

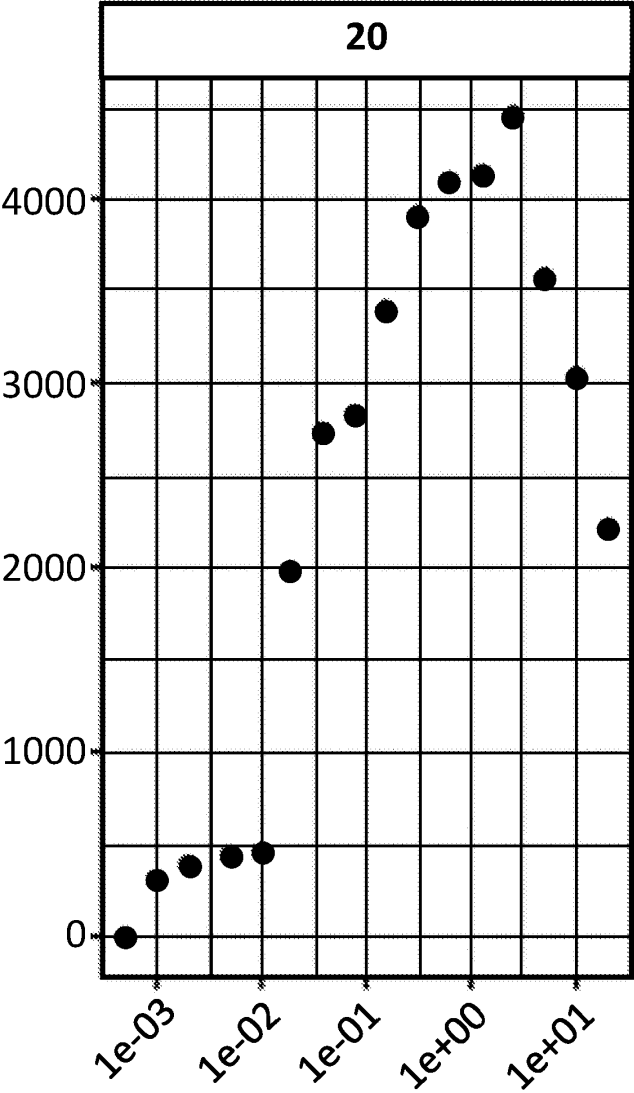


FIG. 1

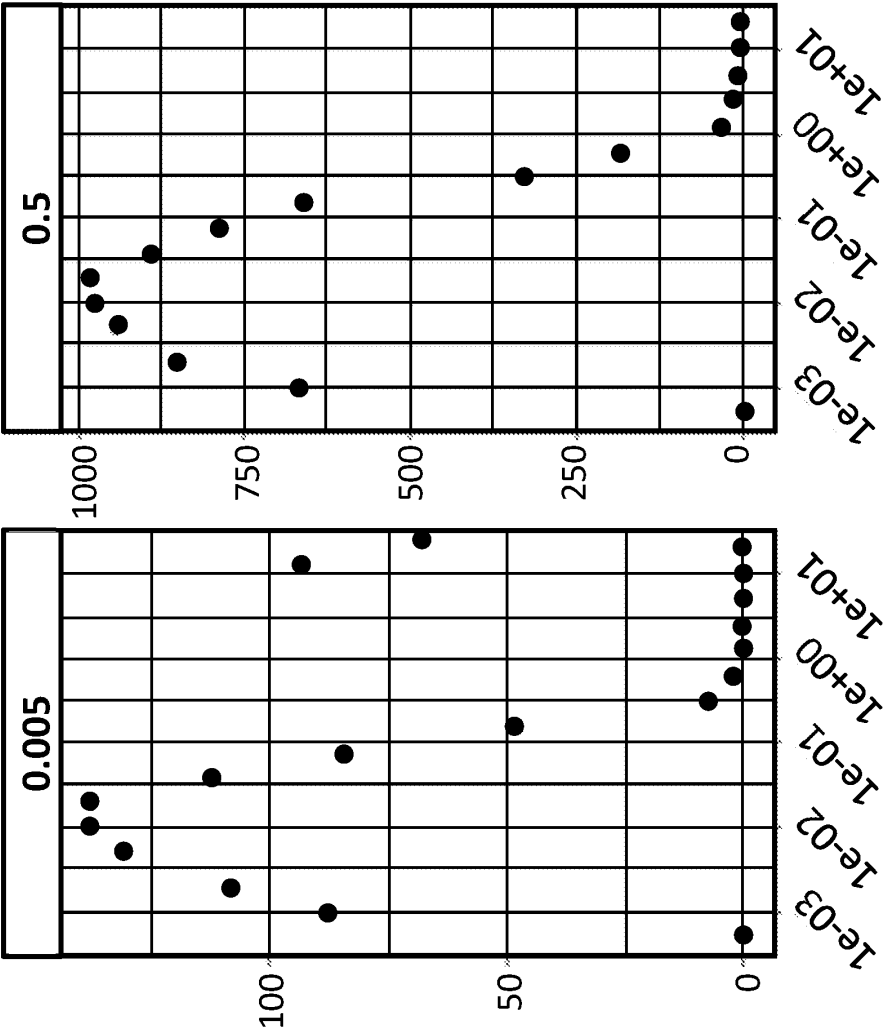


FIG. 2A

FIG. 2B

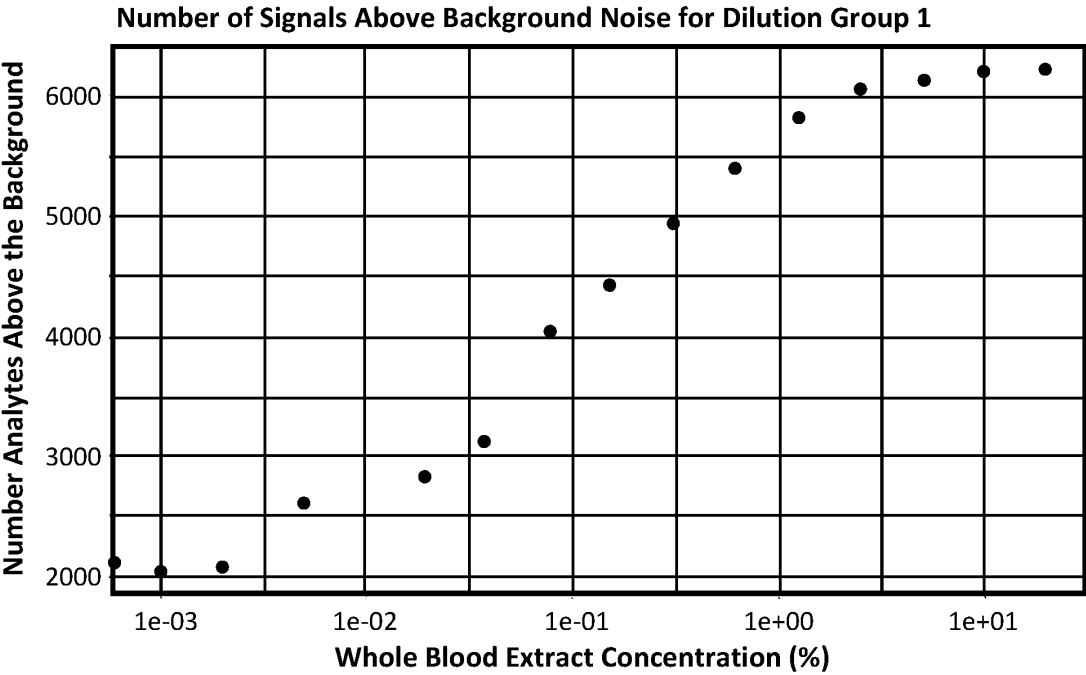


FIG. 3A

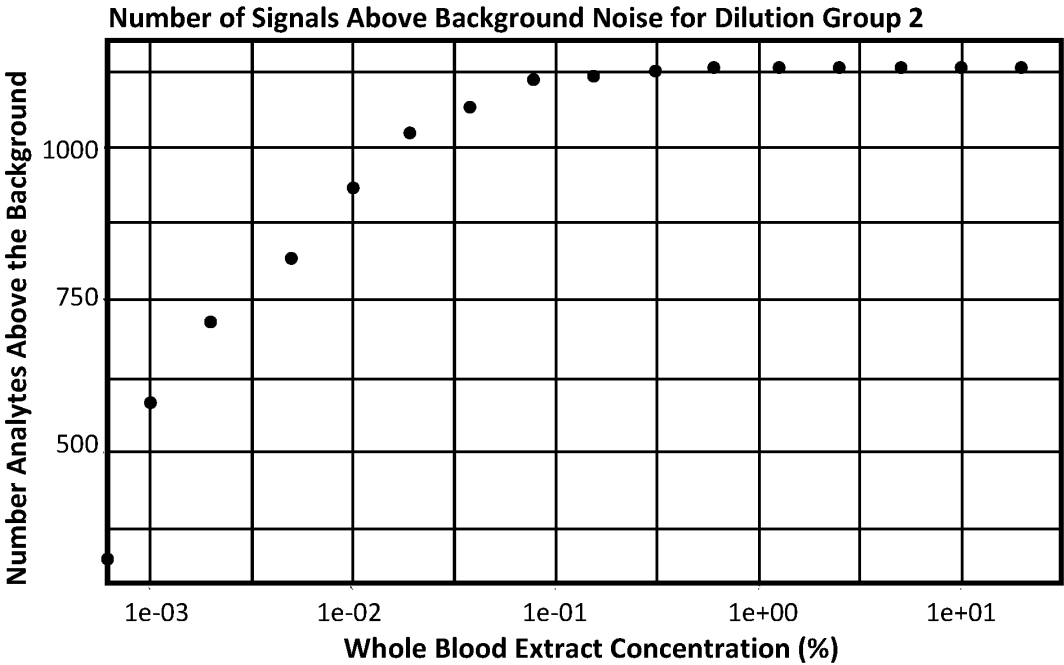


FIG. 3B

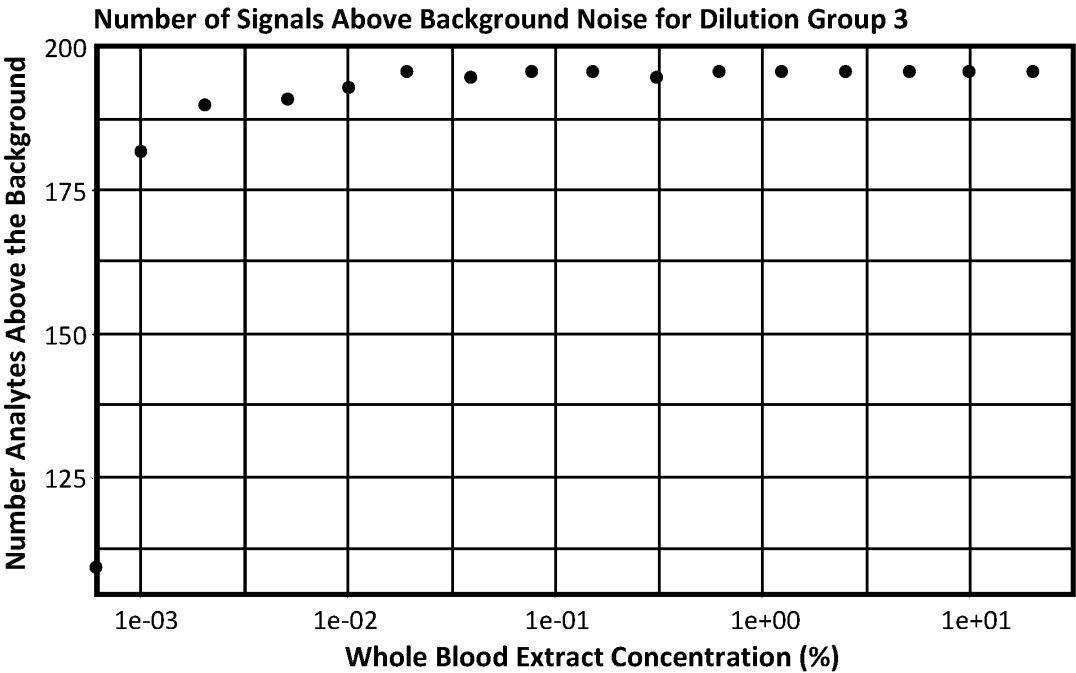


FIG. 3C

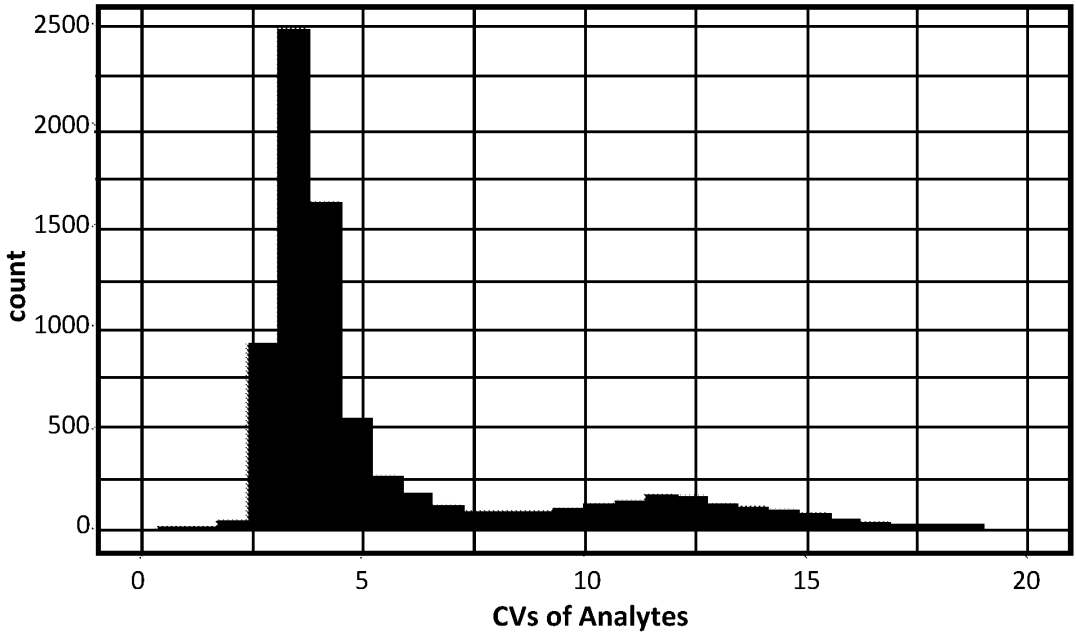


FIG. 4A

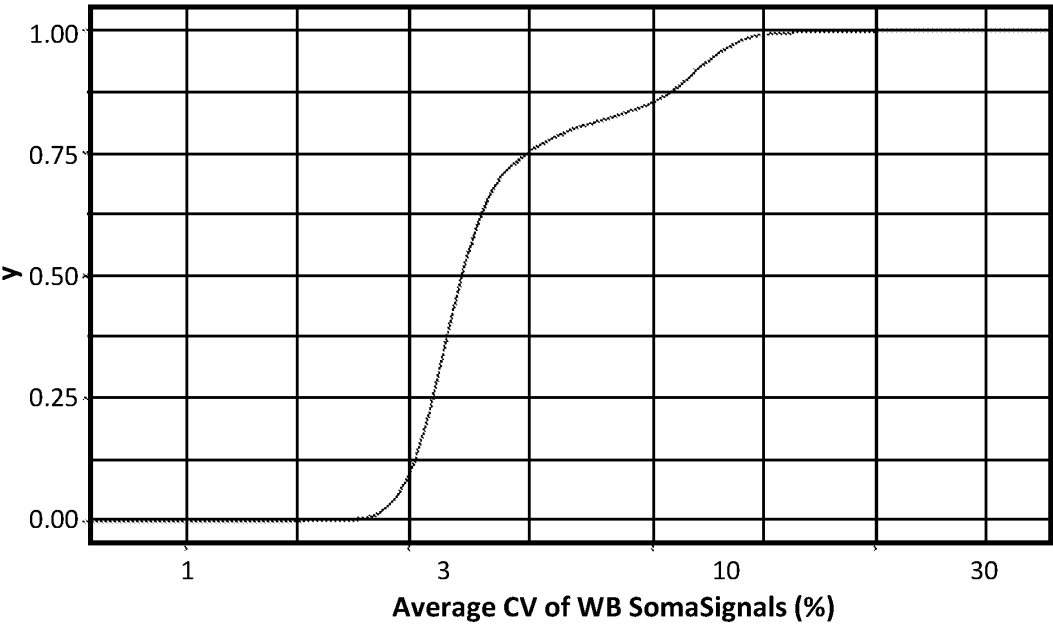


FIG. 4B

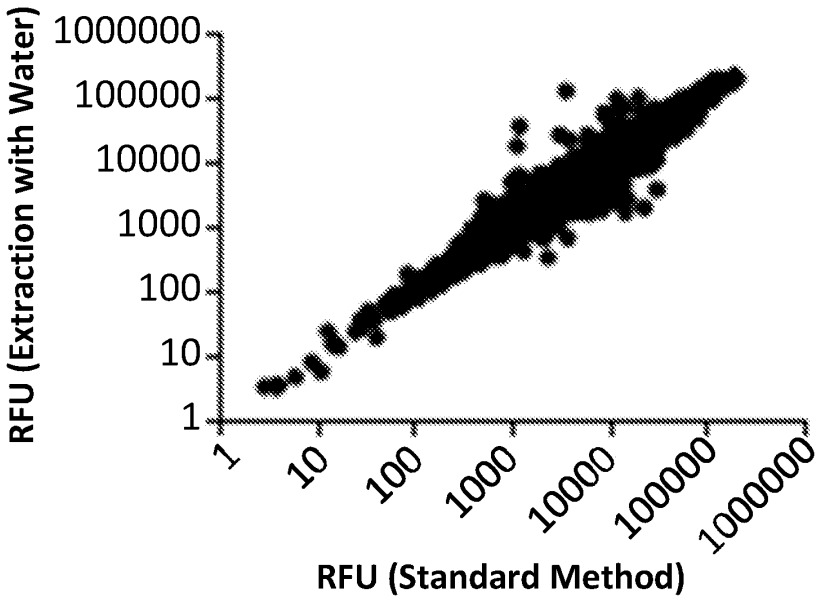


FIG. 5A

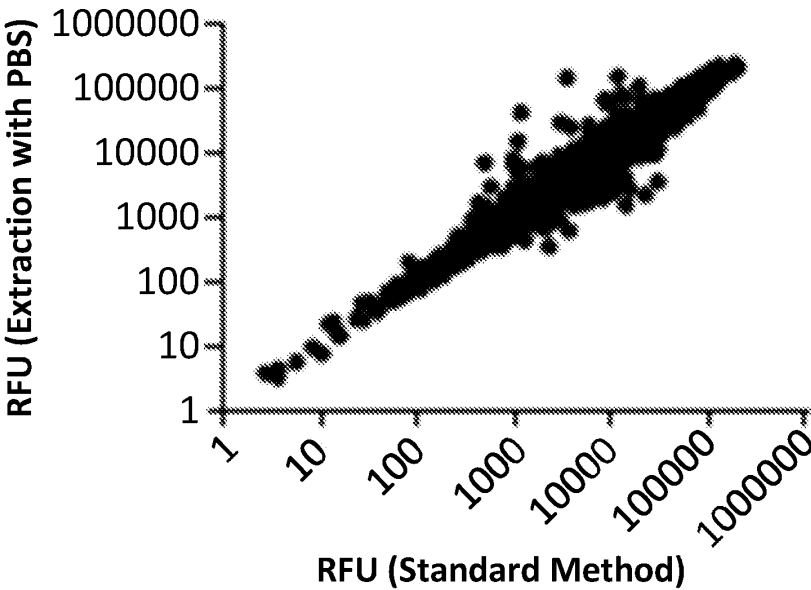


FIG. 5B

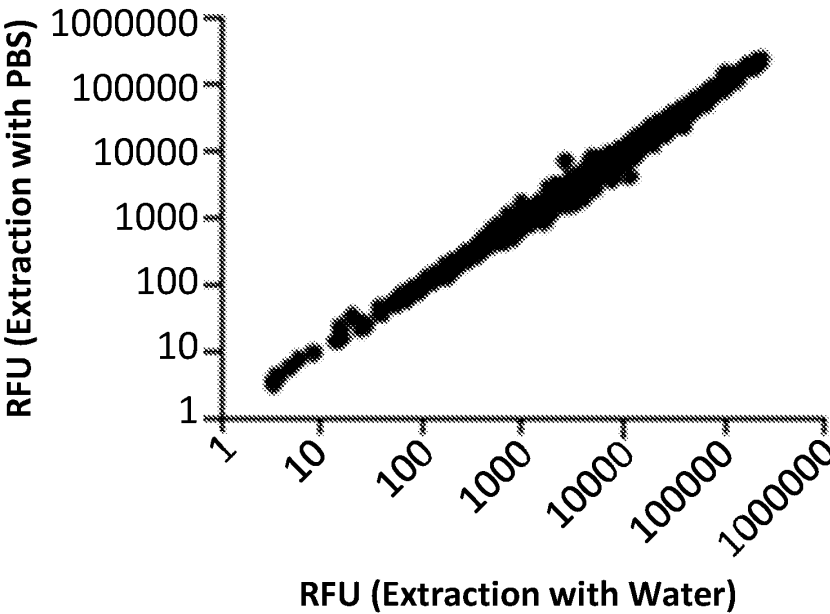


FIG. 5C

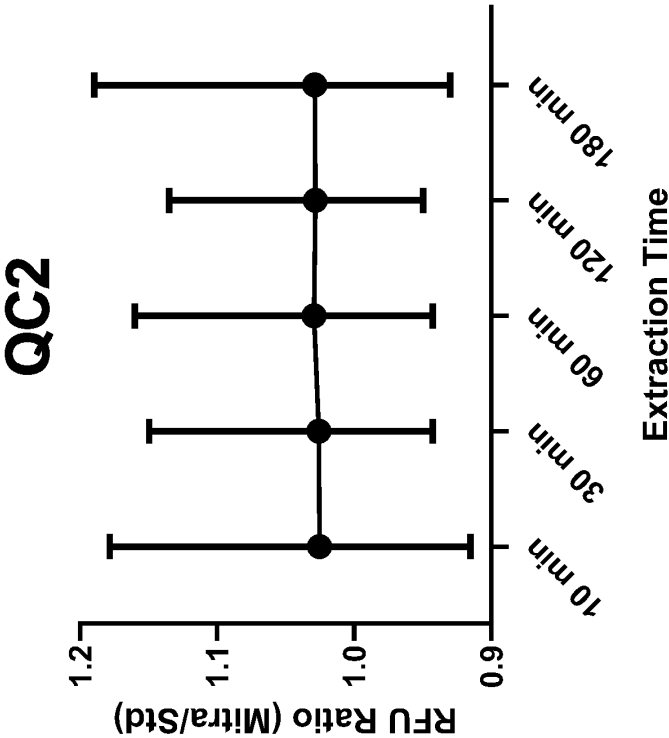


FIG. 6B

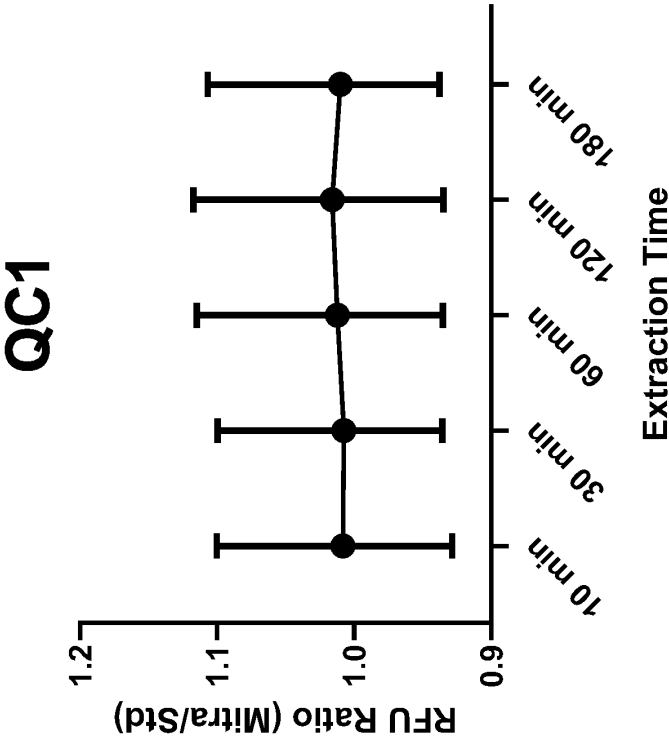


FIG. 6A

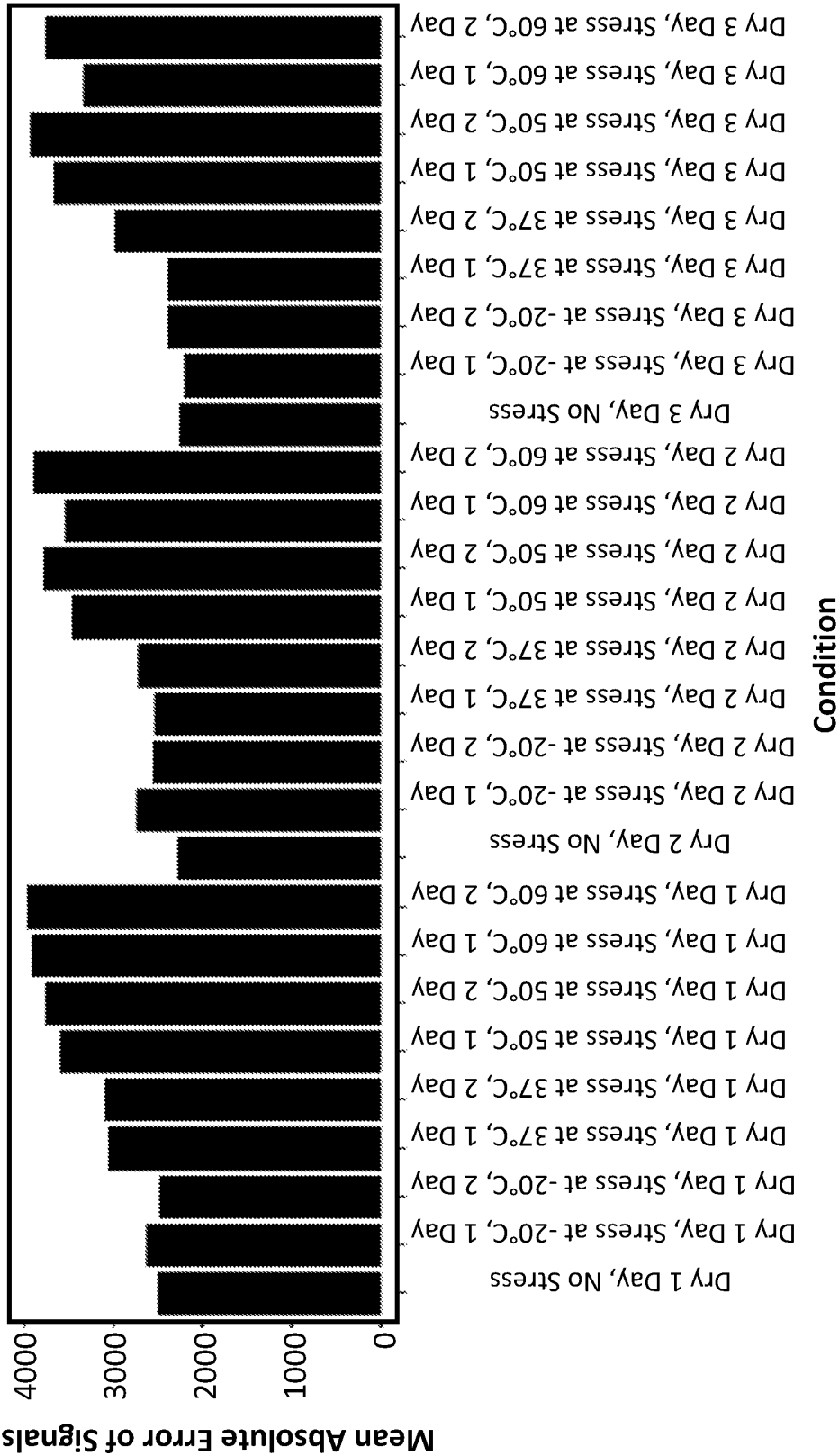


FIG. 7A

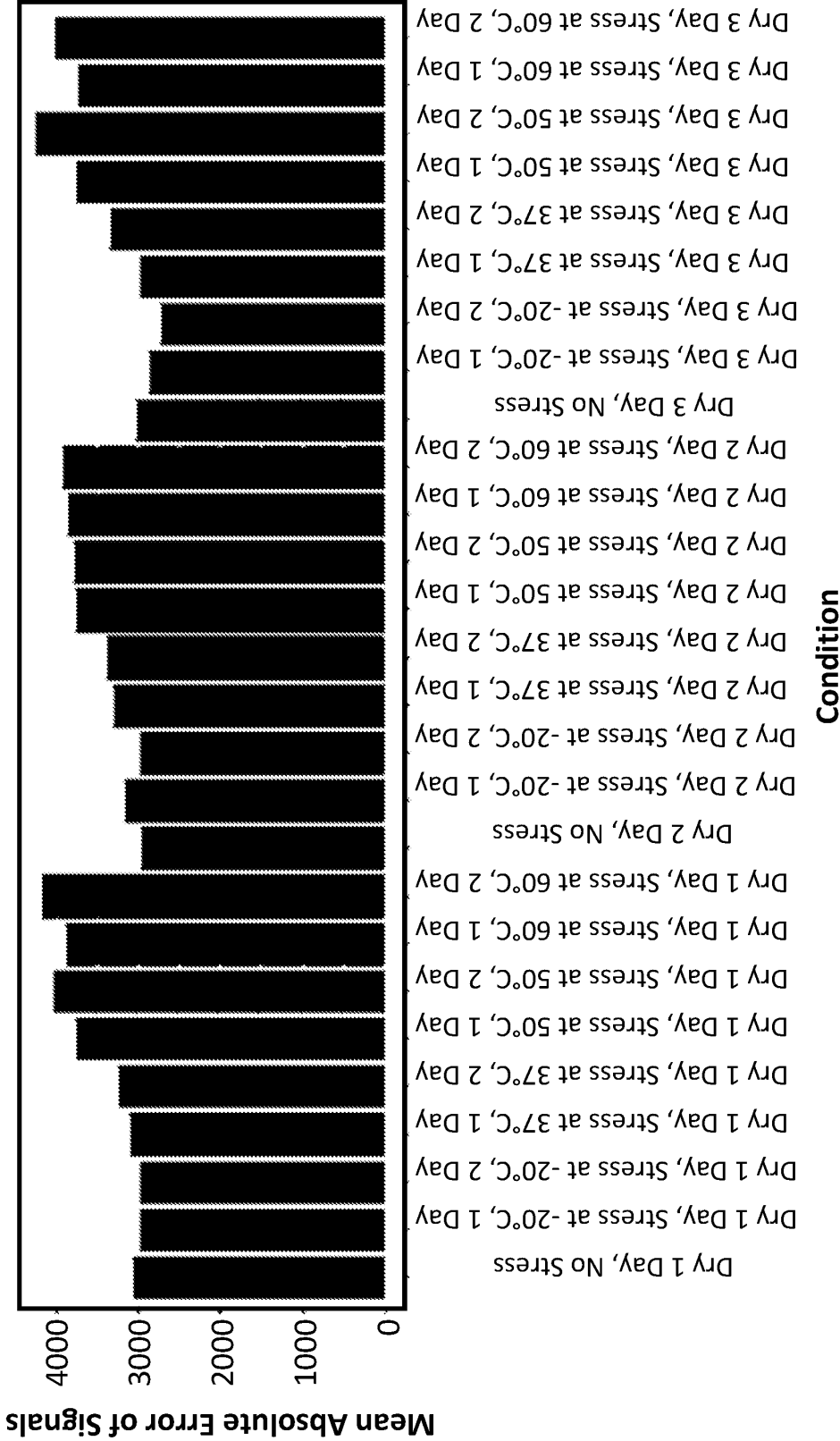


FIG. 7B

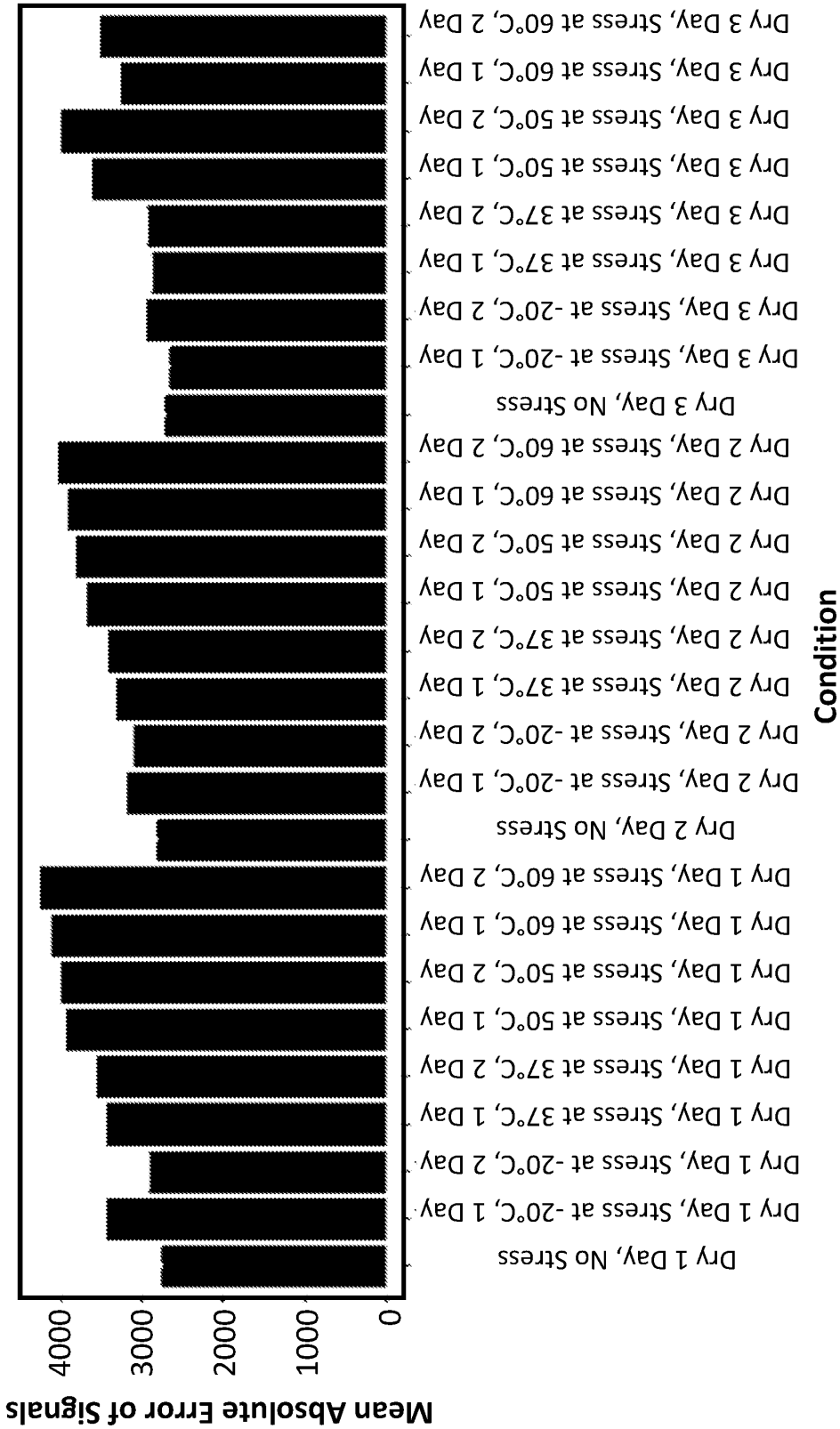


FIG. 7C

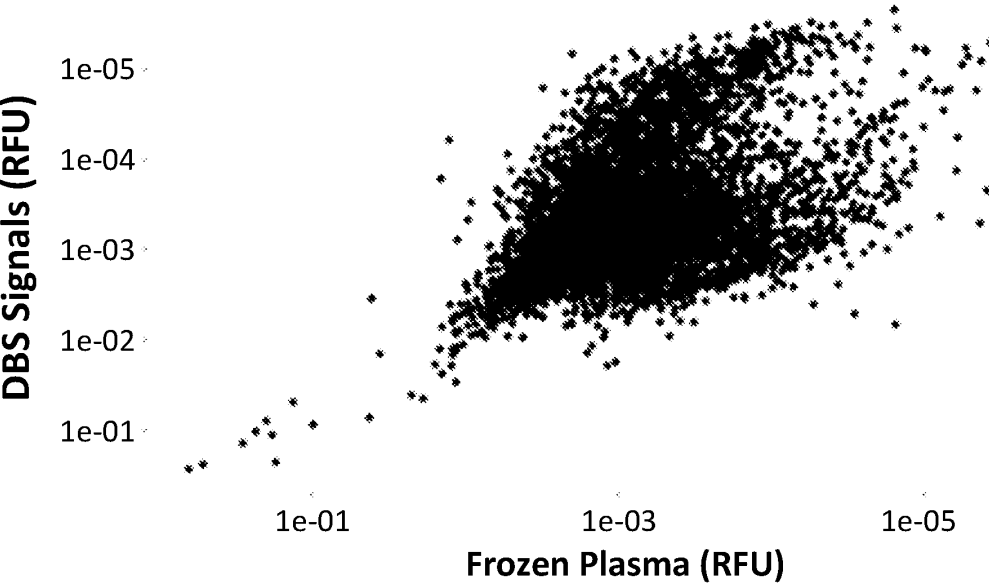


FIG. 8A

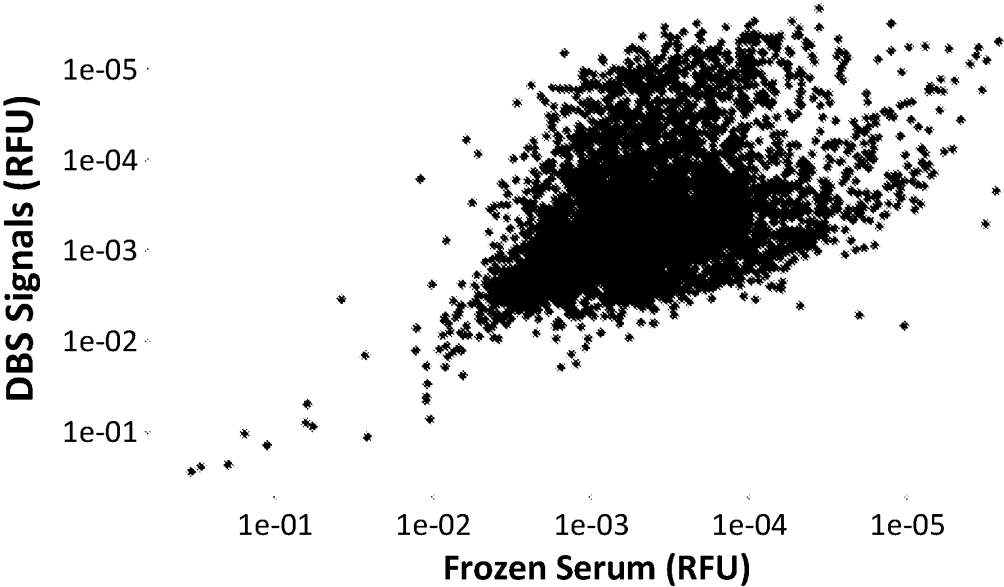


FIG. 8B

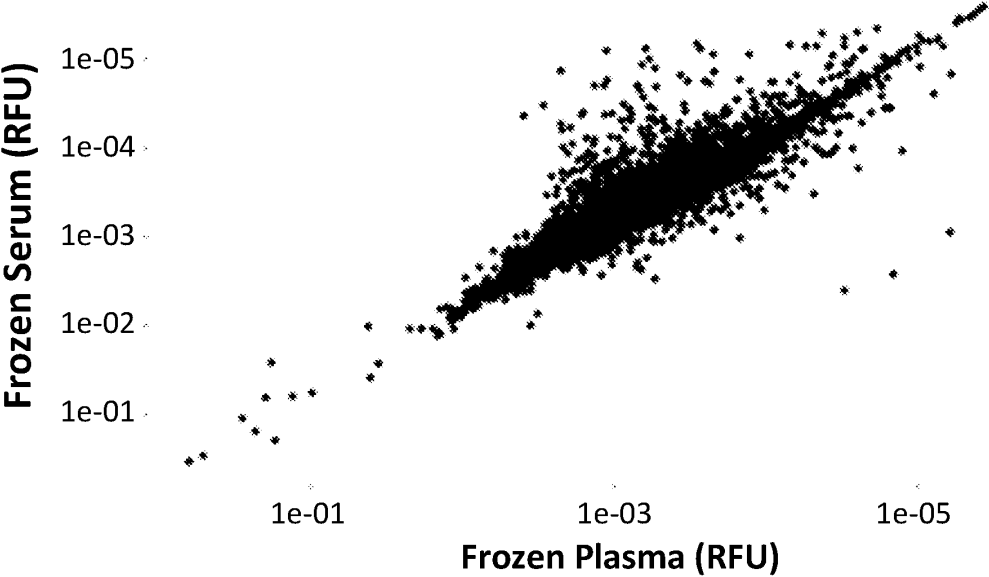


FIG. 8C

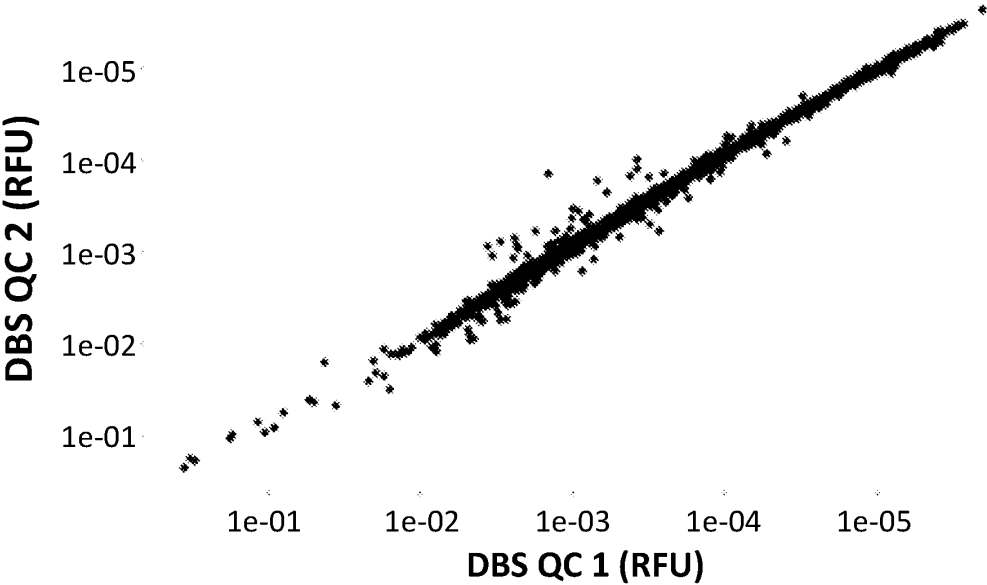


FIG. 8D

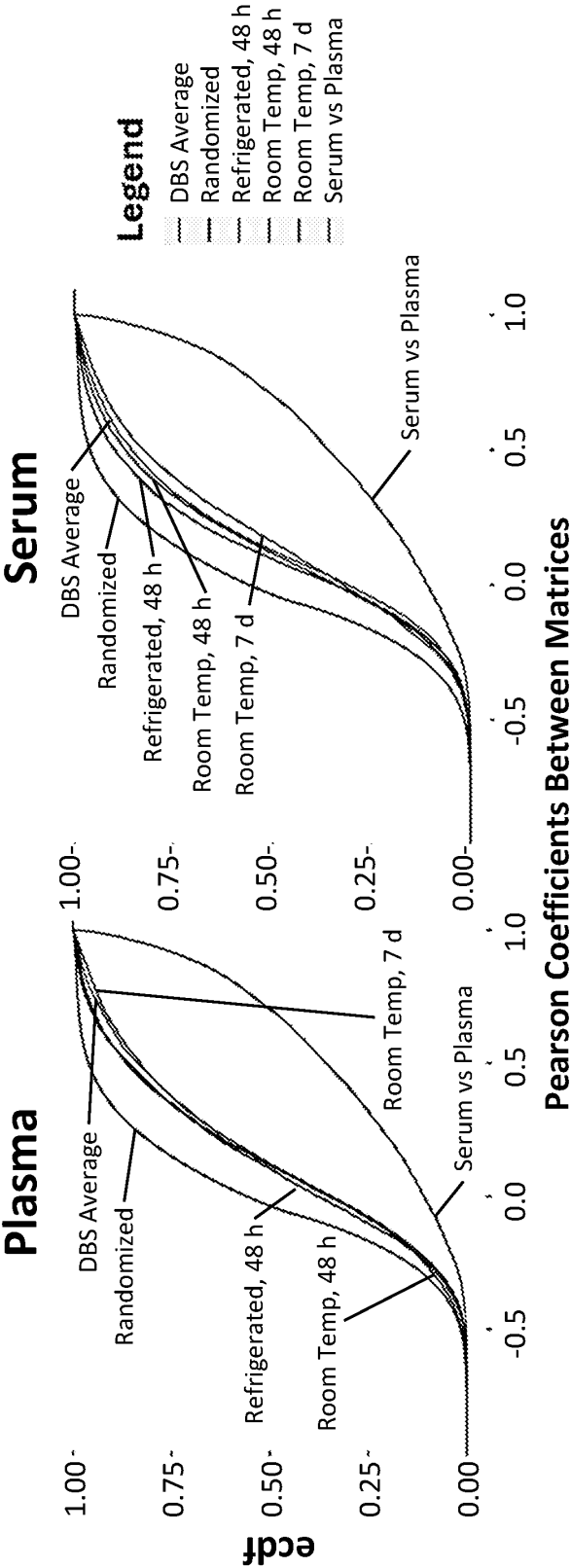


FIG. 9

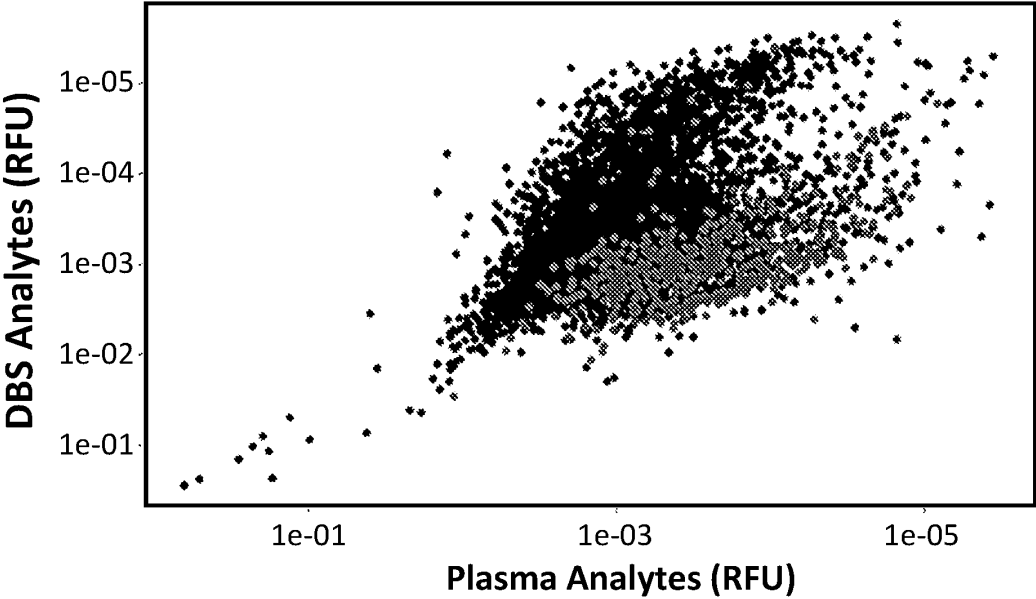


FIG. 10A

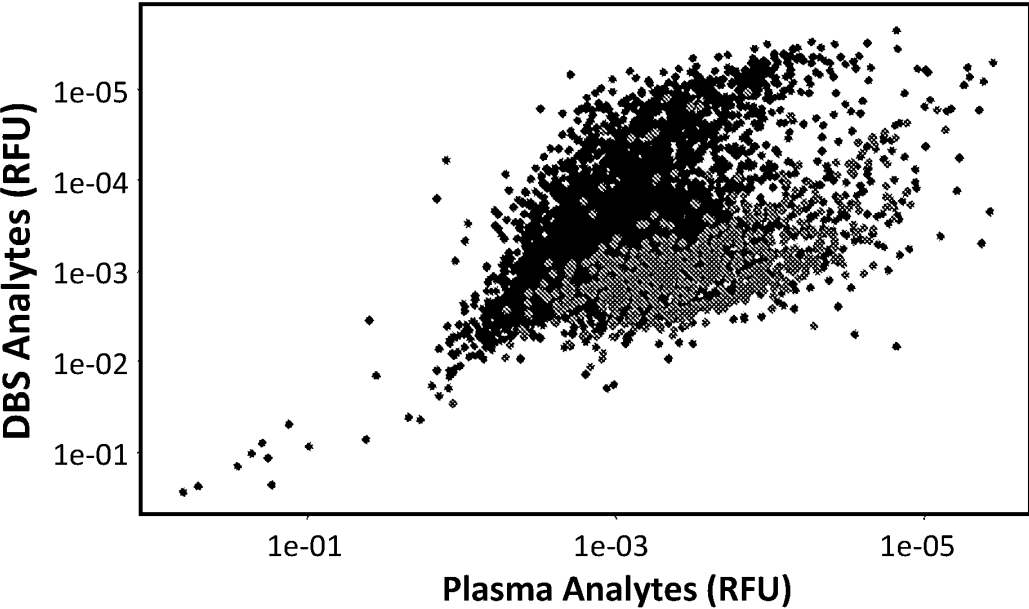
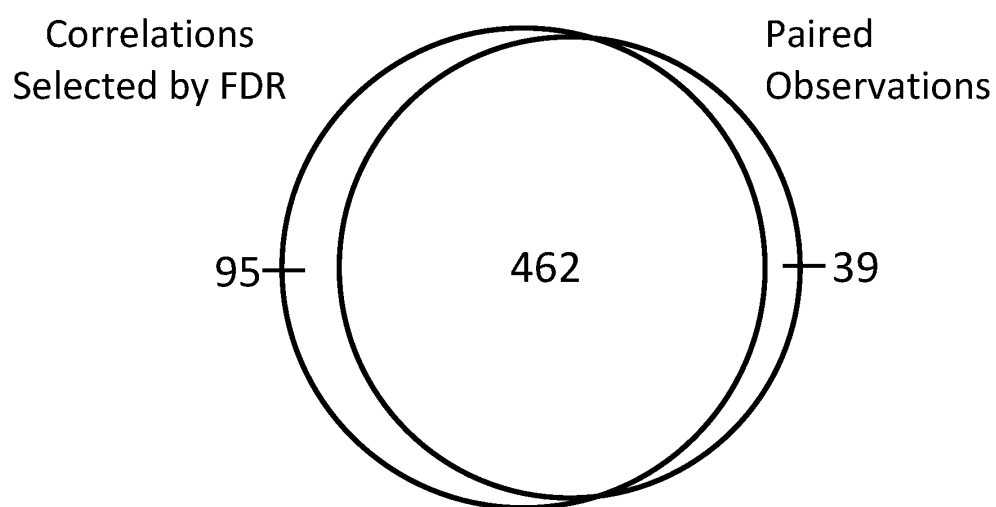


FIG. 10B

**FIG. 11**

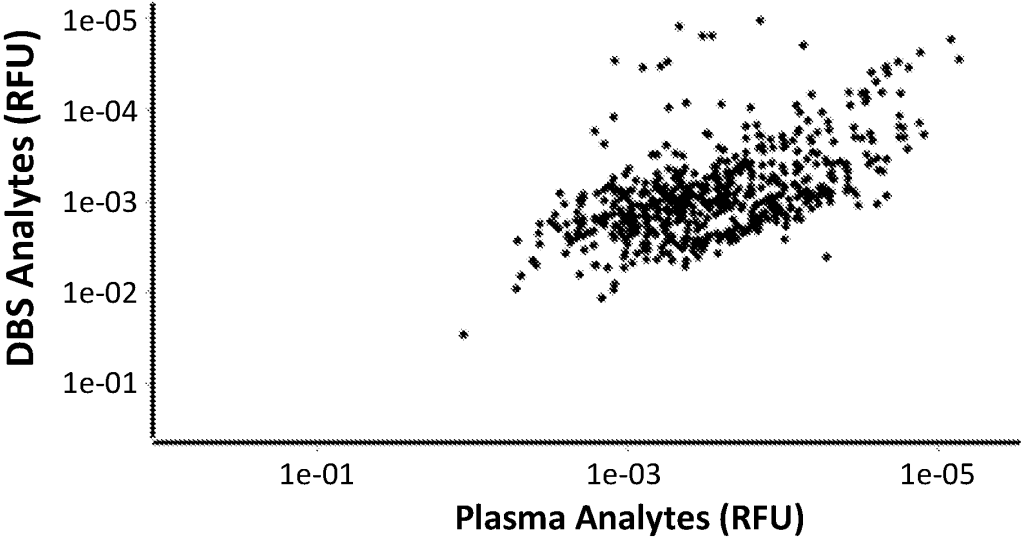


FIG. 12A

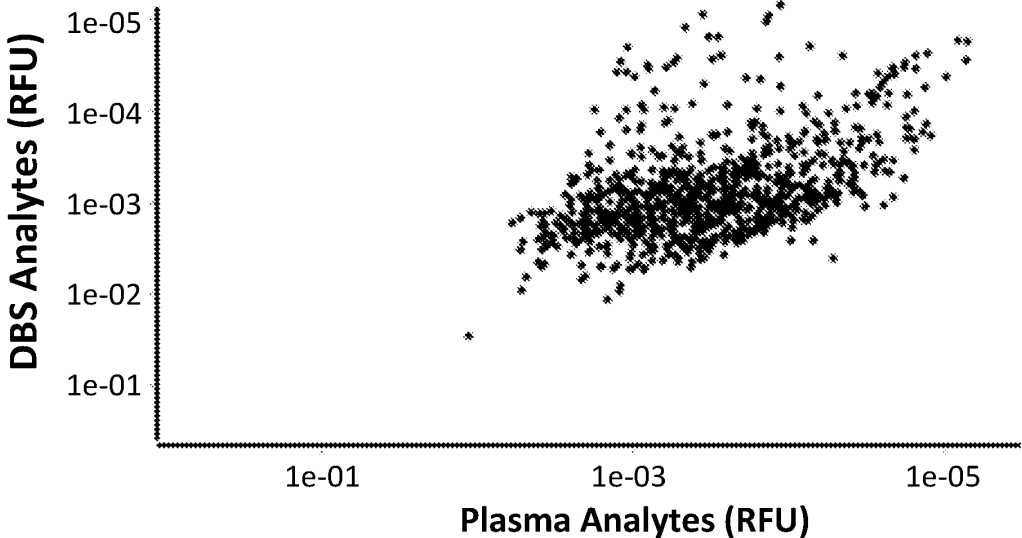


FIG. 12B

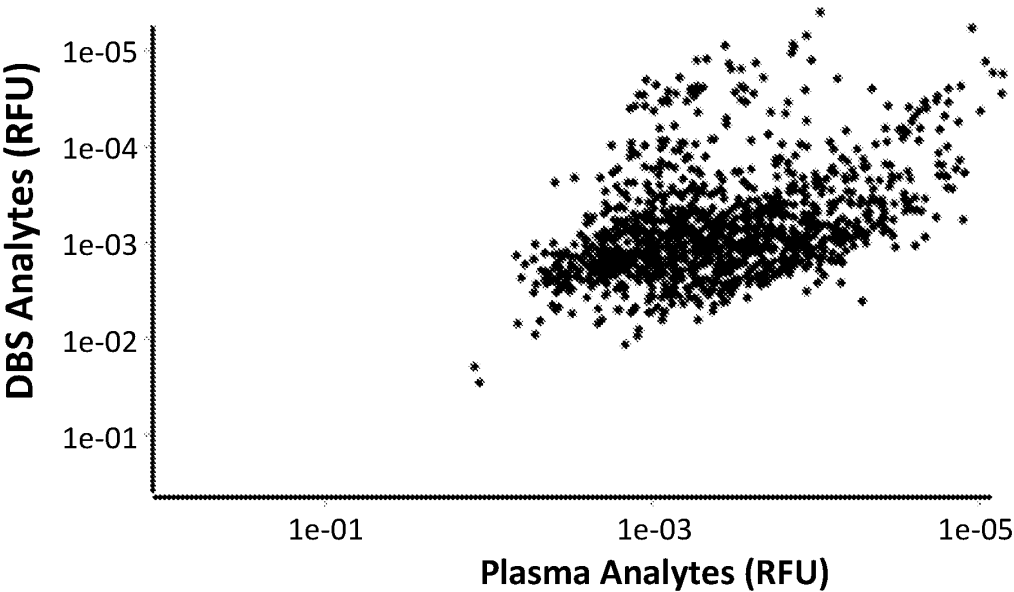


FIG. 12C

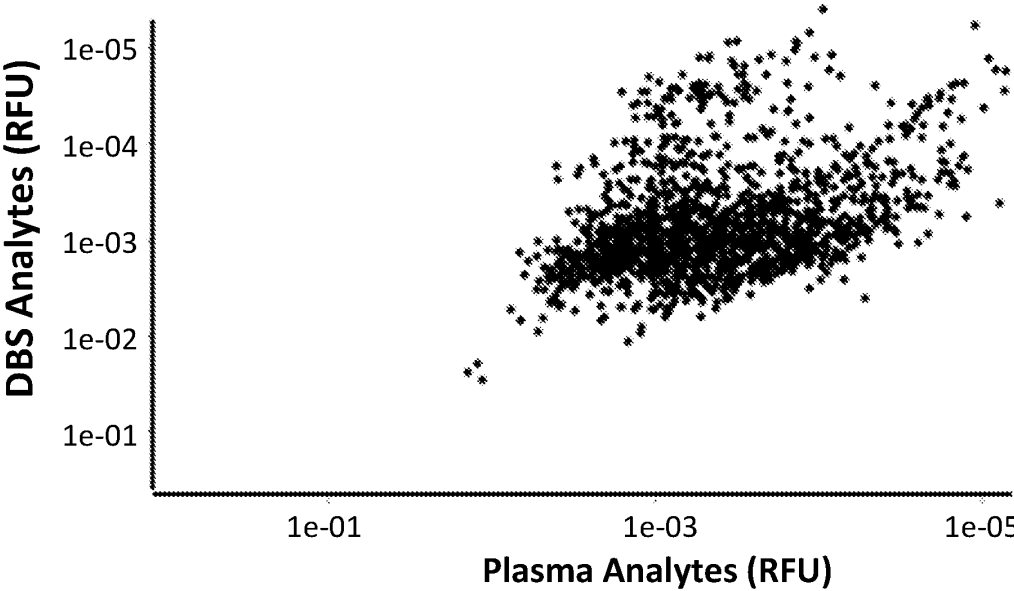


FIG. 12D

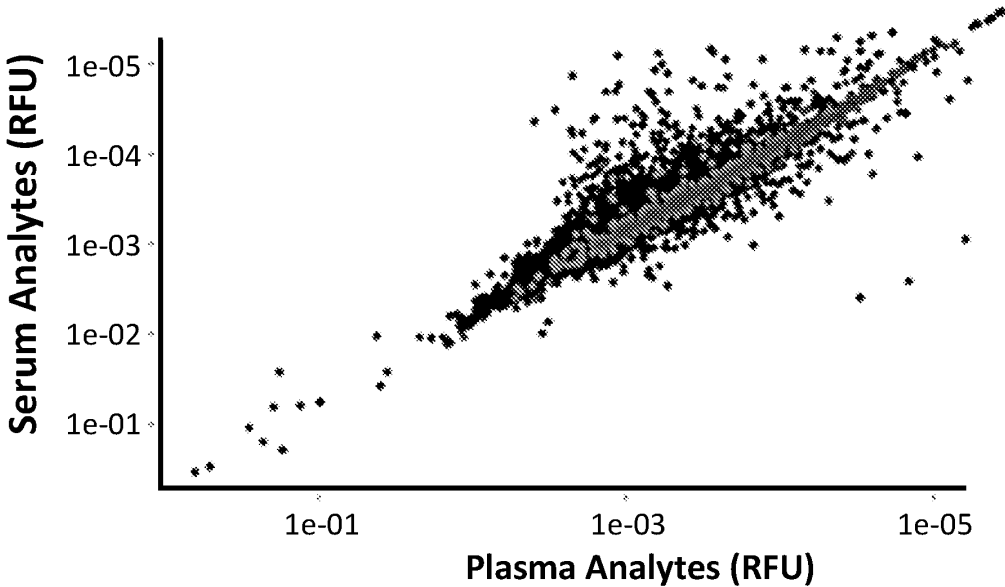


FIG. 13A

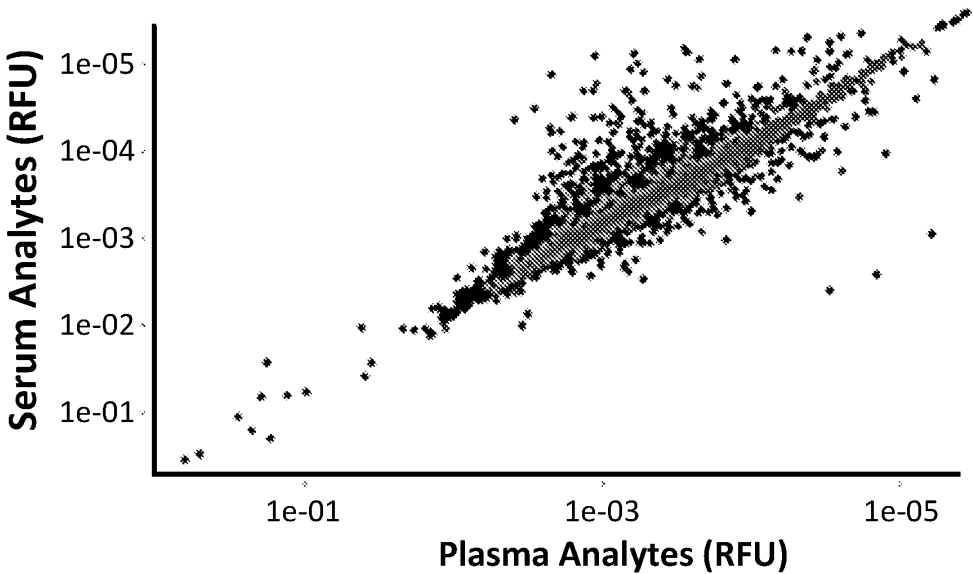


FIG. 13B

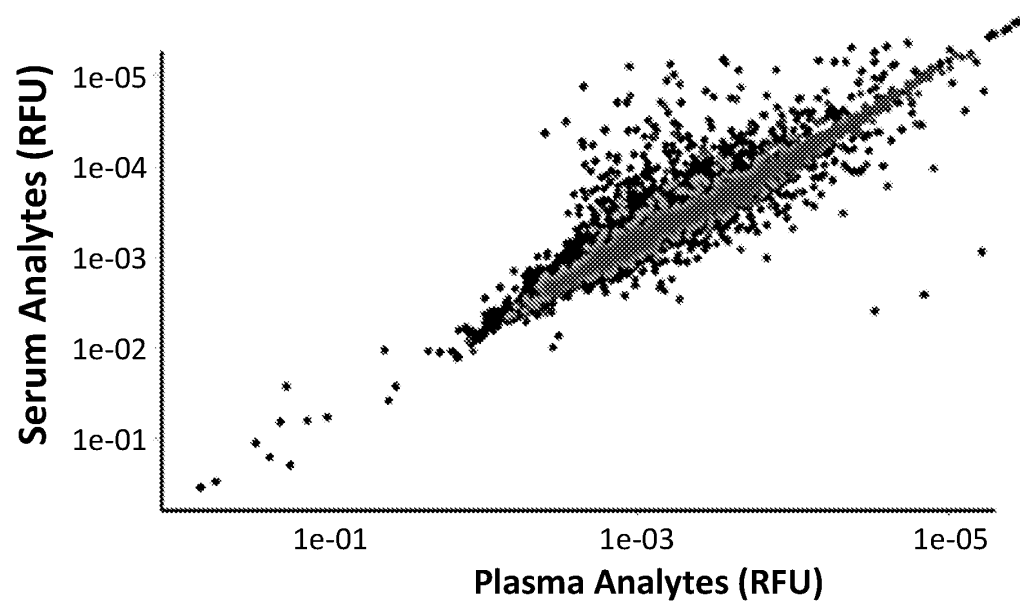


FIG. 13C

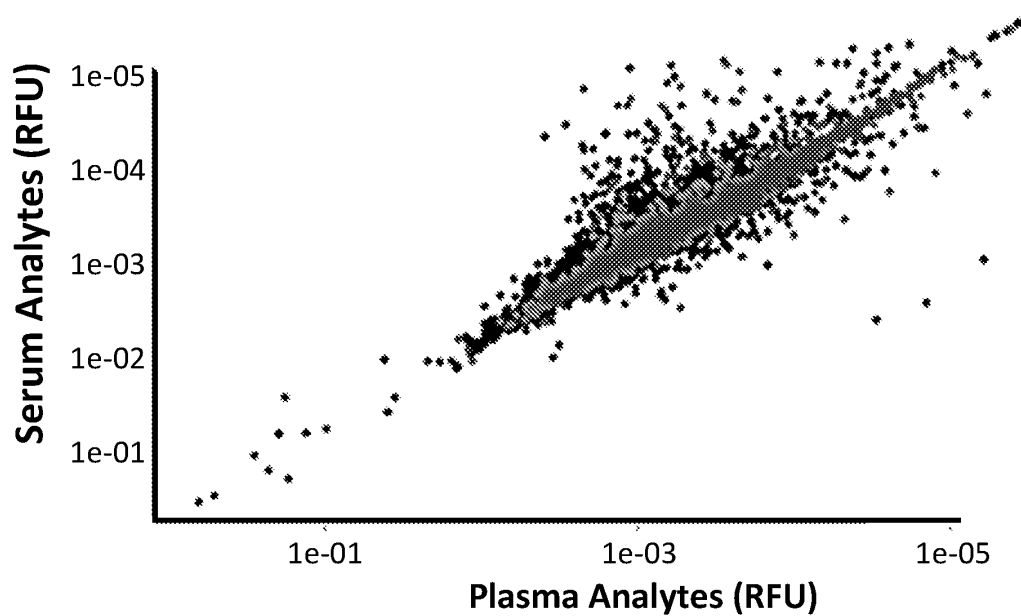


FIG. 13D

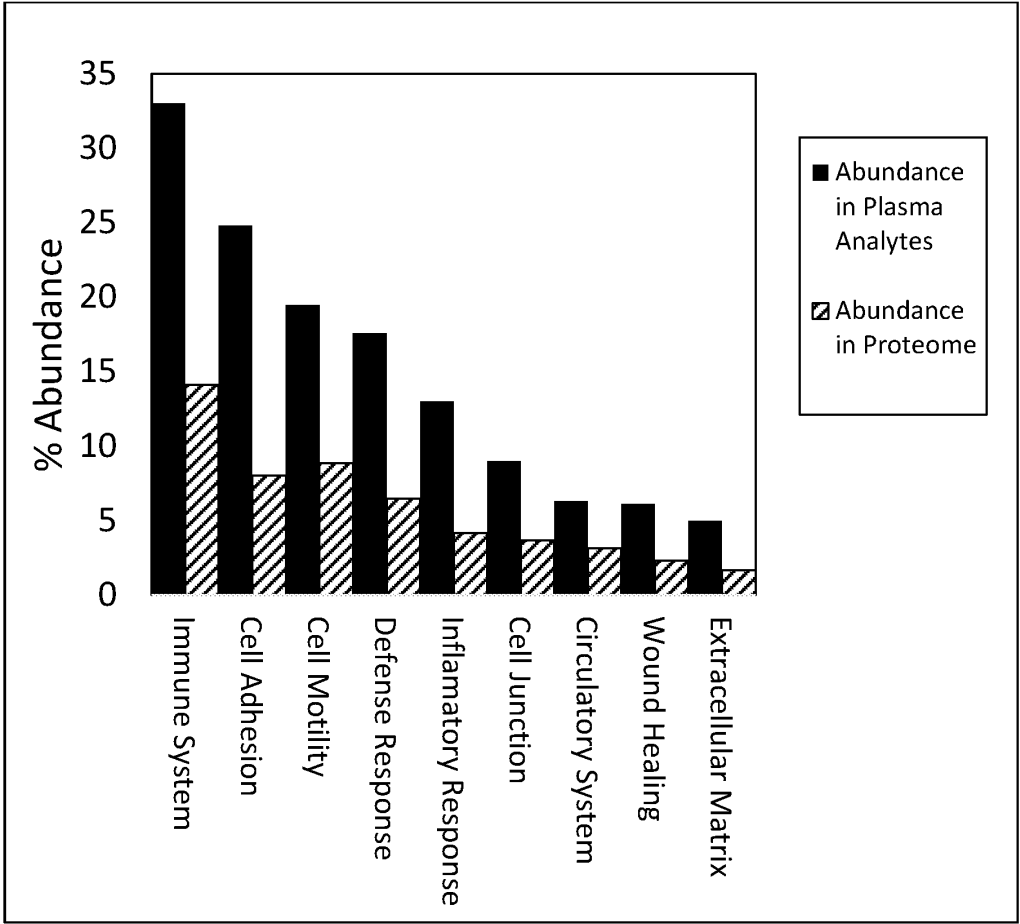


FIG. 14

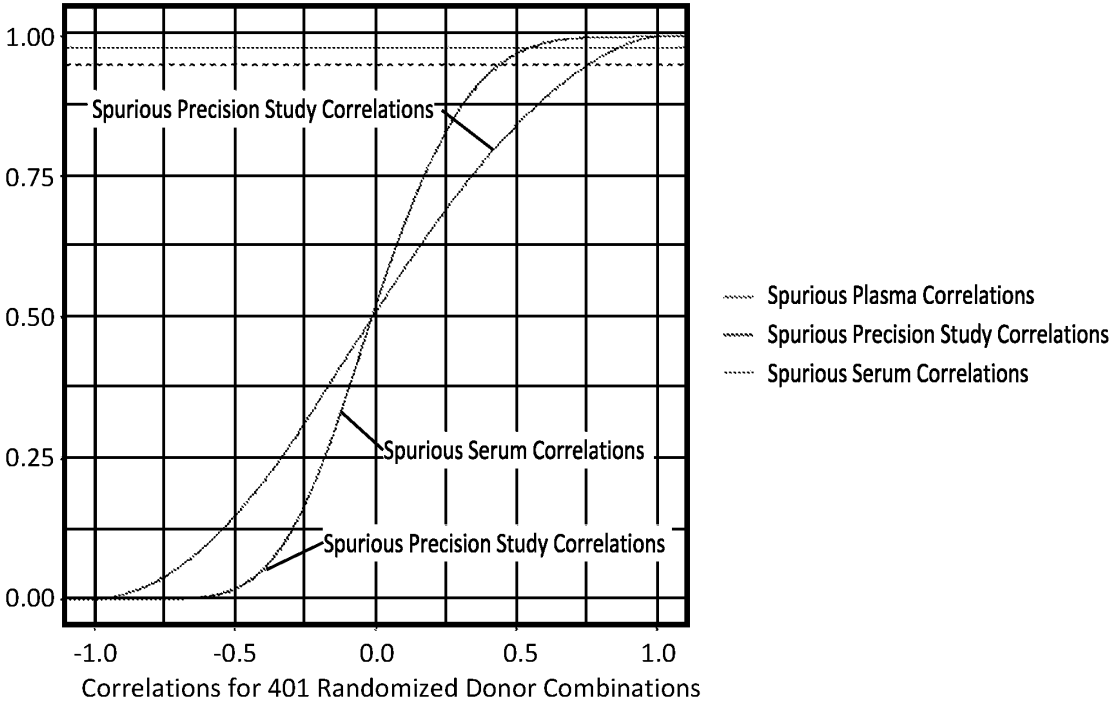


FIG. 15

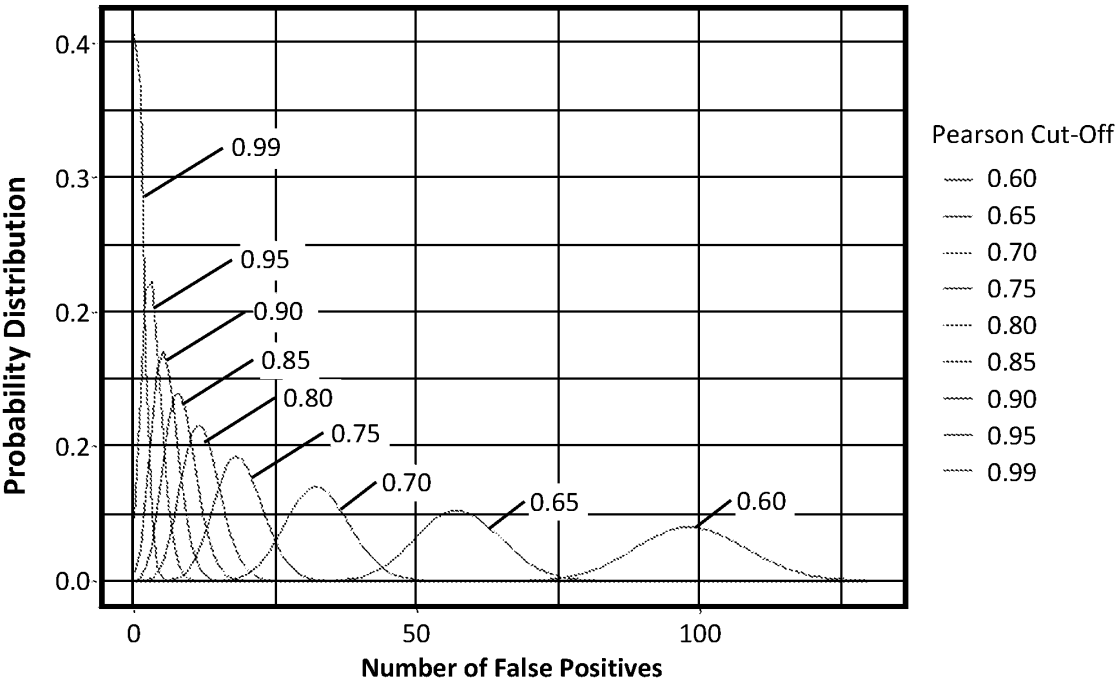


FIG. 16

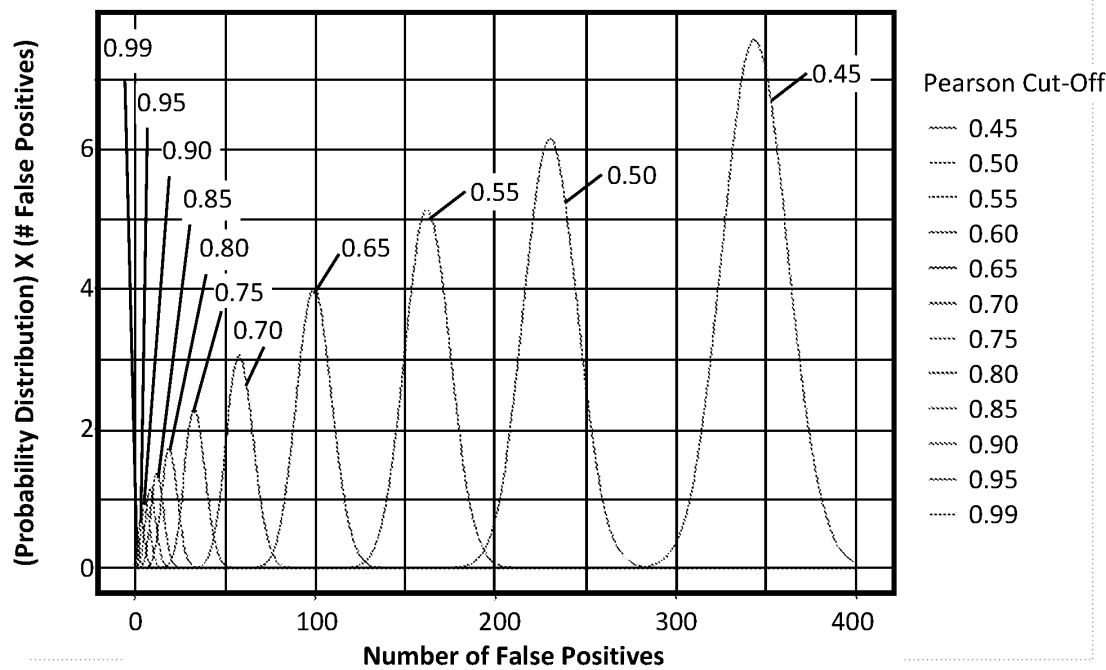


FIG. 17

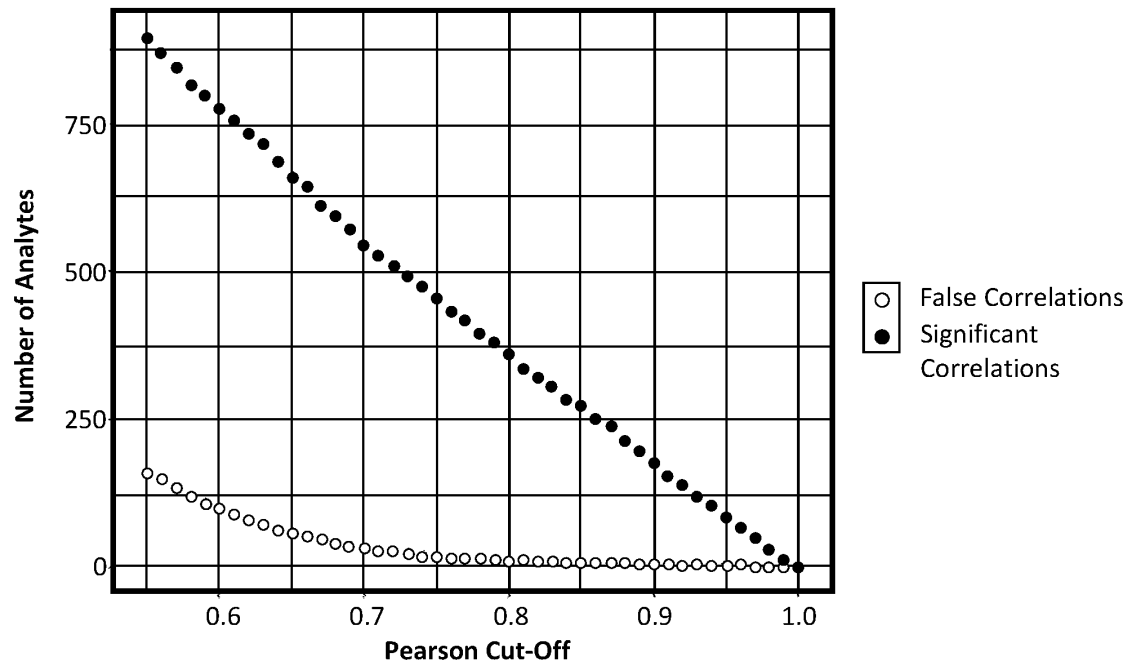


FIG. 18

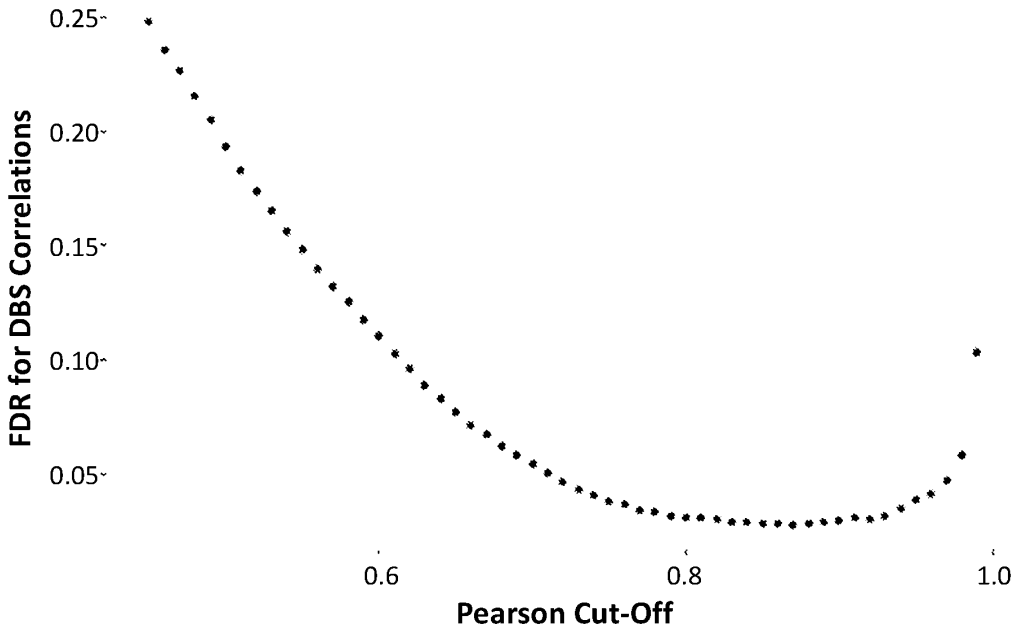


FIG. 19

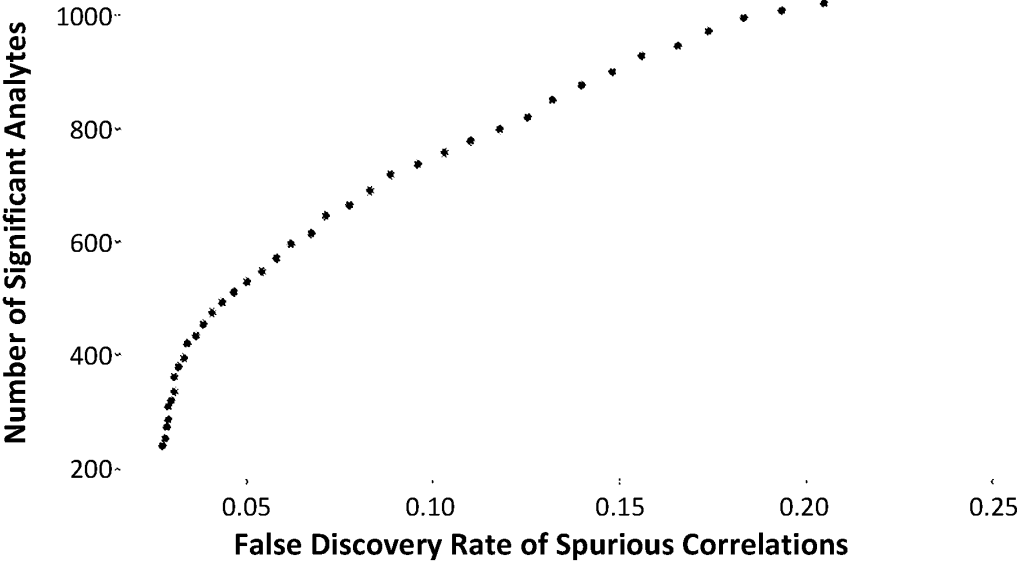
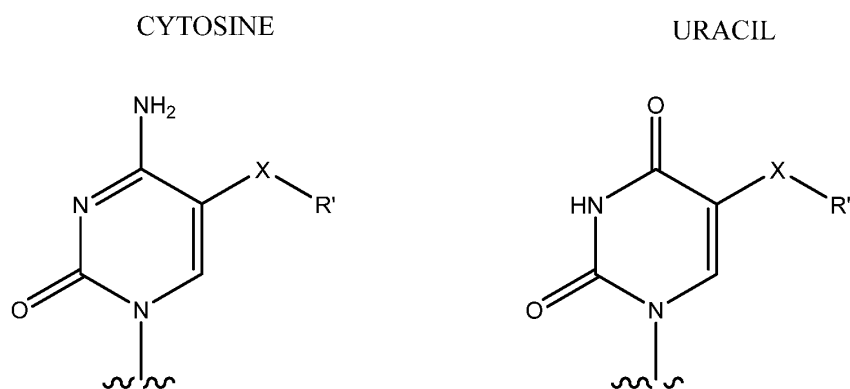


FIG. 20



~~~~~ - denotes attachment to backbone of nucleic acid molecules (e.g., phosphate deoxyribose backbone)

X - denotes a linker attached to the 5-position of the pyrimidine molecule (uracil or cytosine)

R' - denotes a moiety attached to the 5-position of the pyrimidine molecule via the linker (X)

**FIG. 21**

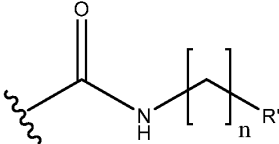
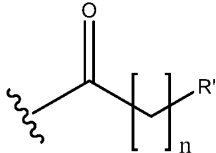
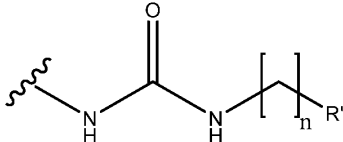
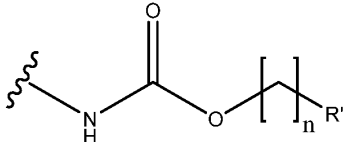
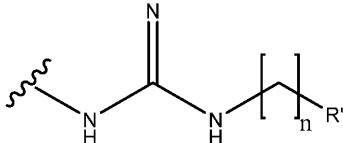
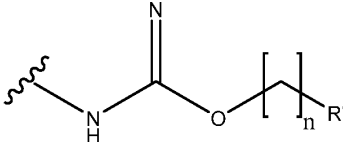
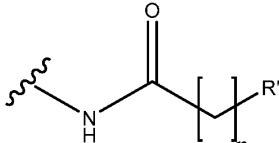
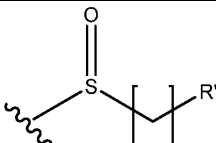
|                                                                                                                                                                                                             |  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| Exemplary Linkers (Denoted as X in Figure 7)<br>n = 0, 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10; R' denotes a moiety<br>~~~~~ - denotes attachment to the 5-position of the pyrimidine molecule (uracil or cytosine) |  |
|                                                                                                                            |  |
|                                                                                                                            |  |
|                                                                                                                            |  |
|                                                                                                                           |  |
|                                                                                                                          |  |
|                                                                                                                          |  |
|                                                                                                                          |  |
|                                                                                                                          |  |

FIG. 21 (cont.)

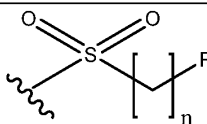
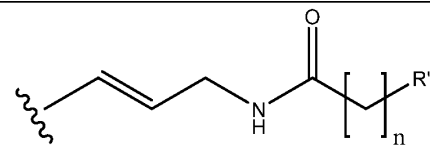
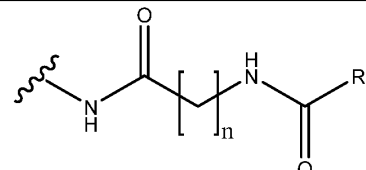
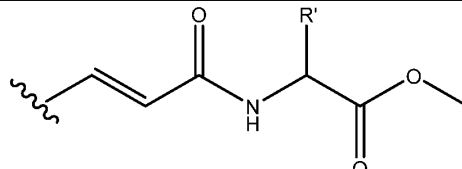
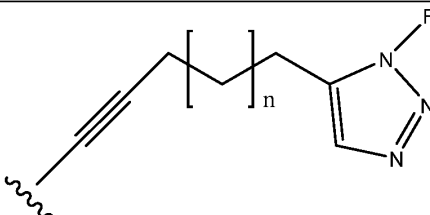
|                                                                                                                                                                                                             |  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| Exemplary Linkers (Denoted as X in Figure 3)<br>n = 0, 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10; R' denotes a moiety<br>~~~~~ - denotes attachment to the 5-position of the pyrimidine molecule (uracil or cytosine) |  |
|                                                                                                                            |  |
|                                                                                                                           |  |
|                                                                                                                           |  |
|                                                                                                                          |  |
|                                                                                                                         |  |

FIG. 21 (cont.)

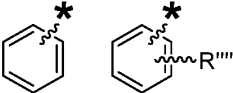
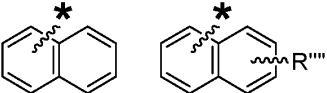
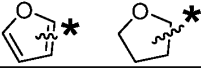
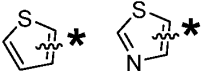
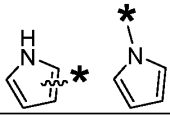
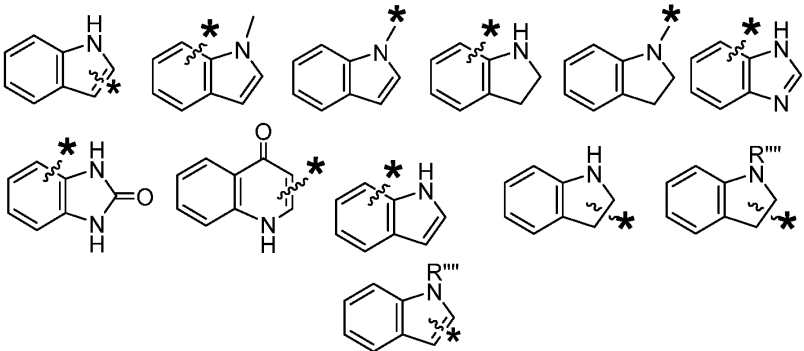
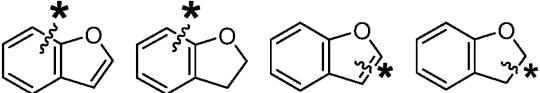
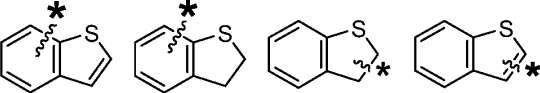
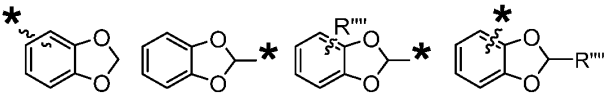
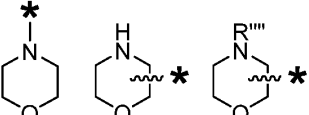
| Group | R' Structures (* denotes the point of attachment of the R' group to X (linker))      |
|-------|--------------------------------------------------------------------------------------|
| I     |     |
| II    |    |
| III   |     |
| IV    |     |
| V     |     |
| VI    |   |
| VII   |  |
| VIII  |  |
| IX    |  |
| X     |  |

FIG. 21 (cont.)

| Group | R' Structures (* denotes the point of attachment of the R' group to X (linker)) |
|-------|---------------------------------------------------------------------------------|
| XI    |                                                                                 |
| XII   |                                                                                 |
| XIII  |                                                                                 |
| XIV   |                                                                                 |
| XV    |                                                                                 |
| XVI   |                                                                                 |
| XVII  |                                                                                 |
| XVIII |                                                                                 |
| XIX   |                                                                                 |
| XX    |                                                                                 |

R'' and R''' are, independently, selected from a halogen (-F, -Cl, -Br, -I); nitrile (-CN); -NH<sub>2</sub>; -OH; branched lower alkyl (C1-C20); linear lower alkyl (C1-C20); primary amide; secondary amide; tertiary amide; alkoxy group.

**FIG. 21 (cont.)**

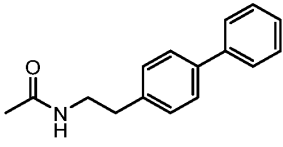
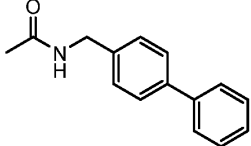
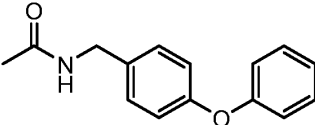
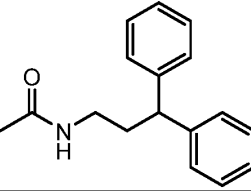
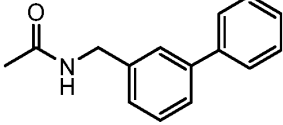
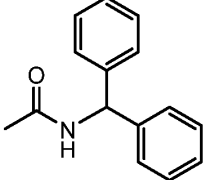
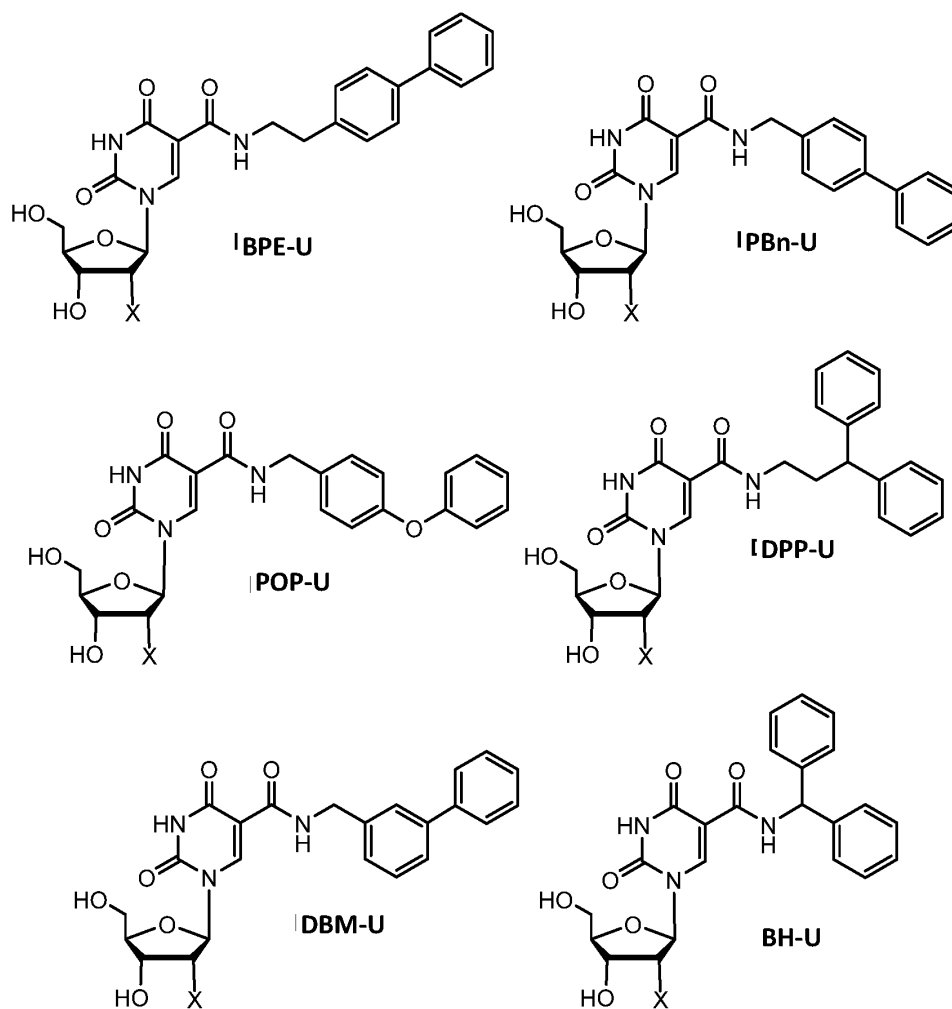
| Abbreviation | 5-dU Modification Attached via Amide Linkage | Chemical Structure                                                                    |
|--------------|----------------------------------------------|---------------------------------------------------------------------------------------|
| BPE          | ((1,1'-biphenyl)-4-yl)ethyl                  |    |
| PBnd         | 4-phenylbenzyl                               |    |
| POP          | 4-phenoxybenzyl                              |     |
| DPP          | 3,3-diphenylpropyl                           |   |
| DBM          | 3-phenylbenzyl                               |  |
| BH           | benzhydryl                                   |  |

FIG. 22

**FIG. 22 (cont.)**

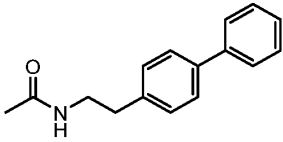
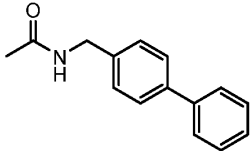
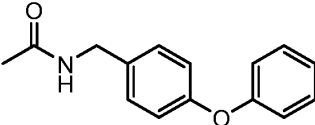
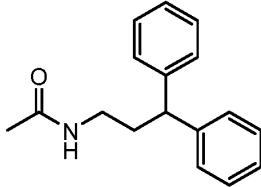
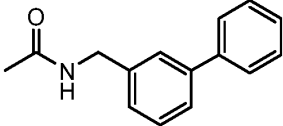
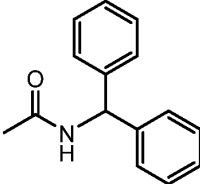
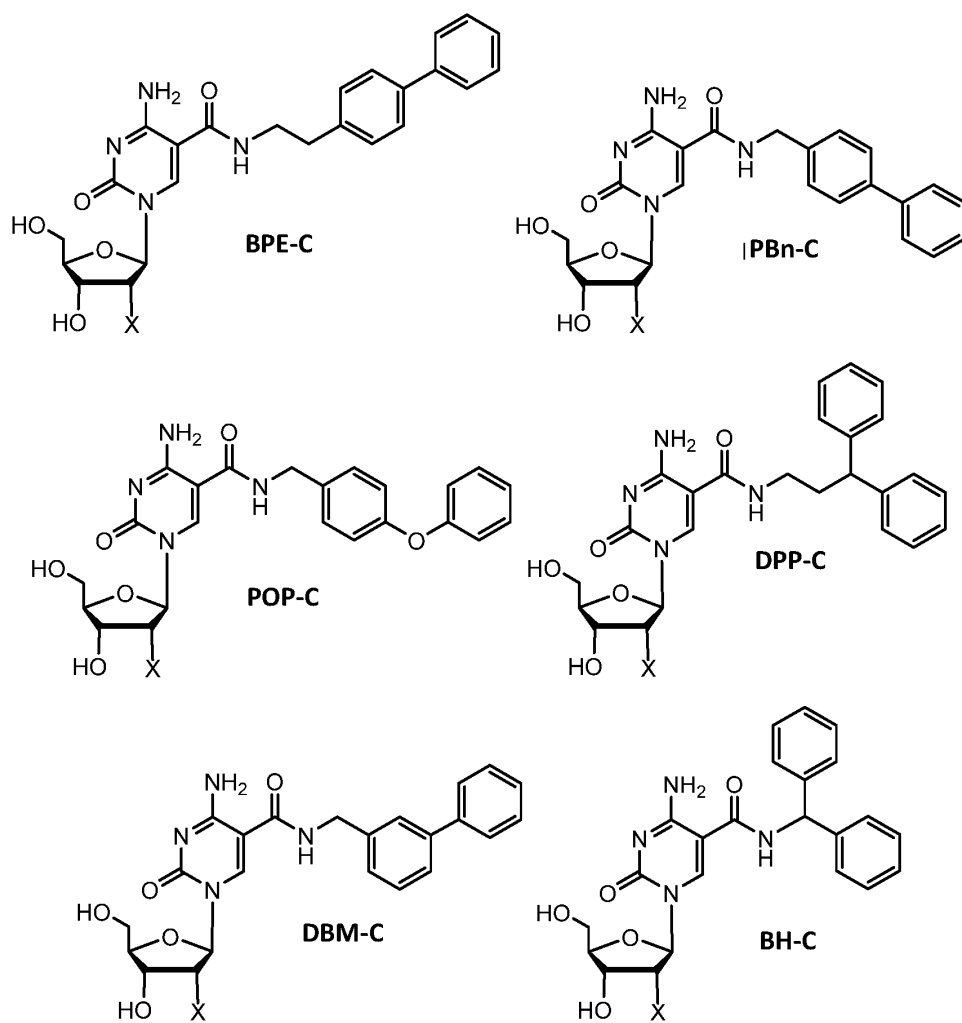
| Abbreviation | 5-dC Modification Attached via Amide Linkage | Chemical Structure                                                                    |
|--------------|----------------------------------------------|---------------------------------------------------------------------------------------|
| BPE          | ((1,1'-biphenyl)-4-yl)ethyl                  |    |
| PBnd         | 4-phenylbenzyl                               |    |
| POP          | 4-phenoxybenzyl                              |     |
| DPP          | 3,3-diphenylpropyl                           |   |
| DBM          | 3-phenylbenzyl                               |  |
| BH           | benzhydryl                                   |  |

FIG. 23

**FIG. 23 (cont.)**

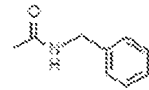
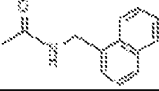
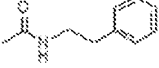
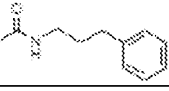
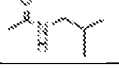
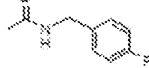
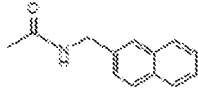
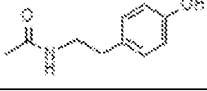
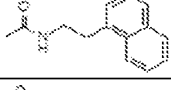
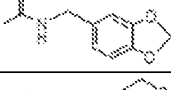
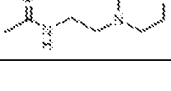
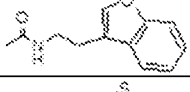
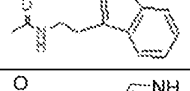
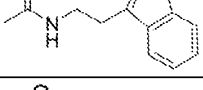
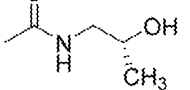
| Abbreviation | 5-dU Modification Attached via Amide Linkage | Chemical Structure                                                                    |
|--------------|----------------------------------------------|---------------------------------------------------------------------------------------|
| Bn           | benzylmethyl                                 |    |
| Nap          | <i>1</i> -naphthylmethyl                     |    |
| PE           | 2-phenylethyl                                |    |
| PP           | 3-phenylpropyl                               |    |
| iBu          | <i>iso</i> -butyl                            |    |
| FBn          | 4-fluorobenzylmethyl                         |    |
| 2Nap         | 2-naphthylmethyl                             |   |
| Tyr          | tyrosyl                                      |  |
| NE           | <i>1</i> -naphthylethyl                      |  |
| MBn          | 3,4-methylenedioxy benzyl                    |  |
| MOE          | morpholinoethyl                              |  |
| BF           | 3-benzofuranylethyl                          |  |
| BT           | 3-benzothiophenylethyl                       |  |
| Trp          | 3-indole-2-ethyl                             |  |
| Thr          | ( <i>R</i> )-2-hydroxypropyl                 |  |

FIG. 24

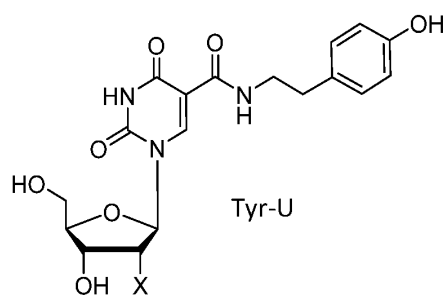
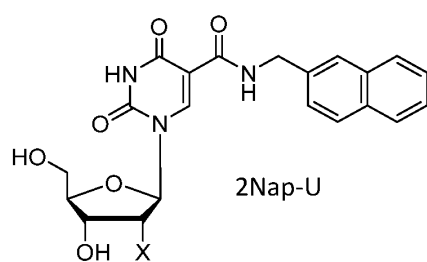
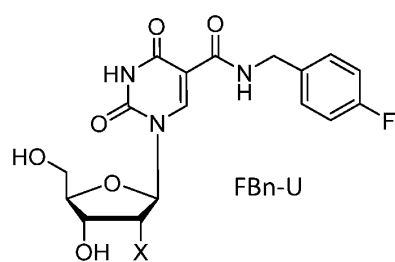
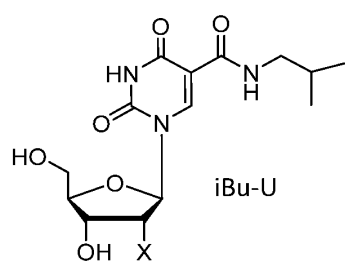
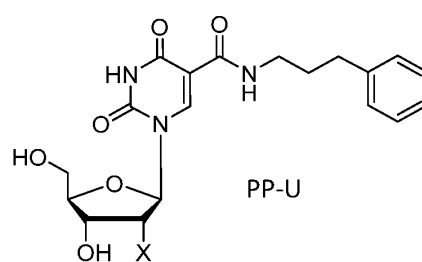
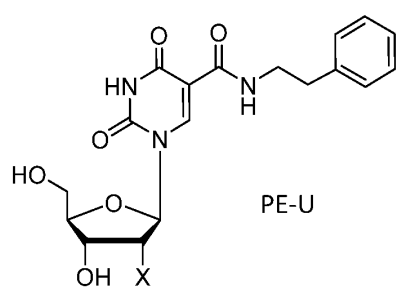
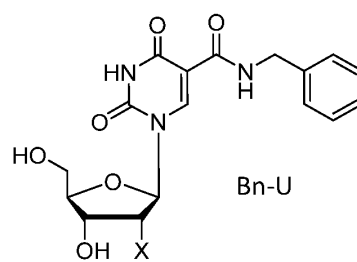
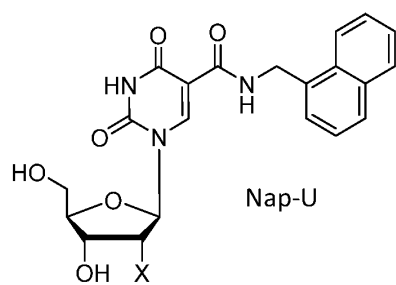


FIG. 24 (cont.)

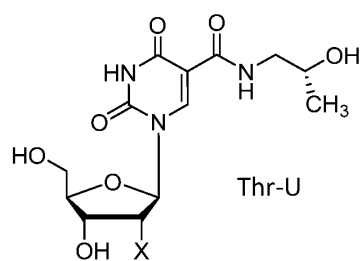
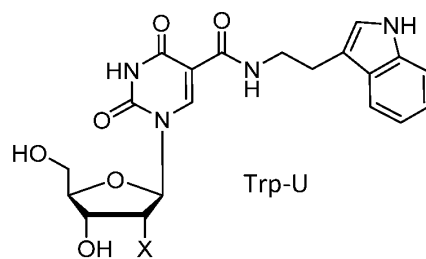
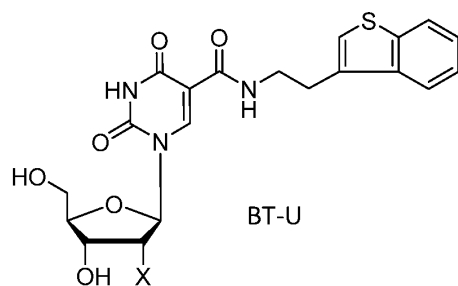
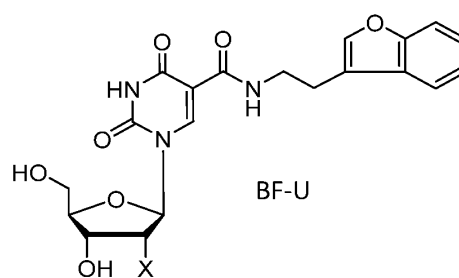
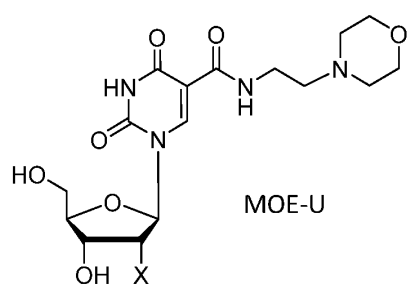
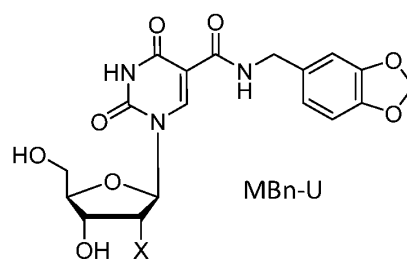
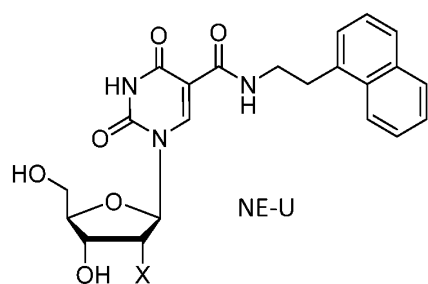
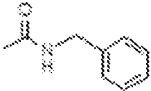
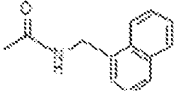
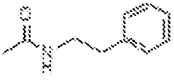
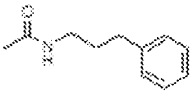
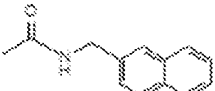
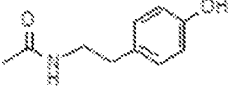
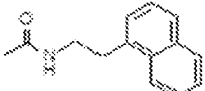
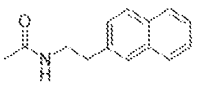
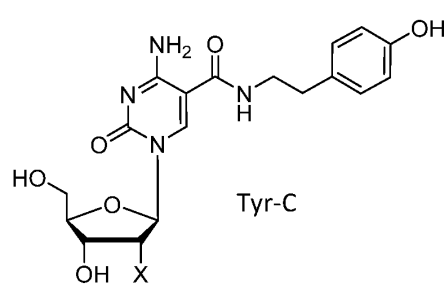
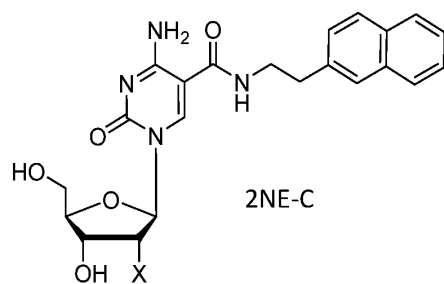
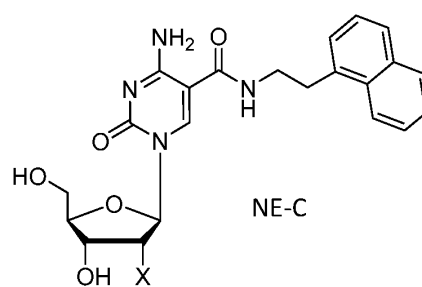
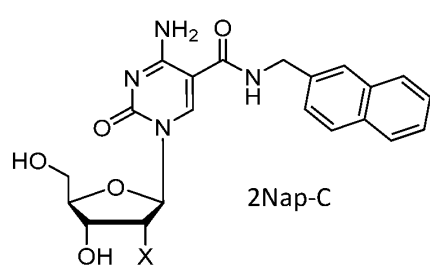
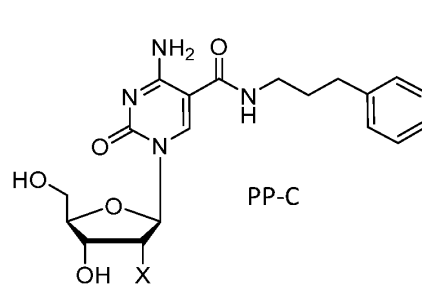
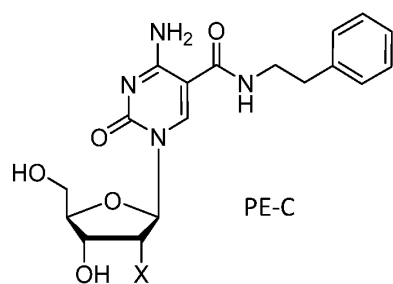
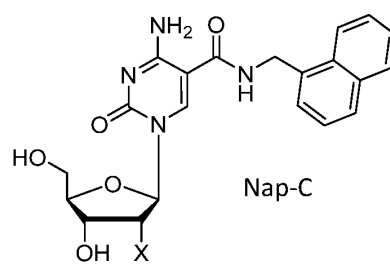
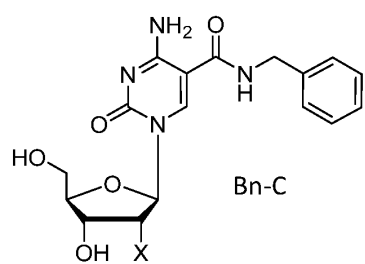


FIG. 24 (cont.)

| <b>FIG. 24</b><br><b>(cont.)</b> Abbreviation | <b>5-dC Modification Attached via</b><br><b>Amide Linkage</b> | <b>Chemical Structure</b>                                                             |
|-----------------------------------------------|---------------------------------------------------------------|---------------------------------------------------------------------------------------|
| Bn                                            | benzylmethyl                                                  |    |
| Nap                                           | <i>l</i> -naphthylmethyl                                      |    |
| PE                                            | 2-phenylethyl                                                 |    |
| PP                                            | 3-phenylpropyl                                                |    |
| 2Nap                                          | 2-naphthylmethyl                                              |    |
| Tyr                                           | tyrosyl                                                       |  |
| NE                                            | <i>l</i> -naphthylethyl                                       |  |
| 2NE                                           | 2-naphthyl-2-ethyl                                            |  |

**FIG. 25**

**FIG. 25 (cont.)**