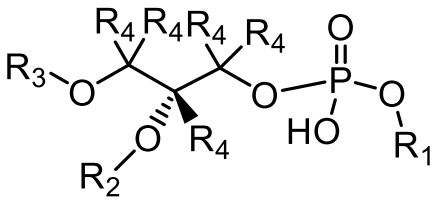
CLAIMS

1. A universal lipid quantitative standard (ULQS) comprising a plurality of isotopically labeled lipid standards, wherein the plurality of isotopically labeled lipid standards includes at least one lipid species selected from a phospholipid class,

   wherein the phospholipid class includes one or more phospholipid species selected from the group consisting of: phosphatidylcholine (PC), phosphatidylethanolamine (PE), phosphatidylserine (PS), phosphatidylglycerol (PG), and phosphatidylinositol (PI),

   and wherein the phospholipid species are represented by the general formula I, or a pharmaceutically acceptable salt thereof:



I

   wherein:

   R_1 is $-(CH_2)_n-N(CH_3)_3$, $-(CH_2)_n-NH_3$, $-(CH_2)_n-C(H)(NH3)-C(O)-O^-$, $-(CH_2)_n-CH(OH)-CH(OH)$, inositol, and H;

   n is 1 to 6;

   R_2 is a C3 to C30 saturated or unsaturated acyl chain;

   R_3 is a C3 to C30 saturated or unsaturated acyl chain; and

   R_4 is independently H or an isotope of H, provided that at least one of R_4 is an isotope of H.

2. The ULQS of claim 1, further comprising at least one lipid species selected from a lysophospholipid class.

3. The ULQS of claim 1 or claim 2, further comprising at least one lipid species selected from a cholesterol ester class.

4. The ULQS of any one of the preceding claims, further comprising at least one lipid species selected from a triacylglycerol class.

5. The ULQS of any one of the preceding claims, further comprising at least one lipid species selected from a diacylglycerol class.

6. The ULQS of any one of the preceding claims, further comprising at least one lipid species selected from a ceramide class.

7. The ULQS of any one of the preceding claims, further comprising at least one lipid species selected from a sphingomyelin class.

8. The ULQS of any one of the preceding claims, wherein R_2 and R_3 are each independently a saturated or unsaturated acyl chain from 3 to 6 carbons in length, from 7 to 11 carbons in length, from 12 to 21 carbons in length, or an acyl chain from 22 to 30 carbons in length.

9. The ULQS of any one of the preceding claims, wherein the length of the acyl chain of R_2 is different from the length of the acyl chain of R_3.

10. The ULQS of claim 9, wherein R_2 is unsaturated and R_3 is saturated.

11. The ULQS of any one of the preceding claims, wherein at least a subset of the phospholipid species included in the ULQS have the same R_3 group, but different R_2 groups, wherein at least one or all of the R_2 groups are unsaturated.

12. The ULQS of any one of the preceding claims, wherein the phospholipid species include at least one species each of PC, PE, PS, PG, and PI, the phospholipid species have the same R_3 group, but different R_2 groups, wherein the length of the R_3 group is n and the length of the R_2 group is from n-5 to n+7, and at least one or all of the R_2 groups are unsaturated.

13. The ULQS of claim 12, wherein the phospholipid species include five species each of PC, PE, PS, PG, and PI and the R_3 and R_2 groups are repeated for each of the PC, PE, PS, PG, and PI species.

14. The ULQS of any one of the preceding claims, wherein the phospholipid species include the phospholipid species of Table 1, wherein the underlined portion corresponds to R_2, and the double underlined portion corresponds to R_3

Table 1				
PC (17:0/14:1)	PE (17:0/14:1)	PS (17:0/14:1))	PG (17:0/14:1))	PI (17:0/14:1)
PC (17:0/16:1)	PE (17:0/16:1)	PS (17:0/16:1)	PG (17:0/16:1)	PI (17:0/16:1)
PC (17:0/18:1)	PE (17:0/18:1)	PS (17:0/18:1)	PG (17:0/18:1)	PI (17:0/18:1)
PC (17:0/20:3)	PE (17:0/20:3)	PS (17:0/20:3)	PG (17:0/20:3)	PI (17:0/20:3)
PC (17:0/22:4)	PE (17:0/22:4)	PS (17:0/22:4)	PG (17:0/22:4)	PI (17:0/22:4)

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