# Supporting information.

**Fluorocarbons enhance intracellular delivery of short STAT3-sensors and enable specific imaging.**

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## 1. HPLC purification

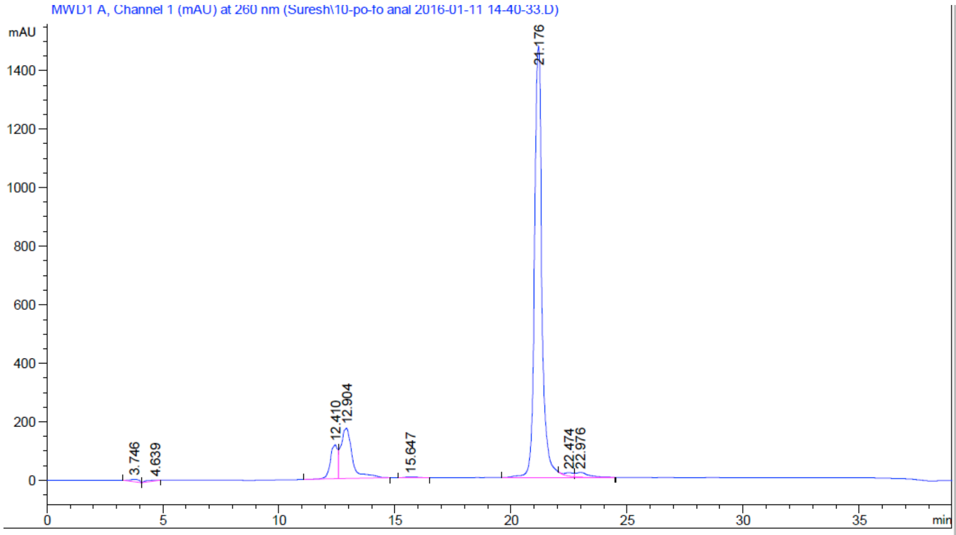


**Figure S1A**. HPLC analysis of the initial reaction mixture containing $CF_3(CF_2)_7CH_2CH_2CH_2O$-AGAGATTTAC*GGGAAATGGCT (FO-ODN) product.

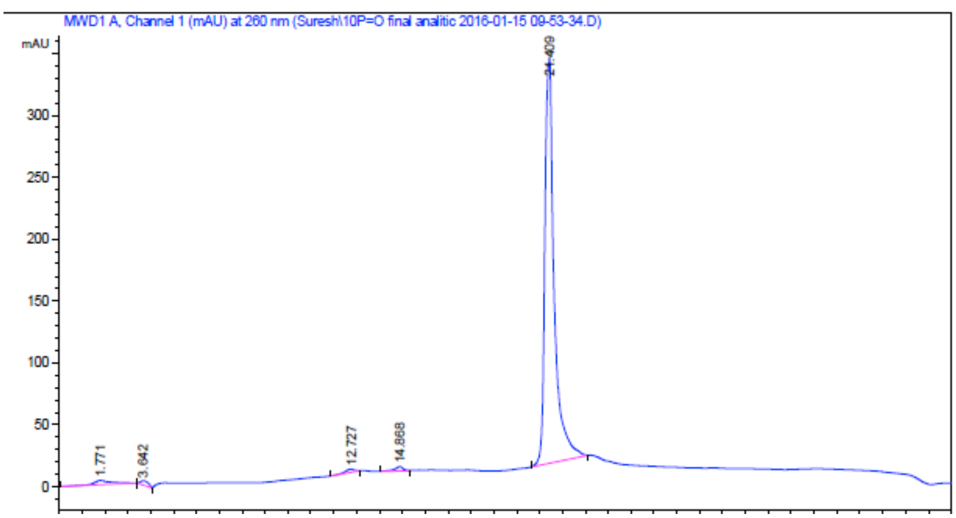


**Figure S1B**. HPLC analysis of purified $CF_3(CF_2)_7CH_2CH_2CH_2O$-AGAGATTTAC*GGGAAATGGCT (FO-ODN).

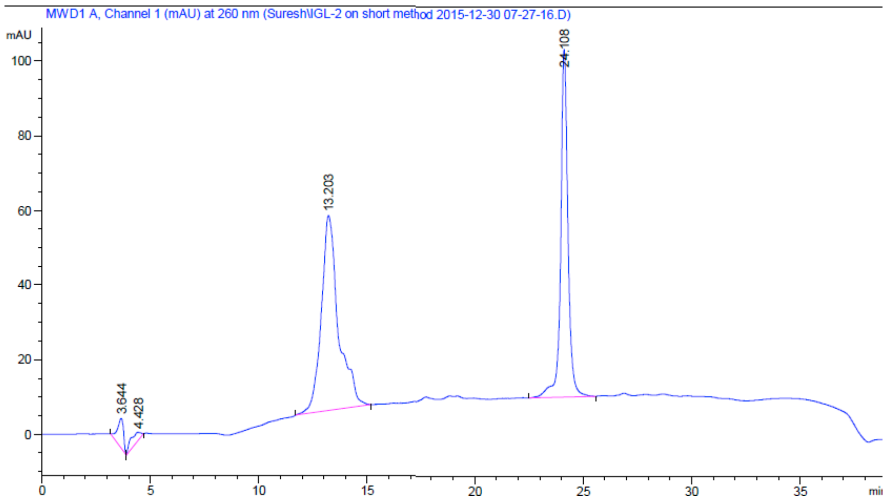


**Figure S2**. Analysis of oligonucleotide mixture after synthesis of $C_8F_{17}CH_2CH_2CH_2NHCO(CH_2)_9O$-**CGAG**ATTTACGGGAAAT**GGCT** (FCN-ODN).

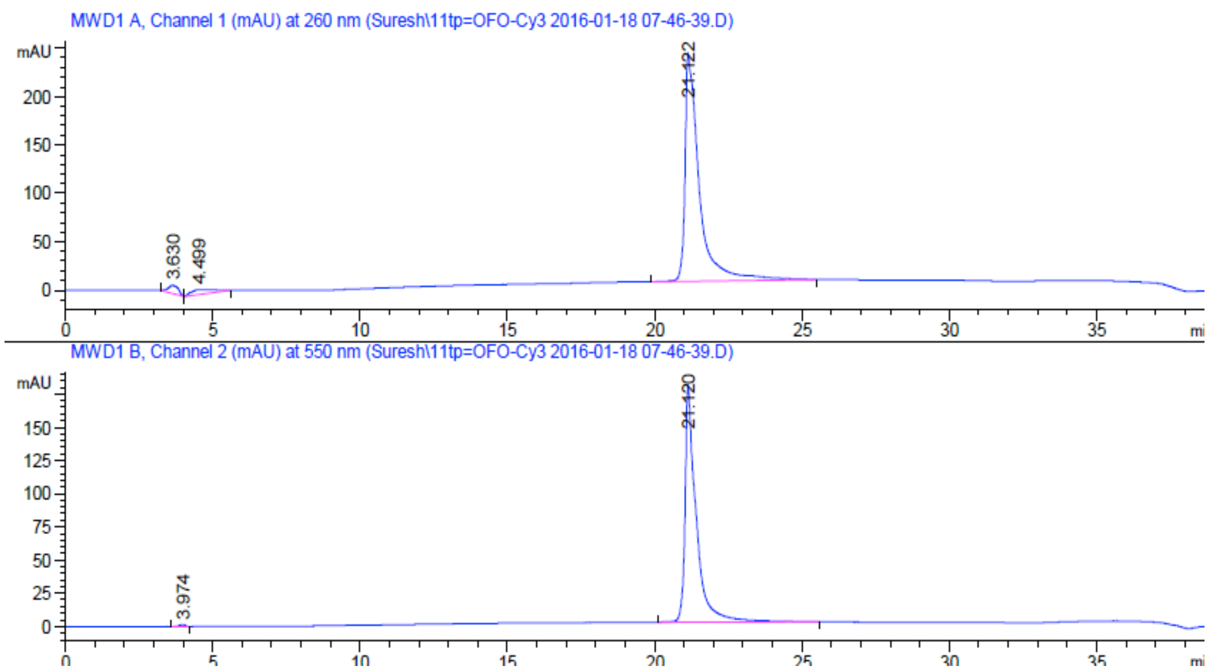


**Figure S3**. RP-HPLC analysis of FO-AGCC*$^{Cy3}$ATTTCCCGTAAATCTCT on C18 column at 260 nm (up profile) and 550 nm (below).

**Table S1**. Retention times of pure modified ODNs on HPLC columns. Microsorb (MV 100-5CN) 250x4.6 mm or C18 HPLC columns were used for purification of FO- or FCN-oligonucleotides using identical protocols.

| ODN | HPLC column, retention time (min) | |
|---|---|---|
| | C18 | CN |
| Unprotected oligonucleotide | 13.5 | 11.7-12.0 |
| MeOTr- protected oligonucleotide | 19.5 | 16.2 |
| FO-oligonucleotide | 21.4 | 17.5 |
| FCN-oligonucleotide | 24.0 | 19.3 |

## 2. ODN duplex melting properties.

**Table S2.** ODND probes used in this study and their melting points ($T_m$): fluorocarbon-free and FO or FCN -modified phosphodiester or hybrid phosphodiester/phosphorothioate ODN duplexes. Melting points were determined by Boltzmann sigmoidal least-squares non-linear fit ($r^2$=0.95-0.98) of experimental data.

<table>
<tr><th>N</th><th>Duplex</th><th>$T_m$ in 0.01 M sodium phosphate, pH 7.4</th><th>+0.15 M NaCl</th></tr>
<tr><td>1</td><td>5’ AGCC|ATTTCCCGTAAATCTCT 3’<br>3’ TCGGTAAAGGG|CATTTAGAGA$p(CH_2)_3(CF_2)_7CF_3$ 5’</td><td>53.2</td><td>65.2</td></tr>
<tr><td>2</td><td>5’ AGCC*ATTTCCCGTAAATCTCT 3’<br>3’ TCGGTAAAGGG|CATTTAGAGA$p(CH_2)_3(CF_2)_7CF_3$ 5’<br>Cy3</td><td>50.8</td><td>63.0</td></tr>
<tr><td>3</td><td>5’ AGCC|ATTTCCCGTAAATCTCT 3’<br>3’ TCGGTAAAGGG|CATTTAGAGA 5’</td><td>52.8</td><td>63.8</td></tr>
<tr><td>4</td><td>5’ $CF_3(CF_2)_7(CH_2)_3$pAGCC|ATTTCCCGTAAATCTCT 3’<br>3’ TCGGTAAAGGG|CATTTAGAGA$p(CH_2)_3(CF_2)_7CF_3$ 5’<br>Cy3</td><td>55.9</td><td>-</td></tr>
<tr><td>5</td><td>Cy3<br>5’ $CF_3(CF_2)_7(CH_2)_3$pAGCC|ATTTCCCGTAAATCTCT 3’<br>3’ TCGGTAAAGGG|CATTTAGAGA$p(CH_2)_3(CF_2)_7CF_3$ 5’</td><td>55.5</td><td>69.5</td></tr>
<tr><td>6</td><td>5’ $CF_3(CF_2)_7(CH_2)_3$pAGCC|ATTTCCCGTAAATCTCT 3’<br>3’ TCGGTAAAGGG|CATTTAGAGA$p(CH_2)_3(CF_2)_7CF_3$ 5’</td><td>59.0</td><td>70.7</td></tr>
<tr><td>7</td><td>Cy3<br>5’ AGCC|ATTTCCCGTAAATCTCT 3’<br>3’ TCGGTAAAGGG|CATTTAGAGA 5’</td><td>-</td><td>62.0</td></tr>
<tr><td>8</td><td>Cy3<br>5’ AGCC|ATTTCCCGTAAATCTCT3’ 3’<br>3’ TCGGTAAAGGG|CATTTAGAGA$p(CH_2)_3(CF_2)_7CF_3$ 5’</td><td>-</td><td>63.2</td></tr>
<tr><td>9</td><td>5’ $CF_3(CF_2)_7(CH_2)_3$pAGCCAT|TTCCCGTAAATCTCT 3’<br>3’ TCGGTAAAGGG|CATTTAGAGA$p(CH_2)_3(CF_2)_7CF_3$ 5’</td><td>-</td><td>59.6</td></tr>
</table>

| | | | |
|---|---|---|---|
| 10 | 5' $CF_3(CF_2)_7(CH_2)_3$p**AGCC**AT\|TTCCC GTAAAT**CTCT** 3'<br>3' **TCGG**TAAAGGG\|CATTTA**GAGA**p$(CH_2)_3(CF_2)_7CF_3$ 5'<br>**Cy3** | | 58.0 |
| 11 | 5' $CF_3(CF_2)_7(CH_2)_3$p**AGCC**AT\|TTCCCGTAAAT**CTCT** 3'<br>3' **TCGG**TAAAGGG\|CATTTA**GAGA** 5' | - | 58.9 |
| 12 | 5' $CF_3(CF_2)_7(CH_2)_3$p**AGCC**AT\|TTCCCGTAAAT**CTCT** 3'<br>3' **TCGG**TAAAGGGCAT\|TTA**GAGAp**$(CH_2)_3(CF_2)_7CF_3$ 5' | - | 59.8 |
| 13 | 5' $CF_3(CF_2)_7(CH_2)_3$pAGCC\|ATTTCCCGTAAATCTCT 3'<br>3' **TCGG**TAAAGGG\|CATTTA**GAGA**p$(CH_2)_3(CF_2)_7CF_3$ 5' | - | 68.8 |
| 14 | 5' $CF_3(CF_2)_7(CH_2)_3$pAGCC\|ATTTCCCGTAAATCTCT 3'<br>3' **TCGG**TAAAGGG\|CATTTA**GAGA** 5' | - | 67.8 |
| 15 | 5' $CF_3(CF_2)_7(CH_2)_3$p**AGCC**AT\|TTCCCGTAAAT**CTCT** 5'<br>3' **TCGG**TAAAGGGCATTTA**GAGC**p$(CH_2)_9$CONH$(CH_2)_3C_8F_{17}$ 3' | - | 60.1 |
| 16 | 5' **AGCC**\|ATTTCCCGTAAAT**CTCT** 5'<br>3' **TCGG**TAAAGGGCATTTA**GAGC**p$(CH_2)_9$CONH$(CH_2)_3C_8F_{17}$ 3' | - | 63.8 |

### 3. Perfluorinated carriers for PF-ODND probes.

**Figure S4.** An example of van der Waals (VDW) interaction between fluorinated groups linked to M5-gPLL-PFUDA and ODN. Modeling of interaction between 1FO-PS-Cy3 ODND and M5-gPLL-PFUDA fragment (n=50 mer) obtained using molecular dynamics simulations run in MOE as described in Materials and Methods. The simulations in MOE were performed by applying assisted model building with energy refinement (Amber10:EHT) force field in simulated water/NaCl solvent (layer, n=8). VDW surfaces (in atom colors) are shown as an overlay over the atoms of the FO moieties linked to ODND and M5-gPLL-PFUDA carrier.

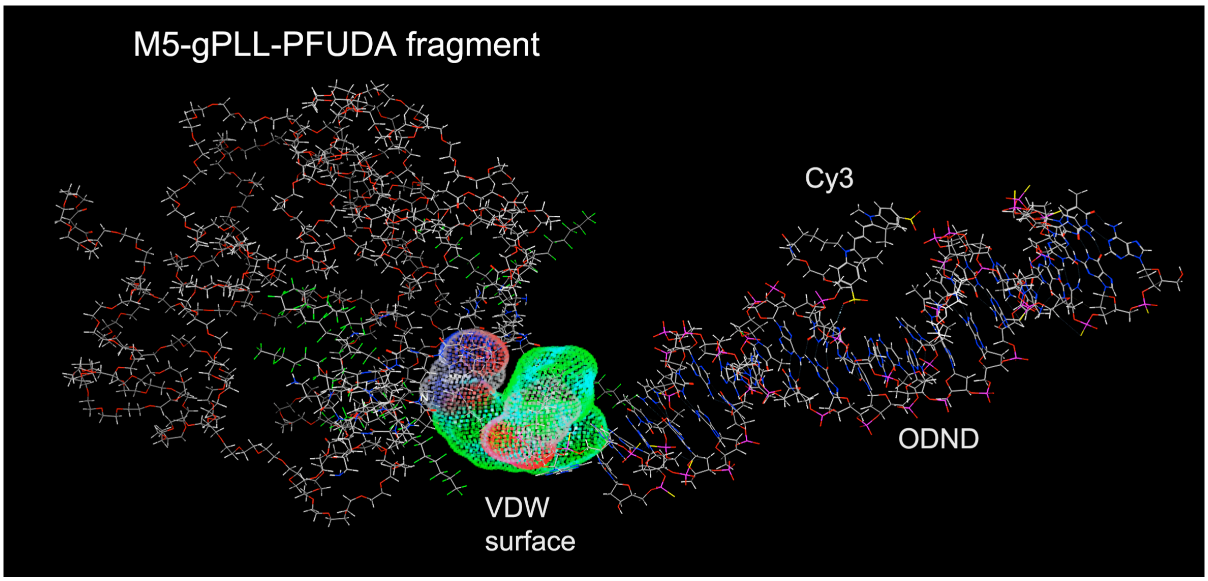

**Figure S5.** $^{19}F$ NMR spectroscopy and MRI of PFUDA standards and M5-gPLL-PFUDA. (**A**) $^{19}F$ NMR spectrum of PFUDA (20 mM) at 200 MHz; (**B**) $^{19}F$ NMR spectrum of the same sample as in A obtained using a 3T clinical scanner (Achieva, Philips); (**C**) $^{19}F$ NMR spectrum of M5-gPLL-PFUDA (6.6 mM PFUDA); (**D**) $^{19}F$ NMR spectrum of M5-gPLL-PFUDA (6.6 mM PFUDA) at 200 MHz (**E**) calibration curve showing the dependence of integrated $^{19}F$ spectroscopic peaks (integration window shown with grey vertical lines in **B** and **C**) from the concentration of PFUDA; (**F**) multi-slice imaging of M5-gPLL-PFUDA (6.6 mM PFUDA) using a 0.5 cm solenoid coil. The $^{19}F$ MR imaging parameters were: TR/TE = 300/0.12 ms; flip angle (FA) = 60°; NSA = 32; 3 slices with slice thickness of 4 mm; field of view (FOV) of 30 mm × 30 mm with matrix size of 60 × 60 pixels.