# 6.1 Blood

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| **Samples** | | | | | | | | |  | **St** | | | **ability** |  |  |
| Analytes | Serum    Pla  s  ma | Heparinate  Plasma | EDTA  Pla  s  ma | Citrated | Whole blood    Hep EDTA Citra | | | Biological half-life | Stability in  blood at room temperature | Stability in serum/plasma  -20 °C 4-8 °C 20-25 °C | | | Stabiliser | Remarks / Comments | Reference |
| Acetamin ophen |  |  |  |  |  |  |  |  |  |  |  |  |  | see Paracetamol |  |
| Acetylsali cylate | + | + | +   | (+ ) |  |  |  | 15 - 30 min |  |  |  |  |  |  | 65 |
| 1-Acid glycoprot ein  (orosomu coid) | + | +  | +  ,   | (+  ) |  |  |  |  | 12 d | 1 y | 5 m | 5 m |  |  | 142, 256 |
| Adenovir us antibodies | + |  | (+  ) |  |  |  |  |  |  |  |  |  |  | Complement  fixation test,  ELISA IgG, IgM |  |
| Alanine aminotran  sferase  (ALAT,  ALT ) | + | + | + | (+  ) |  |  |  | 47 h | 4 d  | 7 d | 7 d | 3 d |  |  | 106, 140 |
| Albumin colorimetr  ic      nephelom  etric | +          + | +\*          + | (+  )    ,+   +   | (+  ) |  |  |  | 3 w | 2 - 6 d  14 d (2 – 6  °C)      6 d | 4 m          3 m | 5 m          1 w | 2,5 m          4 h |  | \*Bichromatic assay recommended for colorimetric assay  (102), | 27, 52, 76,  145, 222,  258, 271 |
| Aldostero ne | + | + |  |  |  |  |  | min | 1 d  | 4 d | 4 d | 4 d | EDTA |  | 289 |
| Alkaline phosphata | + |  | - | (+ |  |  |  | 3 – 7 d | 4 d  | 2 m | 7 d | 7 d |  | EDTA binds  essential cofactor | 100, 106,  271 |

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| **Samples** | | | | | | | | | **Stability** | | | | | | |
| Analytes | Serum    Pla  s  ma | Heparinate  Plasma | EDTA  Pla  s  ma | Citrated | Whole blood    Hep EDTA Citra | | | Biological half-life | Stability in  blood at room temperature | Stability in serum/plasma  -20 °C 4-8 °C 20-25 °C | | | Stabiliser | Remarks / Comments | Reference |
| se, - total - bone isoenzym  e |     + | + | - | )    (+  )   |  |  |  | 9 – 18 h | 4 d | 1 y | 7 d | 7 d |  | zinc |  |
| Aluminiu m | - | - | - | - |  |  |  |  | 7 d | 1 y | 2 w | 1 w |  | Special tube needed | 218 |
| Amikacin | + | + | +   | (+ ) |  |  |  | 30 min – 3 h |  | 14 d | 7 d | 2 h |  |  | 274, 290 |
| Amiodaro  ne | + | + | + |  |  |  |  | 4 h – 25 d |  | 1 w | 1 w | 1 d |  | HPLC | 100, 244 |
| Amitripty line | + | + | + |  |  |  |  | 17 – 40 h |  |  |  | 1 d |  | HPLC | 275 |
| Ammonia (NH4+) | -   | (+)   |  | - | + |  |  | min | 15 min in  EDTA | 3 w | 2 h | 15 min | Serin  5 mmol/L + borate 2 mmol/L  (72) | Do not use ammonium heparin. Contamination by sweat ammonia. | 72 |
| Ampheta mines | + | + | + |  |  |  |  |  |  |  |  |  |  |  | 275 |
| Amylase  -  pancreatic    - total | +    + | +    + | +  + | (+  )    (+  )\* |  |  |  | 9 - 18 h    9 - 18 h | 4 d     4 d  | 1 y    1 y | 7 d    7 d | 7 d    7 d |  | \* Possible decrease of the activity by Mg and Ca binding at   25 °C | 106, 161,  271, 289,  290 |
| Amyloid A (SAA) | + | + |  |  |  |  |  |  |  | 3 m  at -25  °C | 8 d  | 3 d  |  |  | 145 |
| Androsten dione | + |  |  |  |  |  |  |  | 1 d  | 1 y | 4 d | 1 d |  |  | 132 |
| Angiotens | + | + | - | - |  |  |  |  |  | 1 y | 7 d | 1d |  |  | 164 |

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| **Samples** | | | | | | | | | **Stability** | | | | | | |  |
| Analytes | Serum    Pla  s  ma | Heparinate  Plasma | EDTA  Pla  s  ma | Citrated | Whole blood    Hep EDTA Citra | | | Biological half-life | Stability in  blood at room temperature | Stability in serum/plasma  -20 °C 4-8 °C 20-25 °C | | | Stabiliser | Remarks / Comments |  | Reference |
| in convertin g enzyme (ACE) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Anticonv ulsive drugs | + |  |  |  |  |  |  |  |  |  |  |  |  | See carbamazepine, ethosuccimide, phenobarbital, phenytoine, valproic acid |  |  |
| Antimitoc hondrial antibodies  (AMA) | + |  |  |  |  |  |  |  |  | 1 m | 7 d | 1d |  |  | 43 |  |
| Antineutr ophil cytoplasm  ic antibodies  (ANCA) | + |  |  |  |  |  |  |  |  | 1 m | 7 d | 1d |  |  | 43 |  |
| Antinucle  ar  antibodies  (ANA) | + |  |  |  |  |  |  |  |  | 1 m | 7 d | 1d |  |  | 43 |  |
| Antiphosp holipid antibodies | + |  |  |  |  |  |  |  |  | 1 m | 2 – 3 d | 1 d |  |  | 43 |  |
| Antistaph ylolysine | + | + | + |  |  |  |  |  |  | 6 m | 2 d | 2 d |  |  |  |  |
| Antistrept odornase B | + |  |  |  |  |  |  |  |  | 3 m | 8 d |  |  |  |  |  |
| Antistrept | + |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

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| **Samples** | | | | | | | | | **Stability** | | | | | | |
| Analytes | Serum    Pla  s  ma | Heparinate  Plasma | EDTA  Pla  s  ma | Citrated | Whole blood    Hep EDTA Citra | | | Biological half-life | Stability in  blood at room temperature | Stability in serum/plasma  -20 °C 4-8 °C 20-25 °C | | | Stabiliser | Remarks / Comments | Reference |
| okinase |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Antistrept olysine | + | +  ,  ,  ,  - | +  ,  ,  , -  |  |  |  |  |  |  | 6 m | 8 d | 2 d |  |  |  |
| Antithrom  bin  -  functional  -  immunoc  hemical | - | - | -  +  ,   |   (+  )  ,   |  |  | +\* | 30 h  40 – 135 h | 8 h  2 d\*\* | 1 m  1 y | 2 w  8 d | 2 d |  | \*Test by PharmaciaUpjohn \*\*After centrifugation | 105, 137,  256, 259 |
| 1- Antitrypsi n | + | + | +  ,  -   | (+  )  ,   |  |  |  |  | 11 d  7 w (2- 6  °C) | 3 m | 5 m | 3 m |  | EDTA and citrate  | 50, 145,  253, 254,  257, 289 |
| APC  resistance   * function al   screenin g test   * genotypi ng factor   V  Leiden | - | - | - |  |  |  |  |  | 30 min    1 w | 6 m (-70  °C) | 3 h | 3h |  | Centrifuge within  30 min | 292 |
| Apolipopr oteins AI, AII, B | +   | + |   , | (+  ) |  |  |  |  |  | 3 m | 8 d | 1 d |  |  | 44, 63, 145,  189 |
| Apolipopr | + | + |  | (+ |  |  |  |  |  | 1 m | 1 m | 1 m |  |  | 145, 189 |

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| **Samples** | | | | | | | | | **Stability** | | | | | | |
| Analytes | Serum    Pla  s  ma | Heparinate  Plasma | EDTA  Pla  s  ma | Citrated | Whole blood    Hep EDTA Citra | | | Biological half-life | Stability in  blood at room temperature | Stability in serum/plasma  -20 °C 4-8 °C 20-25 °C | | | Stabiliser | Remarks / Comments | Reference |
| otein CIII |  |  |  | ) |  |  |  |  |  |  |  |  |  |  |  |
| Apolipopr otein E | + |  | + |  |  |  |  |  | 1 d | 3 m | 8 d |  |  |  | 216 |
| ApoEgenotypin  g |  |  |  |  |  |  |  |  | 1 w (4 –8  °C) | 3 m | 1 w |  |  | Stability of ApoE2 >  ApoE4 > ApoE3 | 216, 229 |
| Aspartate aminotran sferase (ASAT,  AST) | +   |  | +, -  ,     | (+  ) |  |  |  | 12 - 14 h | 7 d  | 3 m | 7 d | 4 d |  |  | 106, 140, 253, 289,  290 |
| Aspergill us   * antigen detectio n * antibody | +  + |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Atrial natriuretic peptide  (ANP) |  |  | +  \* |  |  |  |  | 8,8 min | Unstable |  |  |  | \*Aprotinin | Centrifuge at 4 °C | 180, 263 |
| -  prohormo ne  (proANP) |  |  | + |  |  |  |  | 1 h | 6 h | 4 w | 3 d | 6 h |  |  | 184 |
| Barbiturat es | + | + |  |  |  |  |  | 50 - 120 h | 2 d | 6 m | 6 m | 6 m |  | See also phenobarbital | 36, 65, 264 |
| Bartonella spp.  antibodies | + |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Batroxobi n time | - | - | - |  |  |  |  |  |  | 1 m | 4 h | 8 h |  | Avoid heparinate contamination  | 105, 253,  289 |

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| **Samples** | | | | | | | | | **Stability** | | | | | | |
| Analytes | Serum    Pla  s  ma | Heparinate  Plasma | EDTA  Pla  s  ma | Citrated | Whole blood    Hep EDTA Citra | | | Biological half-life | Stability in  blood at room temperature | Stability in serum/plasma  -20 °C 4-8 °C 20-25 °C | | | Stabiliser | Remarks / Comments | Reference |
| Benzodiaz epine | + | + |  |  |  |  |  | 25 - 50h | <1 d\* |  | 5m | 5m |  | See also diazepam, flunitrazepam, nitrazepam | 65, 135,  155, 264 |
| Bicarbona  te | + | + | - |  |  |  |  | min | Unstable  (30 min – 2 h at +4°C) | 1 m | 7 d | 1 d \* | Keep tube closed | \*1 h after opening the tube, see also blood gases | 29, 140, 289 |
| Bilirubin   * conjugat ed * total (also in   newbo  rns) | +  + | +  + | +  + | (+  )  (+  ) |  |  |  | h 17 d | Unstable,   | 6 m  6 m | 7 m  7 d | 2 d  1 d |  | Darkness required when stored > 8 h | 27,106, 271,  289 |
| Blood cell surface markers (immunoc ytometry) |  |  |  |  | + | + |  |  | CD4 1d in heparinized blood |  |  |  |  | See also  lymphocyte subtypes | 219 |
| Blood gases (CO2, O2, pH) |  |  |  |  |  |  |  | min | < 15 min  pO2 < 30 min pH, pCO2 < 60 min on ice |  | 2 h \* |  | \*In heparinized blood and closed tubes | Use closed gas tight tubes or capillaries | 19, 29 |
| Bordetella pertussis antibodies | + |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Borrelia  burgdorfe  ri  antibodies  (Lyme | + | + | +   | +   |  |  |  |  |  |  |  |  |  | ELISA, Western blot |  |

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| **Samples** | | | | | | | | | **Stability** | | | | | | |
| Analytes | Serum    Pla  s  ma | Heparinate  Plasma | EDTA  Pla  s  ma | Citrated | Whole blood    Hep EDTA Citra | | | Biological half-life | Stability in  blood at room temperature | Stability in serum/plasma  -20 °C 4-8 °C 20-25 °C | | | Stabiliser | Remarks / Comments | Reference |
| disease) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Brain natriuretic  peptide  (BNP)  NT- pro  BNP | +      + | +      + |       + |  |  |  |  | 13 – 20 min      2 h | 4 – 5 h      3 d | 5 d -8  m    1 y | 1 d      5 d | 4 h      3 d | EDTA |  | 64, 124,170,  175, 226,  233, 236 |
| Brucella antibodies  (Brucellos  is) | + |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| C1esterase  inhibitor  -  functional  assay  -  immunoc  hemical | +  + |  | + | (+  )  +   |  |  |  |  |  | 1 m  1 y | 2 d  8 d | 6 h |  | Stabilise plasma by freezing | 253 |
| CA 125 (Cancer antigen 125) | + | +  ,  ,  µ | +  ,  ,  µ | (+  )  |  |  |  | 5 – 10 d | 2 d  | 3 m | 5 d | 3 d |  |  | 22, 217,  237,246 |
| CA 15-3, (Cancer antigen 15-3) | + | +  ,  , - µ | +  ,  ,  ,  -  µ | (+  )  |  |  |  | 5 - 7 d | 7 d | 3 m | 7 d | 7 d |  |  | 151, 217,  237, 246 |
| CA 19-9 |  |  |  |  |  |  |  |  |  |  |  |  |  | See carbohydrate antigen 19-9 |  |

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| **Samples** | | | | | | | | | **Stability** | | | | | | | |
| Analytes | Serum    Pla  s  ma | Heparinate  Plasma | EDTA  Pla  s  ma | Citrated | Whole blood    Hep EDTA Citra | | | Biological half-life | Stability in  blood at room temperature | Stability in serum/plasma  -20 °C 4-8 °C 20-25 °C | | | Stabiliser | Remarks / Comments | | Reference |
| CA 72-4 (Cancer antigen 72-4) | + | +  | +   | (+  )  |  |  |  | 3 - 7 d | 3 d  | 3 m | 30 d | 7 d |  |  | | 217, 246 |
| Cadmium | - |  |  | - |  |  |  | 10 - 35 y | 1 d in trace element tube |  |  |  |  | Special tube (Released from red stopper) | | 218, 289 |
| Calcitonin | + | + |  |  |  |  |  | min | 4 h stabilized\* | 1 y | 1 d | 4 h | \*Aprotinin 400 KIU/mL |  | 100, 253 | |
| Calcium   * total * ionised   (free) | +  - | +  (+) | -    -   | -    -   | +  \* |  |  | h min | 2 d  15 min  1 d\* | 8 m | 3 w  2 h | 7 d  3 d\*\* | \*Use calciumtitrated heparin  (24) | pH-dependent  \*\*Stable in gel tubes for 25 h & 72 h after centrifugation in closed tube (123) | | 108, 271,  289  24, 29, 123 |
| Campylob  acter jejuni/fetu s antibodies | + |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |
| Candida albicans   * antibodi es * antigen detectio n | +  + |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |
| Carbamaz epine | + | +    ,  ,  ,   | +  ,   | (+ )  ,  ,  ,   |  |  |  | 10 - 25 h | 2 d | 1 m | 7 d | 5 d |  | 10 % higher results in plasma (), unstable in gel separator tubes, but stabile in SST II tubes (30) | | 30, 36, 65 |

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| **Samples** | | | | | | | | | **Stability** | | | | | | |
| Analytes | Serum    Pla  s  ma | Heparinate  Plasma | EDTA  Pla  s  ma | Citrated | Whole blood    Hep EDTA Citra | | | Biological half-life | Stability in  blood at room temperature | Stability in serum/plasma  -20 °C 4-8 °C 20-25 °C | | | Stabiliser | Remarks / Comments | Reference |
| Carbohyd  rate antigen 19-9, (CA  19-9) | + | + | +  ,  µ | (+  )  |  |  |  | 4 - 9 d | 7 d  | 3 m | 30 d | 7 d |  |  | 217, 246 |
| Carbohyd  rate deficient  transferrin  (CDT) | + | - |  |  |  |  |  | 14 - 18 d | 3 d | y | 7 d | 7 d |  | Method-dependent | 224 |
| Carcinoembryoni c antigen  (CEA) | + | + | +      ,  ,  ,  µ | +   |  |  |  | 2 - 4 d | 7 d | 6 m | 7 d | 2 d |  | EDTA reduces by 13 %   | 96, 179,  217,237,  246, 269,  289 |
| Cardiolipi n antibody | + |  |  |  |  |  |  |  |  | 1 m | 2-3 d | 1d |  |  | 43 |
| Catechola mines (epinephri ne, norepinep hrine) | - |  | (+  ) | - |  |  |  | 3 - 5 min | 1 h if not stabilized | 1 m 6 m stabilised | 2 d | 1 d | Glutathione 1.2 g/L  +EGTA (26) | EGTA plasma to be separated within 15 min and frozen at 20°C | 26, 99 |
| Cerulopla smin | + | + | +,  |  |  |  |  | 4 d |  | 1 y | 2 w | 8 d |  |  | 254, 258,  271 |
| Chinidin | + | +  ,   | +   | (+  )   |  |  |  | 6 – 9 h |  | 1 – 2 w | 1 d |  |  |  | 65, 274 |

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| **Samples** | | | | | | | | | **Stability** | | | | | | |
| Analytes | Serum    Pla  s  ma | Heparinate  Plasma | EDTA  Pla  s  ma | Citrated | Whole blood    Hep EDTA Citra | | | Biological half-life | Stability in  blood at room temperature | Stability in serum/plasma  -20 °C 4-8 °C 20-25 °C | | | Stabiliser | Remarks / Comments | Reference |
| Chlamydi  a antibodies (C.  trachomat  is,  C.  pneumoni  ae) | + |  | (+  ) |  |  |  |  |  |  |  | 7 d | 5 d |  | DNA-PCR possible  after 3 – 4 d at room temperature | 173 |
| Chloramp henicol | + | + | + | (+  ) |  |  |  | 2 – 5 h |  |  |  |  |  |  | 274 |
| Chloride | + | + | - | - | + |  |  | 1 h | 1 d  | y | 4 w | 7 d |  |  | 29, 106 |
| Cholester ol | + | + | +, -  ,  ,  ,   | (+  ) |  |  |  |  | 2 - 7 d  | 3 m | 7 d | 7 d |  |  | 11, 27, 44,  63, 106 |
| Cholester ol, HDL | + | + | +    ,  , -   | - |  |  |  |  | 2 d  | 3 m | 7 d | 2 d |  | 3 %lower cholesterol observed in  EDTA plasma due to osmotic dilution effect | 11, 44, 63 |
| Cholester ol, LDL | + | -,  +  ,  , | +  , -  ,   | - |  |  |  |  | 1 d  | 3 m | 7 d | 1 d |  |  | 11, 44, 63 |
| Cholineste rase, | + | + | +,  - |  |  |  |  | 10 d\* | 7 d  | 1 y | 1 y | 1 y |  | \*Shorter in heavily diseased patients | 76, 106,  114, 246 |

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| **Samples** | | | | | | | | | **Stability** | | | | | | |
| Analytes | Serum    Pla  s  ma | Heparinate  Plasma | EDTA  Pla  s  ma | Citrated | Whole blood    Hep EDTA Citra | | | Biological half-life | Stability in  blood at room temperature | Stability in serum/plasma  -20 °C 4-8 °C 20-25 °C | | | Stabiliser | Remarks / Comments | Reference |
| including dibucain number |  |  | ,   |  |  |  |  |  |  |  |  |  |  | (76) |  |
| Ciclospori n | - | - | - | - |  |  |  | 10 - 27 h | 13 d | 3 m\* | 3 w\* | 3 w\* | EDTA | \*Stored in haemolysate | 7, 66, 120, 274 |
| Circulatin g  immunocomplexe s (CIC) | + |  |  |  |  |  |  |  | 4 h | 1 y | 8 h | 4 h |  |  | 43 |
| Clostridiu m tetani toxine antibodies | + |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Coagulati on factors** |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 38, 105, 2564, 292 |
| Factor  II | - | - | - |  |  |  |  | 41 - 72 h | 1 d | 1 m |  | 6 h |  |  | 256, 292 |
| Factor  V | - | - | - |  |  |  |  | 12 - 15 h | 4 h | 1 m | 2 d | 6 h |  | Centrifuge at 4°C | 38, 105,  256, 292 |
| Factor VII | - | - | - |  |  |  |  | 2 - 5 h | 1 d | 1 m | Unstable | 6 h |  |  | 256, 292 |
| Factor VIII | - | - | - |  |  |  |  | 8 - 12 h |  | 2 w | 4 h | 3 h |  |  | 38, 105,  256, 292 |
| Factor VIII R:  Ag | - | - | - |  |  |  |  | 6 - 12 h |  | 6 m | 7 d\* | 7 d\* | \* Sodium azide | Five freezingthawing cycles are possible | 261 |
| Factor VIII R:  Co |  |  |  |  |  |  |  | 6 h |  | 6 m | 2 w\* | 2 d | \* Sodium azide |  | 261 |

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| **Samples** | | | | | | | | | **Stability** | | | | | | |
| Analytes | Serum    Pla  s  ma | Heparinate  Plasma | EDTA  Pla  s  ma | Citrated | Whole blood    Hep EDTA Citra | | | Biological half-life | Stability in  blood at room temperature | Stability in serum/plasma  -20 °C 4-8 °C 20-25 °C | | | Stabiliser | Remarks / Comments | Reference |
| Factor  IX | - | - | - |  |  |  |  | 18 - 30 h | 1 d | 1 m |  | 6 h |  |  | 256 |
| Factor  IX: Ag | - | - | - |  |  |  |  |  | 1 d |  |  |  |  |  | 292 |
| Factor  X | - | - | - |  |  |  |  | 20 - 42 h | 1 d | 1 m |  | 6 h |  |  | 256, 292 |
| Factor  XI | - | - | - |  |  |  |  | 3 – 4 d | 1 d |  | Unstable | 6 h |  |  | 256, 292 |
| Factor XII | - | - | - |  |  |  |  | 50 – 70 h | 1 d |  | Unstable | 6 h |  |  | 256, 292 |
| Factor XIII | - | - | - |  |  |  |  | 4 – 5 h |  | 1 m |  | 4 h |  |  | 256, 292 |
| Cocaine    Benzoyle  cgonin    Ecgoninm ethylester | + | + | - |  |  |  |  |  | < 10 min    5 d  10 d | 4 d | 30 d    5 d  10 d | <30 min  5 d  10 d | Fluoride, pH 5 | Cocaine is converted in vitro into its metabolites. | 109, 155,  231 |
| Cold agglutinin  s |  |  |  |  |  |  |  |  |  |  |  |  |  | Keep whole blood at 37°C (water bath) |  |
| Complem  ent C3 | + | + | +  ,  | (+  ) |  |  |  | min | 1. d 2. d (C3c)   (2 – 6°C) | 8 d | 8 d | 4 d |  | Dependent on antibody, during storage  C3cC3 | 145, 258,  271, 289 |
| Complem  ent C4 | + | + | + | (+  ) |  |  |  | 12 h – 1 d | 1. d 2. d (2 – 6   °C) | 3m | 8 d | 2 d |  | During storage  C4,C4c | 145, 271,  289 |
| Copper | + | + | - | - |  |  |  |  | 7 d | y | 2 w | 2 w |  | Special tube to avoid contamination | 271,289 |
| Corticotro |  |  |  |  |  |  |  | min |  | 6 w | 3 h | 1 h | Aprotinin 400- | Prevent binding to | 64, 178, |

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| **Samples** | | | | | | | | | **Stability** | | | | | | |
| Analytes | Serum    Pla  s  ma | Heparinate  Plasma | EDTA  Pla  s  ma | Citrated | Whole blood    Hep EDTA Citra | | | Biological half-life | Stability in  blood at room temperature | Stability in serum/plasma  -20 °C 4-8 °C 20-25 °C | | | Stabiliser | Remarks / Comments | Reference |
| pin  (ACTH) |  |  |  |  |  |  |  |  | 1 – 4 h  |  | 2 d\* | 1 d\* | 2000 KIU/mL  Mercaptoethanol 2L/mL | glass tubes by using  plastic for storage \* in EDTAplasma | 201, 253 |
| Corticotro pin releasing hormone | +   | + |  |  |  |  |  |  |  |  | 1 d | 11 – 18 h |  |  | 64 |
| Cortisol | + | + , µ | +  ,  ,  µ |  |  |  |  | 1 h | 7 d | 3 m | 7 d | 7 d |  | 11 % less in EDTA  () | 50, 126,  289 |
| Coryneba cterium diphtheria e toxine antibodies | + |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Coxiella burnetiiantibodies (Q-fever) | + |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Coxsackie virus antibodies | + |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| C peptide | + | + |  |  |  |  |  | 30 min | 6 h | 2 m | 5 d | 5 h | EDTA | Fluoride,oxalate also possible() | 64, 79, 178 |
| C-reactive protein  (CRP) | + | (+) \*\* +  ,  ,  , | (+  )\* +  ,  ,  , | (+  ),  +   |  |  |  | 2 - 4 h | 3 w (2 - 6  °C) | 3 y | 2 m | 11 d |  | \*Method-dependent \*\*Patient-dependent lower results | 145, 258,  289 |

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| **Samples** | | | | | | | | | **Stability** | | | | | | |
| Analytes | Serum    Pla  s  ma | Heparinate  Plasma | EDTA  Pla  s  ma | Citrated | Whole blood    Hep EDTA Citra | | | Biological half-life | Stability in  blood at room temperature | Stability in serum/plasma  -20 °C 4-8 °C 20-25 °C | | | Stabiliser | Remarks / Comments | Reference |
|  |  | ,   | ,   |  |  |  |  |  |  |  |  |  |  |  |  |
| Creatinine | + | + | + | (+  ) |  |  |  | 3 min | 2 d  | 3 m | 7 d | 7 d |  |  | 27, 106,  271,289 |
| Creatine kinase (CK) | + | +  ,  ,  ,   | +  ,  ,   | (+  ) |  |  |  | 18 h | 7 d  | 1 m | 1 m | 4 h | Darkness | CK-BB not stable | 106,253,  271, 289 |
| Creatine kinase  MB   * enzyme activity * molecul ar mass | +  + | +,  - +  ,  , ,  - µ | +  ,  ,-    +  ,,  ,  - µ | (+  )    (+  )  |  |  |  | 12 h  12 h | 7 d   7 d  | 1 y  4 w | 7 d  7 d | 2 d  2d | SH reagent |  | 165 |
| C-  terminal  crosslinks (CTX) (ß-  CrossLaps) | + | + |  |  |  |  |  |  | 8 h  7 d (CrossLabs) | 3 m | 7 d | 8h  2 d\* | pH 8.0, \*EDTA | Stability pHdependent | 157, 185 |
| Cyclospor  in |  |  |  |  |  |  |  |  |  |  |  |  |  | see ciclosporin |  |
| Cytokerat inefragment 21-1  (CYFRA  21-1) | + | +  | +   | (+  )  |  |  |  | 30 min | 7 d | 6 m | 1 m | 7 d |  |  | 217, 246 |
| Cystatin | + | + | + |  |  |  |  | min | 1 d | 3 m | 1 w | 2 d |  | More stable in | 68, 145, |

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| **Samples** | | | | | | | | | **Stability** | | | | | | |
| Analytes | Serum    Pla  s  ma | Heparinate  Plasma | EDTA  Pla  s  ma | Citrated | Whole blood    Hep EDTA Citra | | | Biological half-life | Stability in  blood at room temperature | Stability in serum/plasma  -20 °C 4-8 °C 20-25 °C | | | Stabiliser | Remarks / Comments | Reference |
| C |  |  |  |  |  |  |  |  |  |  |  |  |  | EDTA | 176 |
| Cytokines | -   | + |  |  |  |  |  |  | 2 h  (heparinized blood) |  | 2 d |  |  | see also Tumor necrosis factor | 14, 48, 54,  59, 145 |
| - IFN-,  IFN-, 1 |  | +   |  |  |  |  |  |  |  |  |  |  |  |  | 14, 48, 54,  59 |
| - IL-6 | -   | + |  |  |  |  |  |  | 1 h (EDTA) |  |  |  |  |  | 69 |
| - IL-1, sIL-2R, sIL- 6R | -   |  |  |  |  |  |  |  |  |  | 12 h  |  |  |  | 14,48,54,56 |
| Cytomega  lovirus - antigen detection  (pp65) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| - DNA  amplificat ion |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| - CMV  antibodies | + | +  , | +  ,   | (+  )  , |  |  |  |  |  |  |  |  |  |  |  |
| D-Dimer | (+  ) | + | - |  |  |  |  | 6 – 8 h | 1 w | 6 m | 4 d | 8 h |  |  | 20, 31, 256,  292 |
| Dehydroe piandoster one sulfate  (DHEA-  S) | + | +  , | +   |  |  |  |  | 7 - 9 h | 2 d  | y | 2 w | 1 d |  |  | 51, 132,  253 |
| Dengue | + |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

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| **Samples** | | | | | | | | | **Stability** | | | | | | |
| Analytes | Serum    Pla  s  ma | Heparinate  Plasma | EDTA  Pla  s  ma | Citrated | Whole blood    Hep EDTA Citra | | | Biological half-life | Stability in  blood at room temperature | Stability in serum/plasma  -20 °C 4-8 °C 20-25 °C | | | Stabiliser | Remarks / Comments | Reference |
| virus antibodies |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Diazepam | + | + | + |  |  |  |  | 25 – 50 h |  |  | 5 m | 5 m |  |  | 65, 155,  264 |
| Differenti al leucocyte count   * Band neutrop   hiles   * Segment ed neutrop hiles * Eosinop hiles * Basophil es * Monocyt es * Lympho cytes | - | - | - | - |  |  | + | 2 h-3 y              6 – 7 h                    1.5 – 3 y | 2 h-7 d\*         1. – 12 h        1. – 12 h         12 h – 6 d    2 h – 2 d     1. – 12 h      1. h – 7 d |  |  |  | Dry blood smear stable | K3-or K2-EDTA:  Stability temperature- and instrument- dependent \*Prepare blood smear within 3 h after sampling.  Do not store EDTA blood in refrigerator | 103, 107,  213, 242 |
| Digitoxin | + | + | + |  |  |  |  | 6 – 8 d |  | 6 m | 3 m | 2 w |  |  | 65, 289 |
| Digoxin | + | + | + | (+ ) |  |  |  | 1 – 2 d |  | 6 m | 3 m | 2 w |  |  | 65, 289 |
| Disopyra mide | + | + | + | (+  ) |  |  |  | 4 – 9 h |  | 5m | 2 w |  |  |  | 65 |
| DNA  analysis by polymeras | (+  ) | \*,  + | + |  | -\* |  | + |  | 1 w |  |  |  |  | \*Heparin inhibits Taq polymerase and restriction enzymes LiCl 1.8 mol/L | 37, 112,  122, 181,  270, |

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| **Samples** | | | | | | | | | **Stability** | | | | | | |
| Analytes | Serum    Pla  s  ma | Heparinate  Plasma | EDTA  Pla  s  ma | Citrated | Whole blood    Hep EDTA Citra | | | Biological half-life | Stability in  blood at room temperature | Stability in serum/plasma  -20 °C 4-8 °C 20-25 °C | | | Stabiliser | Remarks / Comments | Reference |
| e chain reaction amplificat ion (PCR) |  |  |  |  |  |  |  |  |  |  |  |  |  | eliminates this error(122, 181) |  |
| Dopamine |  | + | + |  |  |  |  | 3 - 5 min |  | 1 m | 2 d | 1 d |  |  | 253 |
| Echinoco ccus spp. antibodies | + |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| ECHO  virus antibodies | + |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Elastase |  |  |  |  |  | + |  |  |  |  |  |  |  | see pancreatic elastase |  |
| Electroph oresis, proteins; see also  lipid  electroph oresis |  | (+)  \* |  |  |  |  |  |  |  | 3 w | 3 – 7 d | 1 d |  | Fibrinogen to be considered when using heparinate plasma, may be eliminated by fibrin precipitation | 253, 257 |
| Endomysi um  antibodies |  |  |  |  |  |  |  |  |  | m - ys | 7 d | 1 d |  |  | 43 |
| Entamoeb  a histolytica antibodies | + |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Enterovir us antibodies | + |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Epstein  Barr virus | + |  | (+ |  |  |  |  |  |  |  |  |  |  |  |  |

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| **Samples** | | | | | | | | | |  | **Stability** | | | | | | |
| Analytes | Serum    Pla  s  ma | Heparinate  Plasma | EDTA  Pla  s  ma | Citrated | Whole blood    Hep EDTA Citra | | | Biological half-life | |  | Stability in  blood at room temperature | Stability in serum/plasma  -20 °C 4-8 °C 20-25 °C | | | Stabiliser | Remarks / Comments | Reference |
| -  heterophil ic  antibodies (Paul Bunnel  test) |  |  | ) |  |  |  |  |  | |  |  |  |  |  |  |  |  |
| - anti-  EBNA, -  VCA, -  EA); | + | + | +   | +   |  |  |  |  | |  |  |  |  |  |  | IgG, IgM, IgA;  ELISA, Western  Blot |  |
| Erythrocy  te count |  |  |  |  | (+) |  | (+) | 2 m | |  | 4 d  7 d (4 – 8  °C) |  | 7 d\* | 7 d\* |  | \*EDTA-blood | 89, 107 |
| Erythrocy  te  sedimenta  tion rate  (ESR) |  |  |  |  |  |  |  |  | |  | 2 h | - | - | - |  | 1 part citrate, 4 parts blood | 253 |
| Erythropo  ietin | + | + | + |  |  |  |  | 4 - 11 h | |  | 6 - 24 h | 5 m |  | 2 w |  | Shipped frozen | 129, 253 |
| Estradiol (E2) | + | (+)  , µ,  +  , | (+  )  , µ, +  ,   | (+  ) |  |  |  |  | |  | 1 d | 1 y | 3 d | 1 d |  |  | 51, 132,  289 |
| Ethanol | + |  | +  , | (+  ) |  | +  \* |  | | 2 – 6 h |  | 2 w  \*\* | 6 m | 6 m | 2 w | EDTA/ Heparin | \*10 g/L NaF recommended to | 83, 155,  171 |

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| **Samples** | | | | | | |  | | | **Stability** | | | | | | |
| Analytes | Serum    Pla  s  ma | Heparinate  Plasma | EDTA  Pla  s  ma | Citrated | Whole b    Hep EDT | | lood  A Citra | Biological half-life | | Stability in  blood at room temperature | Stability in serum/plasma  -20 °C 4-8 °C 20-25 °C | | | Stabiliser | Remarks / Comments | Reference |
|  |  |  | ,    ,   | ,  |  |  |  | |  |  |  |  |  |  | stabilise  \*\*Evaporation, use closed tubes |  |
| Ethosuxi mid | + | + | + |  |  |  |  | | 30 - 60 h |  | 5 m | 4 w |  |  |  | 65 |
| Fatty acids | + | (+)    \* | (+  )   |  |  |  |  | | 2 min | 30 min\* | 2 d | 12 h | 30 min |  | \*Activation of lipase by heparin. Freeze serum/ plasma immediately | 271, 289 |
| Ferritin | + | + , -   | (+ )\*    , -    ,   | (+  )  ,   |  |  |  | |  | 1 d | 1 – 2 y | 7 d | 7 d |  | \*Method-dependent | 84, 252,  253, 289 |
| 1Fetoprotei n (AFP) | + | + | + | (+  ) |  |  |  | | 2-3 d | 7 d | 3 m | 7 d | 3 d |  |  | 22, 128,  289 |
| Fibrin(og en) degradati on products (FDP) | (+ )\* | - | - | (+  )\*  \* |  |  |  | |  | unstable | 1 m | 1 d | 3 h | 10 U thrombin and 150 KIU aprotinin /mL blood | \*Special tube \*\*Aprotinin or soybean trypsin inhibitor | 178, 254,  256 |
| Fibrin  monomer  s | - | - | - |  |  |  |  | | 1h | 1 d | 3 m | 1 d | 2 h |  |  | 202, 256 |
| Fibrinoge n - Clauss | - | - | - |  |  |  |  | | 4 -5 d | 1 w | 1 m | 1-7 d | 1-7 d |  | Stability methoddependent | 2, 15, 105,  183, 256,  259, 292 |

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| **Samples** | | | | | | |  | | | **Stability** | | | | | | |
| Analytes  -  immunoc  hemical | Serum    Pla  s  ma | Heparinate  Plasma | EDTA  Pla  s  ma | Citrated | Whole b    Hep EDT | | lood  A Citra | Biological half-life | | Stability in  blood at room temperature | Stability in serum/plasma  -20 °C 4-8 °C 20-25 °C | | | Stabiliser | Remarks / Comments | Reference |
| - | + | - |  |  |  |  | | 4 -5 d | 1 w | 1 m | 7 d | 7 d |  |  |  |
| Fibrinope ptide A | - | - | - |  |  |  |  | | 3 min |  |  | 2 h |  |  |  | 256 |
| Flunitraze pam | + |  |  |  |  |  |  | |  | < 1 d\* |  |  |  |  | \*Store protected from light | 135 |
| Folate    - in  erythrocyt es | + | +,  - µ | +  ,  -µ | (+ ) | + µ | +  ,   |  | | min | 30 min ,  5 d (2 – 8  °C) | 8 w | 1 d | 30 min | Ascorbate 2g/L | Haemolysate, prepared by 0.5 mL blood + 4.5 mL ascorbic acid (2 g/L). Na-heparin interferes with Axsym-Test (). | 142, 253,  289, 290 |
| Follitropi n (FSH) | + | + | + | (+  )  |  |  |  | | min | 7 d | 1 y | 2 w | 2 w |  |  | 127, 289 |
| Francisell a tularensis- antibodies  (tularemia  ) | + |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |
| Free light chains (,  ) of  immunogl  obulins | + | +, , | +  ,   |  |  |  |  | |  | 2 – 6 h | 6 m | 1 m | 7 d |  |  | 50, 145,  234, 250,  251 |
| Fructosa mine | + | + | + |  |  |  |  | | 12 d | 12 h | 2 m | 2 w | 3 d |  |  | 249, 253 |
| Galactose 1-puridyltransferas |  |  |  |  |  | +  \* |  | |  |  |  |  |  |  | \* In newborns drop of blood on filter paper , analyzed in erythrocytes |  |

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| **Samples** | | | | | | |  | | | **Stability** | | | | | | |
| Analytes | Serum    Pla  s  ma | Heparinate  Plasma | EDTA  Pla  s  ma | Citrated | Whole b    Hep EDT | | lood  A Citra | Biological half-life | | Stability in  blood at room temperature | Stability in serum/plasma  -20 °C 4-8 °C 20-25 °C | | | Stabiliser | Remarks / Comments | Reference |
| e  (galactose mia sceening) |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |
| Gastrin | + |   \* | + | (+  ) |  |  |  | |  | 2 h |  |  | 1 w\* | \*With aprotinin  2000 KIU/mL | Freeze serum as soon as possible | 64, 253,  289 |
| Gastrin releasing peptide (GRP) pro GRP | + |  |    |  |  |  |  | | 2 min    1 d | 1 h Serum,  3 h Plasma | 7d | 1d | 3 h (serum -  8 h(Plasma) |  |  | 246 |
| Gentamici n | + | + | + | (+ ) |  |  |  | | 0.5 - 3 h (<  30 y of age)  1.5 – 15 h (>  30 y of age) | 4 h | 4 w | 4 w | 4 h |  |  | 65, 290 |
| Glucagon | + | + |  |  |  |  |  | |  | Unstable |  | 1.5 d | 30 h | Aprotinin 5002000 KIU/mL | Stabilize | 178 |
| Glucose   * capillary * venous | -    -   | -    -   | -    -    +  \*  \* | -    -   | (+) |  |  | | min min | 10 min,  10 min,  2 h\*\* | 1 d\*  1 d\* | 7 d\*  7 d\* | 2 d\*  2 d\* | Fluoride, monoiodoacetate, mannose, acidity | \*Stabilised haemolysate and plasma  \*\*EDTA,citrate,fluo ride tube (75) | 57,75, 81,  100, 253,  271, 289 |
| Glutamate decarboxy  lase autoantib odies  (GADA) | + |  | (+  ) |  |  |  |  | |  |  |  |  |  |  | Add 25 mmol/L CaCl to EDTA plasma, centrifuge 10 min at 10000 *g* | 182, 196 |
| Glutamate | + | + | + |  |  |  |  | | 18 h |  | 4 w | 7 d | 7 d |  |  | 253, 289 |

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| **Samples** | | | | | | |  | | | **Stability** | | | | | | |
| Analytes | Serum    Pla  s  ma | Heparinate  Plasma | EDTA  Pla  s  ma | Citrated | Whole b    Hep EDT | | lood  A Citra | Biological half-life | | Stability in  blood at room temperature | Stability in serum/plasma  -20 °C 4-8 °C 20-25 °C | | | Stabiliser | Remarks / Comments | Reference |
| dehydrog enase |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |
| Glutamate oxaloaceti c transamin ase  (GOT) |  |  |  |  |  |  |  | |  |  |  |  |  |  | See aspartate aminotransferase |  |
| Glutamate pyruvate transamina se (GPT) |  |  |  |  |  |  |  | |  |  |  |  |  |  | See alanine aminotransferase |  |
| -  Glutamyl transferas e  (-GT) | + | + | (+  )    ,  +  ,   | (+  )  ,   |  |  |  | | 3 - 4 d | 1 d  | y | 7 d | 7 d |  |  | 106, 140,  253, 289,  290 |
| Glycated albumin |  |  |  |  |  |  |  | |  |  |  |  |  |  | See fructosamine |  |
| Gold | + |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |
| Haematoc  rit |  |  |  |  | + |  |  | |  | 1 d  4 d (4 – 8  °C) |  | 4 d\* |  | \*EDTA blood, | K2-superior to K3-  EDTA | 107 |
| Haemoglo  bin A1c |  |  |  |  |  |  |  | | 2 m | 3 d (EDTA blood) | 6 m\* | 7 d\* | 3 d\* |  | \*Haemolysate | 249 |
| Haemoglo  bin F (HbF) |  |  |  |  |  | + |  | |  |  |  |  |  |  |  |  |
| Haemoglo  bin |  |  |  |  |  |  |  | | 2 m | 4 d |  | 7 d\* | 4 d\* |  | \*EDTA blood | 89, 107 |

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| **Samples** | | | | | | | |  | | **Stability** | | | | | | |
| Analytes | Serum    Pla  s  ma | Heparinate  Plasma | EDTA  Pla  s  ma | Citrated | Whole blood    Hep EDTA Citra | | | Biological half-life | | Stability in  blood at room temperature | Stability in serum/plasma  -20 °C 4-8 °C 20-25 °C | | | Stabiliser | Remarks / Comments | Reference |
| (whole blood) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Haemoglo  bin (plasma) | (+  )   |  | (+  )   | (+  ) |  |  |  |  |  |  |  |  |  |  | Haemolysis during clotting (97) | 16, 97, 144 |
| Hanta virus  -  antibodies | + |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| - RNA  amplificat ion |  |  |  |  | - |  | - |  |  |  |  |  |  |  |  |  |
| Haptoglo bin | + | + | + | (+  )  |  |  |  |  | 3.5 - 4 d | 8 d | 3 m | 8 m | 3 m |  |  | 254, 258,  271, 290 |
| HBeAg | + | + | +   | (+  )   |  |  |  |  |  |  |  | 7 d |  |  | also possible from  ACD-B, CPDA-1, CPD and Na-  oxalate- tubes () |  |
| HBsAg | + | +  ,  ,   | +  ,  ,   | (+  )  ,  ,  , |  |  |  |  |  | 9 d | 1 y | 2 w | 7 d |  |  |  |
| Helicobac ter pylori antibodies | + | + | +   | (+ ) |  |  |  |  |  |  |  |  |  |  |  |  |
| Heparin (anti Xa) |  |  |  |  |  |  |  |  |  |  |  |  | 4 h |  |  |  |
| Heparin associated thrombop  enia; | + |  |  |  |  |  | + |  |  | 1 d |  | 4 w |  |  | citrated blood and serum needed |  |

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| **Samples** | | | | | | |  | | | **Stability** | | | | | | |  |
| Analytes | Serum    Pla  s  ma | Heparinate  Plasma | EDTA  Pla  s  ma | Citrated | Whole b    Hep EDT | | lood  A Citra | Biological half-life | | Stability in  blood at room temperature | Stability in serum/plasma  -20 °C 4-8 °C 20-25 °C | | | Stabiliser | Remarks / Comments |  | Reference |
| HIPA test |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |
| Hepatitis antibodies anti-  HAV | + | +  ,  ,   | +  ,  ,   | (+  )  ,  ,   |  |  |  | | 9 d |  | 1 y | 4 w | 5 d |  | prevent repeated freezing and thawing of sample | 100 |  |
| - anti-  HAV IgM | + | +  ,   | +  ,   | +  ,   |  |  |  | |  |  | 1 y | 4 w | 5 d |  |  | 100 |  |
| - anti-  HBsAg | + | +  ,  ,   | +  ,   | + ,  , |  |  |  | |  |  | 1 y | 4 w | 7 d |  |  | 100 |  |
| - anti-  HBc | + | +  ,  ,  ,   | +  ,  ,   | (+  )  ,  ,  ,   |  |  |  | |  |  | 1 y | 4 w | 7 d |  |  | 100 |  |
| - anti-  HBe | + | +  ,   | +  ,   | (+  )  ,   |  |  |  | |  |  | 1 y | 4 w | 5 d |  |  | 100 |  |
| - anti-  HCV | + | +  ,  ,   | +  ,  ,   | +  ,  -  ,   |  |  |  | |  |  | 1 y | 4 w | 7 d |  |  | 100 |  |
| - anti-  Hepatitis | + | + | +   | (+ ) |  |  |  | |  |  |  |  |  |  |  | 100 |  |

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| **Samples** | | | | | | |  | | | **Stability** | | | | | | |  |
| Analytes | Serum    Pla  s  ma | Heparinate  Plasma | EDTA  Pla  s  ma | Citrated | Whole b    Hep EDT | | lood  A Citra | Biological half-life | | Stability in  blood at room temperature | Stability in serum/plasma  -20 °C 4-8 °C 20-25 °C | | | Stabiliser | Remarks / Comments |  | Reference |
| D  - anti-  Hepatitis  E | + |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |
| Hepatitis  B virus  DNA | + |  | + |  |  |  |  | |  |  |  | 6 h |  |  |  | 90 |  |
| Hepatitis  C virus - RNA  amplificat ion | + |  | + |  |  |  |  | |  | 6 h - ys |  | 3 d - ys |  |  |  | 111 |  |
| Hepatitis  D virus - RNA  amplificat ion | + |  | + |  |  |  |  | |  |  |  |  |  |  |  |  |  |
| Hepatitis  E  - RNA  amplificat ion | + |  | + |  |  |  |  | |  |  |  |  |  |  |  |  |  |
| Herpes simplex 1 or 2 virus antibodies | + | + | +   | +   |  |  |  | |  |  |  |  |  |  |  |  |  |
| HHV 6  antibodies (human herpes virus 6) | + |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |
| HHV 6-, |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |

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| **Samples** | | | | | | | |  | | **Stability** | | | | | | |
| Analytes | Serum    Pla  s  ma | Heparinate  Plasma | EDTA  Pla  s  ma | Citrated | Whole blood    Hep EDTA Citra | | | Biological half-life | | Stability in  blood at room temperature | Stability in serum/plasma  -20 °C 4-8 °C 20-25 °C | | | Stabiliser | Remarks / Comments | Reference |
| 7-, 8-  DNA  amplificat ion |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| HI virus 1  -  (provirus)  DNA  amplificat ion  - RNA  amplificat ion |  |  |  |  |  |  |  |  | 5 – 14 d | 7 d |  | 5 d - s | 7 d    1 – 2 d |  | Several freezing/thawing cycles possible | 111, 112,  ,113,          156 |
| HI virus 1 and 2 antibodies | + | +  ,  ,   | +  ,  ,   | (+  )    ,  ,   |  |  |  |  |  |  |  | 4 w | 5 d |  |  |  |
| HIV, viral load |  |  |  |  | + |  | + |  | 5 – 14 d | 7 d |  |  |  |  |  | 265 |
| HLAABC  typing |  |  |  |  |  |  |  |  |  |  |  |  |  |  | Ammonium  heparinized blood |  |
| HLA- B27 |  |  |  |  | + |  |  |  |  | 1 d |  |  | 1 d | Citrate-phosphatedextrose (CPD) |  |  |
| HLA DR  typing |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Homocyst  eine | +  | + |  | (+  ) |  |    |  |  |  | 1 h  6 h (2 – 6  °C) | 4 y | 4 w | 4 d | Sodium  fluoride 4 g /L blood | Sample with  EDTA/acidic citrate (0, mol/L). Store blood at – 4 °C (277). | 6, 192, 194,  200, 208,  0243, 277, 287 |

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| **Samples** | | | | | | |  | | | **Stability** | | | | | | |
| Analytes | Serum    Pla  s  ma | Heparinate  Plasma | EDTA  Pla  s  ma | Citrated | Whole b    Hep EDT | | lood  A Citra | Biological half-life | | Stability in  blood at room temperature | Stability in serum/plasma  -20 °C 4-8 °C 20-25 °C | | | Stabiliser | Remarks / Comments | Reference |
|  |  |  |  |  |  |  |  | |  |  |  |  |  |  | Haemolysed EDTA  sample in detergent stable for 2 d (194). Serum > plasma |  |
| HTLV I  - antibodi es (Tcell  leukemi  a) | + |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |
| - (proviru  s) DNA amplific ation |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |
| - RNA  amplificat ion |  |  | + |  |  |  |  | |  |  |  |  |  |  |  | 111 |
| Human  chorion gonadotro pin (hCG)  - free | + |  |  |  |  |  |  | | 0,5 – 1,5 d | 24 h (2 – 8  °C) | 4 w | 2 d |  |  |  |  |
| - total | + | + | +  ,   | (+ )  ,   |  |  |  | | 1 - 3 d | 2 d | 1 y | 7 d | 2 d |  |  | 96, 127 |
| 3-  Hydroxyb  utyrate |  |  |  |  |  |  |  | |  |  |  |  |  |  | De-proteinisation of whole blood | 100 |
| IgA | + | + | + |  |  |  |  | | 6 d | 8 d  1 m (2 – 6  °C) | 8 m | 8 m | 8 m |  | EDTA and citrate | 50, 145,  258, 271,  289 |

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| **Samples** | | | | | | |  | | | **Stability** | | | | | | |
| Analytes | Serum    Pla  s  ma | Heparinate  Plasma | EDTA  Pla  s  ma | Citrated | Whole b    Hep EDT | | lood  A Citra | Biological half-life | | Stability in  blood at room temperature | Stability in serum/plasma  -20 °C 4-8 °C 20-25 °C | | | Stabiliser | Remarks / Comments | Reference |
| IgD |  |  | -   |  |  |  |  | | 5 d |  | 6 m | 7 d | 7 d |  |  |  |
| IgE      antigen specific  IgE |       + | + | + | (+  )  |  |  |  | | 2.5 d | 7 d | 6 m | 7 d | 7 d |  |  | 145 |
| IgG    IgG subclasses | +    + | +    + | + | - |  |  |  | | 3 w | 11 d  1 m (2 – 6  °C) | 8 m | 8 m | 4 m |  |  | 50, 145,  258, 271,  289 |
| IgM | + | + | +  ,  ,  , -     |  |  |  |  | | 5 d | 17 d  1 m (2 – 6  °C) | 6 m | 4 m | 2 m |  |  | 145, 258,  271, 289 |
| Immunogl  obulin (free) light chains (,  ) |  |  |  |  |  |  |  | |  |  |  |  |  |  | See free light chains  ( , ) of  immunoglobulins |  |
| Influenza virus  ABC  antibodies | + |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |
| Insulin | (+  )   | + | + |  |  |  |  | | 5 min | 15 min  - 6 h | 6 m | 6 d | 1 d |  |  | 64, 79, 151,  253, 289 |

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| **Samples** | | | | | | |  | | | **Stability** | | | | | | |
| Analytes | Serum    Pla  s  ma | Heparinate  Plasma | EDTA  Pla  s  ma | Citrated | Whole b    Hep EDT | | lood  A Citra | Biological half-life | | Stability in  blood at room temperature | Stability in serum/plasma  -20 °C 4-8 °C 20-25 °C | | | Stabiliser | Remarks / Comments | Reference |
| Iron (Fe) | + | + | -   | -   |  |  |  | | 3 h | 2 h | y | 3 w | 7 d |  |  | 271, 276,  289 |
| Islet cell antibodies (1A-2A) | + |  | (+ )\* |  |  |  |  | |  |  |  |  |  |  | \* See also glutamate decarboxylase autoantibodies  (GADA) | 182, 196 |
| JC polyoma virus  - antibodi es  (progres sive multifoc  al  leukoenc ephalopat hy,  PML) | + |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |
| - DNA-  amplific ation  (PML) |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |
| Lactate | -   | -   | -   | - | (+) |  |  | | min | < 5 min, unstable | 1 m\* | 3d 2 w\* | 8 h  6 d\* | Mannose/  fluoride,  monoiodo-  acetate, deproteinisation | Use glycolysis inhibitor tube, if not immediately deproteinised \*Deproteinised in whole blood | 10, 253,  271, 289 |
| Lactate dehydrog | (+  ) |  | (+  ) | (+  ) |  |  |  | | 10 - 54 h  LDH 5 < | 1 h  | 6 w | 4 d | 7 d |  | LDH in serum dependent on | 106, 167,  271, 289 |

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| **Samples** | | | | | | | |  | | **Stability** | | | | | | |
| Analytes | Serum    Pla  s  ma | Heparinate  Plasma | EDTA  Pla  s  ma | Citrated | Whole blood    Hep EDTA Citra | | | Biological half-life | | Stability in  blood at room temperature | Stability in serum/plasma  -20 °C 4-8 °C 20-25 °C | | | Stabiliser | Remarks / Comments | Reference |
| enase  (LDH) |  |  |  |  |  |  |  |  | LDH 1,2 |  |  |  |  |  | platelet number (269) |  |
| Lead (Pb) | - | - |  | - | (+) |  | (+) |  |  |  |  |  | 7 d |  | Special tube | 218 |
| Legionell a antibodies | + |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Leishman ia spp. antibodies (visceral leishmani osis) | + |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Leptin | + | + | + |  |  |  |  |  |  |  | 2 y | 2 m | 3 – 6 d |  | Five freeze/thaw cycles possible | 64, 272 |
| Leptospir a spp.  antibodies (Leptospir osis) | + |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Leucocyte  count |  |  |  |  | + |  | + |  | 6 - 7 h | 7 d |  | 1 d\* |  |  | See also differential count, \* EDTAblood | 60, 89, 107,  159, 191 |
| Lidocaine | + | +  ,   | +   |  |  |  |  |  | 1 – 3 h |  |  | 6 h |  |  | Separator gel | 133 |
| Lipase | + | +  ,  -     | -   | - |  |  |  |  | 7-14 h |  | 1 y | 3 w | 7 d |  | EDTA binds  calcium (activator), 15 % less activated in heparin () | 253, 254,  271 |
| Lipoprote in(a) | + | +  , | + | -  |  |  |  |  |  | 1 d (4-8oC) | 3 m | 2 w | 2 d |  |  | 158, 189,  190, 227, |

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| **Samples** | | | | | | |  | | | **Stability** | | | | | | |
| Analytes | Serum    Pla  s  ma | Heparinate  Plasma | EDTA  Pla  s  ma | Citrated | Whole b    Hep EDT | | lood  A Citra | Biological half-life | | Stability in  blood at room temperature | Stability in serum/plasma  -20 °C 4-8 °C 20-25 °C | | | Stabiliser | Remarks / Comments | Reference |
|  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  | 230 |
| Lipoprote  in electroph oresis |  | - | - | - |  |  |  | |  |  |  | 2-5 d |  |  | Store at –20 ° C with 15 % sucrose |  |
| Listeria  monocyto  genes antibodies | + |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |
| - DNA  amplificat ion |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |
| Lithium | + | +\*  ,  | -,  +   | - |  |  |  | | 8 – 24 h | 1 h  | 6 m | 7 d | 1 d |  | \*Do not use Liheparin | 274 |
| Lupus anticoagul ant | - | - | - |  |  |  |  | |  |  | 6 m |  | 4 h |  | Centrifuge platelet free | 43 |
| Lutropin (LH) | + | + | +  ,  , µ |  |  |  |  | |  | 7 d | 1 y | 5 d | 3 d |  |  | 51, 64, 127,  289 |
| Lymphoc  ytic choriomeningiti s virus  (LCM)  -  antibodies | + |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |
| - RNA  amplificat |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |

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| **Samples** | | | | | | | |  | | **Stability** | | | | | | |
| Analytes  ion | Serum    Pla  s  ma | Heparinate  Plasma | EDTA  Pla  s  ma | Citrated | Whole blood    Hep EDTA Citra | | | Biological half-life | | Stability in  blood at room temperature | Stability in serum/plasma  -20 °C 4-8 °C 20-25 °C | | | Stabiliser | Remarks / Comments | Reference |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Lymphoc  yte subtypes |  |  |  |  |  | + | (+) |  |  | 1 d (7 d)\* |  |  |  |  | \*Special stabiliser recommended (Cyto-Chex) | 211 |
| 2-  Macroglo buline | + | +  ,  |  |  |  |  |  |  |  |  |  |  |  |  |  | 50 |
| Magnesiu m (Mg)  - ionized | +    - | +\*  \*\*    \* | -  - | -    - |   \* |  |  |  |  | 1 d\*\*  1 h | 1 y 3 m | 7 d 1 m | 7 d  4 h | \*Mg-balanced heparin (15-50 kIU/L)(21) | \*\*Separate blood cells before analysis (223), do not use siliconized tubes \*\*\* higher results obtained in Terumo gel-tubes | 21, 57, 106,  223, 276, 289 |
| Malaria  -  plasmodiu  m  antibodies | + |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| -  plasmodiu m spp. |  |  |  |  |  |  |  |  |  |  |  |  |  |  | Microscopic examination of whole blood |  |
| -  trypanoso ma gambiens  e |  |  |  |  |  | (+  ) |  |  |  |  |  |  |  |  | Blood film of capillary blood |  |
| Measles virus  -  antibodies | + |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| - RNA |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

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| **Samples** | | | | | | |  | | | **Stability** | | | | | | |
| Analytes  amplificat ion | Serum    Pla  s  ma | Heparinate  Plasma | EDTA  Pla  s  ma | Citrated | Whole b    Hep EDT | | lood  A Citra | Biological half-life | | Stability in  blood at room temperature | Stability in serum/plasma  -20 °C 4-8 °C 20-25 °C | | | Stabiliser | Remarks / Comments | Reference |
|  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |
| Mercury (Hg) |  |  |  |  | + |  |  | |  |  |  |  |  |  | Special tube | 275 |
| Methadon  e | + | + |  |  |  |  |  | |  |  |  |  |  |  |  |  |
| Methotrex  ate | + |  |  |  |  |  |  | | 2 – 4 h |  | 6 m | 3 d |  |  | Light  | 65, 254 |
| Microfilar ias |  |  |  |  | + | + |  | |  |  |  |  |  |  | Concentrated sample |  |
| 2-  Microglo bulin | + | +,  ,   | +  ,,   | (+  ) |  |  |  | |  | 1 d | 6 m | 3 d | 3d |  |  | 50, 145,  254 |
| Morbilli  virus  -  antibodies | + | + |  |  |  |  |  | |  |  |  |  |  |  |  |  |
| - DNA  amplificat ion |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |
| Morphine, total\* | + | + |  |  |  |  |  | |  | 21 d  6 m (4 °C) | 6 m | 6 m | 3 m |  | Light   \*After hydrolysis | 232 |
| Mumps  virus antibodies | + | + | +   | +   |  |  |  | |  |  |  |  |  |  |  |  |
| Mycobact erium spp.  DNA  amplificat ion |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |
| Mycoplas | + |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |

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| **Samples** | | | | | | |  | | | **Stability** | | | | | | |
| Analytes | Serum    Pla  s  ma | Heparinate  Plasma | EDTA  Pla  s  ma | Citrated | Whole b    Hep EDT | | lood  A Citra | Biological half-life | | Stability in  blood at room temperature | Stability in serum/plasma  -20 °C 4-8 °C 20-25 °C | | | Stabiliser | Remarks / Comments | Reference |
| ma  pneumoni  ae antibodies |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |
| Myeloper oxidase  (MPO) | +   | +   |  |  |  |  |  | |  |  |  | 7 d | 8 h |  |  | 228 |
| Myoglobi  n | + | + | + | (+  )  |  |  |  | | 15 min | 1 h  | 3 m | 1 w | 2 d |  |  | 18, 49, 145,  165, 286 |
| Neisseria  gonorrhoe ae antibodies | + |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |
| Netilmyci n | + |  |  |  |  |  |  | | 2 – 3 h |  |  |  |  |  |  |  |
| Neuron specific enolase (NSE) | +  |  | + |  |  |  |  | | 1 d | 2 h  | 3 m  9 m (-  80oC) | 3 d | 2 d | Heparin | Increased in thrombocytosis Serum > plasma | 35, 91, 197,  253 |
| Nitrazepa m | + | +   | +   | (+  )   |  |  |  | |  | 1 w | 1 w | 1 w |  |  | Light  | 155, 264 |
| Opiates | + | + |  |  |  |  |  | |  | 8 h | 6 m | 2 d | 8 h |  | See also morphine | 275 |
| Osmolalit y | + | + |  |  |  |  |  | |  |  | 3 m | 1 d | 3 h |  |  | 253, 289 |
| Osteocalc  in | +  \* | +\* |   \* |  |  |  |  | | min | 15 min | 8 w (-30  °C)  1 y\*\* | 2 d\*    4 d\*\* | 8 h    2 d\*\* | \*Aprotinin  2500 KIU/mL  + EDTA  (5mmol/L) | Three freezing/thawing cycles are possible. \*\* N - MIDosteocalcin in EDTA plasma | 56, 146,  281 |
| Pancreatic | + |  | + | + |  |  |  | |  |  | 6 m | 2 w |  |  |  |  |

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| **Samples** | | | | | | |  | | | **Stability** | | | | | | |
| Analytes | Serum    Pla  s  ma | Heparinate  Plasma | EDTA  Pla  s  ma | Citrated | Whole b    Hep EDT | | lood  A Citra | Biological half-life | | Stability in  blood at room temperature | Stability in serum/plasma  -20 °C 4-8 °C 20-25 °C | | | Stabiliser | Remarks / Comments | Reference |
| elastase |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |
| Pancreatic polypepti de | + | + | + |  |  |  |  | |  |  |  | 6 d | 2 d |  |  | 64 |
| Paracetam  ol | + | + | + | (+  )   |  |  |  | | 1 – 4 h | 8 h | 45 d | 2 w | 8 h |  |  | 65, 274,  275, 290 |
| Parathyrin (PTH) | +     | +  ,   |  | (+  )  |  |  |  | | 3 – 4 min | 6 h  (2 – 3 d in  EDTA  blood) | 4 m | 1 d | 6 h | EDTA | 15 % lower concentrations in serum compared to EDTA plasma | 151, 212 |
| Partial  thrombopl astin time  (aPTT) | - | - | - |  |  |  |  | |  | 1 w | 1 m | 2-8 h | 2-8 h |  | Stability reduced in plasma of  heparinized patients | 1, 2, 38,  105, 134,  256, 292 |
| Parvoviru s B 19  - antibodi es  (erythem  a  infectios um) | + |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |
| - DNA  amplificat ion |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |
| Phencycli dine | + |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |
| Phenobar  bital | + | + | + | (+  )  ,,   |  |  |  | | 2 – 6 d | 2 d | 6 m | 6 m | 6 m |  |  | 36, 65 |

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| **Samples** | | | | | | |  | | | **Stability** | | | | | | |
| Analytes | Serum    Pla  s  ma | Heparinate  Plasma | EDTA  Pla  s  ma | Citrated | Whole b    Hep EDT | | lood  A Citra | Biological half-life | | Stability in  blood at room temperature | Stability in serum/plasma  -20 °C 4-8 °C 20-25 °C | | | Stabiliser | Remarks / Comments | Reference |
| Phenytoin      free | +      + | +  ,,    -,  ,    +   | +  ,  ,  ,  - | (+  )  ,  ,  +   |  |  |  | | 1 – 8 d | 2 d | 5 m | 1 m | 2 d |  | Unstable in serum separator tubes (36), but stabile in SST II tubes (30)  Biological half-life shorter in children | 30, 36, 65,  290 |
| Phosphate  ,  inorganic | (+  )   |  | ,   ,    + µ | (+  )µ  , -   |  |  |  | | min | 1 – 16 h   | 1 y | 7 d | 3 d |  | Platelet-dependent in serum (163) | 27, 106,  163, 271,  289 |
| Polio virus 1, 2  , 3  antibodies | + |  |  |  |  |  |  | |  |  |  |  |  |  | Neutralisation test |  |
| Potassium (K) | (+  )   |  | - | - | + |  |  | | min | 1 -16 h  | 1 y | 6 w | 6 w |  | Platelet-dependent in serum > plasma (96,  163, ,271), haemolysis | 27, 57, 99,  106, 163,  271, 289 |
| Prealbumin |  |  |  |  |  |  |  | |  |  |  |  |  |  | see Transthyretine |  |
| Primidone | + | + | + | (+  ) |  |  |  | | 4 - 19 h | 1 y | 5 m | 4 w |  |  |  | 65 |
| Procaina mide and N-acetylprocaina | + | +  ,  | +  ,   | (+ ) |  |  |  | | 3 - 5 h  6 – 10 h |  | 6 m | 2 w |  |  |  | 65, 254 |

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| **Samples** | | | | | | |  | | | **Stability** | | | | | | |
| Analytes | Serum    Pla  s  ma | Heparinate  Plasma | EDTA  Pla  s  ma | Citrated | Whole b    Hep EDT | | lood  A Citra | Biological half-life | | Stability in  blood at room temperature | Stability in serum/plasma  -20 °C 4-8 °C 20-25 °C | | | Stabiliser | Remarks / Comments | Reference |
| mide  (NAPA) |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |
| Procalcito nin | + | + | + | (+  ) |  |  |  | | 20 – 26 h | 1 - 2 d |  | 4 d | 4 h |  |  | 168, 245 |
| Procollag en type I  (and its  N-  terminal propeptid e (PINP)) | + | + | + |  |  |  |  | |  |  | 1 y | 2 d | 1 d |  |  | 100 |
| Progastrin releasing peptide (proGRP) |  |  |  |  |  |  |  | |  |  |  |  |  |  | see Gastrin releasing peptide | 246 |
| Progester one | + | +  ,  -,  µ  | + , µ, -   |  |  |  |  | |  | 7 d | 1 y | 4d | 1 d |  |  | 51, 289 |
| Proinsulin | +   | + |  |  |  |  |  | | 15 min | 2 d\* | 6 m | 1 h | 7 min | EDTA | \*in EDTA | 79, 100,  193 |
| Prolactin | + | +  ,  , µ | +  , µ | - |  |  |  | |  | 2 d | 1 y | 6 d | 5 d |  |  | 51, 64, 289 |
| Propaphe none | + | + |  |  |  |  |  | |  |  |  |  |  |  |  |  |
| Propoxyp hene | + | + |  |  |  |  |  | |  |  |  |  |  |  |  |  |
| Prostata |  |  |  |  |  |  |  | |  |  |  |  |  |  | Three freezing | 34, 121, 152, |

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| **Samples** | | | | | | |  | | | **Stability** | | | | | | |
| Analytes | Serum    Pla  s  ma | Heparinate  Plasma | EDTA  Pla  s  ma | Citrated | Whole b    Hep EDT | | lood  A Citra | Biological half-life | | Stability in  blood at room temperature | Stability in serum/plasma  -20 °C 4-8 °C 20-25 °C | | | Stabiliser | Remarks / Comments | Reference |
| specific antigen (PSA)  - free | + | +  | +   |  |  |  |  | |  | 2 h – 7 d | 1 m | 1 d | 6 h |  | thawing cycles possible | 187, 217,  225, 285 |
| - total | + | +  , µ, -  | +  , µ, - | (+  ) |  |  |  | | 2 - 3 d | 4 – 7 d | 3 m - 2 y | 30 d | 7 d |  |  | 34, 121,  188, 203,  284, 285 |
| Protein, total | +  |  | +  ,    , ,   | (+  ) |  |  |  | | Complex | 1 d | 1 y | 4 w | 6 d |  | Plasma results higher due to fibrinogen (Biuret method) | 253, 289 |
| Protein C | - | - | - |  |  |  |  | | 6 - 8 h | 1 d | 3 m | 7 d | 7 d |  | Avoid freezing/thawing cycles | 105, 162,  292 |
| Protein S | - | - | - |  |  |  |  | | 24 - 58 h |  | 1 m | 4 h | 8 h |  | Separate cell-free plasma directly after centrifugation | 20, 105, |
| Protein S100 | + |  |  |  |  |  |  | | 2 – 5 h |  |  | 7 d | 7 d |  |  | 246 |
| Prothrom bin time (thrombo  plastin time, Quick) | - | - | - |  |  |  |  | |  | 4 h – 1 w\* | 1 m | 8 h - 1 d\* | 4 h – 1 d\* |  | \*Reagent-dependent | 1, 2, 105,  198, 253,  256, 292 |
| Pyruvate | -   | -   | - | - | +\* |  |  | |  | < 1 min\* |  |  |  |  | \*Only stable in deproteinized blood |  |
| Renin | - | - | + | - |  |  |  | |  | unstable | 1 y |  | < 1 h |  |  | 254 |

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| **Samples** | | | | | | | |  | | **Stability** | | | | | | |
| Analytes | Serum    Pla  s  ma | Heparinate  Plasma | EDTA  Pla  s  ma | Citrated | Whole blood    Hep EDTA Citra | | | Biological half-life | | Stability in  blood at room temperature | Stability in serum/plasma  -20 °C 4-8 °C 20-25 °C | | | Stabiliser | Remarks / Comments | Reference |
| Reovirus antibodies | + |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Respirator y syncytial virus (RSV) antibodies | + |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Reticuloc yte count maturity index |  |  |  |  | (+) |  |  |  | 12 h | 3 d\*  1 d\* |  | 3 d\*  1 d\* |  |  | \*EDTA blood | 33, 159,  206 |
| Retinol binding protein  (RBP) | + | + |  |  |  |  |  |  | 10 h |  | 3 m | 8 d | 1 d |  |  | 50, 145,  222 |
| Rheumato  id factors    subfract ions IgA,  IgG | +    + | +  ,  (+)   | +    ,  (+  )   | (+  ) |  |  |  |  |  | 6 h | 3 m | 8 d | 1 d |  |  | 151, 289,  290 |
| Rickettsia antibodies | + |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| RNA  analysis by amplificat ion (PCR) | (+  ) | -\* | + |  | -\* |  | + |  |  | 2 h , 12 h  (4oC),  4 d (EDTA)  1 m\*\* | 1 y | 1 d | <1 h | RNA: 5 mmol/L Guanidiniumisothiocyanate  \*\*PAXgen | \*Heparin inhibits Taq polymerase and restriction enzymes LiCl 1.8 mol/L eliminates this error (122, 181). | 111, 122,  195, 263 |
| Rotavirus | + |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

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| **Samples** | | | | | | |  | | | **Stability** | | | | | | |
| Analytes | Serum    Pla  s  ma | Heparinate  Plasma | EDTA  Pla  s  ma | Citrated | Whole b    Hep EDT | | lood  A Citra | Biological half-life | | Stability in  blood at room temperature | Stability in serum/plasma  -20 °C 4-8 °C 20-25 °C | | | Stabiliser | Remarks / Comments | Reference |
| antibodies |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |
| Rubella  virus  -  antibodies | + | +  ,   | +  ,   | (+  )  ,   |  |  |  | |  |  |  |  |  |  |  |  |
| - RNA  amplificat ion |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |
| S 100 protein |  |  |  |  |  |  |  | |  |  |  |  |  |  | see Protein S 100 |  |
| Salicylate | + | + | + | (+  ) |  |  |  | | 24\* – 30 min |  | 6 m | 2 q | 7 d |  | \*Higher at toxic concentrations | 65, 274 |
| Sandfly  (pappataci -) fever antibodies | + |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |
| Selenium (Se) | - | - | - | - |  | +  \* |  | |  | 2 d | 1 y | 2 w | 1 w |  | \*Special tubes, contamination | 218 |
| Sirolimus |  |  |  |  |  | + |  | |  | 1d\* (4-8 oC) |  |  |  |  | \*EDTA blood | 221 |
| Sodium (Na) | + | + | - | - | +\* |  |  | | min | 4 d | 1 y | 2 w | 2 w |  | \* Use 140 mmol/L Na-stabilized heparin 8-12 IU/mL blood (29) | 57, 106,  289 |
| Soluble transferrin receptor (sTfR) | + | +,  ,   | - |  |  |  |  | |  | 2-6 h | 3 m | 7 d | 3 d |  | Freeze only once | 48, 145,  151, 253,  290 |
| Somatotro  pin  (STH) | + | + |  |  |  |  |  | | 20 – 50 min | 1 d | 3 m | 8 d | 3 d | EDTA |  | 51, 64, 289 |

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| **Samples** | | | | | | |  | | | **Stability** | | | | | | |
| Analytes | Serum    Pla  s  ma | Heparinate  Plasma | EDTA  Pla  s  ma | Citrated | Whole b    Hep EDT | | lood  A Citra | Biological half-life | | Stability in  blood at room temperature | Stability in serum/plasma  -20 °C 4-8 °C 20-25 °C | | | Stabiliser | Remarks / Comments | Reference |
| (growth hormone) |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |
| Squamous  cell  carcinoma antigen (SCCA) | + | + |  |  |  |  |  | | 1,5 – 3 h | 7 d | 1 m | 1 m | 7 d | Closed tubes | Increase by contamination (skin) | 179, 217,  248 |
| Staphyloc occal antibodies  -  antistaphy lolysin O | + | +  | +   |  |  |  |  | |  |  |  |  |  |  |  |  |
| Streptocc occal antibodies |  |  |  |  |  |  |  | |  | 1 h | > 1 m | 3 d |  |  |  | 100 |
| - anti-  DNAse B | + |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |
| -  antihyalur onidase | + | +,  ,  ,   | +,  ,  ,   |  |  |  |  | |  |  |  |  |  |  |  |  |
| - antistrep tokinase  -  antistrept olysin O | +  + | +  ,  ,   | +  ,  ,   |  |  |  |  | |  |  |  |  |  |  |  |  |
| Tacrolism us | - | - | - | - | - |  |  | | 6 – 21 h | 7 d | 1 y | 2 w | 7 d |  |  | 7, 274 |
| Tartrate resistant acid | + | + | + |  |  |  |  | |  | 2 h | 2 m |  | 4 h |  |  | 100 |

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| **Samples** | | | | | | | |  | | **Stability** | | | | | | |
| Analytes | Serum    Pla  s  ma | Heparinate  Plasma | EDTA  Pla  s  ma | Citrated | Whole blood    Hep EDTA Citra | | | Biological half-life | | Stability in  blood at room temperature | Stability in serum/plasma  -20 °C 4-8 °C 20-25 °C | | | Stabiliser | Remarks / Comments | Reference |
| phosphata se  (TRACP  5 b) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Testostero n | + | + | + | (+  )  |  |  |  |  |  | 7 d  1 d in  women | 1 y | 7 d | 1 d |  |  | 51, 132,  271 |
| Tetrahydr  ocannabin  ol  carbonic acid (THC) | + | + |  |  |  |  |  |  | ~ 45 h |  | 6 m | 6 m | 2m | Na azide | Unstable in plastic tubes | 65, 155 |
| Theophyll ine | + | + | + | (+  )  ,  |  |  |  |  | 3 - 12 h |  | 3 m | 3 m | 3 m |  |  | 65, 264,  274 |
| Thrombin time | - | - | - |  |  |  |  |  |  | 1 - 4 h | 1 m | 1 h – 2 d\* | 1 - 4 h\* |  | \*Stability reagent- and heparindependent | 38, 105,  256, 259 |
| Thromboc  yte antibodies | + |  | + | + |  |  |  |  |  |  |  |  |  |  |  |  |
| Thromboc  yte count    Thromboc  yte  volume |  |  |  |  | (+)   |        | (+) |  | 9 - 10 d | 4 d\*,  7 d (4-8oC)\* |  |  |  | \* in EDTAblood | Aminoglycosides avoid pseudothrombocytopenia in EDTA  (214) | 105, 107,  160, 214 |
| Thromboc  yte function using | - | - | - | - |  |  |  |  | 9 - 10 d | 4 d      2 h (7d)\* |  |  | 1 h |  | \* | 211,  219 |

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| **Samples** | | | | | | | |  | | **Stability** | | | | | | |
| Analytes | Serum    Pla  s  ma | Heparinate  Plasma | EDTA  Pla  s  ma | Citrated | Whole blood    Hep EDTA Citra | | | Biological half-life | | Stability in  blood at room temperature | Stability in serum/plasma  -20 °C 4-8 °C 20-25 °C | | | Stabiliser | Remarks / Comments | Reference |
| platelet function analyzer (PFA) (), using flow cytometry | - | - | - | - |  |  |  |  |  |  |  |  |  |  | Special stabilizer recommended (211) |  |
| Thyreoglo bulin | + |  |  |  |  |  |  |  | 1 d | 2 d | 1 m | 3 d – 3 w | 1 d |  | three freezing – thawing cycles possible (45) | 45, 253,  289 |
| Thyreotro pine (TSH) | + | +  ,  , µ,  -   | +  ,  ,  ,  - µ | (+  ) |  |  |  |  | min | 7 d | 3 m | 3 d | 1 d |  | Spot blood on filter paper in newborns | 49, 269,  287 |
| Thyreotro pine receptor antibodies  (TRAb) | + |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Thyroid antibodies Thyreoide  a peroxidas  e  antibodies  (anti-  TPO) Thyreoglo bulin | + | + |  |  |  |  |  |  |  |  |  | 2 d |  |  |  |  |

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| **Samples** | | | | | | |  | | | **Stability** | | | | | | |
| Analytes | Serum    Pla  s  ma | Heparinate  Plasma | EDTA  Pla  s  ma | Citrated | Whole b    Hep EDT | | lood  A Citra | Biological half-life | | Stability in  blood at room temperature | Stability in serum/plasma  -20 °C 4-8 °C 20-25 °C | | | Stabiliser | Remarks / Comments | Reference |
| antibodies (anti-TG) |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |
| Thyroxine (T4) |  | +  ,  , , - , µ | +  ,  , ,    , - , µ | (+  )  |  |  |  | | 6 m | 7 d | 1 m | 7 d | 5 d |  |  | 51, 271,  289 |
| Thyroxine  , free ( fT4) | + | + | + | (+  )  |  |  |  | |  | 6 h | 3 m | 8 d | 2 d |  |  | 151, 289 |
| Thyroxine binding globulin  (TBG) | + | + |  |  |  |  |  | |  | 7 d | 1 m | 5 d | 5 d |  |  | 57, 254,  289 |
| Tick borne encephalit is virus antibodies | + |  | (+  ) |  |  |  |  | |  |  |  |  |  |  |  |  |
| Tobramyc  in | + | + , ,   | +   | (+ ) |  |  |  | | 0.5 - 3 h (<  30 y of age)  1,5 – 15 h (>30 y of age) |  | 1 m | 3 d | < 2 h |  | Lower results obtained in heparinized plasma | 65, 207,  274 |
| Toxoplas ma gondii antibodies | + | +  ,   | +  ,   | +  ,   |  |  |  | |  |  |  | 8 d | 8 d |  |  |  |

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| **Samples** | | | | | | |  | | | **Stability** | | | | | | |
| Analytes | Serum    Pla  s  ma | Heparinate  Plasma | EDTA  Pla  s  ma | Citrated | Whole b    Hep EDT | | lood  A Citra | Biological half-life | | Stability in  blood at room temperature | Stability in serum/plasma  -20 °C 4-8 °C 20-25 °C | | | Stabiliser | Remarks / Comments | Reference |
| (IgA, IgG,  IgM) |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |
| Transferri n | + | +  ,   | + |  |  |  |  | | 7 - 10 d | 11 d 3 w (2 – 6  °C) | 6 m – 2 y | 8 m | 4 m |  |  | 84, 145,  258, 271,  289 |
| Transthyr etine  (prealbum  in) | + | +  | +   |  |  |  |  | |  2 d |  | 1 y | 6 m | 3 d |  |  | 222 |
| Treponem  a pallidum  -  antibodies | + | + | +   | +   |  |  |  | |  |  |  |  |  |  |  |  |
| - DNA  amplificat ion |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |
| Tricyclic antidepres sants | + | + | +   | (+ ) |  |  |  | |  | 1 w | 1 y |  |  |  | see also Amitryptilin group | 47, 275 |
| Triglyceri des | + | + | +, - | (+  ) |  |  |  | | 3 h - 3 d | 7 d\* | y | 7 d | 2 d |  | \*Decrease of triglycerides, increase of free glycerol, but only minor increase of total glycerol | 44, 106,  271, 289 |
| Triiodoth yronine  (T3)      - free |       + | (+)    ,  ,  , µ | + µ      + | (+  ) |  |  |  | | 19 h |  | 3 m      3 m | 8 d      2 w | 2 d      2 d |  | Serum-plasma difference methoddependent | 271, 289 |

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| **Samples** | | | | | | |  | | | **Stability** | | | | | | |
| Analytes | Serum    Pla  s  ma | Heparinate  Plasma | EDTA  Pla  s  ma | Citrated | Whole b    Hep EDT | | lood  A Citra | Biological half-life | | Stability in  blood at room temperature | Stability in serum/plasma  -20 °C 4-8 °C 20-25 °C | | | Stabiliser | Remarks / Comments | Reference |
| (fT3) |  | + |  |  |  |  |  | |  |  |  |  |  |  |  |  |
| Troponin  I | + | +  ,  , -  ,  µ  | + , - , µ  |  |  | + |  | | 2-4 h |  | 4 w | 3 d | 2 d |  |  | 17, 80, 104,  165, 189,  247 |
| Troponin T | + | + | + |  |  |  |  | | 2 – 4 h | 8 h | 3 m | 7 d | 1 d |  |  | 80, 165,  247, 253 |
| Tumor  necrosis factor (TNF) | - |  |  |  |  |  |  | |  | 1 h |  |  |  | EDTA |  | 54, 69 |
| Urea | + | + | + |  |  |  |  | | min | 1 d | 1 y | 7 d | 7 d |  | Do not use NH4heparin | 106,258,  289, 290 |
| Uric acid | + | + | +  | (+  ) |  |  |  | | min | 3 - 7d | 6 m | 7 d | 3 d |  |  | 27, 271,  289, 290 |
| Valproate | + | + | + | (+  )   |  |  |  | | 8 - 15 h | 2 d | 3 m | 7 d | 2d |  |  | 36, 65 |
| Vancomy  cin | + | + | + | (+ ) |  |  |  | | 4 - 10 h |  | 7 d | 1 d | 2 d |  |  | 65, 269,  274, 290 |
| Varicella Zoster virus  -  antibodies | + | + | +   | +   |  |  |  | |  |  |  |  |  |  |  |  |
| - DNA  amplificat ion |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |
| Vasoactiv |  |  |  |  |  |  |  | |  |  | > 6 d | 6 d | 1 d | EDTA + |  | 64, 178 |

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| **Samples** | | | | | | |  | | | **Stability** | | | | | | |
| Analytes | Serum    Pla  s  ma | Heparinate  Plasma | EDTA  Pla  s  ma | Citrated | Whole b    Hep EDT | | lood  A Citra | Biological half-life | | Stability in  blood at room temperature | Stability in serum/plasma  -20 °C 4-8 °C 20-25 °C | | | Stabiliser | Remarks / Comments | Reference |
| e intestinale polypepti de (VIP) |  |  |  |  |  |  |  | |  |  |  |  |  | aprotinin |  |  |
| Vasopress in (ADH) |  | + | + |  |  |  |  | |  |  |  | 6 d | 1 d | EDTA | Freeze plasma | 64 |
| Vitamin A  (retinol) | + |  |  |  |  |  |  | | 11 h | 1 h | 2 y | 1 m | 3 h |  | light sensitive | 100, 253 |
| Vitamin  B1  (thiamine) | + | + | + |  |  |  |  | |  |  | 1 y |  |  |  |  | 100, 116 |
| Vitamin  B2 (riboflavi n) |  | + | + |  |  |  |  | |  | 1 h | 1 m |  |  |  |  | 100 |
| Vitamin  B6  (pyridoxal  phosphate  ) | + |  |  |  |  |  |  | |  |  | d | h | 30min | EDTA,  darkness |  | 100, 116 |
| Vitamin  B12  (cobalami n) | + | + |  |  |  |  |  | |  | 6 h | 8 w | 1 d | 15min | EDTA,  darkness |  | 100, 142,  151 |
| Vitamin C (ascorbic acid) | + | + | + |  |  |  |  | |  | 3 h (4 °C) | 3 w\* | 3 h |  | 60 g/L metaphosphate, deproteinised | \*Only with stabilizer | 100 |
| Vitamin  D  1.25dihydroxy | +    + | +    + | +    + |  |  |  |  | |  | 3 d    3 d | 1 y    1y | 7 d    7 d | 3 d    3 d |  |  | 100, 253,  289 |
| **Samples** | | | | | | |  | | | **Stability** | | | | | | |
| Analytes | Serum    Pla  s  ma | Heparinate  Plasma | EDTA  Pla  s  ma | Citrated | Whole b    Hep EDT | | lood  A Citra | Biological half-life | | Stability in  blood at room temperature | Stability in serum/plasma  -20 °C 4-8 °C 20-25 °C | | | Stabiliser | Remarks / Comments | Reference |
| -vitamin  D  (calcitriol  ),  25hydroxyvitamin D (calcidiol) |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |
| Vitamin E (tocopher ol) | + |  |  |  |  |  |  | |  | 8 h | 1 y | 1 m |  | EDTA |  | 100, 253 |
| Vitamin  K  (transphyl  lochinone  ) |  |  | + |  |  |  |  | |  | unstable | 3 m | unstable |  |  | UV light | 100, 253 |
| von Willebran d factor |  |  |  |  |  |  |  | |  | 1 w |  |  |  |  |  | 292 |
| Yersinia enterocoli tica antibodies | + |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |
| Zinc (Zn) | - | + | - | - |  |  |  | |  | 30 min | 1 y | 2 w | 1 w |  | Special tube, avoid con- tamination by stopper | 218, 271,  289 |

# 6.2 Urine

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Analyte** | **- 20 °C** | | **Stability in urine at 4 – 8 °C 20 – 25 °C** | | **Stabilizer** | **Comments** | **Reference** |
| Albumin | 6 m | | 1 m | 7 d |  |  | 110, 148,  250, 251 |
| Aluminium | 1 y | | 7 d | 3 d |  |  | 218 |
| 5()-Aminolevulinic acid | 1 m | | 4 d | 1 d | pH 6 - 7, stabilized with  0.3 % NaHCO3 | Drugs  Light  | 253, 289 |
| Amphetamine | 1 y | |  |  |  |  | 53 |
| Amylase | > 3 w | | > 10 d | 2 d |  | Saliva contaminates  | 161 |
| Bence Jones protein  (immunoglobulin light chains , ) | 6 m | | 1 m | 7 d |  |  | 250, 251 |
| Calcium | > 3 w | | 4 d | 2 d | Acidify, pH < 2 | Crystallisation at cool temperature | 42 |
| Catecholamines Norepinephrine  Epinephrine  Dopamine | Unstabilized  20 d 4 d  Stabilized  1 y 1 y | | | 4 d 3 w | Acidify, pH < 2,5 -5 (9 ml 20% HCl in 24 h urine) or EDTA  (250 mg/L) and sodium metabisulfite (250 mg/L) |  | 26, 172, 278 |
| Citrate | 4 w\* |  | | 1 d\* | \*pH 1,7 | Unstable in native urine | 108 |
| Cocaine metabolite Benzoylecgonine | 4 m | 3 w | |  | pH 5, ascorbic acid |  | 53, 109, 155 |
| Codeine | 1 y |  | |  |  |  | 53 |
| Copper | 1 y | 7 d | | 3 d |  |  | 218 |
| Cortisol, free | 1 w | 1 w | | 2 d | 10 g/L boric acid |  | 42, 126, 276 |

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| **Analyte** | **- 20 °C** | **Stability in urine at 4 – 8 °C 20 – 25 °C** | | | **Stabilizer** | **Comments** | **Reference** |
| C-peptide |  | 6 d | | 19 h |  |  | 64 |
| Creatinine | 6 m | 6 d | | 2 d |  |  | 42, 253 |
| Cystine (Cysteine) | > 1 y\* | 3 m\* | | 7 d\* | \*Stabilised in HCl |  | 108 |
| Ethanol |  | 30d | |  |  |  | 83, 155 |
| Glucose | 2 d | 2 h | | 2 h  | 10 mmol/L azide | Bacteria decrease stability. | 42, 253, 254 |
| 5-Hydroxyindoleacetic acid | 2 d | 2 d | | 2 h | Acidify |  | 253, 289 |
| Hydroxyproline | 5 d | 5 d | | 5 d |  |  | 253 |
| Immunoglobulin G (IgG) | Unstable | 1 m | | 7 d |  |  | 110, 148,  250, 251 |
| Iron | 1 y | 7 d | | 3 d |  |  | 42 |
| Lysergic acid diethylamide (LSD) | 2 m 1 m | | | 1 m |  |  | 53, 155 |
| 2-Macroglobulin | 7 d | | | 7 d |  |  |  |
| Magnesium | 1 y 3 d | | | 3 d | Acidify, pH < 2 |  | 42, 108 |
| Methanephrines | 8 d | | | |  |  | 278 |
| 1-Microglobulin | 6 m | | 1 m | 7 d |  |  | 110, 148,  250, 251 |
| Morphine | 1 y | |  |  |  |  | 53, 65, 155 |
| Myoglobin | 12d\* | | 12d\* | 12d\* | \*pH  8.0 | Unstable at acid pH | 286 |
| N-Acetyl-,Dglucosaminidase (-NAG) | 1 m | | 7 d | 1 d |  |  | 166 |
| Neutrophil gelatinase associated lipocalin (NGAL) | 7 d 1 d | | | |  |  | 61 |

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| --- | --- | --- | --- | --- | --- | --- | --- |
| **Analyte** | **- 20 °C** | **Stability in urine at 4 – 8 °C 20 – 25 °C** | | | **Stabilizer** | **Comments** | **Reference** |
| N-telopeptides (NTx) | 4 w | 5 d | | |  |  |  |
| Osmolality | > 3 m | 7 d 3 h | | |  |  | 42 |
| Oxalate | > 4 m unstable < 1 h  (at pH 1.5) | | | | pH  2, HCl 1 vol %, thymol 5 mL/L | Vitamin C  | 108 |
| pH | unstable | | | |  | Increase by NH4 formation | 42 |
| Phosphate, inorganic | 6 m (pH<5) 2 d at pH <5.0 | | | | 1 vol % thymol, 5 mL/L | precipitates at alkaline pH | 42, 108 |
| Porphobilinogen | 1 m\* | | 7 d\* | 4 d\* | \*pH 6 – 7 by NaHCO3 | Acid pH  Light | 253, 289 |
| Porphyrines  Total porphyrine  Uroporphyrine  Heptacarboxyporphyrine  Hexacarboxyporphyrine  Pentacarboxyporphyrine  Coproporphyrine  Tricarboxyporphyrine  Dicarboxyporphyrine | 1 m\* | | 7 d\* | 4 d\* | \*0.3 % NaHCO3, pH 6-7 | Light  | 100, 253 |
| Potassium | 1 y | | 2 m | 45 d |  |  | 42 |
| Protein | 1 m | | 7 d | 1 d |  |  | 42 |
| Pyridinolines | >1 y | | 1 w | 3 d |  | UV light  | 100, 273, 281 |

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| **Analyte** | **- 20 °C** | **Stability in urine at 4 – 8 °C 20 – 25 °C** | | **Stabilizer** | **Comments** | **Reference** |
| Sediment of urine |  | 1 - 8 h | 1 – 2h |  | Do not freeze | 42, 136, 138 |
| Acanthocytes |  | 2 d | 1 d\* |  | \*300 mosmol./kg |  |
| Casts (hyaline and others) |  |  | 2 d | Osmolality 300 mosmol/kg | \*\*pH 6,5 |  |
| Bacteria |  | 24 h | 1 – 2 h\*\*\* |  | \*\*\*pH 7,5 |  |
| Epithelial cells |  |  | 3 h |  |  |  |
| Erythrocytes |  | 1-4 h | 1 h, 24 h\* |  |  |  |
| Leukocytes |  | 1-4 h | 24 h\*\*  1 h \*\*\* |  |  |  |
| Sodium | 1 y | 45 d | 45 d |  |  | 42 |
| Test-strip fields  Erythrocytes  Leukocytes  Nitrite  Protein |  | 1 - 3 h 1 d\*  8 h | 4 – 8 h  1 d   4 h  2 h\*\* |  | \* 300 mosmol./kg  \*\* Unstable at pH >7.5 | 42, 136, 138 |
| Transferrin | 4 w 1 w | | 7 d |  |  | 148 |
| Urea | 4 w 7 d | | 2 d | pH < 7 |  | 42 |
| Uric acid | Unstable | | 4 d | pH  8 | Precipitation at pH < 7 | 42, 108 |
| Vanillyl mandelic acid  (VMA) | 1 y 7d 7d at pH 3 - 5 | | | pH  5 |  | 42, 253, 289 |

# 6.3 Cerebrospinal Fluid (CSF)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Analyte** | **Stability in urine at**  **- 20 °C 4-8 °C 20-25 °C** | | | **Stabilizer** | **Comments** | **Reference** |
| Albumin | 1 y | 2 m | 1 d | Up to 1h: Do not cool    Up to 3 h: Transport on ice  No additives  No partial fixation  Long term storage:  Immediately –70 °C  in glass or polypropylene vessels tightly closed | Glucose ,lactate:  Stability depends on cell content IgG: Freezing is not  recommended    Leukocytes: Store cells as dry  smears          Store cells as dry smears | 130, 131  130, 131  130. 131  130, 131  130 131  61  197  130, 131 |
| Glucose | 1m | 3 d | 5 h  |
| IgA, IgG, IgM | unstable | 7 d | 1 d |
| Lactate | m | 1 h | 30 min |
| Leukocytes |  | 3-5 h | 1-2 h |
| Myeline basic protein (MBP) | 2 w 2 d | | |
| Neurone specific enolase (NSE) | 1 m,  6 m at -80oC | | |
| Protein, total | > 1 y 6 d 1 d | | |
| Tumor cells | 1 – 12 h | | |