



Article

Raman spectroscopic techniques to detect ovarian cancer biomarkers in blood plasma

Paraskevaidi, Maria, Ashton, Katherine M, Stringfellow, Helen F, Wood, Nicholas J, Keating, Patrick J, Rowbottom, Anthony W, Martin-Hirsch, Pierre L and Martin, Francis L

Available at <http://clock.uclan.ac.uk/23949/>

Paraskevaidi, Maria, Ashton, Katherine M, Stringfellow, Helen F, Wood, Nicholas J, Keating, Patrick J, Rowbottom, Anthony W, Martin-Hirsch, Pierre L and Martin, Francis L ORCID: 0000-0001-8562-4944 (2018) Raman spectroscopic techniques to detect ovarian cancer biomarkers in blood plasma. Talanta, 189 . pp. 281-288. ISSN 0039-9140

It is advisable to refer to the publisher's version if you intend to cite from the work.
<http://dx.doi.org/10.1016/j.talanta.2018.06.084>

For more information about UCLan's research in this area go to <http://www.uclan.ac.uk/researchgroups/> and search for <name of research Group>.

For information about Research generally at UCLan please go to <http://www.uclan.ac.uk/research/>

All outputs in CLoK are protected by Intellectual Property Rights law, including Copyright law. Copyright, IPR and Moral Rights for the works on this site are retained by the individual authors and/or other copyright owners. Terms and conditions for use of this material are defined in the [policies](#) page.

1 **Raman spectroscopic techniques to detect ovarian cancer biomarkers in blood plasma**

2
3 Maria Paraskevasidi^{a,1}, Katherine M. Ashton^b, Helen F. Stringfellow^b, Nicholas Wood^c, Patrick
4 Keating^c, Anthony Rowbottom^d, Pierre L. Martin-Hirsch^c and Francis L. Martin^{a,1}

5 *^aSchool of Pharmacy and Biomedical Sciences, University of Central Lancashire, Preston PR1*
6 *2HE, UK*

7 *^bPathology Department, Lancashire Teaching Hospitals NHS Foundation Trust, Preston PR2*
8 *9HT, UK*

9 *^cDepartment of Obstetrics and Gynaecology, Lancashire Teaching Hospitals NHS Foundation*
10 *Trust, Preston PR2 9HT, UK*

11 *^dImmunology Laboratory, Pathology Department, Lancashire Teaching Hospitals NHS*
12 *Foundation Trust, Preston PR2 9HT, UK*

13
14
15
16
17
18
19
20
21 ¹To whom correspondence should be addressed. Email: mparaskevasidi@uclan.ac.uk or
22 flmartin@uclan.ac.uk Tel: +44 (0) 1772 89 6482

25 **Table S1:** Detailed patient information. OC: ovarian cancer; FIGO: International Federation of
 26 Gynecology and Obstetrics; diff: differentiated; mod: moderately;

Participant Number	Diagnosis/stage	Class for spectroscopy	Age	CA-125 level
1	Serous borderline FIGO stage 1C	Early OC	77	348
2	Clear cell adenocarcinoma FIGO stage 1C	Early OC	69	32
3	G3 mixed endometrioid & clear cell adenocarcinoma FIGO stage 1C	Early OC	74	43
4	High grade serous adenocarcinoma FIGO stage 1c	Early OC	82	192
5	G1 endometrioid adenocarcinoma, stage 1	Early OC	88	1142
6	High grade serous adenocarcinoma FIGO stage 3b	Late OC	69	83
7	High grade serous adenocarcinoma FIGO stage 3b	Late OC	62	132
8	High grade serous adenocarcinoma FIGO stage 3c	Late OC	72	642
9	High grade serous adenocarcinoma, stage 1	Early OC	77	135
10	G3 endometrioid/serous adenocarcinoma FIGO stage 1c	Early OC	73	3165
11	Well diff mixed type adenocarcinoma FIGO stage 1a	Early OC	48	93
12	Serous adenocarcinoma FIGO stage 1C	Early OC	58	185
13	Borderline mucinous tumour FIGO stage 1C2	Early OC	59	67
14	High grade serous adenocarcinoma FIGO stage 3c	Late OC	85	483
15	Borderline mucinous tumour FIGO stage 1A	Early OC	79	21

16	G3 clear cell/endometrioid adenocarcinoma FIGO stage 1C2	Early OC	73	840
17	High grade serous carcinoma FIGO stage 3a2	Late OC	67	800
18	High grade serous carcinoma, minor endometrioid & clear cell adenocarcinoma FIGO stage 3C	Late OC	56	1000
19	Mixed endometrioid adenocarcinoma & dediff carcinoma G3 FIGO stage 2A	Late OC	78	319
20	High grade serous adenocarcinoma FIGO stage 1C2	Early OC	59	8
21	High grade serous adenocarcinoma FIGO stage 3C	Late OC	65	187
22	Poorly diff mucinous adenocarcinoma, stage 1	Early OC	60	86
23	Mod to poorlu diff metastatic adenocarcinoma. Stage 3	Late OC	67	9
24	Well diff mucinous adenocarcinoma FIGO stage 1A	Early OC	51	25
25	Granulosa cell tumour FIGO stage 1C2	Early OC	87	360
26	High grade mixed serous & clear cell adenocarcinoma FIGO stage 3A2	Late OC	60	39
27	Clear cell cancer of ovary, stage 1A	Early OC	54	23
28	Adenomyosis/prolapse	Control	81	13
29	Leiomyoma/prolapse	Control	72	20
30	Normal/heavy periods	Control	40	12
31	Heavy periods	Control	39	18
32	Leiomyoma/abnormal smear	Control	60	24
33	Leiomyoma/fibroids	Control	62	18
34	Benign mucinous cystadenoma	Control	60	23
35	Normal/prolapse	Control	55	8
36	Adenomyosis/heavy periods	Control	46	18
37	Polyp/prolapse	Control	48	11

38	Normal/prolapse	Control	78	6
39	Complex hyperplasia/post-menopausal bleeding	Control	56	12
40	Leiomyoma/heavy periods	Control	45	16
41	Leiomyoma/heavy periods	Control	54	7
42	Leiomyoma/heavy periods	Control	45	58
43	Leiomyoma/heavy periods	Control	47	21
44	Benign teratoma of ovary	Control	45	87
45	Simple hyperplasia/irregular bleeding	Control	53	17
46	Normal/prolapse	Control	80	16
47	Leiomyoma/prolapse	Control	63	29
48	BRCA1 mutation	Control	44	32
49	Leiomyoma/fibroids	Control	55	143
50	Normal/prolapse	Control	48	17
51	Benign simple ovarian cyst	Control	57	26
52	Normal/prolapse	Control	68	9
53	Leiomyoma	Control	82	481
54	Leiomyoma	Control	40	7
55	Normal/heavy periods	Control	48	27

27

28

29

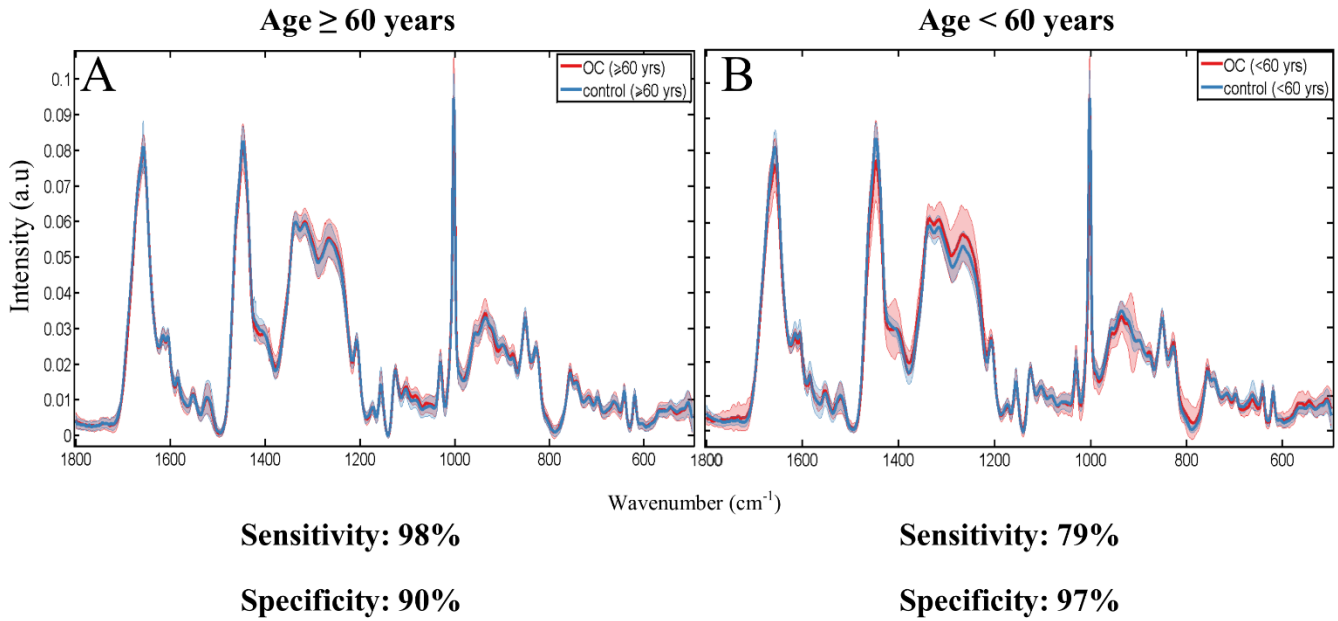
30

31

32

33

Raman



34

35 **Figure S1:** Diagnostic segregation between ovarian cancer (OC) patients and healthy controls
36 according to their age (OC ≥ 60 years ($n=20$); Control ≥ 60 years ($n=10$); OC < 60 years ($n=7$);
37 Control < 60 years ($n=19$)). Sensitivity and specificity are provided for (A) individuals older than
38 60 years old and (B) individuals younger than 60 years old after Raman analysis.