Fluorescent phospholipids

Lipophilic fluorescent probes to investigate the structure and dynamics of lipids in membranes

Product Information

FluoProbes® Dye	DPPE	DOPE	PPE	DMPE
390A	FP-AS4ER0, 1mg FP-AS4ER1, 5mg	FP-AS4EQ0, 1mg FP-AS4EQ1, 5mg		
488	FP-AS4F40, 1mg FP-AS4F41, 5mg	FP-AS4F30, 1mg FP-AS4F31, 5mg	FP-AS4F50, 1mg FP-AS4F51, 5mg	FP-AS4F20, 1mg FP-AS4F21, 5mg
520A	FP-AS4FO0, 1mg FP-AS4FOA, 5mg	FP-AS4FN0, 1mg FP-AS4FN1, 5mg	FP-AS4FQ0, 1mg FP-AS4FQ1, 5mg	FP-AS4FM0, 1mg FP-AS4FM1, 5mg
532A	FP-AS4FT0, 1mg FP-AS4FT1, 5mg	FP-AS4FS0, 1mg FP-AS4FS1, 5mg	FP-AS4FU0, 1mg FP-AS4FU1, 5mg	FP-AS4FR0, 1mg FP-AS4FR1, 5mg
FluoQuench 540Q		FP-AS4FW0, 1mg FP-AS4FW1, 5mg		
550A	FP-AS4G50, 1mg FP-AS4G51, 5mg	FP-AS4G40, 1mg FP-AS4G41, 5mg	FP-AS4G60, 1mg FP-AS4G61, 5mg	FP-AS4G30, 1mg FP-AS4G31, 5mg
565A	FP-AS4G70, 1mg FP-AS4G71, 5mg			
590A	FP-AS4GA0, 1mg FP-AS4GA1, 5mg	FP-AS4G90, 1mg FP-AS4G91, 5mg	FP-AS4GB0, 1mg FP-AS4GB1, 5mg	FP-AS4G80, 1mg FP-AS4G81, 5mg
594A	FP-AS4GE0, 1mg FP-AS4GE1, 5mg	FP-AS4GD0, 1mg FP-AS4GD1, 5mg	FP-AS4GH0, 1mg FP-AS4GH1, 5mg	FP-AS4GC0, 1mg FP-AS4GC1, 5mg
633A	FP-AS4GM0, 1mg FP-AS4GM1, 5mg	FP-AS4GL0, 1mg FP-AS4GL1, 5mg	FP-AS4GN0, 1mg FP-AS4GN1, 5mg	FP-AS4GK0, 1mg FP-AS4GK1, 5mg
647A		FP-AS4GO0, 1mg FP-AS4GOA, 5mg		
647N	FP-AS4GS0, 1mg FP-AS4GS1, 5mg	FP-AS4GR0, 1mg FP-AS4GR1, 5mg	FP-AS4GT0, 1mg FP-AS4GT1, 5mg	FP-AS4GQ0, 1mg FP-AS4GQ1, 5mg
655A	FP-AS4GV0, 1mg FP-AS4GV1, 5mg	FP-AS4GU0, 1mg FP-AS4GU1, 5mg		
680A		FP-AS4H30, 1mg FP-AS4H31, 5mg		
700A	FP-AS4H70, 1mg FP-AS4H71, 5mg			

FT-AS4ER0

FluoProbes® Dye	DPPE	DOPE	PPE	DMPE
740A	FP-AS4HC0, 1mg	FP-AS4HB0, 1mg		
	FP-AS4HC1, 5mg	FP-AS4HB1, 5mg		

Storage: Freeze upon receipt ≤ - 20°C. Desiccate. Protect from light.
When stored as indicated, fluorescent phospholipids are stable for at least 3 years.

Introduction

Phospholipids play a major role in cell structure and function. Due to their amphiphilic nature and the ability to form lipid bilayers phospholipids are the predominant building block of biological membranes such as plasma- and, intracellular membranes etc. These biological barriers control the passage of a large variety of molecules, both between cells and extracellular space and between different compartments within the cells. Membranes are the turntables for crucial processes in neurobiology, muscle contraction, and cell signaling.

To study and investigate cell structures, processes like lipid metabolism, signal transduction, transmembrane diffusion, etc., lipophilic fluorescent probes are very useful tools. Natural phospholipids are generally very similar in structure. However, minor differences e.g. number and length of the fatty acid chains, degree of unsaturation of the fatty acid and nature of hydrophilic head group may result in significant variations of the physical properties and biological activity of such membranes.

FluoProbes® offers a variety of phospholipids based on glycerol carrying one or two fatty acids (lipophilic groups) and a phosphate monoester residue (hydrophilic group). They are labeled at the hydrophilic head group. After incorporation of the fluorescent phospholipid the fluorophore is located at the water/lipid interface of the membrane. We currently provide 1,2-dipalmitoyl-sn-glycero-3-phosphoethanolamine (DPPE), 1,2-dioleoyl-sn-glycero-3-phosphoethanolamine (DOPE), palmitoyl-sn-glycero-phosphoethanolamine (PPE), and 1,2-dimyristoyl-sn-glycero-3-phospho-ethanolamine (DMPE) labeled with FluoProbes®-dyes (see above Table).

Directions for use

Handling and Storage

Fluorescent phospholipid derivatives are supplied in solid form and should be stored at –20°C, desiccated and protected from light. When stored as indicated, FluoProbes®-dye labeled phospholipids are stable for at least three years.
For the preparation of stock solutions we recommend using chloroform/methanol 80:20 as solvent of choice. The stock solution of labeled phospholipids should be stored in the same way as the solid, however the shelf life of such solutions might be significantly reduced.

Table 1: Optical properties of available FluoProbes®-label in chloroform/methanol 80:20:

FluoProbes® Dye	λ_{abs} nm	ε_{max} $M^{-1}cm^{-1}$	MW, g/mol DPPE	MW, g/mol DOPE	MW, g/mol PPE	MW, g/mol DMPE
390A	387	24000	1017	1069		
425A	433	45000	1075			
488A	508	90000	1264	1316	1025	1207
520A	513	110000	1040	1092	802	984
532A	543	115000	1320	1372	1081	1264
540Q	546	120000		1285		
550A	565	120000	1382	1420	1130	1312
565A	555	120000	1299	1237		
590A	595	120000	1379	1417	1127	1309
594A	606	120000	1480	1532	1241	1424

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FluoProbes® Dye	λ_{abs} nm	ε_{max} $M^{-1}cm^{-1}$	MW, g/mol DPPE	MW, g/mol DOPE	MW, g/mol PPE	MW, g/mol DMPE
633A	630	130000	1326	1378	1088	1270
647A	653	120000	1267	1319		1211
647N	646	150000	1420	1485	1194	1364
655A	657	125000	1316	1368	964	1146
680A	678	125000		1366		
700A	694	120000	1353			
740A	745	120000	1142	1194		

λ_{abs} : longest-wavelength absorption maximum; ε_{max} : molar extinction coefficient at the longest-wavelength absorption maximum.

Application

Membrane incorporation of fluorescent lipid analogs can be performed as described in literature [1, 2 ,3]. Generally a complex of the fluorescent labeled phospholipid and Bovine Serum Albumin (BSA) is prepared, dried, preferably redissolved in ethanol and simply injected to cell containing aqueous medium. The densities of the labeled species in a plasma membrane varies with the concentration of the BSA-lipid-complex and conditions (incubation time and temperature).

For recent applications using FluoProbes®-dye labeled phospholipids we refer to Literature [3,4,5,6].

References

1. Martin O.C. *et al.*, Internalization and sorting of a fluorescent analogue of glucosylceramide to the Golgi apparatus of human skin fibroblasts: Utilization of endocytic and nonendocytic transport mechanisms, *J Cell Biol* 125 (1994) 769–781.
2. Schwarzmann G., *et al.*, Demonstration of direct glycosylation of nondegradable glucosylceramide analogs in cultured cells, *J Biol Chem* 270 (1995) 21271–21276.
3. Eggeling C, *et al.*, Direct observation of the nanoscale dynamics of membrane lipids in a living cell, *Nature* 457 (2009) 1159–1163.
4. Sahl, S.J.; *et al.*, Fast molecular tracking maps nanoscale dynamics of plasma membrane lipids, *PNAS* 107 (2010), 6829-6834.
5. Kulakowska, A.; *et al.*, Fluorescence Lifetime Tunig - A Novel Approach to Study Flip-Flop Kinetics in Supported Phospholipid Bilayers, *J. Fluoresc*. 20 (2010), 563-569.
6. Honigmann, A.; *et al.*, Characterization of Horizontal Lipid Bilayers as a Model System to Study Lipid Phase Separation, *Biophys. J* 98 (2010), 2886-2894

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