**Supplementary material 1, Details of study materials in this commutability study.**

**Addition-1:**

1. 5g/L ascorbic acid (AA) solution (SIGMA-ALDRICH, MKCM4324, USA)
2. PGA and 5-MeTHF mixed standard solution (PGA purity standard materials GBW(E)100265, purchased from the Chinese Academy of Metrology, China; 5-MeTHF standard purchased from SIGMA-ALDRICH, Lot M0132, USA.)

**Addition-2:** 5g/L AA solution

**Procude a.**: All samples were thawed, pooled on a magnetic stirrer (Variomag Compact, Thermo Fisher Scientific, Waltham, MA, USA), and filtered sequentially through 0.45-μm and 0.22-μm PES membranes (Cornig, USA) using a vacuum pump (Thermo Scientific™ RAP, Thermo Fisher Scientific, Waltham, MA, USA)

| **Materials** | **Materials ID** | **Source of materials / matrix** | **Preprations** |
| --- | --- | --- | --- |
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| EQA  materials | EQA202011 | Lyophilized powder purchased from Randox Laboratories Ltd. (County Antrim, UK). | 1. According to the instructions on the bottle, add the corresponding amount of deionized water to dissolve the powdered sample. Gently shake or mix to ensure thorough homogenization, avoiding the generation of bubbles 2. Aliquot the solution into 1 mL light-protected vials, and stored in -80℃ |
| EQA202012 |
| EQA202013 |
| EQA202021 |
| EQA202022 |
| EQA202023 |
| candidate RMs | cRM-1 | Left-over human serum pooled after 50% diluted with deionized water | 1. Procude a. 2. cRM-1, cRM-2, cRM-3 are spiked with addition-1 at 5.0 ng/ml, 8.0 ng/ml, 15.0 ng/ml respectively, and thawed on a magnetic stirrer for 4h ~ 6h at 4℃ in dark |
| cRM-2 | Pooled left-over human serum |
| cRM-3 | Pooled left-over human serum from pregnant women |
| cRM-4 | Pooled left-over human serum with low PGA concentration | 1. Procude a. 2. cRM-4, cRM-5 are spiked with addition-1 at 5.0 ng/ml, 8.0 ng/ml respectively, and thawed on a magnetic stirrer for 4h ~ 6h at 4℃ in dark |
| cRM-5 |
| TV  materials | TV-202111 | Pooled left-over human serum | 1. Procedure a. 2. Addition-2 |
| TV-202111 | Pooled left-over human serum spiked with high concentration of standard solution | 1. Procedure a. 2. Addition-1 with different concentrations |
| TV-202011 | Pooled left-over human serum spiked with low concentration of standard solution |
| TV-202012 |
| TV-202013 | Pooled left-over human serum spiked with medium concentration of standard solution |
| TV-202014 | Pooled left-over human serum spiked with high concentration of standard solution |
| Processed materials | CS-L | Sterile filtered charcoal stripped serum purchased from Equitech Enterprises (catalog number:  SCHS-0500; lot number: 14121801-SHSC33, USA) | Spiked with low (5.0 ng/ml) level of addition-1 |
| CS-M | Spiked with medium (8.0 ng/ml) level of addition-1 |
| CS-H | Spiked with high (15.0 ng/ml) level of addition-1 |
| LHS-1 | Pooled left-over human serum | 1. Lyophilized 2. Addition-2 |
| LHS-2 | Lyophilized without any additives |
| FS-1 | Pooled fresh (stored in 4℃ no more than 24 hours) left-over human serum | None |
| FS-2 | Addition-2 |
| RS 2W-1 | Pooled left-over human serum which have been stored at 4℃ for two weeks | None |
| RS 2W-2 | Addition-2 |
| RS 1W-1 | Pooled left-over human serum which have been stored at 4℃ for one week | Lyophilized without any additives |
| RS 1W-2 | 1. Lyophilized 2. Addition-2 |
| CS-5MeTHF | Pooled left-over human serum sterile filtered with charcoal | Spiked with 8.0 ng/ml 5-MeTHF standard solution [5-MeTHF standard materials purchased from SIGMA-ALDRICH, Lot M0132, USA.], thawed on a magnetic stirrer for 4h~6h at 4℃ in dark |
| CS-PGA | Spiked with 2.0 ng/ml PGA standard solution. [PGA purity standard materials (GBW (E) 100265), purchased from the Chinese Academy of Metrology, China), and thawed on a magnetic stirrer for 4h ~ 6h at 4℃ in dark |

*Note: materials in the blue is purchased materials.*

All pooled left-over human serum was collected from department of laboratory medicine of Beijing Hospital. After preparation described in the Table, all samples, including the candidate reference materials, trueness verification (TV) materials, and processed materials, were aliquoted into 1 mL portions using brown, light-protected cryovials (Steller Scientific) and stored at −80℃.

These materials were kept in the dark and were only removed from the freezer when needed for analysis.