

SUPPLEMENTARY TABLES

Supplementary Table 1. Modified H-score–based evaluation of MMR protein expression in liver tumors

Patient ID	gender	age	clone	organ	antibody	core number	tumor type	%	intensity	m. H score	internal control
2279	F	73	CAB013294	liver	MLH1	2	cholangio	0	0	0	1
3215	F	61	CAB013294	liver	MLH1	2	hepatocell	3	1	3	1
937	F	65	CAB013294	liver	MLH1	1	cholangio	80	2	160	1
2766	F	73	CAB013294	liver	MLH1	2	hepatocell	10	2	20	1
2177	F	58	CAB013294	liver	MLH1	2	hepatocell	0	0	0	1
1163	M	55	CAB013294	liver	MLH1	2	hepatocell	0	0	0	1
2399	F	52	CAB013294	liver	MLH1	2	cholangio	80	1	80	1
2280	M	80	CAB013294	liver	MLH1	2	hepatocell	5	1	5	1
2556	M	72	CAB013294	liver	MLH1	2	hepatocell	0	0	0	0
1252	F	55	CAB013294	liver	MLH1	1	cholangio	100	2	200	1
282	F	65	CAB013294	liver	MLH1	2	cholangio	100	2	200	1
2279	F	73	HPA052707	liver	MLH1	2	cholangio	0	0	0	1
3334	M	67	HPA052707	liver	MLH1	2	cholangio	0	0	0	0
3625	M	59	HPA052707	liver	MLH1	1	cholangio	0	0	0	0
2766	F	73	HPA052707	liver	MLH1	2	hepatocell	60	2	120	1
4791	F	82	HPA052707	liver	MLH1	2	hepatocell	0	0	0	0
3215	F	61	HPA052707	liver	MLH1	2	hepatocell	0	0	0	0
4836	F	64	HPA052707	liver	MLH1	2	cholangio	5	2	10	1
3324	M	70	HPA052707	liver	MLH1	1	hepatocell	5	2	10	1
2556	M	72	HPA052707	liver	MLH1	2	hepatocell	0	0	0	0
2399	F	52	HPA052707	liver	MLH1	2	cholangio	0	0	0	0
3196	M	65	HPA052707	liver	MLH1	2	hepatocell	0	0	0	0
5036	F	73	CAB070868	liver	MLH1	2	hepatocell	70	2	140	1
878	M	73	CAB070868	liver	MLH1	2	hepatocell	100	3	300	1
5032	F	58	CAB070868	liver	MLH1	2	hepatocell	100	3	300	1
3324	M	70	CAB070868	liver	MLH1	2	hepatocell	80	2	160	1
653	M	67	CAB070868	liver	MLH1	2	hepatocell	25	2	50	1
5031	M	69	CAB070868	liver	MLH1	2	hepatocell	100	3	300	1
5037	F	41	CAB070868	liver	MLH1	2	hepatocell	100	3	300	1
4791	F	82	CAB070868	liver	MLH1	2	hepatocell	80	2	160	1
5094	M	58	CAB070868	liver	MLH1	2	cholangio	100	2	200	1
3862	F	79	CAB070868	liver	MLH1	1	cholangio	100	3	300	1
5099	M	65	CAB070868	liver	MLH1	1	cholangio	90	3	270	1

intensity: 0: negative, 1: mild, 2: moderate, 3: strong

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Supplementary Table 1. Continued

Patient ID	gender	age	clone	organ	antibody	core number	tumor type	%	intensity	m. H score	internal control
2279	F	73	CAB070868	liver	MLH1	2	cholangio	95	1	95	1
2279	F	73	CAB010235	liver	PMS2	2	cholangio	90	1	90	1
3215	F	61	CAB010235	liver	PMS2	2	hepatocell	0	0	0	0
937	F	65	CAB010235	liver	PMS2	2	cholangio	100	2	200	1
2766	F	73	CAB010235	liver	PMS2	2	hepatocell	100	2	200	1
2177	F	58	CAB010235	liver	PMS2	2	hepatocell	0	0	0	0
2578	M	50	CAB010235	liver	PMS2	2	cholangio	0	0	0	0
3196	M	65	CAB010235	liver	PMS2	2	hepatocell	0	0	0	0
2399	F	52	CAB010235	liver	PMS2	2	cholangio	95	2	190	0
2280	M	80	CAB010235	liver	PMS2	2	hepatocell	0	0	0	0
2556	M	72	CAB010235	liver	PMS2	2	hepatocell	0	0	0	0
1252	F	55	CAB010235	liver	PMS2	2	cholangio	100	3	300	1
887	F	67	CAB010235	liver	PMS2	2	cholangio	80	2	160	1
2279	F	73	CAB009572	liver	MSH2	2	cholangio	80	1	80	1
3215	F	61	CAB009572	liver	MSH2	2	hepatocell	0	0	0	1
937	F	65	CAB009572	liver	MSH2	2	cholangio	15	1	15	1
2766	F	73	CAB009572	liver	MSH2	2	hepatocell	0	0	0	1
2177	F	58	CAB009572	liver	MSH2	2	hepatocell	0	0	0	1
2578	M	50	CAB009572	liver	MSH2	2	cholangio	0	0	0	1
3196	M	65	CAB009572	liver	MSH2	2	hepatocell	0	0	0	1
2399	F	52	CAB009572	liver	MSH2	2	cholangio	90	1	90	1
2280	M	80	CAB009572	liver	MSH2	2	hepatocell	0	0	0	1
2556	M	72	CAB009572	liver	MSH2	2	hepatocell	0	0	0	1
1252	F	55	CAB009572	liver	MSH2	2	cholangio	0	0	0	0
887	F	67	CAB009572	liver	MSH2	2	cholangio	0	0	0	0
878	M	73	CAB070867	liver	MSH2	2	hepatocell	2	1	2	0
1287	M	24	CAB070867	liver	MSH2	2	hepatocell	0	0	0	0
3324	M	70	CAB070867	liver	MSH2	2	hepatocell	0	0	0	0
3196	M	65	CAB070867	liver	MSH2	2	hepatocell	0	0	0	0
1033	M	40	CAB070867	liver	MSH2	2	hepatocell	0	0	0	0
3215	F	61	CAB070867	liver	MSH2	1	hepatocell	0	0	0	0
4791	F	82	CAB070867	liver	MSH2	2	hepatocell	0	0	0	0
3625	M	59	CAB070867	liver	MSH2	2	cholangio	0	0	0	0

intensity: 0: negative, 1: mild, 2: moderate, 3: strong

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Supplementary Table 1. Continued

Patient ID	gender	age	clone	organ	antibody	core number	tumor type	%	intensity	m. H score	internal control
4836	F	64	CAB070867	liver	MSH2	1	cholangio	50	2	100	1
3736	M	56	CAB070867	liver	MSH2	1	cholangio	95	2	190	1
2279	F	73	CAB070867	liver	MSH2	1	cholangio	70	2	140	1
2279	F	73	CAB080131	liver	MSH2	2	cholangio	100	3	300	1
3334	M	67	CAB080131	liver	MSH2	1	cholangio	90	3	270	1
3625	M	59	CAB080131	liver	MSH2	2	cholangio	85	2	170	1
2766	F	73	CAB080131	liver	MSH2	2	cholangio	95	1	95	1
1163	M	55	CAB080131	liver	MSH2	1	hepatocell	100	2	200	1
2325	M	76	CAB080131	liver	MSH2	2	hepatocell	100	3	300	1
4836	F	64	CAB080131	liver	MSH2	2	cholangio	100	2	200	1
3324	M	70	CAB080131	liver	MSH2	2	hepatocell	70	1	70	1
2556	M	72	CAB080131	liver	MSH2	2	hepatocell	55	1	55	1
2399	F	52	CAB080131	liver	MSH2	2	cholangio	100	3	300	1
3196	M	65	CAB080131	liver	MSH2	2	cholangio	95	1	95	1
2279	F	73	CAB009091	liver	MSH6	2	cholangio	70	1	70	1
3215	F	61	CAB009091	liver	MSH6	2	hepatocell	0	0	0	1
937	F	65	CAB009091	liver	MSH6	2	cholangio	10	1	10	1
2766	F	73	CAB009091	liver	MSH6	2	hepatocell	65	2	130	1
2177	F	58	CAB009091	liver	MSH6	2	hepatocell	0	0	0	1
2578	M	50	CAB009091	liver	MSH6	2	hepatocell	0	0	0	1?
3196	M	65	CAB009091	liver	MSH6	2	hepatocell	0	0	0	1
2399	F	52	CAB009091	liver	MSH6	2	cholangio	0	0	0	0?
2280	M	80	CAB009091	liver	MSH6	2	hepatocell	0	0	0	0
2556	M	72	CAB009091	liver	MSH6	2	hepatocell	0	0	0	0
1252	F	55	CAB009091	liver	MSH6	2	cholangio	20	1	20	1
887	F	67	CAB009091	liver	MSH6	2	cholangio	25	1	25	1
2279	F	73	HPA028376	liver	MSH6	2	cholangio	5	1	5	1?
3334	M	67	HPA028376	liver	MSH6	2	cholangio	0	0	0	0
3625	M	59	HPA028376	liver	MSH6	2	cholangio	0	0	0	0
2766	F	73	HPA028376	liver	MSH6	2	hepatocell	0	0	0	0
2177	F	58	HPA028376	liver	MSH6	2	hepatocell	0	0	0	0
3733	F	75	HPA028376	liver	MSH6	2	cholangio	5	1	5	1
3196	M	65	HPA028376	liver	MSH6	2	hepatocell	0	0	0	0

intensity: 0: negative, 1: mild, 2: moderate, 3: strong

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Supplementary Table 1. Continued

Patient ID	gender	age	clone	organ	antibody	core number	tumor type	%	intensity	m. H score	internal control
2399	F	52	HPA028376	liver	MSH6	2	cholangio	0	0	0	0
2280	M	80	HPA028376	liver	MSH6	2	hepatocell	0	0	0	0
2556	M	72	HPA028376	liver	MSH6	2	hepatocell	0	0	0	0
3346	F	73	HPA028376	liver	MSH6	2	hepatocell	0	0	0	0
3477	M	67	HPA028376	liver	MSH6	2	hepatocell	0	0	0	0
2279	F	73	HPA028446	liver	MSH6	2	cholangio	5	2	10	1
3334	M	67	HPA028446	liver	MSH6	2	cholangio	0	0	0	0
3625	M	59	HPA028446	liver	MSH6	2	cholangio	5	1	5	1
2766	F	73	HPA028446	liver	MSH6	2	hepatocell	0	0	0	0
2177	F	58	HPA028446	liver	MSH6	2	hepatocell	15	1	15	1
3733	F	75	HPA028446	liver	MSH6	2	cholangio	95	2	190	1
3196	M	65	HPA028446	liver	MSH6	2	hepatocell	0	0	0	0
2399	F	52	HPA028446	liver	MSH6	2	cholangio	35	2	70	1
2280	M	80	HPA028446	liver	MSH6	2	hepatocell	5	1	5	1
2556	M	72	HPA028446	liver	MSH6	2	hepatocell	0	0	0	0
3346	F	73	HPA028446	liver	MSH6	2	hepatocell	0	0	0	0
3477	M	67	HPA028446	liver	MSH6	2	hepatocell	0	0	0	0
5036	F	73	CAB070870	liver	MSH6	2	hepatocell	15	5	75	1
878	M	73	CAB070870	liver	MSH6	2	hepatocell	100	3	300	1
5032	F	58	CAB070870	liver	MSH6	2	hepatocell	95	3	285	1
3324	M	70	CAB070870	liver	MSH6	2	hepatocell	10	3	30	1
653	M	67	CAB070870	liver	MSH6	2	hepatocell	0	0	0	1
5031	M	69	CAB070870	liver	MSH6	2	hepatocell	95	3	285	1
5037	F	41	CAB070870	liver	MSH6	2	hepatocell	80	3	240	1
4791	F	82	CAB070870	liver	MSH6	2	hepatocell	15	2	30	1
5094	M	58	CAB070870	liver	MSH6	2	cholangio	90	2	180	1
3862	F	79	CAB070870	liver	MSH6	1	cholangio	100	3	300	1
5099	M	65	CAB070870	liver	MSH6	1	cholangio	100	3	300	1
2279	F	73	CAB070870	liver	MSH6	1	cholangio	90	3	270	1

intensity: 0: negative, 1: mild, 2: moderate, 3: strong

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Supplementary Table 2. Binary evaluation of MMR protein expression patterns in normal liver tissue

Patient ID	gender	age	clone	antibody	hepatocytes	cholangiocytes	fibroblasts	inflammatory cells
3402	F	54	HPA052707	MLH1	0	0	0	0
3222	F	63	HPA052707	MLH1	0	0	0	0
1846	F	32	CAB013294	MLH1	0	0	0	0
1720	M	67	CAB013294	MLH1	0	0	0	0
2251	F	50	CAB070868	MLH1	1	1	1	1
3402	F	54	CAB070868	MLH1	1	1	1	1
1720	M	67	CAB070868	MLH1	0	1	1	1
1846	F	32	CAB010235	PMS2	0	0	0	0
3222	F	63	CAB010235	PMS2	0	N/A	0	0
2429	M	55	CAB010235	PMS2	0	0	0	0
1846	F	32	CAB009572	MSH2	0	1	1	1
3222	F	63	CAB009572	MSH2	0	0	0	0
2429	M	55	CAB009572	MSH2	0	0	1	1
2251	F	50	CAB070867	MSH2	0	0	0	0
3402	F	54	CAB070867	MSH2	0	0	0	1
1720	M	67	CAB070867	MSH2	0	0	0	1
2592	F	32	CAB080131	MSH2	0	0	0	0
2251	F	50	CAB080131	MSH2	0	1	1	1
1720	M	67	CAB080131	MSH2	0	1	1	1
1846	F	32	HPA028376	MSH6	0	0	0	0
2429	M	55	HPA028376	MSH6	0	0	0	0
1846	F	32	HPA028446	MSH6	0	N/A	N/A	0
2429	M	55	HPA028446	MSH6	1	1	0	N/A
1846	F	32	CAB009091	MSH6	0	0	0	0
3222	F	63	CAB009091	MSH6	0	0	0	N/A
2429	M	55	CAB009091	MSH6	0	0	0	N/A
2251	F	50	CAB070870	MSH6	1	1	1	1
3402	F	54	CAB070870	MSH6	1	1	1	1
1720	M	67	CAB070870	MSH6	1	N/A	1	1

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Supplementary Table 3. Summary of normal liver MMR expression patterns by cell type and clone

	Normal Expression Pattern			
	Hep.	chol.	Fib.	Infl.
MLH1 (clone 1)	(-)	(-)	(-)	(-)
(clone 2)	(-)	(-)	(-)	(-)
(clone 3)	(+)	(+)	(+)	(+)
PMS2 (clone 1)	(-)	(-)	(-)	(-)
MSH2 (clone 1)	(-)	(+)	(+)	(+)
(clone 2)	(-)	(-)	(-)	(+)
(clone 3)	(-)	(+)	(+)	(+)
MSH6 (clone 1)	(-)	(-)	(-)	(-)
(clone 2)	(+)	(+)	(-)	(-)
(clone 3)	(-)	(-)	(-)	(-)
(clone 4)	(+)	(+)	(+)	(+)

Hep: Hepatocytes, chol: Cholangiocytes, Fib: fibroblasts, Infl: inflammatory cells.

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Supplementary Table 4. Clone-dependent MMR expression loss patterns in cholangiocarcinoma and hepatocellular carcinoma

		Total Expression Loss (< 25%)	Focal Expression Loss (25% - 75%)	No Expression Loss (> 75%)	Positive Inner Control Tissue
Cholangiocarcinoma	MLH1 (clone 1)	1 (n:5)	0 (n:5)	4 (n:5)	5 (n:5)
	(clone 2)	5 (n:5)	0 (n:5)	0 (n:5)	2 (n:5)
	(clone 3)	0 (n:4)	0 (n:4)	4 (n:4)	4 (n:4)
	PMS2 (clone 1)	1 (n:6)	0 (n:6)	5 (n:6)	4 (n:6)
	MSH2 (clone 1)	4 (n:6)	0 (n:6)	2 (n:6)	4 (n:6)
	(clone 2)	1 (n:4)	2 (n:4)	1 (n:4)	3 (n:4)
	(clone 3)	0 (n:7)	0 (n:7)	7 (n:7)	7 (n:7)
	MSH6 (clone 1)	4 (n: 5)	1 (n: 5)	0 (n: 5)	4 (n: 5)
	(clone 2)	5 (n: 5)	0 (n: 5)	0 (n: 5)	2 (n: 5)
	(clone 3)	3 (n: 5)	1 (n: 5)	1 (n: 5)	4 (n: 5)
(clone 4)	0 (n:4)	0 (n:4)	4 (n:4)	4 (n:4)	
Hepatocellular carcinoma	MLH1 (clone 1)	6 (n:6)	0 (n:6)	0 (n:6)	5 (n:6)
	(clone 2)	5 (n:6)	1 (n:6)	0 (n:6)	2 (n:6)
	(clone 3)	1 (n:8)	1 (n:8)	6 (n:8)	8 (n:8)
	PMS2 (clone 1)	5 (n:6)	0 (n:6)	1 (n:6)	1 (n:6)
	MSH2 (clone 1)	6 (n:6)	0 (n:6)	0 (n:6)	6 (n:6)
	(clone 2)	7 (n:7)	0 (n:7)	0 (n:7)	0 (n:7)
	(clone 3)	0 (n:4)	2 (n:4)	2 (n:4)	4 (n:4)
	MSH6 (clone 1)	6 (n:7)	1 (n:7)	0 (n:7)	5 (n:7)
	(clone 2)	7 (n:7)	0 (n:7)	0 (n:7)	0 (n:7)
	(clone 3)	7 (n:7)	0 (n:7)	0 (n:7)	2 (n:7)
(clone 4)	4 (n:8)	0 (n:8)	4 (n:8)	8 (n:8)	

* MLH1 (clone1: CAB013294, clone2: HPA052707 and clone3: CAB070868), PMS2 (clone1: CAB010235), MSH2 (clone1: CAB009572, clone2: CAB070867 and clone3: CAB080131) and MSH6 (clone1: CAB009091, clone2: HPA028376, clone3: HPA028446 and clone4: CAB070870)