

| Individual-spectrum | Oocyte average-spectrum | Peak Intensity (a.u.) |                   |                   | Peak intensity ratio                 |                                      |
|---------------------|-------------------------|-----------------------|-------------------|-------------------|--------------------------------------|--------------------------------------|
|                     |                         | I <sub>1658</sub>     | I <sub>1381</sub> | I <sub>1000</sub> | I <sub>1658</sub> /I <sub>1000</sub> | I <sub>1381</sub> /I <sub>1000</sub> |
| oo1 IMM-1           | OO1 IMM                 | 5.31                  | 46.76             | 24.37             | 0.22                                 | 1.92                                 |
| oo1 IMM-2           |                         |                       |                   |                   |                                      |                                      |
| oo1 IMM-3           |                         |                       |                   |                   |                                      |                                      |
| oo1 IMM-4           |                         |                       |                   |                   |                                      |                                      |
| oo2 IMM-1           | OO2 IMM                 | 8.56                  | 21.31             | 12.74             | 0.67                                 | 1.67                                 |
| oo2 IMM-2           |                         |                       |                   |                   |                                      |                                      |
| oo2 IMM-3           |                         |                       |                   |                   |                                      |                                      |
| oo2 IMM-4           |                         |                       |                   |                   |                                      |                                      |
| oo3 IMM-1           | OO3 IMM                 | 13.03                 | 18.70             | 8.83              | 1.47                                 | 2.12                                 |
| oo3 IMM-2           |                         |                       |                   |                   |                                      |                                      |
| oo3 IMM-3           |                         |                       |                   |                   |                                      |                                      |
| oo3 IMM-4           |                         |                       |                   |                   |                                      |                                      |
| oo4 IMM-1           | OO4 IMM                 | 8.30                  | 14.74             | 7.24              | 1.15                                 | 2.04                                 |
| oo4 IMM-2           |                         |                       |                   |                   |                                      |                                      |
| oo4 IMM-3           |                         |                       |                   |                   |                                      |                                      |
| oo5 IMM-1           | OO5 IMM                 | 36.68                 | 44.22             | 18.94             | 1.94                                 | 2.33                                 |
| oo5 IMM-2           |                         |                       |                   |                   |                                      |                                      |
| oo5 IMM-3           |                         |                       |                   |                   |                                      |                                      |
| oo5 IMM-4           |                         |                       |                   |                   |                                      |                                      |
| oo6 IMM-1           | OO6 IMM                 | 23.66                 | 43.20             | 18.66             | 1.27                                 | 2.32                                 |
| oo6 IMM-2           |                         |                       |                   |                   |                                      |                                      |
| oo6 IMM-3           |                         |                       |                   |                   |                                      |                                      |
| oo6 IMM-4           |                         |                       |                   |                   |                                      |                                      |
| oo6 IMM-5           |                         |                       |                   |                   |                                      |                                      |
| oo7 IMM-1           | OO7 IMM                 | 22.56                 | 33.80             | 17.74             | 1.27                                 | 1.91                                 |
| oo7 IMM-2           |                         |                       |                   |                   |                                      |                                      |
| oo7 IMM-3           |                         |                       |                   |                   |                                      |                                      |
| oo7 IMM-4           |                         |                       |                   |                   |                                      |                                      |
| oo8 IMM-1           | OO8 IMM                 | 19.76                 | 23.22             | 13.74             | 1.44                                 | 1.69                                 |
| oo8 IMM-2           |                         |                       |                   |                   |                                      |                                      |
| oo8 IMM-3           |                         |                       |                   |                   |                                      |                                      |
| oo8 IMM-4           |                         |                       |                   |                   |                                      |                                      |
| oo8 IMM-5           |                         |                       |                   |                   |                                      |                                      |
| oo9 IMM-1           | OO9 IMM                 | 17.67                 | 29.95             | 9.96              | 1.77                                 | 3.01                                 |
| oo9 IMM-2           |                         |                       |                   |                   |                                      |                                      |
| oo9 IMM-3           |                         |                       |                   |                   |                                      |                                      |
| oo9 IMM-4           |                         |                       |                   |                   |                                      |                                      |
| oo10 IMM-1          | OO10 IMM                | 19.77                 | 30.23             | 20.41             | 0.97                                 | 1.48                                 |
| oo10 IMM-2          |                         |                       |                   |                   |                                      |                                      |
| oo10 IMM-3          |                         |                       |                   |                   |                                      |                                      |
| oo10 IMM-4          |                         |                       |                   |                   |                                      |                                      |
| oo11 IMM-1          | OO11 IMM                | 14.54                 | 29.77             | 15.19             | 0.96                                 | 1.96                                 |
| oo11 IMM-2          |                         |                       |                   |                   |                                      |                                      |
| oo11 IMM-3          |                         |                       |                   |                   |                                      |                                      |

|            |           |       |       |       |      |      |
|------------|-----------|-------|-------|-------|------|------|
| oo11 IMM-4 |           |       |       |       |      |      |
| oo11 IMM-5 |           |       |       |       |      |      |
| oo12 IMM-1 | OO12 IMM  | 26.90 | 33.42 | 28.27 | 0.95 | 1.18 |
| oo12 IMM-2 |           |       |       |       |      |      |
| oo12 IMM-3 |           |       |       |       |      |      |
| oo12 IMM-4 |           |       |       |       |      |      |
| oo13 IMM-1 | OO13 IMM  | 39.31 | 56.64 | 44.87 | 0.88 | 1.26 |
| oo13 IMM-2 |           |       |       |       |      |      |
| oo13 IMM-3 |           |       |       |       |      |      |
| oo13 IMM-4 |           |       |       |       |      |      |
| oo14 IMM-1 | OO14 IMM  | 21.73 | 36.20 | 19.72 | 1.10 | 1.84 |
| oo14 IMM-2 |           |       |       |       |      |      |
| oo14 IMM-3 |           |       |       |       |      |      |
| oo14 IMM-4 |           |       |       |       |      |      |
| oo15 IMM-1 | OO 15 IMM | 11.07 | 13.85 | 8.07  | 1.37 | 1.72 |
| oo15 IMM-2 |           |       |       |       |      |      |
| oo15 IMM-3 |           |       |       |       |      |      |
| oo1 IVM-1  | OO1 IVM   | 11.47 | 15.33 | 8.44  | 1.36 | 1.82 |
| oo1 IVM-2  |           |       |       |       |      |      |
| oo1 IVM-3  |           |       |       |       |      |      |
| oo2 IVM-1  | OO2 IVM   | 18.56 | 18.04 | 16.72 | 1.11 | 1.08 |
| oo2 IVM-2  |           |       |       |       |      |      |
| oo2 IVM-3  |           |       |       |       |      |      |
| oo2 IVM-4  |           |       |       |       |      |      |
| oo3 IVM-1  | OO3 IVM   | 12.17 | 12.36 | 11.83 | 1.03 | 1.05 |
| oo3 IVM-2  |           |       |       |       |      |      |
| oo3 IVM-3  |           |       |       |       |      |      |
| oo4 IVM-1  | OO4 IVM   | 10.87 | 21.14 | 12.58 | 0.86 | 1.68 |
| oo4 IVM-2  |           |       |       |       |      |      |
| oo4 IVM-3  |           |       |       |       |      |      |
| oo5 IVM-1  | OO5 IVM   | 29.06 | 10.22 | 12.49 | 2.33 | 0.82 |
| oo5 IVM-2  |           |       |       |       |      |      |
| oo5 IVM-3  |           |       |       |       |      |      |
| oo6 IVM-1  | OO6 IVM   | 15.45 | 14.28 | 10.58 | 1.46 | 1.35 |
| oo6 IVM-2  |           |       |       |       |      |      |
| oo6 IVM-3  |           |       |       |       |      |      |
| oo7 IVM-1  | OO7 IVM   | 50.32 | 10.32 | 39.04 | 1.29 | 0.26 |
| oo7 IVM-2  |           |       |       |       |      |      |
| oo7 IVM-3  |           |       |       |       |      |      |
| oo8 IVM-1  | OO8 IVM   | 12.72 | 10.88 | 8.95  | 1.42 | 1.22 |
| oo8 IVM-2  |           |       |       |       |      |      |
| oo8 IVM-3  |           |       |       |       |      |      |
| oo9 IVM-1  | OO9 IVM   | 20.67 | 10.36 | 13.00 | 1.59 | 0.80 |
| oo9 IVM-2  |           |       |       |       |      |      |
| oo9 IVM-3  |           |       |       |       |      |      |
| oo10 IVM-1 | OO10 IVM  | 5.55  | 13.06 | 5.10  | 1.09 | 2.56 |
| oo10 IVM-2 |           |       |       |       |      |      |
| oo10 IVM-3 |           |       |       |       |      |      |

|            |           |       |       |       |      |      |
|------------|-----------|-------|-------|-------|------|------|
| oo10 IVM-4 |           |       |       |       |      |      |
| oo11 IVM-1 | OO11 IVM  | 13.56 | 13.39 | 9.73  | 1.39 | 1.38 |
| oo11 IVM-2 |           |       |       |       |      |      |
| oo11 IVM-3 |           |       |       |       |      |      |
| oo12 IVM-1 | OO12 IVM  | 9.61  | 3.02  | 7.09  | 1.36 | 0.43 |
| oo12 IVM-2 |           |       |       |       |      |      |
| oo12 IVM-3 |           |       |       |       |      |      |
| oo13 IVM-1 | OO13 IVM  | 20.61 | 4.85  | 10.19 | 2.02 | 0.48 |
| oo13 IVM-2 |           |       |       |       |      |      |
| oo13 IVM-3 |           |       |       |       |      |      |
| oo14 IVM-1 | OO14 IVM  | 15.32 | 9.24  | 8.24  | 1.85 | 1.12 |
| oo14 IVM-2 |           |       |       |       |      |      |
| oo14 IVM-3 |           |       |       |       |      |      |
| oo15 IVM-1 | OO 15 IVM | 22.64 | 7.23  | 13.11 | 1.73 | 0.55 |
| oo15 IVM-2 |           |       |       |       |      |      |
| oo15 IVM-3 |           |       |       |       |      |      |

Table ESI1: List of individual-spectra acquired from 15 immature and 15 *in vitro* matured oocytes. Three, four or five different points in the ZP of each oocyte were irradiated for spectral measurements. Single oocyte average-spectrum was obtained by averaging all the individual-spectra obtained from its ZP. By using the peak height tool of the OMNIC program, the intensities of the bands corresponding to the protein Amide I ( $1658\text{ cm}^{-1}$ ), the  $\text{CH}_3$  deformation of saccharide moiety ( $\sim 1381\text{ cm}^{-1}$ ), and the Phe in-plane deformation ( $\sim 1000\text{ cm}^{-1}$ ) were extracted from the oocyte average-spectra. The intensity of the band at  $1000\text{ cm}^{-1}$  was used as an internal standard, and the intensity ratios  $I_{1658}/I_{1000}$  and  $I_{1381}/I_{1000}$  were calculated. These ratios were then used for statistical analysis.

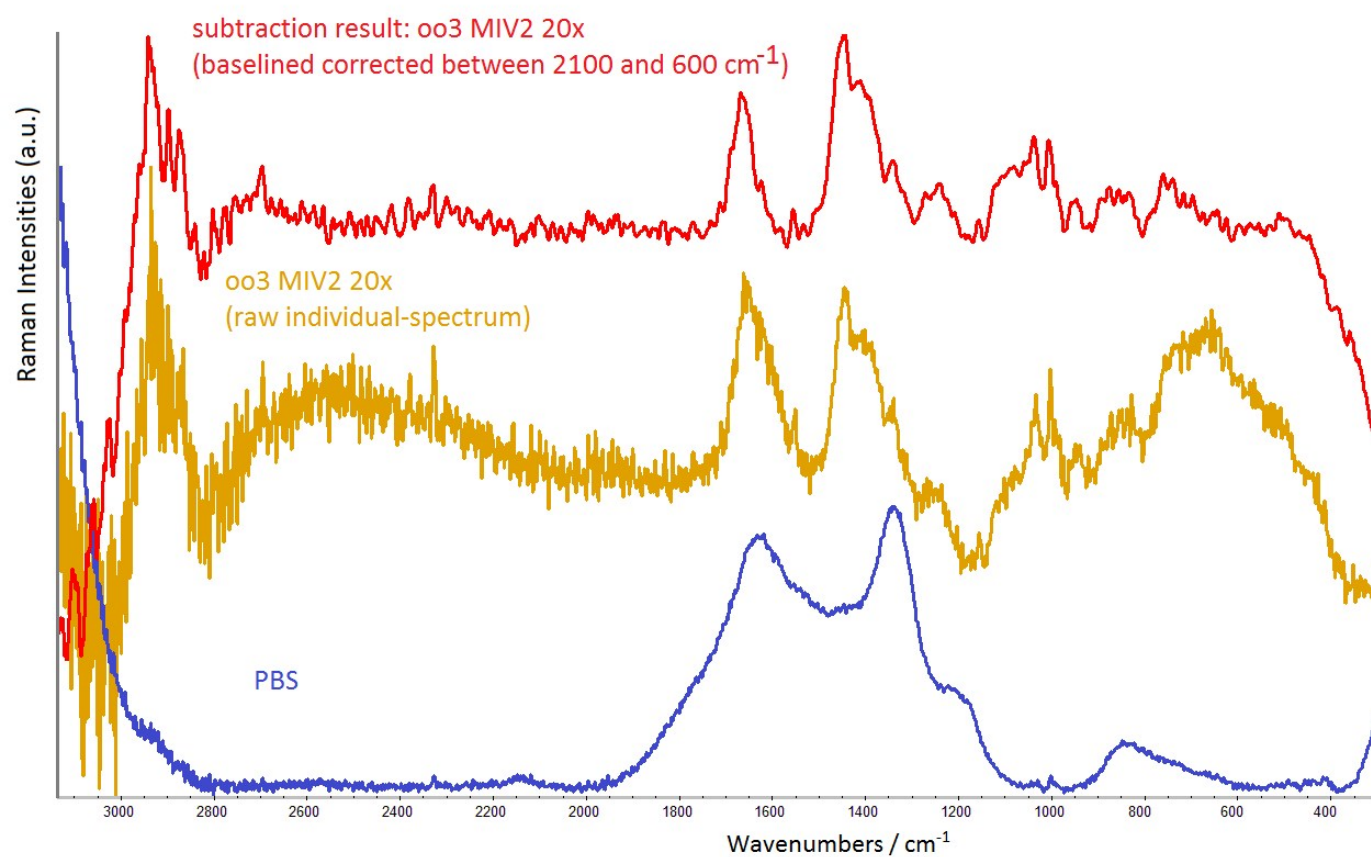


Figure ESI1: Example of the spectral processing. From each individual spectrum the PBS contribution was subtracted in the entire spectral range. The Subtraction result was baseline corrected in the spectral region of interest.