967, **361**, 15; 1975, **565**, 8; WHO/BS 856, 896, 1077
1st Reference Preparation 1974 *2nd Standard* 1989	WHO Technical Report Series, 1967, **361**, 15; 1975, **565**, 8; 1985, **725**, 21; 1987, **760**, 23; 1989, **786**, 24; 1990, **800**, 21; WHO/BS 856, 896, 1077, 1528, 1620
1st Reference Preparation 1975 *3rd Standard* 1986	*Bull. World Health Organ.*, 1976, **54**, 463; WHO Technical Report Series, 1975, **565**, 11; 1979, **638**, 27; 1981, **658**, 23; 1982, **673**, 29; 1987, **760**, 23; WHO/BS 1081, 1094, 1191, 1235, 1331, 1519; *J. Endocrinol.*, 1980, **84**, 295
1st Reference Preparation 1975	*Bull. World Health Organ.*, 1976, **54**, 463; WHO Technical Report Series, 1975, **565**, 11; WHO/BS 1081, 1094; *J. Endocrinol.*, 1980, **84**, 295
1st Reference Preparation 1975	*Bull. World Health Organ.*, 1976, **54**, 463; WHO Technical Report Series, 1975, **565**, 11; 1982, **673**, 29; WHO/BS 1081, 1094, 1331; *J. Endocrinol.*, 1980, **84**, 295

Endocrinological and related substances I (contd)

Held and distributed by
International Laboratory for Biological Standards, National Institute for Biological Standards and Control, Potters Bar

Preparation	IU per ampoule	Form in which available
Corticotrophin (ACTH), porcine, for bioassay	5.0	Ampoules containing approximately 50 μg of freeze-dried corticotrophin from the anterior lobes of porcine pituitary glands, with 5 mg of lactose
Desmopressin	27	Ampoules containing approximately 27 μg of 1-(3-mercaptopropionic acid)-8-D-argininevasopressin,[1] with 5 mg of human albumin and citric acid
Elcatonin	15	Ampoules containing approximately 3 μg of lyophilized Asu$^{1-7}$ eel calcitonin analogue, with 0.25 mg of albumin and 2 mg of trehalose
Erythropoietin, human, urinary, for bioassay	10.0	Ampoules containing approximately 2 mg of freeze-dried extract of human urine, with 3 mg of sodium chloride
FSH, human, pituitary	80	Ampoules containing approximately 4.17 μg of lyophilized pituitary follicle stimulating hormone, with 5 mg of mannitol and 1 mg of HSA
FSH and LH, human, pituitary, for bioassay		Ampoules containing approximately 500 μg of freeze-dried extract of human pituitaries, with 1.25 mg of lactose
FSH activity	10.0	
LH activity	25.0	
FSH and LH, human, urinary		Ampoules containing approximately 1 mg of freeze-dried extract of urine from post-menopausal women, with 5 mg of lactose
FSH activity	54.0	
LH activity	46.0	

[1] Formerly known as 1-deamino-8-D-argininevasopressin.

Years of establishment (in brackets, weight of previous standard containing one IU)	References (WHO/BS refers to unpublished working documents of the WHO Expert Committee on Biological Standardization)
1st Standard 1950 (1.00 mg) 2nd Standard 1955 (0.88 mg) *3rd Standard* 1962	*Bull. World Health Organ.*, 1956, **14**, 543; 1962, **27**, 395; *Bull. Health Organ. L.o.N.*, 1938, **7**, 887; WHO Technical Report Series, 1950, **2**, 9; 1951, **36**, 7; 1952, **56**, 9; 1953, **68**, 13; 1954, **86**, 17; 1955, **96**, 13; 1956, **108**, 15; 1957, **127**, 16; 1958, **147**, 8; 1959, **172**, 8; 1960, **187**, 9; 1961, **222**, 9; 1963, **259**, 13; 1969, **413**, 15; 1981, **658**, 23; WHO/BS 85, 85 Corr. 1, 156, 158, 249, 262 Add. 1, 308, 356, 386, 387, 432, 473, 526, 548, 896; *J. Endocrinol.*, 1980, **85**, 533
1st Standard 1980	WHO Technical Report Series, 1978, **626**, 23; 1981, **658**, 26; WHO/BS 1232, 1266
1st Standard 1985	WHO Technical Report Series, 1987, **745**, 22; 1987, **760**, 24; WHO/BS 1494, 1529
1st Reference Preparation 1965 (1.45 mg) *2nd Reference Preparation* 1970	*Bull. World Health Organ.*, 1966, **35**, 751; 1972, **47**, 99; WHO Technical Report Series, 1964, **274**, 13; 1964, **293**, 13; 1966, **329**, 10; 1969, **413**, 16, 17; 1971, **463**, 14; WHO/BS 662, 712, 780, 933, 1015
1st Standard 1986	WHO Technical Report Series, 1985, **725**, 23; 1987, **760**, 24; WHO/BS 1535; *J. Endocrinol.*, 1989, **123**, 275
1st Reference Preparation 1974 *2nd Reference Preparation* 1980	*J. clin. Endocrinol. Metab.*, 1973, **36**, 647; WHO Technical Report Series, 1964, **274**, 12; 1964, **293**, 12; 1975, **565**, 12; 1979, **638**, 26; 1981, **658**, 24; 1984, **700**, 11; WHO/BS 632, 718, 1086, 1087, 1152, 1221, 1255, 1416
1st Standard 1974 for bioassay *2nd Standard* 1988	*Bull. World Health Organ.*, 1960, **22**, 563; *Acta endocrinol.*, 1976, **83**, 700; WHO Technical Report Series, 1958, **147**, 9; 1959, **172**, 9; 1960, **187**, 9; 1961, **222**, 9; 1963, **259**, 12; 1964, **274**, 11; 1964, **293**, 12; 1969, **413**, 15; 1971, **463**, 14; 1975, **565**, 6; 1989, **786**, 23; WHO/BS 392, 434, 474, 532, 533, 651, 723, 896, 1018, 1080, 1595

Endocrinological and related substances I (contd)

Held and distributed by
International Laboratory for Biological Standards, National Institute for Biological Standards and Control, Potters Bar

Preparation	IU per ampoule	Form in which available
Glucagon, porcine, for — bioassay	1.49	Ampoules containing approximately 1.5 mg of freeze-dried porcine glucagon, with 5 mg of lactose and sodium chloride
— immunoassay	1.49	Ampoules containing approximately 1.5 mg of freeze-dried porcine glucagon, with 5 mg of lactose and sodium choride
Gonadorelin (gonadotrophin-releasing hormone), for bioassay	31	Ampoules containing the freeze-dried residue of a solution containing approximately 50 μg of gonadorelin acetate, with 2.5 mg of lactose, and 0.5 mg of human plasma albumin
Gonadotrophin, equine serum, for bioassay	1600	Ampoules containing approximately 0.8 mg of freeze-dried extract from the serum of pregnant mares, with 5 mg of lactose
Growth hormone (INN = somatotropin)	4.4	Ampoules containing 1.75 mg of freeze-dried purified human growth hormone, 20 mg of glycine, 2 mg of mannitol, 2 mg of lactose, and 2 mg of sodium bicarbonate
Insulin, bovine	NA[1]	Ampoules containing hydrated bovine insulin crystals
Insulin, human	NA[1]	Ampoules containing hydrated human insulin crystals
Insulin, human, for immunoassay	3.0	Ampoules containing approximately 130 μg of freeze-dried crystallized human insulin, with 5 mg of sucrose
Insulin, porcine	NA[1]	Ampoules containing hydrated porcine insulin crystals

[1] NA = not applicable.

Years of establishment (in brackets, weight of previous standard containing one IU)	References (WHO/BS refers to unpublished working documents of the WHO Expert Committee on Biological Standardization)
1st Standard 1973	*Acta endocrinol.*, 1974, **77**, 705; *J. biol. Stand.*, 1975, **3**, 263; WHO Technical Report Series, 1967, **361**, 15; 1971, **463**, 13; 1972, **486**, 11; 1973, **530**, 6; WHO/BS 826, 896, 1002, 1042, 1064
1st Reference Preparation 1974	*Acta endocrinol.*, 1974, **77**, 705; *J. biol. Stand.*, 1975, **3**, 263; WHO Technical Report Series, 1975, **565**, 19; WHO/BS 1092
1st Reference Preparation 1980	WHO Technical Report Series, 1975, **565**, 19; 1979, **638**, 29; 1981, **658**, 25; WHO/BS 1219, 1257; *J. Endocrinol.*, 1982, **95**, 45
1st Standard 1939 (0.25 mg) *2nd Standard* 1966	*Bull. World Health Organ.*, 1966, **35**, 761; *Bull. Health Organ. L.o.N.*, 1939, **8**, 887, 898; 1945/46, **12**, 60; WHO Technical Report Series, 1961, **222**, 9; 1963, **259**, 12; 1964, **274**, 11; 1964, **293**, 11; 1967, **361**, 14; 1969, **413**, 16; WHO/BS 519, 600, 632, 737, 799, 855
1st Standard 1987[1]	WHO Technical Report Series, 1978, **626**, 21; 1981, **658**, 22; 1982, **673**, 27; 1983, **687**, 27; 1988, **771**, 27; WHO/BS 1156, 1261, 1322, 1369; *Mol. cell. Endocrinol.*, 1985, **42**, 269
1st Standard 1986	WHO Technical Report Series, 1985, **725**, 20; 1987, **745**, 22; 1987, **760**, 25; WHO/BS 1502, 1524; *J. biol. Stand.*, 1988, **16**, 165
1st Standard 1986	WHO Technical Report Series, 1985, **725**, 20; 1987, **745**, 22; 1987, **760**, 25; WHO/BS 1502, 1524; *J. biol. Stand.*, 1988, **16**, 165
1st Reference Preparation 1974	WHO Technical Report Series, 1964, **293**, 14; 1966, **329**, 11; 1967, **361**, 14; 1969, **413**, 16; 1975, **565**, 17; 1982, **673**, 29; 1984, **700**, 19; WHO/BS 722, 782, 824, 896, 1084, 1323, 1399
1st Standard 1986	WHO Technical Report Series, 1985, **725**, 20; 1987, **745**, 22; 1987, **760**, 25; WHO/BS 1502, 1524; *J. biol. Stand.*, 1988, **16**, 165

[1] Formerly established and distributed as the First International Standard for Human Growth Hormone for Bioassay; change in name only.

Endocrinological and related substances I (contd)

Held and distributed by
International Laboratory for Biological Standards, National Institute for Biological Standards and Control, Potters Bar

Preparation	IU per ampoule	Form in which available
Kininogenase, porcine, pancreatic	22.5	Ampoules containing approximately 20 μg of freeze-dried porcine pancreatic kininogenase, with 5 mg of human albumin
LH, human, pituitary	35	Ampoules containing approximately 5.8 μg of freeze-dried extract of luteinizing hormone from human pituitaries, with 1 mg of human albumin, 5 mg of mannitol, and 1 mg of sodium chloride
LH, human, pituitary, α subunit	10	Ampoules containing approximately 10 μg of freeze-dried extract of LH from human pituitaries, alpha subunit, with 2.5 mg of lactose, 0.5 mg of human albumin, and 45 μg of sodium chloride
LH, human, pituitary, β subunit	10	Ampoules containing 10 μg of freeze-dried extract of LH from human pituitaries, beta subunit, with 2.5 mg of lactose, 0.5 mg of human albumin, and 45 μg of sodium chloride
Lysine vasopressin (INN = lypressin)	7.7	Ampoules containing approximately 23.4 μg of freeze-dried synthetic lysine vasopressin, with 5 mg of albumin and citric acid
Oxytocin, for bioassay	12.5	Ampoules containing approximately 21.4 μg of freeze-dried synthetic oxytocin peptide with 5 mg of human albumin and citric acid
Parathyroid hormone, bovine, for bioassay	200	Ampoules containing approximately 0.6 mg of freeze-dried trichloroacetic acid extract of bovine parathyroids, with 5 mg of lactose
Parathyroid hormone, bovine, for immunoassay	2.0	Ampoules containing approximately 1 μg of freeze-dried purified isohormone I from bovine parathyroids, with 200 μg of human albumin and 1 mg of lactose

Years of establishment (in brackets, weight of previous standard containing one IU)	References (WHO/BS refers to unpublished working documents of the WHO Expert Committee on Biological Standardization)
1st Standard 1982	WHO Technical Report Series, 1978, **626**, 23; 1979, **638**, 29; 1982, **673**, 31; 1983, **687**, 28; WHO/BS 1217, 1260, 1367
1st Reference Preparation 1974 for immunoassay *2nd Standard* 1988	*Acta endocrinol.*, 1978, **88**, 250; WHO Technical Report Series, 1964, **274**, 12; 1964, **293**, 12; 1975, **565**, 13; 1978, **626**, 21; 1979, **638**, 26; 1981, **658**, 24; 1984, **700**, 11; 1988, **771**, 28; 1989, **786**, 21; WHO/BS 632, 718, 896, 1086, 1087, 1152, 1218, 1264, 1416, 1604
1st Standard 1984	WHO Technical Report Series, 1985, **725**, 22; WHO/BS 1443
1st Standard 1984	WHO Technical Report Series, 1985, **725**, 22; WHO/BS 1443
1st Standard 1978	WHO Technical Report Series, 1978, **626**, 22; 1979, **638**, 24; WHO/BS 1163, 1230
4th Standard 1978[1]	WHO Technical Report Series, 1978, **626**, 22; 1979, **638**, 24; WHO/BS 1163, 1227
1st Reference Preparation 1974	WHO Technical Report Series, 1967, **361**, 15; 1975, **565**, 9; 1982, **673**, 28; 1983, **687**, 29; 1984, **700**, 20; WHO/BS 853, 1078, 1315, 1360, 1405
1st Reference Preparation 1974	WHO Technical Report Series, 1967, **361**, 15; 1975, **565**, 9; WHO/BS 853, 896, 1078

[1] The first standard for oxytocin and vasopressin, for bioassay, was established in 1925, the second in 1942, and the third in 1957. This combined standard was discontinued in 1978, when a separate standard for oxytocin, for bioassay, was established. Since the unitage of this standard was based on the oxytocin unitage of the combined standard, it was called the 4th Standard.

Endocrinological and related substances I (contd)

Held and distributed by
International Laboratory for Biological Standards, National Institute for Biological Standards and Control, Potters Bar

Preparation	IU per ampoule	Form in which available
Parathyroid hormone, bovine, for *in vitro* bioassay	39	Ampoules containing the lyophilized residue of approximately 10 μg of bovine parathyroid hormone in solution in 0.01 mol/litre acetic acid and 0.1% w/v mannitol buffer
Parathyroid hormone, human, for immunoassay	0.1	Ampoules containing approximately 100 ng of freeze-dried purified hormone, with 250 μg of human serum albumin, and 1.25 mg of lactose
Placental lactogen, human, for immunoassay	0.000850	Ampoules containing approximately 850 μg of freeze-dried purified placental lactogen, with 5 mg of mannitol
Prolactin, human	0.053	Ampoules containing approximately 2.2 μg of freeze-dried human pituitary prolactin, with 5 mg of lactose, and 1 mg of HSA
Prolactin, ovine, for bioassay	—	Ampoules containing approximately 10 μg of freeze-dried purified prolactin from sheep pituitary glands (22.0 IU/mg)
Renin, human, for bioassay	0.1	Ampoules containing approximately 0.27 mg of freeze-dried purified extract of renin from human kidneys, with 5 mg of lactose and buffer salts
Tetracosactide, for bioassay	490	Ampoules containing approximately 490 μg of synthetic tetracosactide, with 20 mg of mannitol
(anti)-Thyroglobulin serum, human	1000	Ampoules containing approximately 44.3 mg of freeze-dried human autoimmune serum
Thyroid stimulating hormone (pituitary TSH), human, for immunoassay and bioassay	0.037	Ampoules containing approximately 7.5 μg of human thyroid stimulating hormone, 1 mg of albumin, and 5 mg of lactose

Years of establishment (in brackets, weight of previous standard containing one IU)	References (WHO/BS refers to unpublished working documents of the WHO Expert Committee on Biological Standardization)
1st Standard 1985	WHO Technical Report Series, 1987, **745**, 25; 1987, **760**, 27; WHO/BS 1440, 1490, 1527
1st Reference Preparation 1981	WHO Technical Report Series, 1975, **565**, 9; 1981, **658**, 25; 1982, **673**, 28; WHO/BS 1254, 1315
1st Reference Preparation 1977	*Br. J. Obst. Gynec.*, 1978, **85**, 451; WHO Technical Report Series, 1975, **565**, 16; 1978, **626**, 20; WHO/BS 1082, 1165
1st Reference Preparation 1978 2nd Standard 1986 *3rd Standard* 1988	WHO Technical Report Series, 1978, **626**, 20; 1979, **638**, 25; 1982, **673**, 30; 1984, **700**, 20; 1986, **725**, 20; 1987, **760**, 28; 1989, **786**, 24; WHO/BS 1165, 1216, 1324, 1401, 1401 Add. 1, 1520, 1596; *J. Endocrinol.*, 1989, **121**, 157
1st Standard 1939 (0.1 mg) *2nd Standard* 1962	*Bull. World Health Organ.*, 1963, **29**, 721; *Bull. Health Organ. L.o.N.*, 1939, **8**, 901; 1942/43, **10**, 96; 1945/46, **12**, 62; WHO Technical Report Series, 1954, **86**, 18; 1955, **96**, 14; 1956, **108**, 16; 1957, **127**, 16; 1958, **147**, 9; 1959, **172**, 9; 1960, **187**, 10; 1961, **222**, 10; 1963, **259**, 12; 1969, **413**, 15; WHO/BS 208, 310, 350, 405, 446, 492, 523, 577
1st Reference Preparation 1974	*Clin sci. & mol. med.*, 1975, **48**, 1355; WHO Technical Report Series, 1964, **274**, 13; 1966, **329**, 10; 1969, **413**, 17; 1970, **444**, 12; 1975, **565**, 11; WHO/BS 633, 791, 907, 987, 1089
1st Reference Preparation 1981	WHO Technical Report Series, 1982, **673**, 30; WHO/BS 1313; *J. Endocrinol.*, 1984, **100**, 51
1st Reference Preparation 1978	WHO Technical Report Series, 1969, **413**, 22; 1979, **638**, 14; WHO/BS 1188
1st Reference Preparation 1974 (40.3 mg) *2nd Reference Preparation* 1983	WHO Technical Report Series, 1966, **329**, 12; 1967, **361**, 14; 1975, **565**, 14; 1979, **638**, 25; 1982, **673**, 29; 1983, **687**, 28; 1984, **700**, 21; WHO/BS 805, 818, 896, 1079, 1222, 1263, 1321, 1364, 1402; *Acta endocrinol.*, 1978, **88**, 291; *J. Endocrinol.*, 1985, **104**, 367

Endocrinological and related substances I (contd)

Held and distributed by
International Laboratory for Biological Standards, National Institute for Biological Standards and Control, Potters Bar

Preparation	IU per ampoule	Form in which available
Thyrotrophin (pituitary TSH), bovine, for bioassay	—	Ampoules containing 10 tablets of approximately 20 mg of a blend of 1 part of purified thyrotrophin from bovine pituitary glands and 19 parts of lactose

Endocrinological and related substances II

Held and distributed by
Rijksinstituut voor Volksgezondheid en Milieuhygiene, Bilthoven

Preparation	IU per ampoule	Form in which available
Luteinizing hormone, bovine, for immunoassay	0.025	Ampoules containing approximately 20 μg of freeze-dried bovine luteinizing hormone, with 1 mg of BSA and 5 mg of lactose

Years of establishment (in brackets, weight of previous standard containing one IU)	References (WHO/BS refers to unpublished working documents of the WHO Expert Committee on Biological Standardization)
1st Standard 1954	*Bull. World Health Organ.*, 1955, **13**, 917; *Bull. Health Organ. L.o.N.*, 1938, **7**, 887; WHO Technical Report Series, 1950, **2**, 9; 1951, **36**, 8; 1952, **56**, 10; 1953, **68**, 13; 1954, **86**, 18; 1955, **96**, 14; 1956, **108**, 16; 1969, **413**, 15; WHO/BS 155, 158, 210, 284, 309, 896

Years of establishment (in brackets, weight of previous standard containing one IU)	References (WHO/BS refers to unpublished working documents of the WHO Expert Committee on Biological Standardization)
1st Standard 1985	WHO Technical Report Series, 1987, **745**, 24; WHO/BS 1474

Miscellaneous

Held and distributed by
International Laboratory for Biological Standards, National Institute for Biological Standards and Control, Potters Bar

Preparation	IU per ampoule	Form in which available
Carcinoembryonic antigen (CEA), human	100	Ampoules containing 2.36 mg of freeze-dried carcinoembryonic antigen
C-reactive protein, human	0.049	Ampoules containing freeze-dried plasma enriched with C-reactive protein
Endotoxin, for *Limulus* gelation tests	14 000	Ampoules containing approximately 2 μg of freeze-dried endotoxin from *Escherichia coli*, with 3 mg of trehalose
Hyaluronidase, bovine	Approx. 200 IU per tablet	Ampoules containing 10 tablets of approximately 20 mg of dried bovine testicular hyaluronidase diluted with lactose (10 IU/mg)
Opacity	NA[1]	Rod of plastic simulating the optical properties of a bacterial suspension (10 IU of opacity)
Protamine (INN = protamine sulfate)	NA[1]	Ampoules containing approximately 60 mg of protamine of salmon origin
Pyrogen	NA[1]	Ampoules containing approximately 2 mg of purified "O" somatic antigen of *Shigella dysenteriae*, freeze-dried
Vitamin D	NA[1]	Bottles containing approximately 6 g of a solution of vitamin D_3 (INN = colecalciferol) in vegetable oil (1000 IU per g)

[1] NA = not applicable.

Years of establishment (in brackets, weight of previous standard containing one IU)	References (WHO/BS refers to unpublished working documents of the WHO Expert Committee on Biological Standardization)
1st Reference Preparation 1975	WHO Technical Report Series, 1976, **594**, 13; 1977, **610**, 18; 1979, **638**, 18; WHO/BS 1110, 1138, 1200
1st Standard 1986	WHO Technical Report Series, 1987, **760**, 21; WHO/BS 1514
1st Standard 1986	WHO Technical Report Series, 1987, **745**, 26; 1987, **760**, 29; WHO/BS 1539
1st Standard 1955	*Bull. World Health Organ.*, 1957, **16**, 291; WHO Technical Report Series, 1951, **36**, 11; 1952, **56**, 12; 1953, **68**, 15; 1954, **86**, 19; 1955, **96**, 15; 1956, **108**, 18; WHO/BS 78, 135, 160, 163, 232, 271, 306
1st Reference Preparation 1953 2nd Reference Preparation 1962 3rd Reference Preparation 1965 4th Reference Preparation 1974 *5th Reference Preparation* 1975	*Bull. World Health Organ.*, 1955, **12**, 769; 1962, **26**, 213, 219; WHO Technical Report Series, 1952, **56**, 17; 1953, **68**, 7; 1954, **86**, 14; 1955, **96**, 8; 1961, **222**, 22; 1963, **259**, 26; 1966, **329**, 21; 1973, **530**, 9; 1976, **594**, 16; WHO/BS 124, 172, 198, 256, 531, 584, 585, 743, 1061, 1074, 1119
1st Reference Preparation 1954	WHO Technical Report Series, 1952, **56**, 11; 1953, **68**, 12; 1954, **86**, 16; 1955, **96**, 14; WHO/BS 261
1st Reference Preparation 1958	WHO Technical Report Series, 1952, **56**, 13; 1953, **68**, 18; 1954, **86**, 19; 1955, **96**, 16; 1956, **108**, 19; 1957, **127**, 18; 1958, **147**, 11; 1959, **172**, 11; 1979, **638**, 32; 1983, **687**, 31; WHO/BS 90, 147, 206, 264, 312, 365, 400, 425, 1265, 1372
1st Standard 1931 (0.1 mg) [irradiated ergosterol] *2nd Standard* 1949	*Bull. World Health Organ.*, 1947/48, **1**, 14; 1954, **10**, 875; *Bull. Health Organ. L.o.N.*, 1940/41, **9**, 425; 1945/46, **12**, 54; WHO Technical Report Series, 1950, **2**, 10; 1950, **3**, 7; 1951, **36**, 7; 1972, **486**, 11; 1973, **530**, 7; WHO/BS 8, 1030

International Biological Reference Reagents

Reference reagents I

Held and distributed by
International Laboratory for Biological Standards, Statens Seruminstitut, Copenhagen

Preparation	Form in which available
Anti-echinococcus serum, human	Ampoules containing 87.36 mg of freeze-dried human serum
Anti-tick-borne encephalitis sera, sheep:	
Anti-tick-borne encephalitis serum (louping ill (Moredun) virus)	Ampoules containing 1 ml of freeze-dried sheep serum
Anti-tick-borne encephalitis serum (Russian spring-summer encephalitis (Sophyn and Absettarov) virus)	Ampoules containing 2 ml of freeze-dried sheep serum
Anti-trichinella serum, human	Ampoules containing 1 ml of freeze-dried pooled human serum
Diphtheria toxoid, for flocculation tests	Ampoules containing 900 Lf units of diphtheria toxoid
Tetanus toxoid, for flocculation tests	Ampoules containing 1000 Lf units of tetanus toxoid

Years of establishment	References (WHO/BS refers to unpublished working documents of the WHO Expert Committee on Biological Standardization)
1st Reference Reagent 1975	WHO Technical Report Series, 1960, **187**, 20; 1961, **222**, 18; 1964, **274**, 19; 1971, **463**, 23; 1976, **594**, 17; WHO/BS 470, 542, 703, 747, 1106
1st Reference Reagent 1964	WHO Technical Report Series, 1959, **172**, 17; 1960, **187**, 17; 1961, **222**, 19; 1963, **259**, 22; 1964, **274**, 20; 1964, **293**, 21; 1966, **329**, 21; WHO/BS 463, 511, 562, 615, 615 Add. 1, 615 Corr. 1, 707, 757, 757 Corr. 1
1st Reference Reagent 1968	WHO Technical Report Series, 1961, **222**, 20; 1963, **259**, 21; 1964, **293**, 18; 1968, **384**, 20; 1969, **413**, 23; WHO/BS 470, 542, 623, 736, 846, 946
1st Reference Reagent 1988	WHO Technical Report Series, 1989, **786**, 20; WHO/BS 1590; *Biologicals*, 1990, **18**, 11–17
1st Reference Reagent 1988	WHO Technical Report Series, 1989, **786**, 20; WHO/BS 1590; *Biologicals*, 1990, **18**, 11–17

Reference reagents II

Held and distributed by
WHO/FAO Collaborating Centre for Reference and Research on Leptospirosis, Laboratory of Tropical Hygiene, Royal Tropical Institute,[1] Amsterdam

Preparation	Form in which available
Anti-*Leptospira* sera, rabbit:	
Anti-*Leptospira interrogans* serotype *saxkoebing* serum	Ampoules containing 0.5 ml or 1.0 ml of hyperimmune rabbit serum, dried
Anti-*Leptospira interrogans* serotype *castellonis* serum	
Anti-*Leptospira interrogans* serotype *sejroe* serum	
Anti-*Leptospira interrogans* serotype *mini* serum	
Anti-*Leptospira interrogans* serotype *australis* serum	
Anti-*Leptospira interrogans* serotype *copenhageni* serum	
Anti-*Leptospira interrogans* serotype *tarassovi* serum	
Anti-*Leptospira interrogans* serotype *autumnalis* serum	
Anti-*Leptospira interrogans* serotype *rachmati* serum	
Anti-*Leptospira interrogans* serotype *pomona* serum	
Anti-*Leptospira interrogans* serotype *bataviae* serum	
Anti-*Leptospira interrogans* serotype *hebdomadis* serum	
Anti-*Leptospira interrogans* serotype *andamana* serum	
Anti-*Leptospira interrogans* serotype *javanica* serum	
Anti-*Leptospira interrogans* serotype *pyrogenes* serum	
Anti-*Leptospira interrogans* serotype *naam* serum	Ampoules containing 0.5 ml or 1.0 ml of hyperimmune rabbit serum, dried
Anti-*Leptospira interrogans* serotype *mankarso* serum	
Anti-*Leptospira interrogans* serotype *sarmin* serum	
Anti-*Leptospira interrogans* serotype *poi* serum	
Anti-*Leptospira interrogans* serotype *schueffneri* serum	
Anti-*Leptospira interrogans* serotype *muenchen* serum	
Anti-*Leptospira interrogans* serotype *cynopteri* serum	
Anti-*Leptospira interrogans* serotype *bangkinang* serum	
Anti-*Leptospira interrogans* serotype *wolffi* serum	
Anti-*Leptospira interrogans* serotype *hardjo* serum	
Anti-*Leptospira interrogans* serotype *kremastos* serum	
Anti-*Leptospira interrogans* serotype *benjamin* serum	
Anti-*Leptospira interrogans* serotype *zanoni* serum	
Anti-*Leptospira interrogans* serotype *medanensis* serum	
Anti-*Leptospira interrogans* serotype *paidjan* serum	
Anti-*Leptospira interrogans* serotype *semaranga* serum	Ampoules containing 1.0 ml of hyperimmune rabbit serum, dried

[1] WHO/FAO, FAO/WHO, and WHO Leptospirosis Collaborating Centres are co-custodians of these international reference sera. Samples can therefore also be obtained by application to one of the following: *WHO/FAO Collaborating Centres for Reference and Research on Leptospirosis:* Laboratory of Microbiology and Pathology, Department of Health, Brisbane, Australia 4000; Leptospirosis Reference Unit, Public Health Laboratory, County Hospital, Hereford HR1 2ER, England. *WHO/FAO Collaborating Centre for the Epidemiology of Leptospirosis:* Israel Institute of Biological Research, P.O.B. 19, Ness Ziona, Israel. *FAO/WHO Collaborating Centre for the Epidemiology of Leptospirosis:* Bacterial Diseases Division, Center for Infectious Diseases, Centers for Disease Control, Atlanta, GA 30333, USA. *WHO Collaborating Centres for the Epidemiology of Leptospirosis:* Leptospirosis Laboratory, Gamaleja Institute of Epidemiology and Microbiology, Moscow 123098, USSR; Istituto Superiore di Sanità, Viale Regina Elena 299, Rome, Italy; National Institute of Health, Tokyo, Japan.

Years of establishment	References (WHO/BS refers to unpublished working documents of the WHO Expert Committee on Biological Standardization)
1st Reference Reagent 1958	WHO Technical Report Series, 1956, **113**; 1959, **172**, 17; 1966, **329**, 108; 1967, **361**, 26; 1979, **638**, 30; WHO/BS 413, 437, 508, 664, 847, 847 Add. 1
1st Reference Reagent 1962	WHO Technical Report Series, 1956, **113**; 1961, **222**, 18; 1963, **259**, 20; 1966, **329**, 110; 1967, **361**, 26; 1979, **638**, 30; WHO/BS 437, 489, 543, 601, 664, 847, 847 Add. 1
1st Reference Reagent 1958 *2nd Reference Reagent* 1962	WHO Technical Report Series, 1956, **113**; 1959, **172**, 17; 1963, **259**, 20; 1966, **329**, 110; 1967, **361**, 26; 1979, **638**, 30; WHO/BS 413, 437, 508, 601, 847, 847 Add. 1

Reference reagents II (contd)

Held and distributed by
WHO/FAO Collaborating Centre for Reference and Research on Leptospirosis, Laboratory of Tropical Hygiene, Royal Tropical Institute,[1] Amsterdam

Preparation	Form in which available
Anti-*Leptospira interrogans* serotype *canicola* serum Anti-*Leptospira interrogans* serotype *grippotyphosa* serum Anti-*Leptospira interrogans* serotype *icterohaemorrhagiae* serum	Ampoules containing 0.5 ml of hyperimmune rabbit serum, dried
Anti-*Leptospira interrogans* serotype *atlantae* serum Anti-*Leptospira interrogans* serotype *georgia* serum Anti-*Leptospira interrogans* serotype *bratislava* serum Anti-*Leptospira interrogans* serotype *erinacei-auriti* serum Anti-*Leptospira interrogans* serotype *coxi* serum Anti-*Leptospira interrogans* serotype *fugis* serum Anti-*Leptospira interrogans* serotype *worsfoldi* serum Anti-*Leptospira interrogans* serotype *malaya* serum	Ampoules containing 0.5 ml or 1.0 ml of hyperimmune rabbit serum, dried
Anti-*Leptospira interrogans* serotype *butembo* serum	Ampoules containing 1.0 ml of hyperimmune rabbit serum, dried
Anti-*Leptospira interrogans* serotype *jules* serum Anti-*Leptospira interrogans* serotype *sumneri* serum	Ampoules containing 1.0 ml of hyperimmune rabbit serum, dried

[1] A list of other laboratories from which anti-*Leptospira* sera may be obtained is given on p. 78.

Years of establishment	References (WHO/BS refers to unpublished working documents of the WHO Expert Committee on Biological Standardization)
1st Reference Reagent 1958 *2nd Reference Reagent* 1966	WHO Technical Report Series, 1956, **113**; 1959, **172**, 17; 1966, **329**, 108; 1967, **361**, 27; 1979, **638**, 30; WHO/BS 413, 437, 508, 664, 847, 847 Add. 1
1st Reference Reagent 1966	WHO Technical Report Series, 1966, **329**, 128; 1967, **361**, 27; 1979, **638**, 30; WHO/BS 601, 664, 847, 847 Add. 1
1st Reference Reagent 1970	WHO Technical Report Series, 1969, **413**, 24; 1971, **463**, 23; 1979, **638**, 30; WHO/BS 601, 1020
1st Reference Reagent 1970	WHO Technical Report Series, 1967, **361**, 27; 1969, **413**, 24; 1971, **463**, 23; 1979, **638**, 30; WHO/BS 847, 847 Add. 1, 1020

Reference reagents III

Held and distributed by
International Laboratory for Biological Standards, Central Laboratory, Netherlands Red Cross Blood Transfusion Service, Amsterdam

Preparation	Form in which available
Subtype specific antisera to Hepatitis B surface antigens:	
Anti-HBs*/ad* serum, guinea pig Anti-HBs*/ay* serum, guinea pig	Ampoules containing the freeze-dried powder from 0.5 ml of hyperimmune guinea-pig serum
Anti-HBs*/ar* serum, rabbit	Ampoules containing the freeze-dried powder from 0.5 ml of hyperimmune rabbit serum
Anti-HBs*/ad* serum, goat Anti-HBs*/ay* serum, goat	Ampoules containing the freeze-dried powder from 0.5 ml of hyperimmune goat serum
Anti-nuclear ribonucleoprotein serum, human	Ampoules containing the freeze-dried powder from aliquots of serum from a patient with Raynaud's disease
Anti-smooth muscle serum, human	Ampoules containing the freeze-dried powder from aliquots of human serum containing anti-actin antibodies

Years of establishment	References (WHO/BS refers to unpublished working documents of the WHO Expert Committee on Biological Standardization)
1st Reference Reagent 1980	WHO Technical Report Series, 1981, **658**, 27; WHO/BS 1287
1st Reference Reagent 1980	WHO Technical Report Series, 1981, **658**, 27; WHO/BS 1287
1st Reference Reagent 1980	WHO Technical Report Series, 1981, **658**, 27; WHO/BS 1287
1st Reference Reagent 1983	WHO Technical Report Series, 1984, **700**, 22; WHO/BS 1390
1st Reference Reagent 1983	WHO Technical Report Series, 1984, **700**, 22; WHO/BS 1390

Reference reagents IV

Held and distributed by
Centers for Disease Control, Atlanta

Preparation	Form in which available
Adenovirus antisera, equine:	
Types 1, 2, 3, 5, 6, 7a, 8, 9, 10, 11, 13, 15, and 17	Ampoules containing 0.5 ml of freeze-dried horse serum
Types 4, 19, 20, 22, 23, and 24	Ampoules containing 0.5 ml of freeze-dried horse serum
Types 12 and 18	Ampoules containing 0.5 ml of freeze-dried horse serum
Types 25, 26, 27, 28, 29, 30, 31, 32, and 33	Ampoules containing 0.5 ml of freeze-dried horse serum
Types 34, 35, and 36	Ampoules containing 2.0 ml of freeze-dried horse serum
Histoplasmin, for H and M immunodiffusion, test[1]	Vials containing freeze-dried *Histoplasma capsulatum* histoplasmin antigens H and M
Histoplasmin antiserum, rabbit, for H and M immunodiffusion test[1]	Vials containing 0.5 ml of freeze-dried anti-histoplasmin rabbit serum
Parainfluenza virus antisera, equine: Types 1, 2, and 3	Ampoules containing 0.5 ml of freeze-dried horse serum
Mycoplasma pneumoniae antiserum, equine	

[1] The two histoplasmin preparations are supplied together as a set.

Years of establishment	References (WHO/BS refers to unpublished working documents of the WHO Expert Committee on Biological Standardization)
1st Reference Reagent 1966	WHO Technical Report Series, 1966, **329**, 21; 1967, **361**, 28; WHO/BS 784, 835
1st Reference Reagent 1976	WHO Technical Report Series, 1977, **610**, 19; WHO/BS 1133
1st Reference Reagent 1967	WHO Technical Report Series, 1967, **361**, 28; 1968, **384**, 21; WHO/BS 784, 835, 879
1st Reference Reagent 1978	WHO Technical Report Series, 1979, **638**, 30; WHO/BS 1180
1st Reference Reagent 1981	WHO Technical Report Series, 1982, **673**, 31; WHO/BS 1310, 1333
1st Reference Reagent 1981	WHO Technical Report Series, 1982, **673**, 32; WHO/BS 1308
1st Reference Reagent 1981	WHO Technical Report Series, 1982, **673**, 32; WHO/BS 1308
1st Reference Reagent 1968	WHO Technical Report Series, 1967, **361**, 28; 1968, **384**, 21; 1969, **413**, 24; WHO/BS 836, 897, 944

Reference reagents V

Held and distributed by
International Laboratory for Biological Standards, National Institute for Biological Standards and Control, Potters Bar

Preparation	Form in which available
Hepatitis B preparation, plasma-derived, for immunogenicity studies	Ampoules containing plasma-derived hepatitis B surface antigen adsorbed on to aluminium hydroxide gel
Insulin C-peptide, human	Ampoules containing 10 μg of human insulin C-peptide
Insulin-like growth factor I, for immunoassay	Ampoules containing 3.1 μg of insulin-like growth factor I
Measles vaccine	Lyophilized ampoules containing 5000 infectious entities of measles virus, Schwartz strain
Proinsulin, bovine	Ampoules containing 25 μg of freeze-dried bovine proinsulin
Proinsulin, human	Ampoules containing 6 μg of freeze-dried human proinsulin
Proinsulin, porcine	Ampoules containing 20 μg of freeze-dried porcine proinsulin

Years of establishment	References (WHO/BS refers to unpublished working documents of the WHO Expert Committee on Biological Standardization)
1st Reference Reagent 1986	WHO Technical Report Series, 1987, **745**, 17; 1987, **760**, 29; WHO/BS 1525
1st Reference Reagent 1986	WHO Technical Report Series, 1987, **760**, 26; WHO/BS 1538
1st Reference Reagent 1988	WHO Technical Report Series, 1987, **760**, 28; 1989, **786**, 23; WHO/BS 1606
1st Reference Reagent 1985	WHO Technical Report Series, 1987, **745**, 16; WHO/BS 1483
1st Reference Reagent 1986	WHO Technical Report Series, 1987, **760**, 27; WHO/BS 1534
1st Reference Reagent 1986	WHO Technical Report Series, 1987, **760**, 28; WHO/BS 1537
1st Reference Reagent 1986	WHO Technical Report Series, 1987, **760**, 27; WHO/BS 1534

Discontinued International Biological Reference Materials

The International Biological Reference Materials for the following substances, which can now be characterized completely by chemical or physical tests or for which there has been little demand, have been discontinued. (References: WHO Technical Report Series, 1952, **56,** 14; 1953, **68,** 25; 1957, **127,** 9, 19; 1969, **413,** 14, 21; 1971, **463,** 12; 1972, **486,** 12; 1973, **530,** 6, 8; 1977, **610,** 17; 1978, **626,** 13, 14; 1979, **638,** 24; 1984, **700,** 14, 19; 1987, **745,** 13, 26; 1987, **760,** 19; 1988, **771,** 215; 1989, **786,** 178; 1990, **800,** 217.)

Samples of the substances marked with an asterisk (*) are still available at the WHO Collaborating Centre for Chemical Reference Substances, Apoteksbolaget AB, Central Laboratory, S-105 14 Stockholm, Sweden (see pp. 98–101).

Substance	Adopted	Discontinued
Arsphenamine	1925	1935
Neoarsphenamine	1940	1973
Sulfarsphenamine	1951	1973
Oxophenarsine	1951	1973
MSb	1954	1973
* Ouabain	1928	1954
Provitamin A (β-carotene)	1931	1956
Vitamin B (synthetic vitamin B_1)	1931	1956
* Oestrone (INN = estrone)	1932	1949
Vitamin C	1934	1956
* Oestradiol monobenzoate (INN = estradiol)	1935	1949
Androsterone	1935	1950
* Progesterone	1935	1955
Vitamin E (α-tocopheryl acetate)	1941	1956
Penicillin	1944	1968
* Vitamin A (vitamin A acetate) (INN = retinol)	1949	1954
* Tubocurarine (*d*-tubocurarine chloride)	1951	1955
Penicillin K	1951	1970
Staphylococcus β antitoxin	1952	1956
* Chloramphenicol	1953	1956

Substance	Adopted	Discontinued
Cholera agglutinating serum (Inaba)	1953	1967
Cholera agglutinating serum (Ogawa)	1953	1967
Cholera antigen (Inaba)	1953	1968
Cholera antigen (Ogawa)	1953	1968
* Phenoxymethylpenicillin	1957	1968
Vitamin B_{12} (INN = cyanocobalamine)	1959	1971
Gramicidin S	1962	1973
Ristocetin	1960	1976
Ristocetin B	1964	1976
Anti-pneumococcus sera	1934	1977
Influenza virus haemagglutinin (type A)	1967	1977
Oxytocin and vasopressin, bovine, for bioassay	1925	1978
Lecithin (bovine, heart)	1970	1983
Thromboplastin, human, combined	1976	1983
Dimercaprol	1954	1985
Kanamycin B	1964	1985
Mel B	1954	1985
Insulin, bovine and porcine, for bioassay	1958	1986
Blood coagulation factor IX, human	1976	1987
Growth hormone, human, for immunoassay	1968	1987
Digitalis	1949	1988
Cefalotin	1965	1989
Clindamycin	1971	1989
Lincomycin	1965	1989

Requirements for biological substances and other sets of recommendations

The specification by national control authorities of requirements to be fulfilled by preparations of biological substances is necessary in order to ensure that these products are safe, reliable, and potent prophylactic, diagnostic or therapeutic agents. International recommendations on requirements are intended to facilitate the exchange of biological substances between countries and to provide guidance to workers responsible for the production of these substances, as well as to others who may have to decide upon appropriate methods of assay and control.

Recommended requirements and sets of recommendations concerned with biological substances are formulated by international groups of experts and are published in the Technical Report Series of the World Health Organization,[1] as listed here.

I. Requirements

1. General Requirements for Manufacturing Establishments and Control Laboratories

   Revised 1965, WHO TRS **323** (1966)

2. Requirements for Poliomyelitis Vaccine (Inactivated)

   Revised 1981, WHO TRS **673** (1982)
   Addendum 1985, WHO TRS **745** (1987)

3. Requirements for Yellow Fever Vaccine

   Revised 1975, WHO TRS **594** (1976)
   Addendum 1987, WHO TRS **771** (1988)

4. Requirements for Cholera Vaccine

   Revised 1968, WHO TRS **413** (1969)
   Addendum 1973, WHO TRS **530** (1973)

[1] Abbreviated here as WHO TRS.

5. Requirements for Smallpox Vaccine
   Adopted 1966, WHO TRS **323** (1966)

6. General Requirements for the Sterility of Biological Substances
   Revised 1973, WHO TRS **530** (1973)

7. Requirements for Poliomyelitis Vaccine, Oral
   Revised 1989, WHO TRS **800** (1990)

8 & 10. Requirements for Diphtheria, Tetanus, Pertussis and Combined Vaccines
   Revised 1989, WHO TRS **800** (1990)

9. Requirements for Procaine Benzylpenicillin in Oil with Aluminium Monostearate
   Revised 1966, WHO TRS **361** (1967), **discontinued**

11. Requirements for Dried BCG Vaccine
   Revised 1985, WHO TRS **745** (1987)
   Amendment 1987, WHO TRS **771** (1988)

12. Requirements for Measles Vaccine (Live)
   Revised 1987, WHO TRS **771** (1988)

13. Requirements for Anthrax Spore Vaccine (Live, for Veterinary Use)
   Adopted 1966, WHO TRS **361** (1967)

14. Requirements for Human Immunoglobulin
   Adopted 1966, WHO TRS **361** (1967), *replaced by Requirements No. 27*

15. Requirements for Typhoid Vaccine
   Adopted 1966, WHO TRS **361** (1967)

16. Requirements for Tuberculins
   Revised 1985, WHO TRS **745** (1987)

17. Requirements for Influenza Vaccine (Inactivated)
   Revised 1978, WHO TRS **638** (1979)

18. Requirements for Immune Sera of Animal Origin

    Adopted 1968, WHO TRS **413** (1969)

19. Requirements for Rinderpest Cell Culture Vaccine (Live) and Rinderpest Vaccine (Live)

    Adopted 1969, WHO TRS **444** (1970)

20. Requirements for *Brucella abortus* Strain 19 Vaccine (Live, for Veterinary Use)

    Adopted 1969, WHO TRS **444** (1970)
    Addendum 1975, WHO TRS **594** (1976)

21. Requirements for Snake Antivenins

    Adopted 1970, WHO TRS **463** (1971)

22. Requirements for Rabies Vaccine for Human Use

    Revised 1980, WHO TRS **658** (1981)

23. Requirements for Meningococcal Polysaccharide Vaccine

    Adopted 1975, WHO TRS **594** (1976)
    Addendum 1976, WHO TRS **610** (1977)
    Addendum 1977, WHO TRS **626** (1978)
    Addendum 1980, WHO TRS **658** (1981)

24. Requirements for Rubella Vaccine (Live)

    Adopted 1976, WHO TRS **610** (1977)
    Addendum 1980, WHO TRS **658** (1981)

25. Requirements for *Brucella melitensis* Strain Rev. 1 Vaccine (Live, for Veterinary Use)

    Adopted 1976, WHO TRS **610** (1977)

26. Requirements for Antimicrobic Susceptibility Tests
    I. Agar diffusion tests using antimicrobic susceptibility discs

    Revised 1981, WHO TRS **673** (1982)
    Addendum 1982, WHO TRS **687** (1983)
    Addendum 1985, WHO TRS **745** (1987)
    Addendum 1987, WHO TRS **771** (1988)
    Addendum 1989, WHO TRS **800** (1990)

27. Requirements for the Collection, Processing, and Quality Control of Blood, Blood Components, and Plasma Derivatives

    Revised 1988, WHO TRS **786** (1989)

28. Requirements for Influenza Vaccine (Live)
    Adopted 1978, WHO TRS **638** (1979)

29. Requirements for Rabies Vaccine for Veterinary Use
    Adopted 1980, WHO TRS **658** (1981)

30. Requirements for Thromboplastins and Plasma used to Control Oral Anticoagulant Therapy
    Revised 1982, WHO TRS **687** (1983)

31. Requirements for Hepatitis B Vaccine prepared from Plasma
    Revised 1987, WHO TRS **771** (1988)

32. Requirements for Rift Valley Fever Vaccine
    Adopted 1981, WHO TRS **673** (1982)

33. Requirements for Louse-Borne Human Typhus Vaccine (Live)
    Adopted 1982, WHO TRS **687** (1983)

34. Requirements for Typhoid Vaccine (Live Attenuated, Ty 21a, Oral)
    Adopted 1983, WHO TRS **700** (1984)

35. Requirements for Rift Valley Fever Vaccine (Live, Attenuated) for Veterinary Use
    Adopted 1983, WHO TRS **700** (1984)

36. Requirements for Varicella Vaccine (Live)
    Adopted 1984, WHO TRS **725** (1985)

37. Requirements for Continuous Cell Lines used for Biologicals Production
    Adopted 1985, WHO TRS **745** (1987)

38. Requirements for Mumps Vaccine (Live)
    Adopted 1986, WHO TRS **760** (1987)

39. Requirements for Hepatitis B Vaccines Made by Recombinant DNA Techniques in Yeast
    Adopted 1986, WHO TRS **760** (1987), *replaced by Requirements No. 45*

40. Requirements for Rabies Vaccine (Inactivated) for Human Use Produced in Continuous Cell Lines

    Adopted 1986, WHO TRS **760** (1987)

41. Requirements for Human Interferons Made by Recombinant DNA Techniques

    Adopted 1987, WHO TRS **771** (1988)

42. Requirements for Human Interferons Prepared from Lymphoblastoid Cells

    Adopted 1988, WHO TRS **786** (1989)

43. Requirements for Japanese Encephalitis Vaccine (Inactivated) for Human Use

    Adopted 1987, WHO TRS **771** (1988)

45. Requirements for Hepatitis B Vaccines Made by Recombinant DNA Techniques

    Adopted 1988, WHO TRS **786** (1989)

Requirements for Immunoassay Kits (unnumbered)

Adopted 1980, WHO TRS **658** (1981)

II. Other documents

Recommendations for the assessment of binding-assay systems (including immunoassay and receptor assay systems) for human hormones and their binding proteins (A guide to the formulation of requirements for reagents and assay kits for the above assays and notes on cytochemical bioassay systems)

WHO TRS **565** (1975)

Development of national assay services for hormones and other substances in community health care

WHO TRS **565** (1975)

Report of a WHO Working Group on the Standardization of Human Blood Products and Related Substances

WHO TRS **610** (1977)

Guidelines for quality assessment of antitumour antibiotics

WHO TRS **658** (1981)

The national control of vaccines and sera

WHO TRS **658** (1981)

Procedure for approval by WHO of yellow fever vaccines in connection with the issue of international vaccination certificates

WHO TRS **658** (1981)

A review of tests on virus vaccines

WHO TRS **673** (1982)

Standardization of interferons (reports of WHO informal consultations)

WHO TRS **687** (1983)
WHO TRS **725** (1985)
WHO TRS **771** (1988)

Report of a WHO Meeting on Hepatitis B Vaccines Produced by Recombinant DNA Techniques

WHO TRS **760** (1987)

Laboratories approved by WHO for the production of yellow fever vaccines, revised 1987

WHO TRS **771** (1988)

Procedure for evaluating the acceptability in principle of vaccines proposed to United Nations agencies for use in immunization programmes, revised 1988

WHO TRS **786** (1989)

Guidelines for the preparation, characterization and establishment of international and other standards and reference reagents for biological substances

WHO TRS **800** (1990)

List of available International Chemical Reference Substances **1991**

General information

International Chemical Reference Substances are established upon the advice of the WHO Expert Committee on Specifications for Pharmaceutical Preparations. They are supplied primarily for use in physical and chemical tests and assays described in the specifications for quality control of drugs published in *The International Pharmacopoeia* or proposed in draft monographs.

Directions for use and analytical data as required for the use intended in the relevant specifications of *The International Pharmacopoeia* are given in the certificates enclosed with the substances when distributed. More detailed analytical reports on the substances may be obtained on request from the WHO Collaborating Centre for Chemical Reference Substances.

International Chemical Reference Substances may also be used in tests and assays not described in *The International Pharmacopoeia.* However, the responsibility for assessing the suitability of the substances then rests with the user or with the pharmacopoeia commission or other authority that has prescribed these substances to be used.

It is generally recommended that the substances should be stored protected from light and moisture and preferably at a temperature of about +5 °C. When special storage conditions are required, this is stated on the label or in the accompanying leaflet.

The stability of the International Chemical Reference Substances kept at the Collaborating Centre is monitored by regular re-examination, and deteriorated materials are replaced by new batches when necessary. Lists giving control numbers for the current batches are issued in the annual reports from the Centre and may be obtained an request.

Ordering information

Ordering information is available from:

WHO Collaborating Centre for Chemical Reference Substances
Apoteksbolaget AB
Centrallaboratoriet
S-105 14 Stockholm
Sweden

(Telex: 115 53 APOBOL S)
(Fax: + 46 8 740 60 40)

The International Chemical Reference Substances are supplied only in standard packages as indicated in the following list.

Reference substance	Package size
aceclidine salicylate	100 mg
p-acetamidobenzalazine	25 mg
acetazolamide	100 mg
allopurinol	100 mg
2-amino-5-nitrothiazole	25 mg
3-aminopyrazole-4-carboxamide hemisulfate	100 mg
amitriptyline hydrochloride	100 mg
ampicillin	200 mg
ampicillin sodium	200 mg
ampicillin trihydrate	200 mg
anhydrotetracycline hydrochloride	25 mg
atropine sulfate	100 mg
azathioprine	100 mg
bendazol hydrochloride	100 mg
benzobarbital	100 mg
benzylamine sulfate	100 mg
benzylpenicillin potassium	200 mg
benzylpenicillin sodium	200 mg
bephenium hydroxynaphthoate	100 mg
betamethasone	100 mg
betanidine sulfate	100 mg
bupivacaine hydrochloride	100 mg
caffeine	100 mg
carbamazepine	100 mg
carbenicillin monosodium	200 mg
chloramphenicol	200 mg
chloramphenicol palmitate	1 g
chloramphenicol palmitate (polymorph A)	200 mg
5-chloro-2-methylaminobenzophenone	100 mg

Reference substance	Package size
2-(4-chloro-3-sulfamoylbenzoyl)benzoic acid	50 mg
chlorphenamine hydrogen maleate	100 mg
chlorpromazine hydrochloride	100 mg
chlortalidone	100 mg
chlortetracycline hydrochloride	200 mg
clomifene citrate	100 mg
clomifene citrate *Z*-isomer [zuclomifene]	50 mg
cloxacillin sodium	200 mg
cortisone acetate	100 mg
dapsone	100 mg
desoxycortone acetate	100 mg
dexamethasone	100 mg
dexamethasone acetate	100 mg
diazepam	100 mg
diazoxide	100 mg
dicloxacillin sodium	200 mg
dicolinium iodide	100 mg
dicoumarol	100 mg
diethylcarbamazine dihydrogen citrate	100 mg
digitoxin	100 mg
digoxin	100 mg
NN'-di-(2,3-xylyl)anthranilamide	50 mg
emetine hydrochloride	100 mg
4-epianhydrotetracycline hydrochloride	25 mg
4-epitetracycline ammonium salt	25 mg
ergometrine hydrogen maleate	50 mg
ergotamine tartrate	50 mg
estradiol benzoate	100 mg
estrone	100 mg
etacrynic acid	100 mg
ethambutol hydrochloride	100 mg
ethinylestradiol	100 mg
ethisterone	100 mg
ethosuximide	100 mg
etocarlide	100 mg
flucytosine	100 mg
fluorouracil	100 mg
fluphenazine decanoate dihydrochloride	100 mg
fluphenazine enantate dihydrochloride	100 mg
fluphenazine hydrochloride	100 mg
folic acid	100 mg
furosemide	100 mg
griseofulvin	200 mg
haloperidol	100 mg
hydrochlorothiazide	100 mg

Reference substance	Package size
hydrocortisone	100 mg
hydrocortisone acetate	100 mg
(−)-3-(4-hydroxy-3-methoxyphenyl)-2-methylalanine	25 mg
ibuprofen	100 mg
imipramine hydrochloride	100 mg
indometacin	100 mg
o-iodohippuric acid	100 mg
isoniazid	100 mg
lanatoside C	100 mg
levodopa	100 mg
levothyroxine sodium (thyroxine sodium)	100 mg
lidocaine	100 mg
lidocaine hydrochloride	100 mg
mefenamic acid	100 mg
melting point reference substances (set of 13 substances with melting temperatures ranging from +69 °C to +263 °C)	13 × 4 g
metazide	100 mg
methaqualone	100 mg
methyldopa	100 mg
methyltestosterone	100 mg
meticillin sodium	200 mg
metronidazole	100 mg
nafcillin sodium	200 mg
neostigmine metilsulfate	100 mg
nicotinamide	100 mg
nicotinic acid	100 mg
niridazole	200 mg
niridazole-chlorethylcarboxamide	25 mg
norethisterone	100 mg
norethisterone acetate	100 mg
ouabain	100 mg
oxacillin sodium	200 mg
oxytetracycline dihydrate	200 mg
oxytetracycline hydrochloride	200 mg
papaverine hydrochloride	100 mg
phenethicillin potassium	200 mg
phenoxymethylpenicillin	200 mg
phenoxymethylpenicillin calcium	200 mg
phenoxymethylpenicillin potassium	200 mg
phenytoin	100 mg
prednisolone	100 mg
prednisolone acetate	100 mg
prednisone	100 mg

Reference substance	Package size
prednisone acetate	100 mg
procaine hydrochloride	100 mg
procarbazine hydrochloride	100 mg
progesterone	100 mg
propicillin potassium	200 mg
propranolol hydrochloride	100 mg
propylthiouracil	100 mg
pyridostigmine bromide	100 mg
reserpine	100 mg
riboflavin	250 mg
sodium cromoglicate	100 mg
sulfamethoxazole	100 mg
sulfamethoxypyridazine	100 mg
sulfanilamide	100 mg
testosterone propionate	100 mg
tetracycline hydrochloride	200 mg
thioacetazone	100 mg
4,4'-thiodianiline	50 mg
tolbutamide	100 mg
tolnaftate	100 mg
trimethadione	200 mg
trimethoprim	100 mg
trimethylguanidine sulfate	100 mg
tubocurarine chloride	100 mg
vitamin A acetate (solution) [retinol]	5 capsules[1]
warfarin	100 mg

[1] About 9 mg in 250 mg of oil per capsule.

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* The International Nonproprietary Name appears in brackets.

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