Microsatellite Instability Testing

Overview	Overview of DNA repair
Describe	Describe Mismatch Repair System
Discuss	Discuss Lynch Syndrome
Review	Review Testing Methods Frequently Used for MSI Testing
Present	Present Validation of Idylla MSI System

Learning Objectives

- Describe the two main testing strategies for MSI testing
- Identify the reasons/clinical applications for performing MSI testing and what and MSI-High vs. Microsatellite Stable (MSS) results means
- Analyze the performance of three MSI testing technologies (IHC + 2 molecular testing methods)

Genomic Instability

- Humans are constantly bombarded and attacked by environmental toxins that damage DNA: *Chemicals, Radiation, Sunlight*
- Cancer is relatively rare
- Humans have the ability to repair DNA damage effectively
- Inherited and acquired defects with DNA repair result in increased risk of cancer

Three fundamental mechanisms for repairing DNA damage

Repair of DNA DAMAGE

Nucleotide excision repair pathway

Homologous recombination DNA repair

Mismatch repair (Lynch Syndrome)

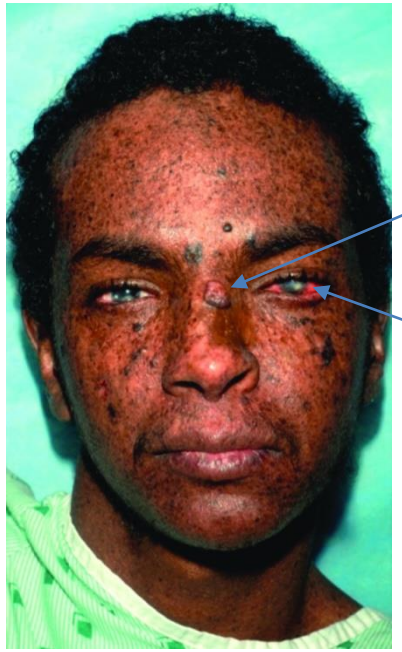
People with inherited mutations in genes that repair DNA have greatly increased risk for developing cancer

Nucleotide Excision Repair (NER)

- Removes DNA damage induced by UV light
- UV results in bulky DNA adducts (eg, thymine dimers)
- NER removes short segment of damaged DNA lesion
- DNA polymerase and ligase fill-in the gap

Xeroderma Pigmentosum

- Risk of cancer on sun-exposed skin 1000X
- Defective repair of UV damage to pyrimidines
- Multiple genes contribute to disease
- XPC and XPD (ERCC2)



DNA Repair by Homologous Recombination

- Double strand DNA breaks are extremely genotoxic
- Ineffective repair leads to chromosomal instability and cancer
- Accurate repair is mediated through Homologous Recombination

- Fanconi anemia (multi-genic)
- Bloom syndrome *(BLM* gene)
- Ataxia-Telangiectasia (*ATM* gene)

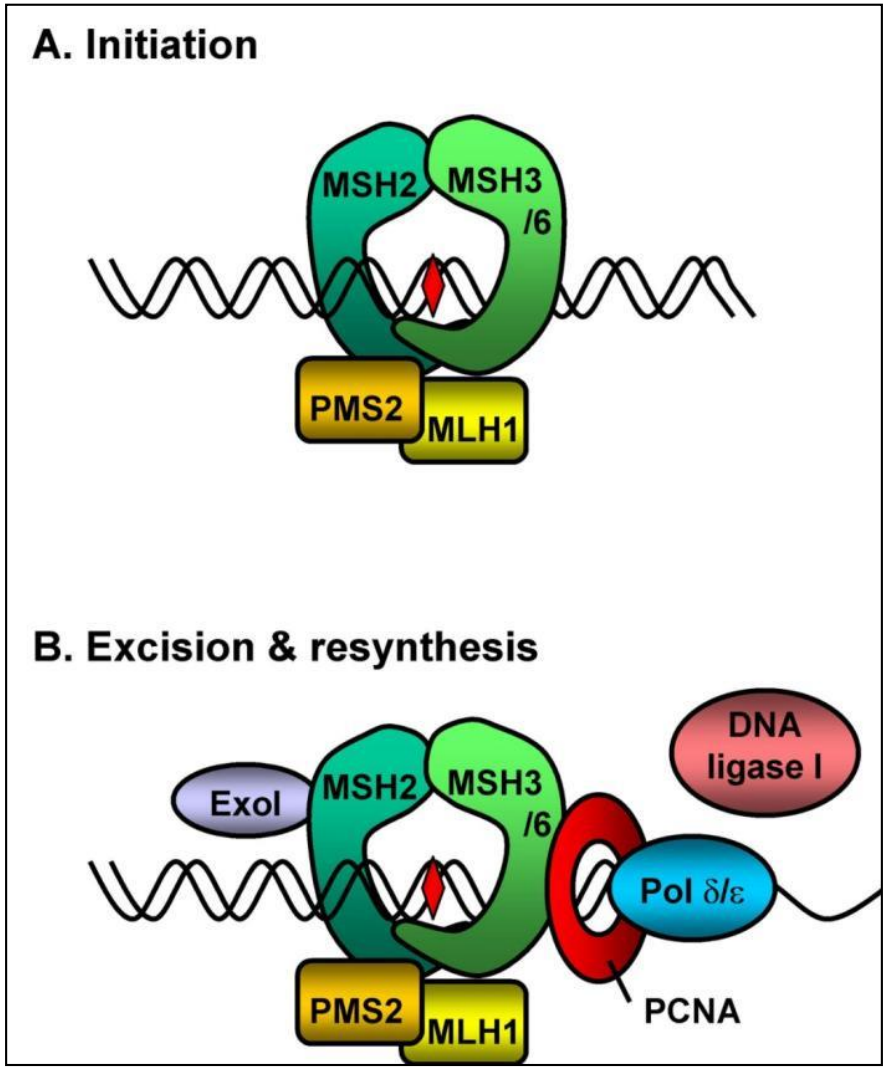
BRCA1

Risk of ovarian and prostate cancer

BRCA2

Risk of ovarian, prostate, pancreas, biliary, stomach, melanoma, lymphoma

Mismatch Repair (MMR): MLH1, PMS2, MSH2, MSH6

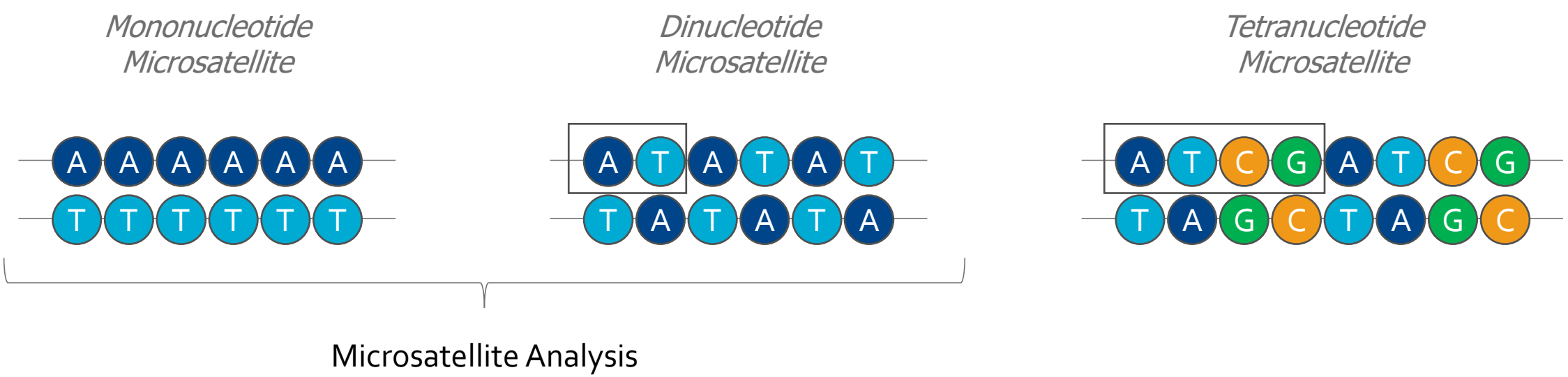


- Mismatch repair genes (MMR)
  - MLH1, MSH2, MSH6, PMS2
- Proofread and repair mismatches during replication
- Defective in MMR genes leads to accumulation of mutations in genome
- Some mutations occur in critical genes becoming the initiating event in a patient's cancer
- Results in Microsatellite Instability Phenotype (MSI)

What are Microsatellites?

- Microsatellites are short repeated regions of DNA
  - 1 – 6 nucleotides units
  - Units repeated 5 – 50 times
  - Distributed throughout the genome

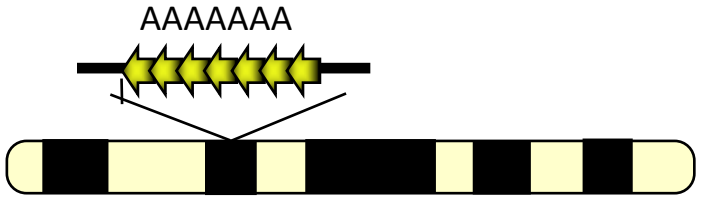
- Examples:



Repetitive regions are more likely to have mismatches

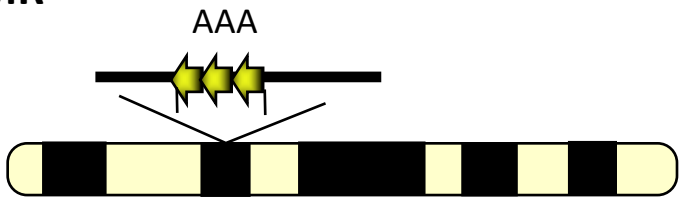
- During DNA replication repetitive regions (microsatellites) are prone to polymerase ‘slippage’
- pMMR: Cells with proficient mismatch repair machinery correct mistakes
- dMMR: Cells with deficient mismatch repair acquire mistakes leading to microsatellite instability (MSI)

INTACT MMR



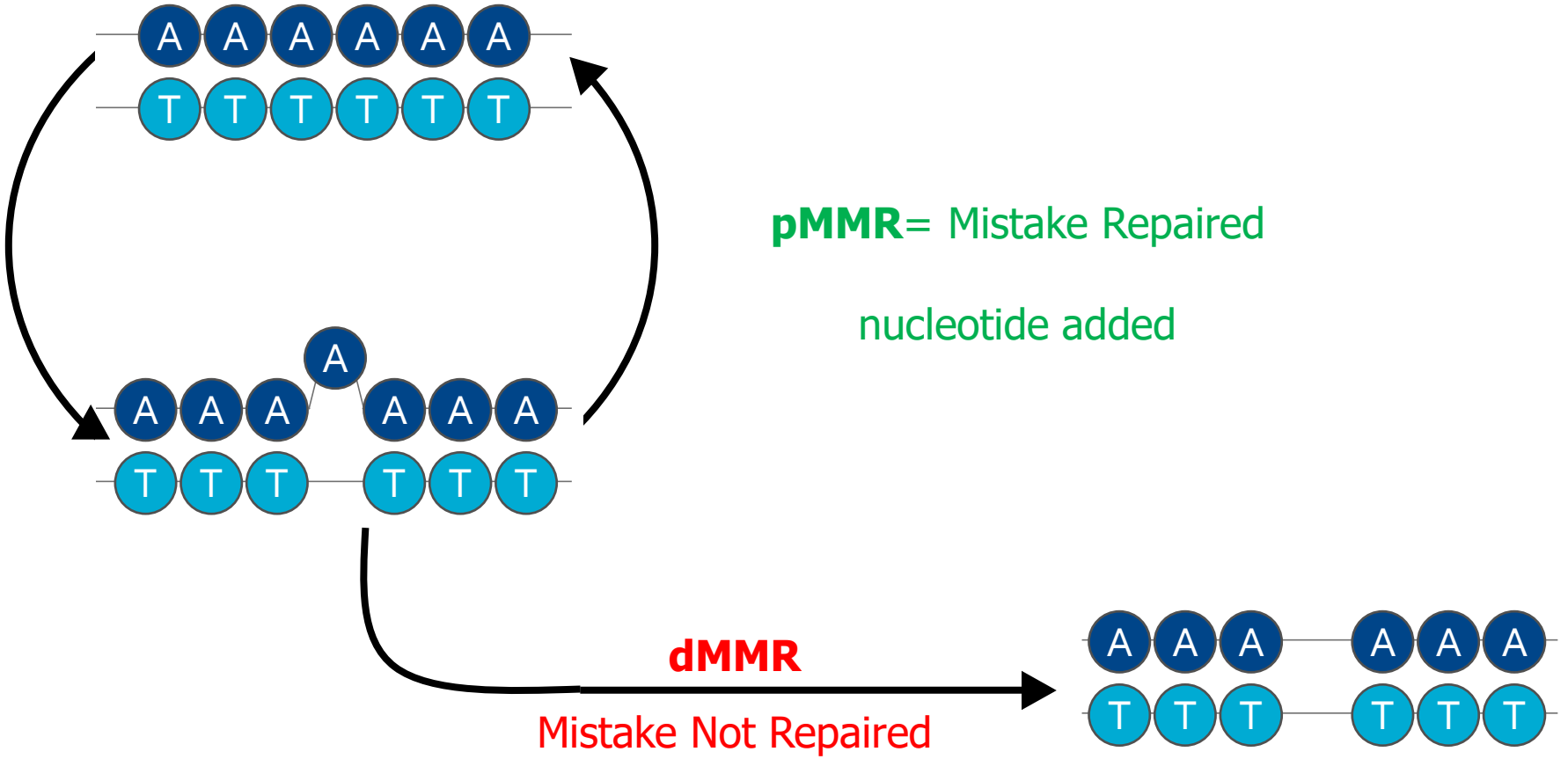
Microsatellite Stable

DEFECTIVE MMR



Microsatelite Instability

Defective MMR function results in MSI



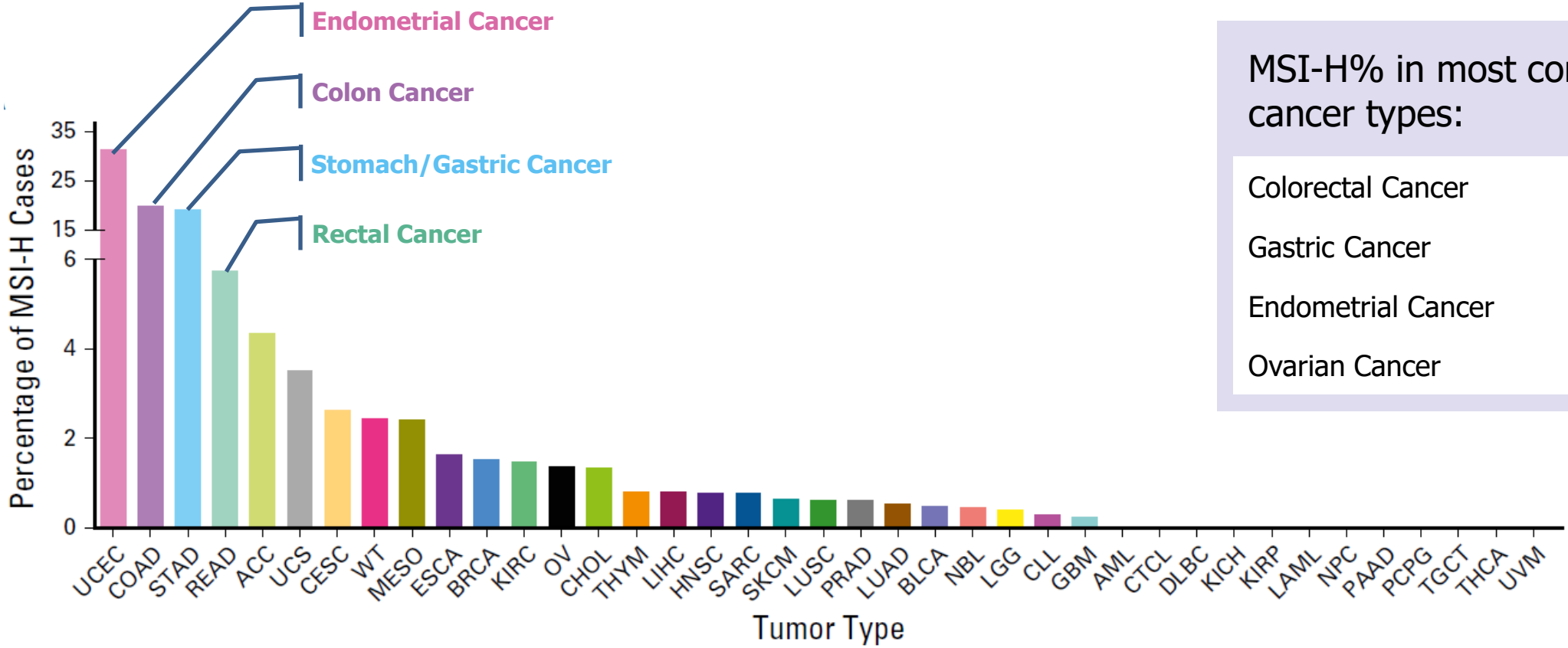
dMMR/ MSI creates high probability for mutations in cancer genes

Significant Genes with Microsatellites

Gene	Function of encoded protein	Wild-type coding sequence	Colon	Stomach	Endometrium
ACTRII	GF receptor	A_8	X		
AIM2	interferon-inducible	A_{10}	X		
APAF1	pro-apoptotic factor	A_8	X	X	
AXIN-2	Wnt signaling	A_6, G_7, C_6	X		
BAX	pro-apoptotic factor	G_8	X	X	X
BCL-10	pro-apoptotic factor	A_8	X	X	X
BLM	DNA damage response	A_9	X	X	X
Caspase-5	pro-apoptotic factor	A_{10}	X	X	X
CDX2	homeobox TF	G_7	X		
CHK1	DNA damage response	A_9	X		X
FAS	pro-apoptotic factor	T_7	X		X
GRB-14	signal transduction	A_9	X	X	
hG4-1	cell cycle	A_8	X		
IFRIIR	decoy GF receptor	G_8	X	X	X
KIAA097	unknown	T_9	X		
MLH3	MMR	A_9	X		X
MSH3	MMR	A_8	X	X	X
MSH6	MMR	C_8	X	X	X
NADH-UO8	electron transport	T_9	X		
OGT	glycosylation	T_{10}	X		
PTEN	pro-apoptotic	A_6	X		X
RAD50	DNA damage response	A_9	X	X	
RHAMM	cell motility	A_9	X		
RIZ	pro-apoptotic factor	A_8, A_9	X	X	X
SEC63	protein translocation into endoplasmic reticulum	A_{10}, A_9	X		
SLC23A1	transporter	C_9	X		
TCF-4	transcription factor	A_{10}	X	X	X
TGF-βRII	*TGF-β receptor*	A_{10}	X	X	X
WISP-3	growth factor	A_9	X		

From A. Duval and R. Hamelin, *Cancer Res.* 62:2447–2454, 2002.

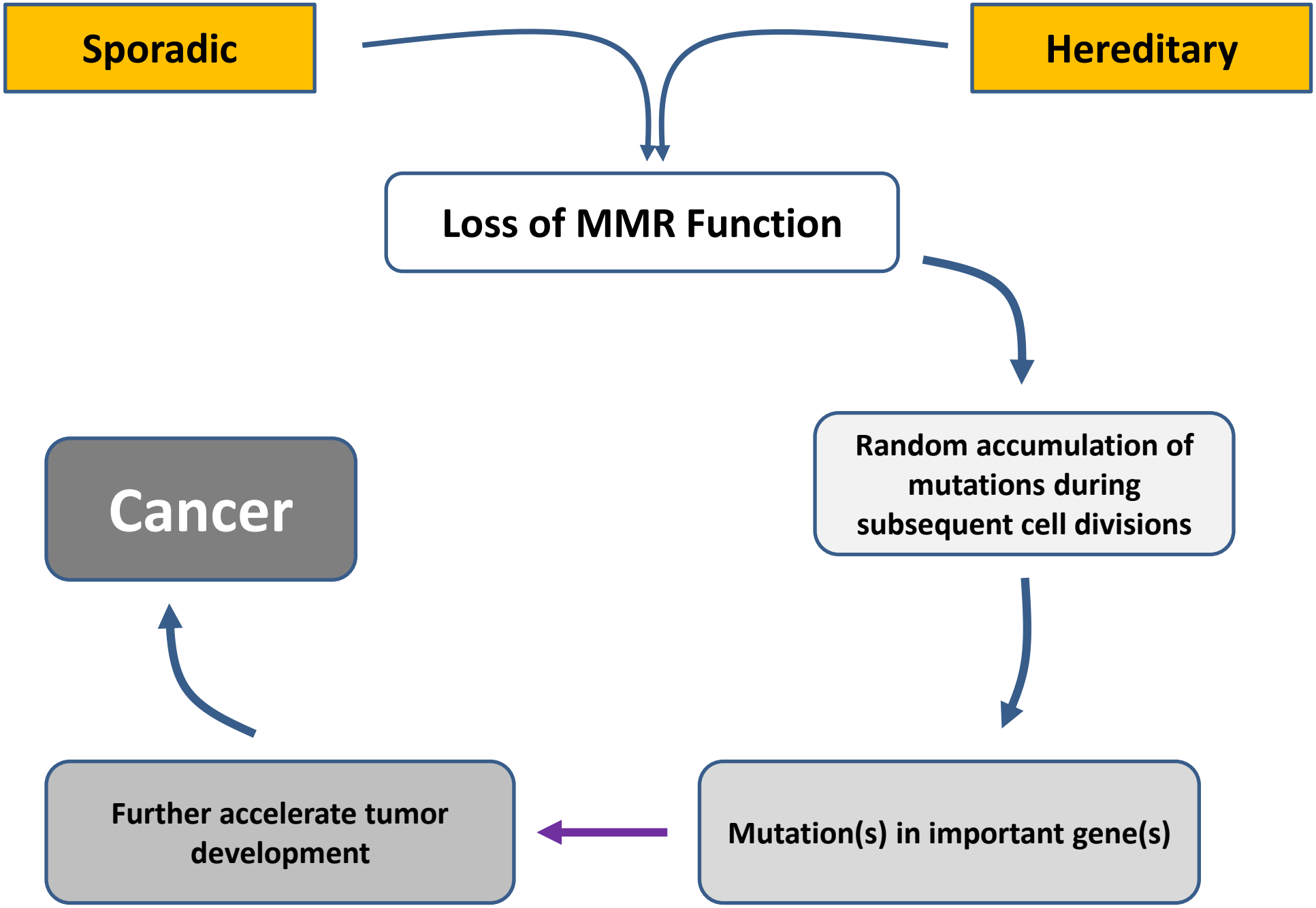
Prevalence of MSI across different cancer types – survey of 39 cancer types



MSI-H% in most common cancer types:

Colorectal Cancer	15-20%
Gastric Cancer	10-20%
Endometrial Cancer	20-30%
Ovarian Cancer	2-10%

Reference: Bonneville et al. Lanscape of MSI across 39 cancer types. JCO Precision Oncology ASCO 2017
Reference: Richman S et al. International Journal of Oncology 2015


Sporadic
Hereditary
Loss of MMR Function
Random accumulation of mutations during subsequent cell divisions
Mutation(s) in important gene(s)
Further accelerate tumor development
Cancer

Lynch Syndrome (LS)

(*Hereditary Nonpolyposis Colorectal Cancer*)

Inherited predisposition to developing cancer

Caused by genetic defect in DNA mismatch repair genes (MMR)

MLH1, MSH2, MSH6, PMS2, EPCAM

Types of Cancers

- Most common: Colorectal, endometrial
- Others: extra-intestinal cancer

2-3% of Colon cancer occurs in LS patients

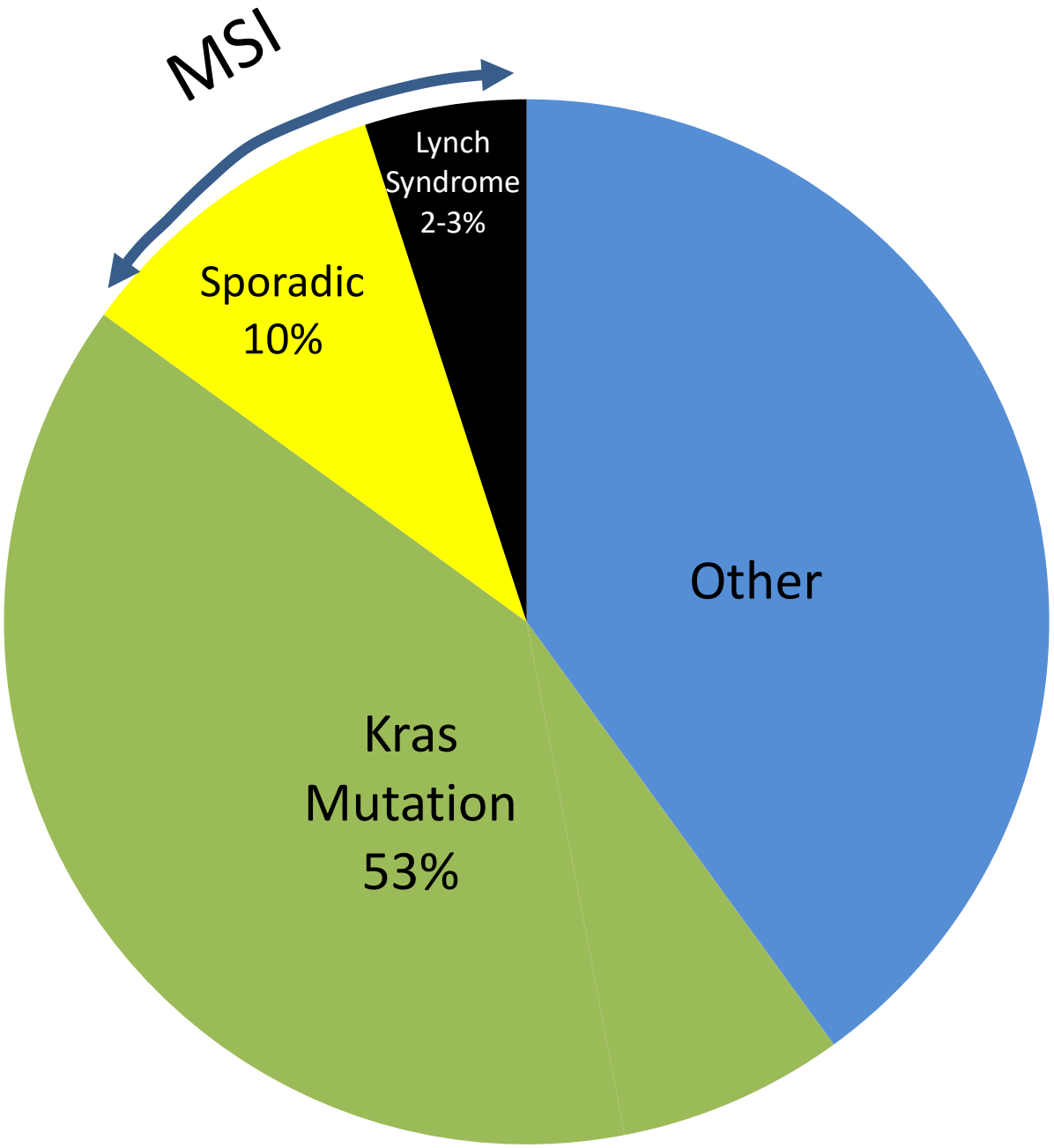
Cancer occurs at an earlier age (40’s versus 60’s)

Synchronous: occurring at the same time

Metachronous: occurring at different times

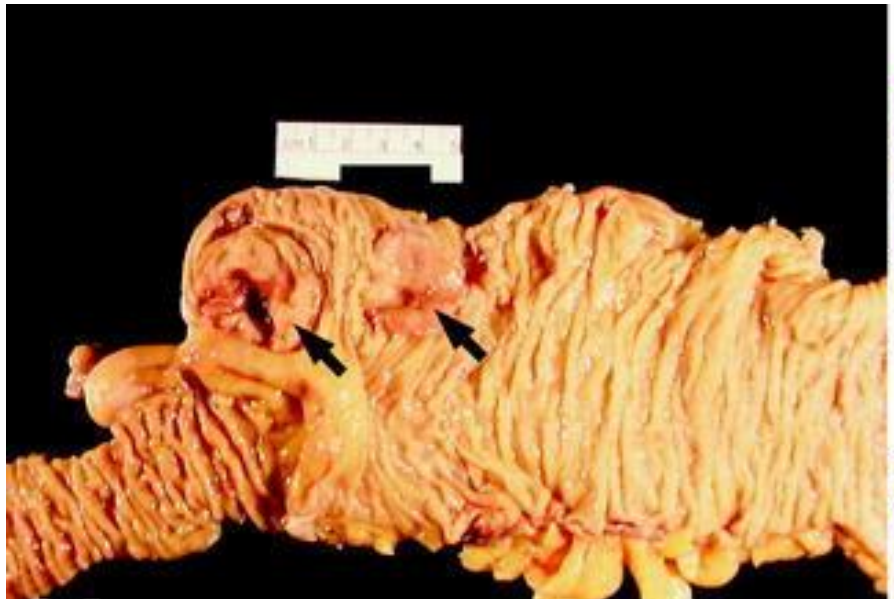
Cancer	Lifetime Risk with MMR gene mutation	Average age of presentation (years)
Colon	28-80%	44
Endometrial	30-50%	46
Small intestine	4-7%	
Stomach	2-13%	56
Ovarian	3-13%	42.5
Hepatobiliary tract	2%	
Upper genitourinary	1-12%	
Brain (glioblastoma)	1-4%	
Skin	2-6%	
Upper genitourinary	1-12	

Lynch, H., Clin Genet, 76(1):1-18, 2009

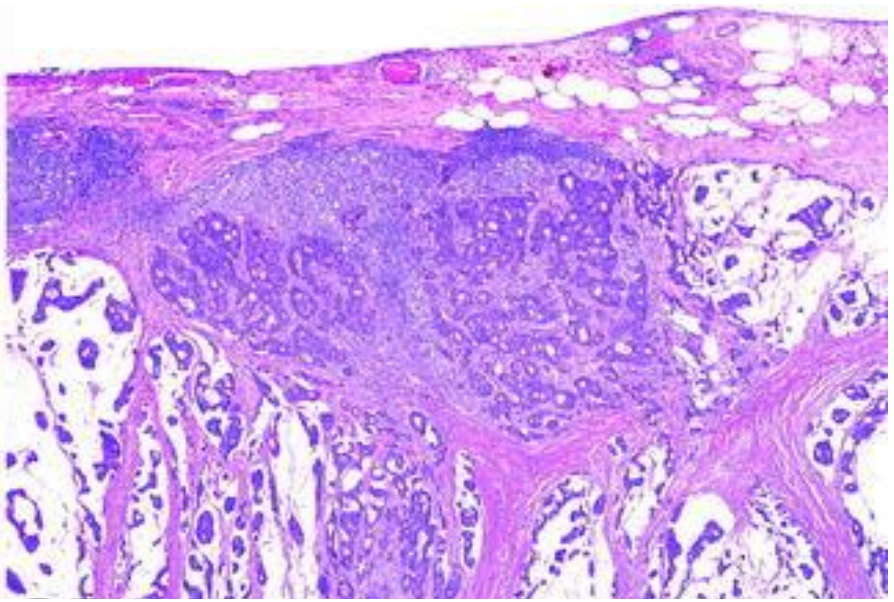


Features of CRC in Lynch Syndrome Patients

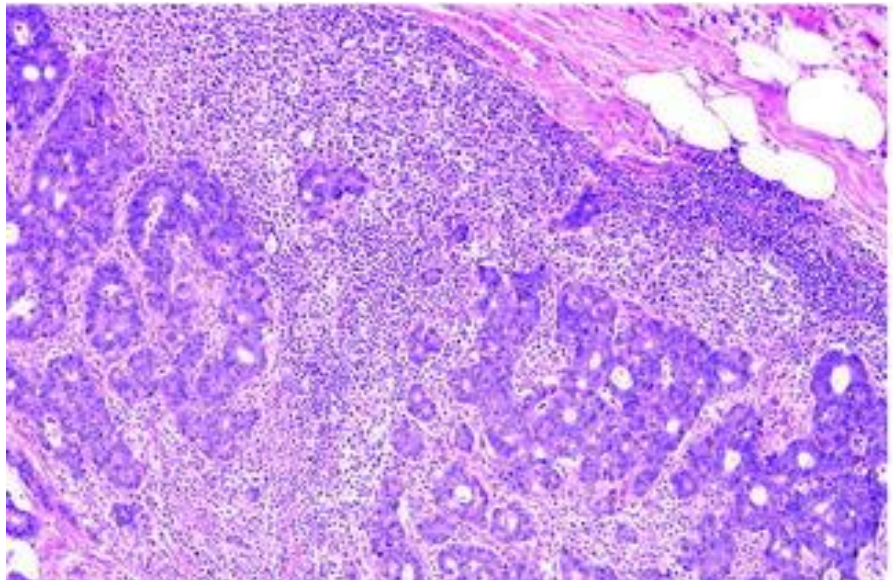
- About 1 in 35 CRC patients have LS
- High risk for second primary cancer (16% in 10 years)
- Better prognosis and survival rates



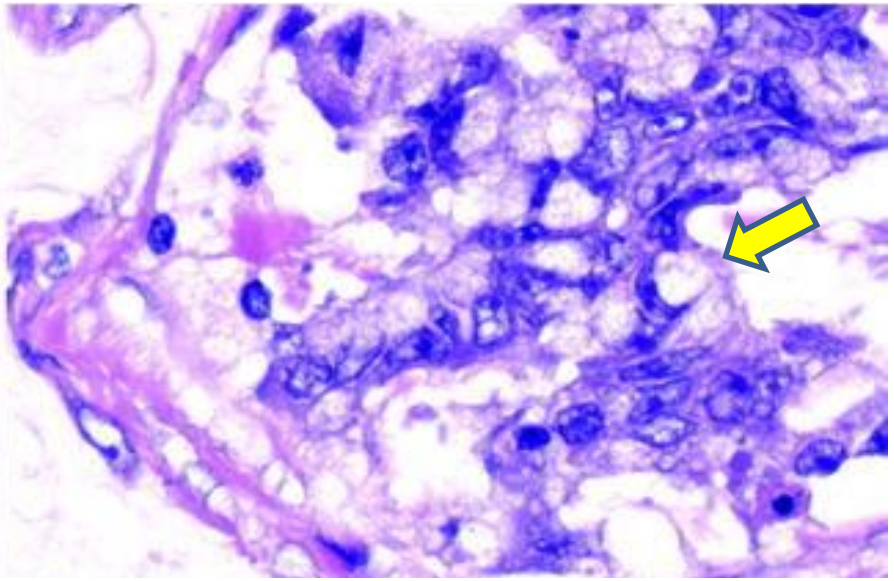
2 synchronous tumors



Mucinous Features and Chronic Inflammation



Chronic Inflammation



Signet Ring Features

Gologan, Arch Path Lab Med, 129:1390-1397, 2005

Why is MSI testing performed?

Characterization of Cancer

- Prognostic Stratification
- Lynch Syndrome Screening
- Predictive Value

Clinical Practice Guidelines:

NCCN

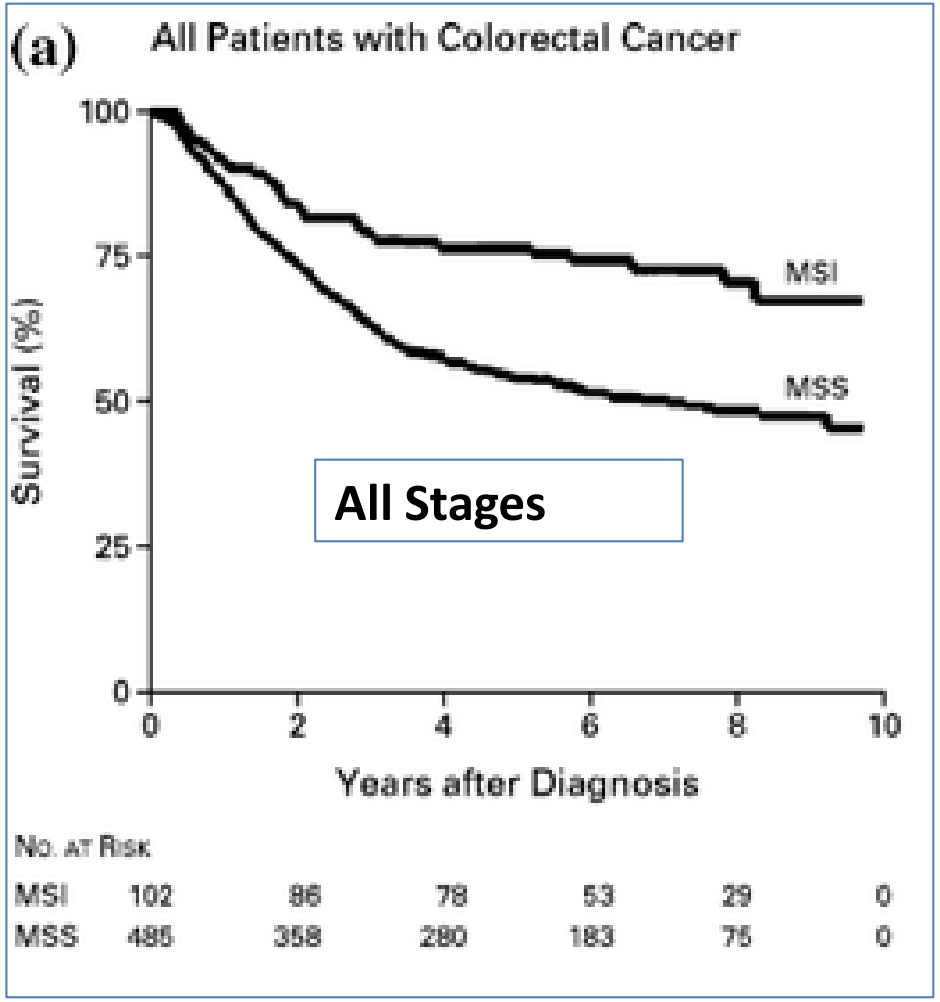
"Tumor screening for MMR deficiency is appropriate for all CRC and endometrial cancers…"

ASCO CAP AMP ASCP

"Clinicians should order MMR status testing in patients with colorectal cancer for identification of patients at high risk for Lynch syndrome and/or prognostic stratification"

1. NCCN Guidelines "Gentic/Familial High-Risk Assessment: Colorectal" Version 3.2017
2. Sepulveda et al. ASCP/CAP/AMP/ASCO CRC guidelines. J Clin Oncol 2017

MSI has better prognosis



Ribic, NEJM, 349(3):247, 2003

Patients with MSI have a more favorable prognosis:

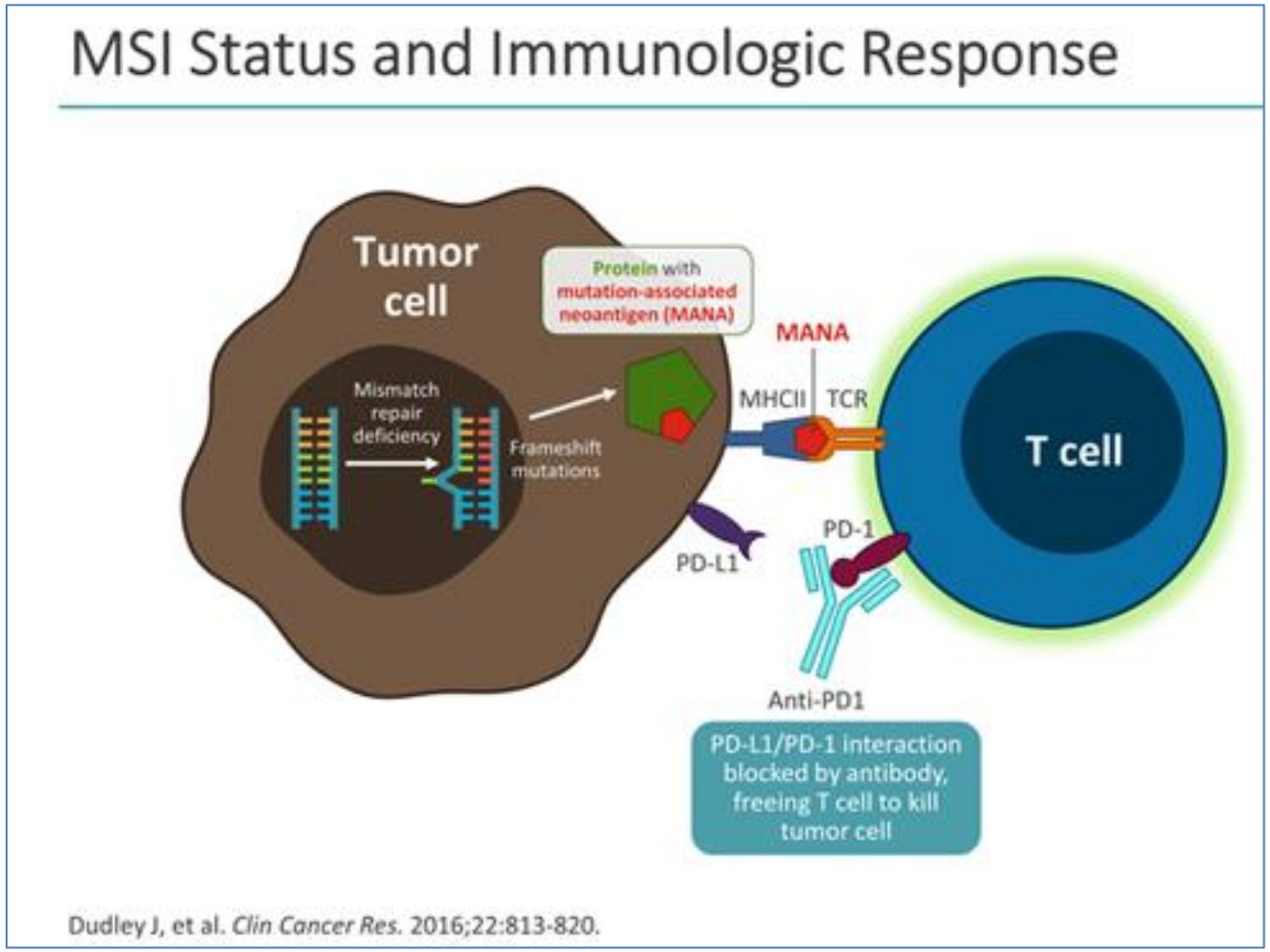
MSI tumors have a decreased likelihood to metastasize

A review of 31 studies reporting survival on 12,782 patients with MSI tumors show a favorable prognosis

1. NCCN Guidelines "Gentic/Familial High-Risk Assessment: Colorectal" Version 3.2017
2. Sepulveda et al. ASCP/CAP/AMP/ASCO CRC guidelines. J Clin Oncol 2017

MMR/MSI predicts response to PD-1 inhibition

- MSI tumors ~1000-2000 mutations per cell.
- Many become tumor-specific neoantigens
- Tumors block anti-tumor immunity via PD-L1::PD-1 binding
- PD-1 therapy restores antitumor immunity



MMR/MSI predicts best response to PD-1 inhibition

Cancer patient who has progressed on prior therapies

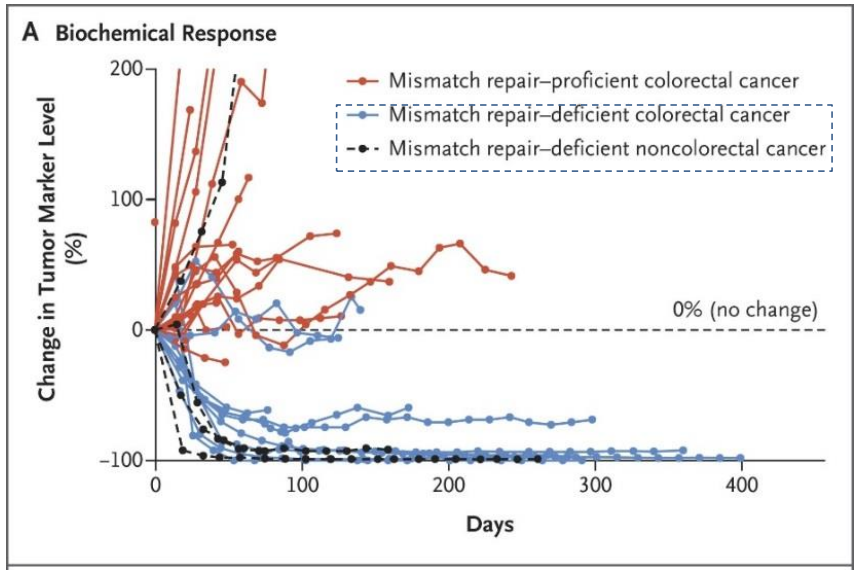
MSI and/or MMR Testing

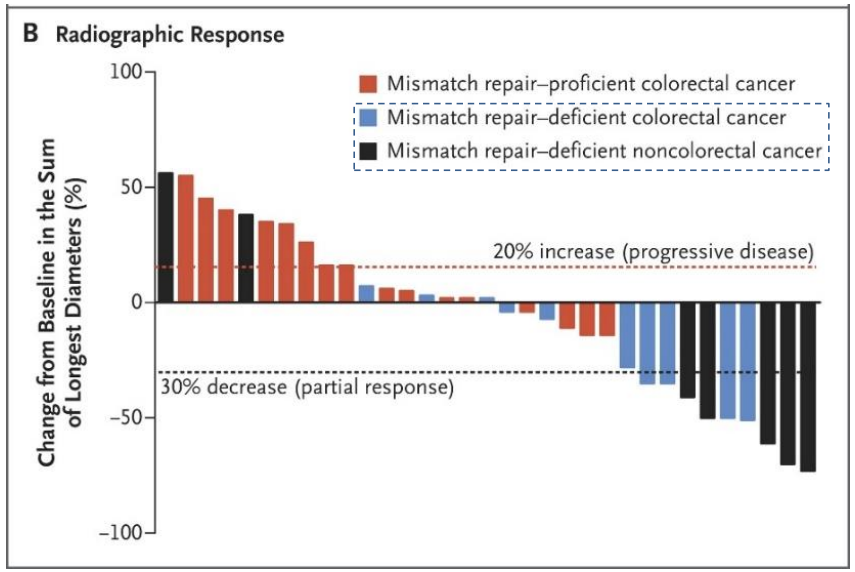
MSI-H dMMR

MSS

Patient Receives Immunotherapy

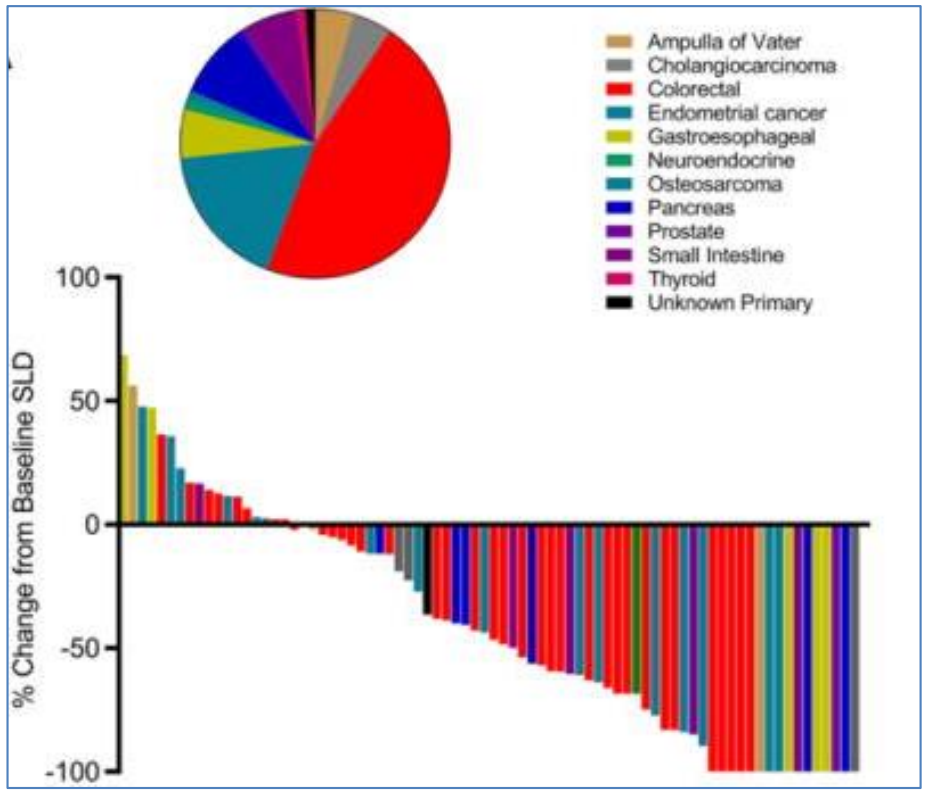
Patient Receives Alternate Therapy





Le, NEJM, 372:2509-2520, 2015
Le, Science, 357(6349):409-413, 2017

MMR/MSI predicts response to PD-1 inhibition



Le, NEJM, 372:2509-2520, 2015
Le, Science, 357(6349):409-413, 2017

KEYTRUDA® (pembrolizumab) for Injection 50 mg

MERCK May 23rd, 2017

TEST FOR MSI OR MMR TO SEE IF KEYTRUDA COULD BE RIGHT FOR YOU

Getting tested for MSI or MMR status can help determine if KEYTRUDA could be an appropriate treatment for you or someone you care about.
Test if you have any of these cancers:

- Colorectal
- Endometrial
- Biliary
- Bladder
- Breast
- Esophageal
- Gastric or gastroesophageal junction
- Pancreatic
- Prostate
- Renal cell
- Retroperitoneal adenocarcinoma
- Sarcoma
- Small cell lung
- Small intestinal
- Thyroid
- Other advanced solid tumors

KEYTRUDA IS THE FIRST FDA-APPROVED IMMUNOTHERAPY BASED ON A BIOMARKER, REGARDLESS OF TUMOR TYPE

KEYTRUDA may be used in adults and children to treat:

- cancer that has spread or cannot be removed by surgery (advanced cancer), **and**
- has progressed following treatment, and you have no satisfactory treatment options, **or**
- you have colon or rectal cancer, and you have received chemotherapy with fluoropyrimidine, oxaliplatin, and irinotecan but it did not work or is no longer working.

It is not known if KEYTRUDA is safe and effective in children with MSI-H cancers of the brain or spinal cord (central nervous system cancers).

OPDIVO™ (nivolumab)

Bristol-Myers Squibb August 1st, 2017

INDICATION

For People 12 Years of Age and Older Whose dMMR or MSI-H CRC Has Spread to Other Parts of the Body (Metastatic) and Who Have Tried Chemotherapy With a Fluoropyrimidine, Oxaliplatin, and Irinotecan and It Did Not Work or Is No Longer Working

OPDIVO® (nivolumab) is a prescription medicine used to treat adults and children 12 years of age and older who have **colorectal cancer (a type of colon or rectal cancer)**, and who:

- Have colorectal cancer that has spread to other parts of the body (metastatic); **AND**
- Have a tumor that is mismatch repair deficient (dMMR) or microsatellite instability-high (MSI-H); **AND**
- Have tried chemotherapy with a fluoropyrimidine, oxaliplatin, and irinotecan, and it did not work or is no longer working.

OPDIVO was approved based on response rate and how long patients' responses lasted. There is ongoing evaluation of clinical benefit of OPDIVO for this use.

It is not known if OPDIVO is safe and effective in children less than 12 years of age with MSI-H or dMMR metastatic colorectal cancer.

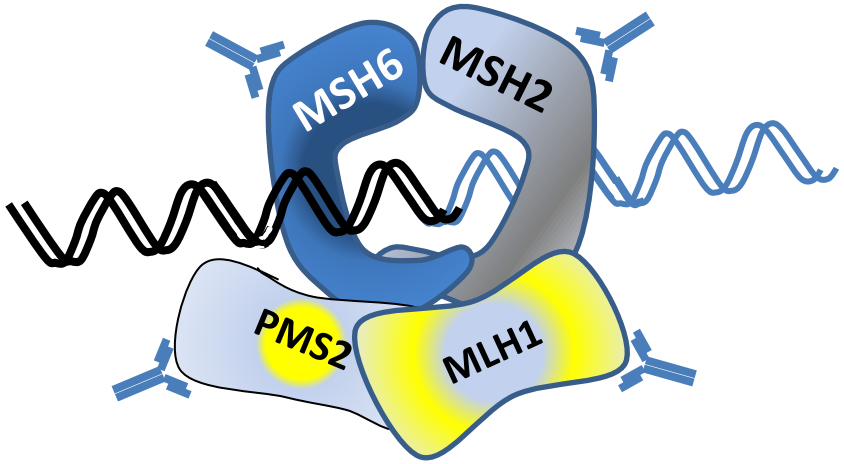
5-FU ADJUVANT THERAPY in CRC

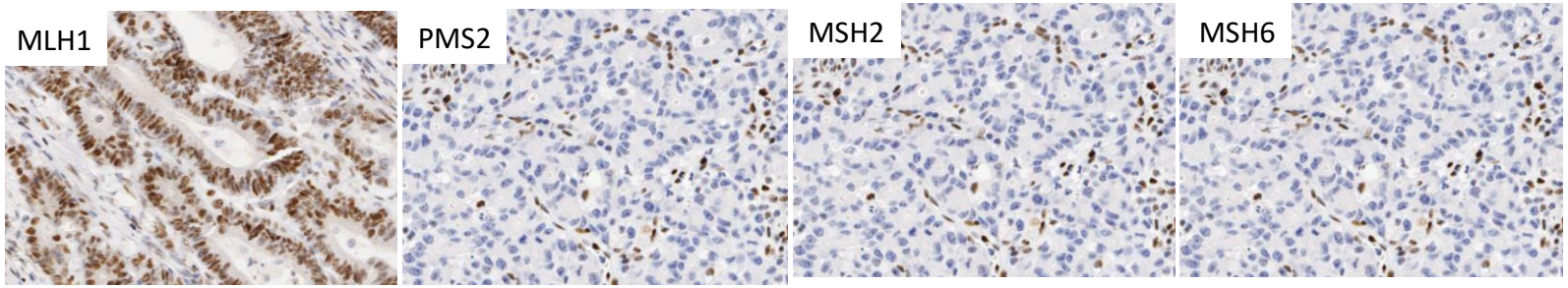
- Reduced response to 5-FU based chemotherapy in dMMR tumours
- Improved response of MSI-CRC tumors to combination chemotherapy with oxaliplatin and irinotecan in comparison to 5-FU based agents.
- According to the National Comprehensive Cancer Network (NCCN), MMR testing should be considered for all patients with stage-II disease, as stage-II MSI tumors have a good prognosis and may not benefit from chemotherapy.

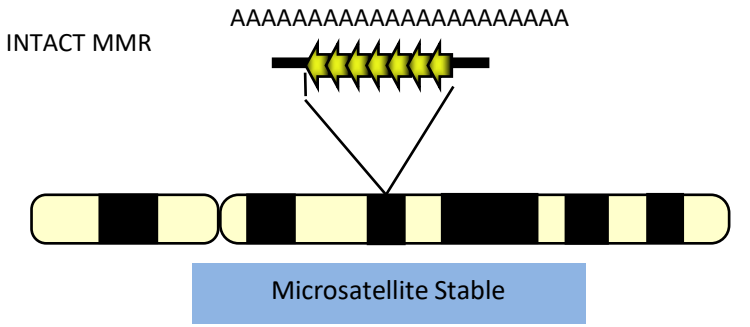
G. Hutchins, K. Southward, K. Handley, L. Magill, C. Beaumont, J. Stahlschmidt, S.Richman, P. Chambers, M. Seymour, D. Kerr, R. Gray, P. QuirkeValue of mismatch repair, KRAS, and BRAF mutations in predicting recurrence and benefits from chemotherapy in colorectal cancer. J. Clin. Oncol., 29 (10) (2011), pp. 1261-1270.

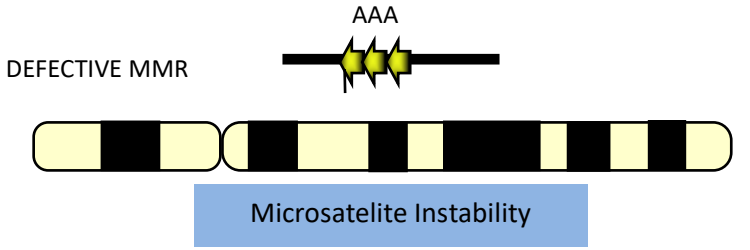
National Comprehensive Cancer Network (NCCN) Clinical Practice Guidelines in Oncology, Version 2.2015 Colon Cancer, COL-D, 2015. Version 2.2015, 34 (2015).

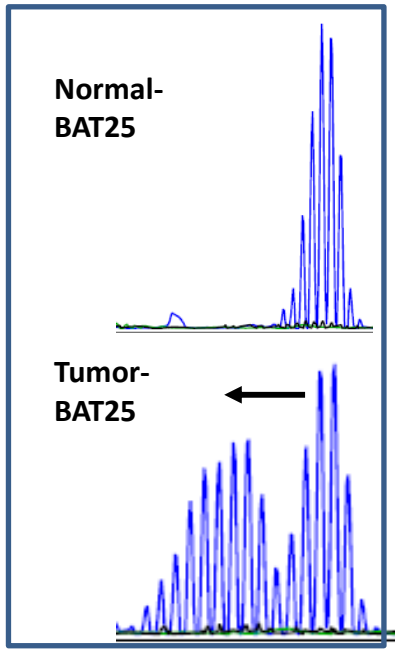
MMR/MSI Testing : IHC or MSI

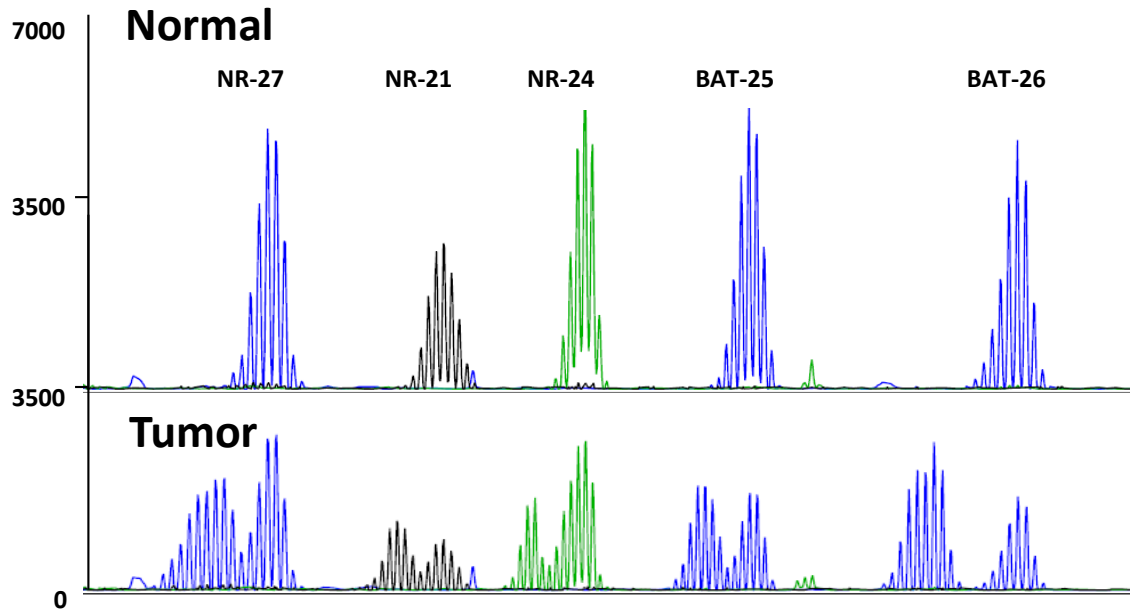




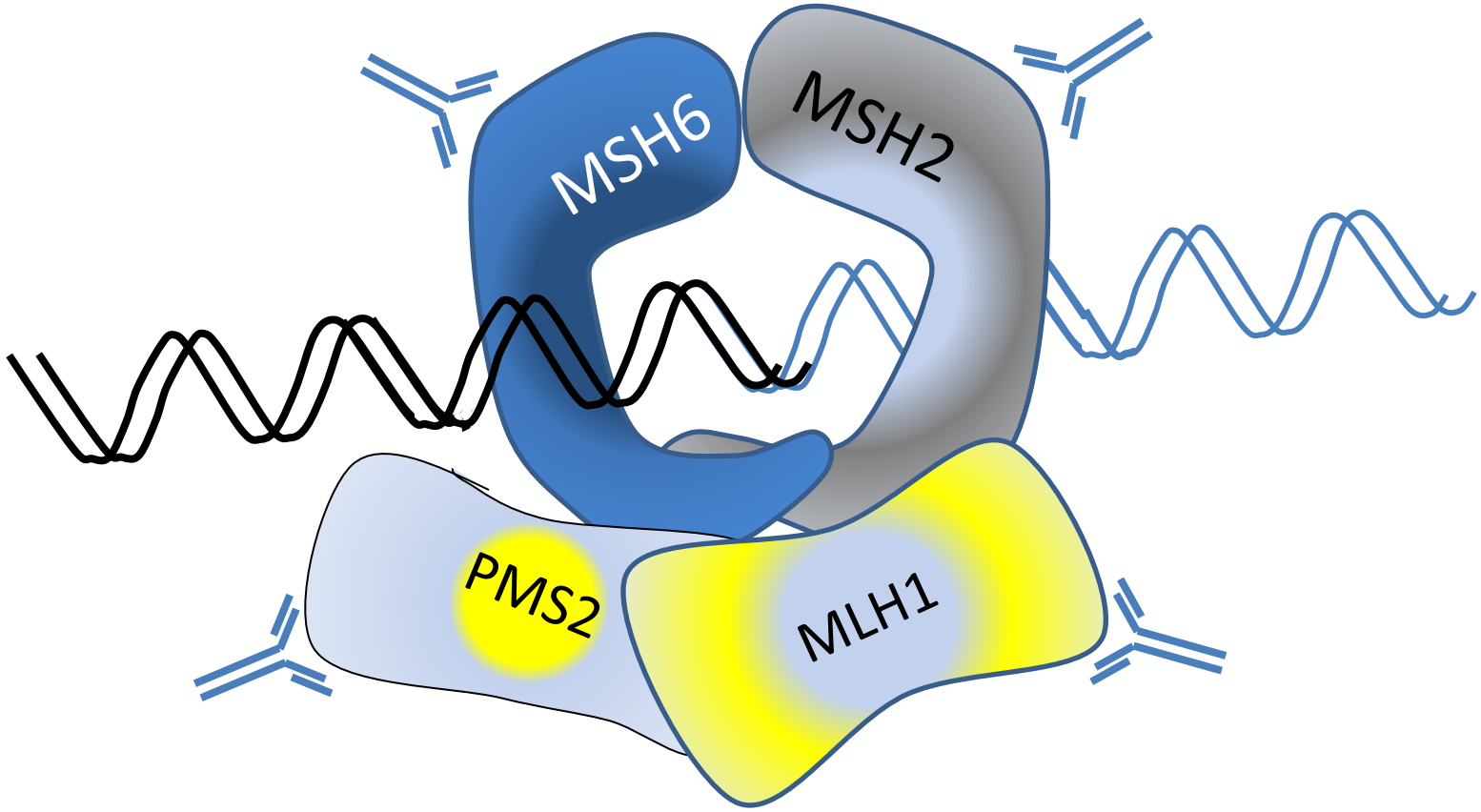


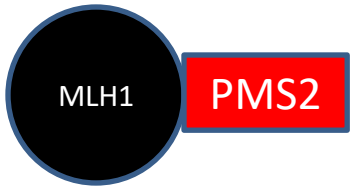


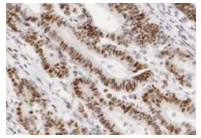
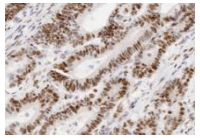
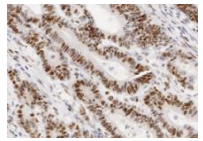
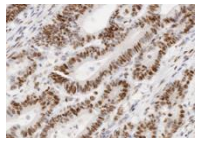




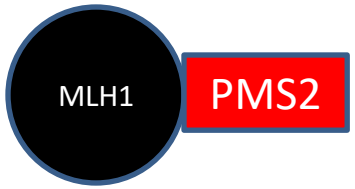
Clinical Analysis of MMR: Immunohistochemistry

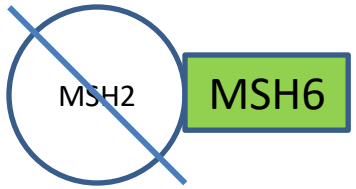


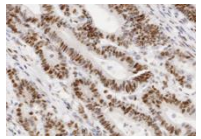
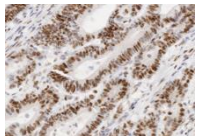
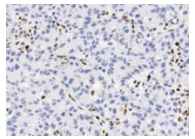
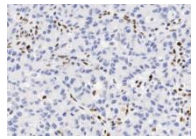


	MLH 1 IHC	PMS2 IHC	MSH2 IHC	MSH6 IHC
NO MUTATION				

Sepulveda, A., http://cme.medscape.com/viewarticles/57610





	MLH 1 IHC	PMS2 IHC	MSH2 IHC	MSH6 IHC
MSH2 Mutation				

MSH6 depends upon MSH2 for stability

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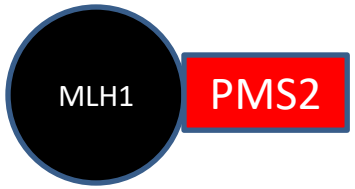

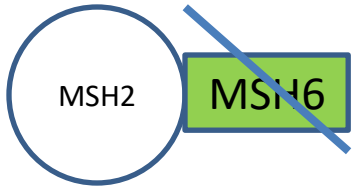

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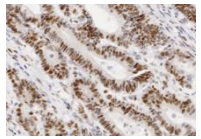
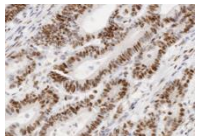
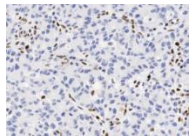
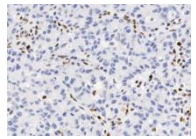
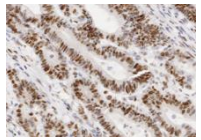
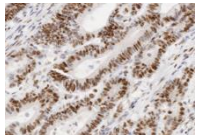
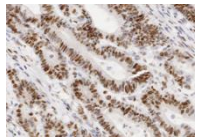
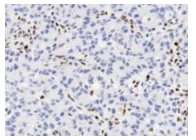
MSH2 Mutation				
MSH6 Mutation				

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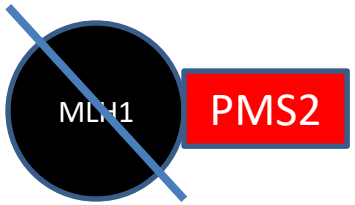

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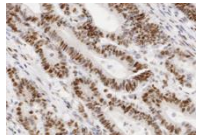
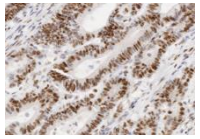
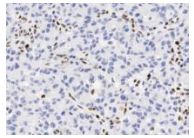
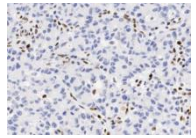
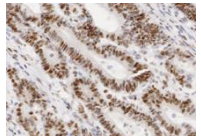
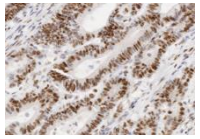
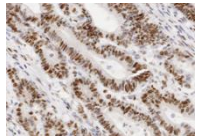
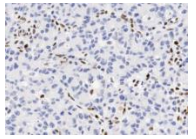
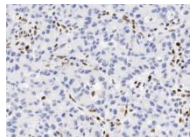
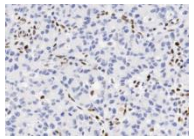
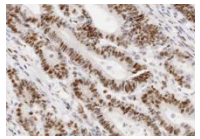
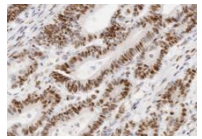
MSH2 Mutation				
MSH6 Mutation				
MLH1 Mutation				

Most common pattern and frequently seen in somatic MSI CRC

PMS2 depends upon MLH1 for stability

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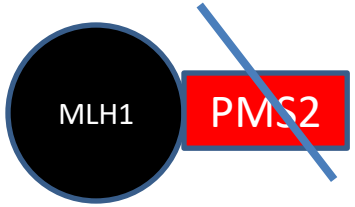

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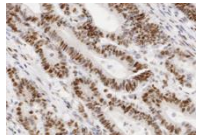
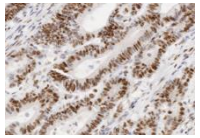
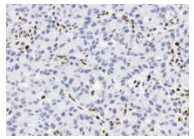
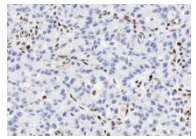
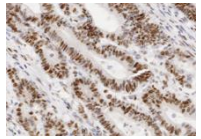
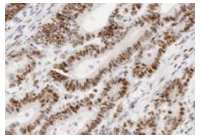
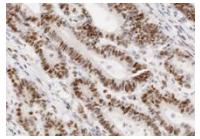
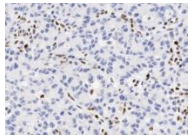
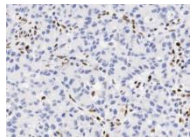
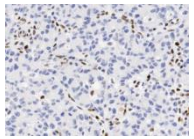
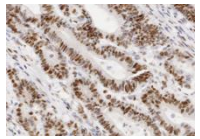
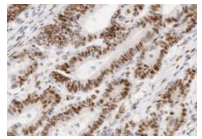
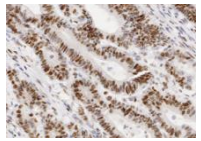
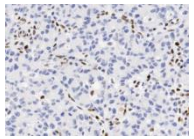
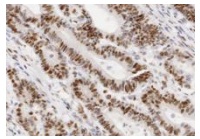
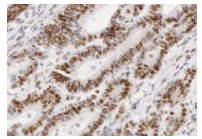
MSH2 Mutation				
MSH6 Mutation				
MLH1 Mutation				
PMS2 Mutation				

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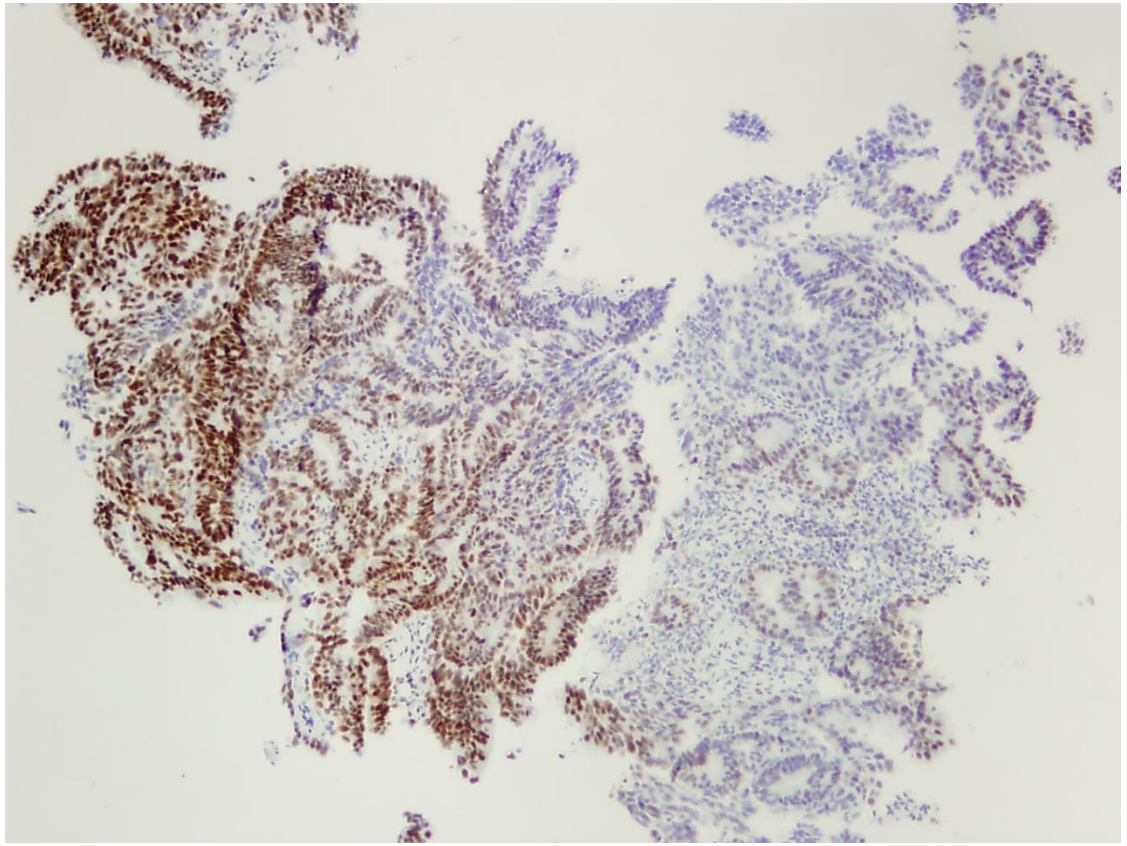
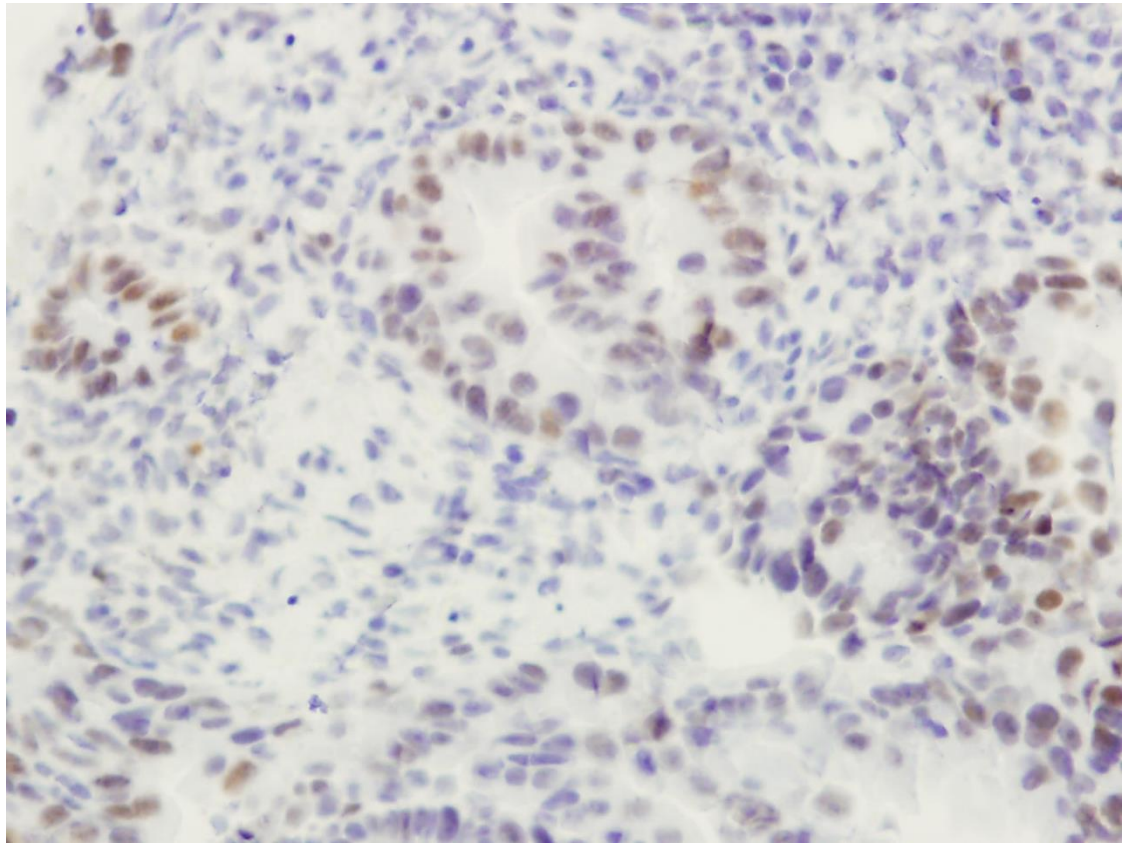
Patterns of Staining

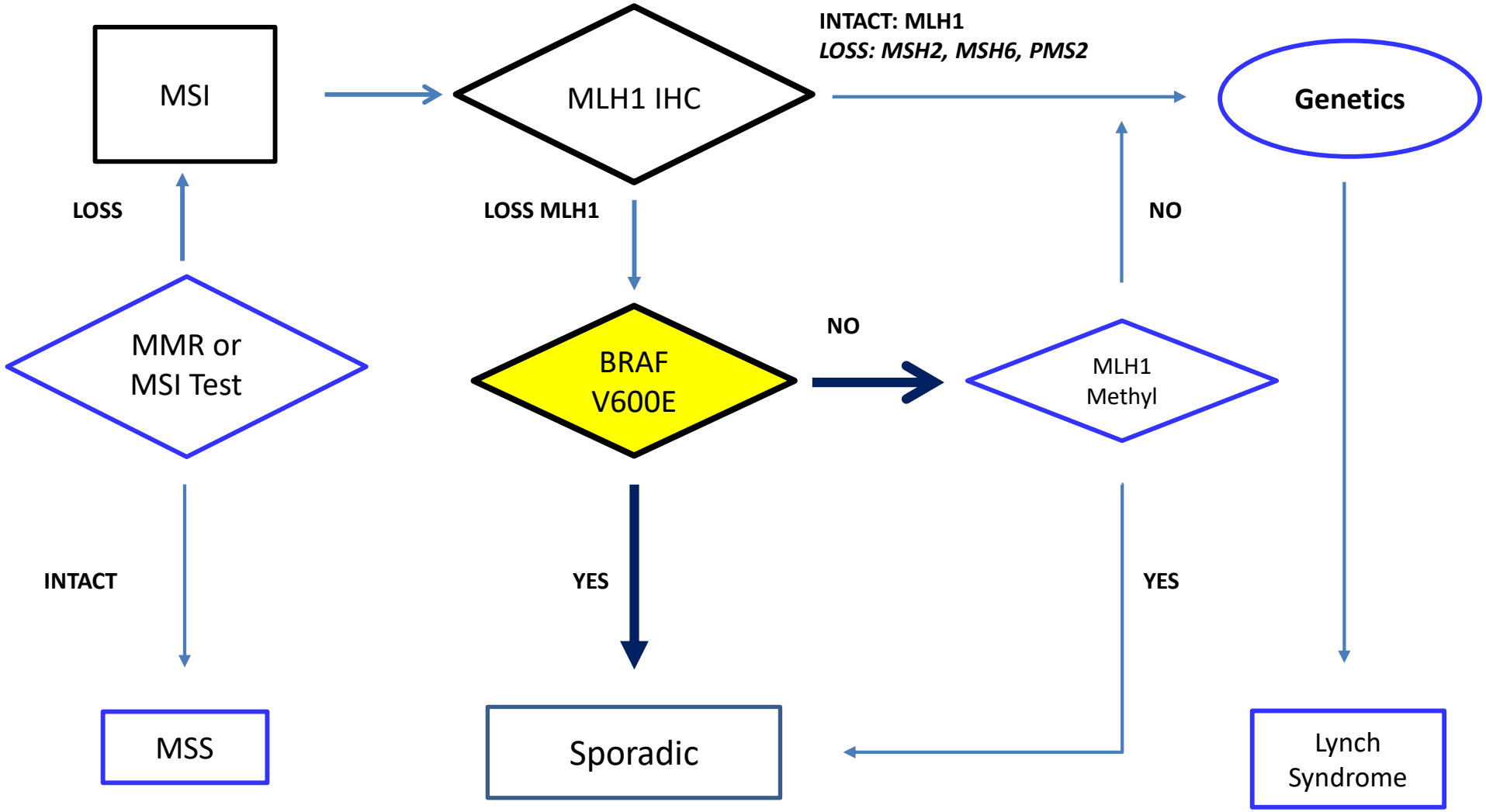
MLH1	PMS2	MSH2	MSH6	Clinical Interpretation	Confirmation Testing
+	+	+	+	Sporadic cancer	*
-	-	+	+	LS or sporadic cancer	BRAF V600E MLH1 hypermethylation MLH1 mutation
+	+	-	-	Need to rule out LS	MSH2 mutation
+	+	+	-	Need to rule out LS	MSH6 mutation
+	-	+	+	Need to rule out LS	PMS2 mutation



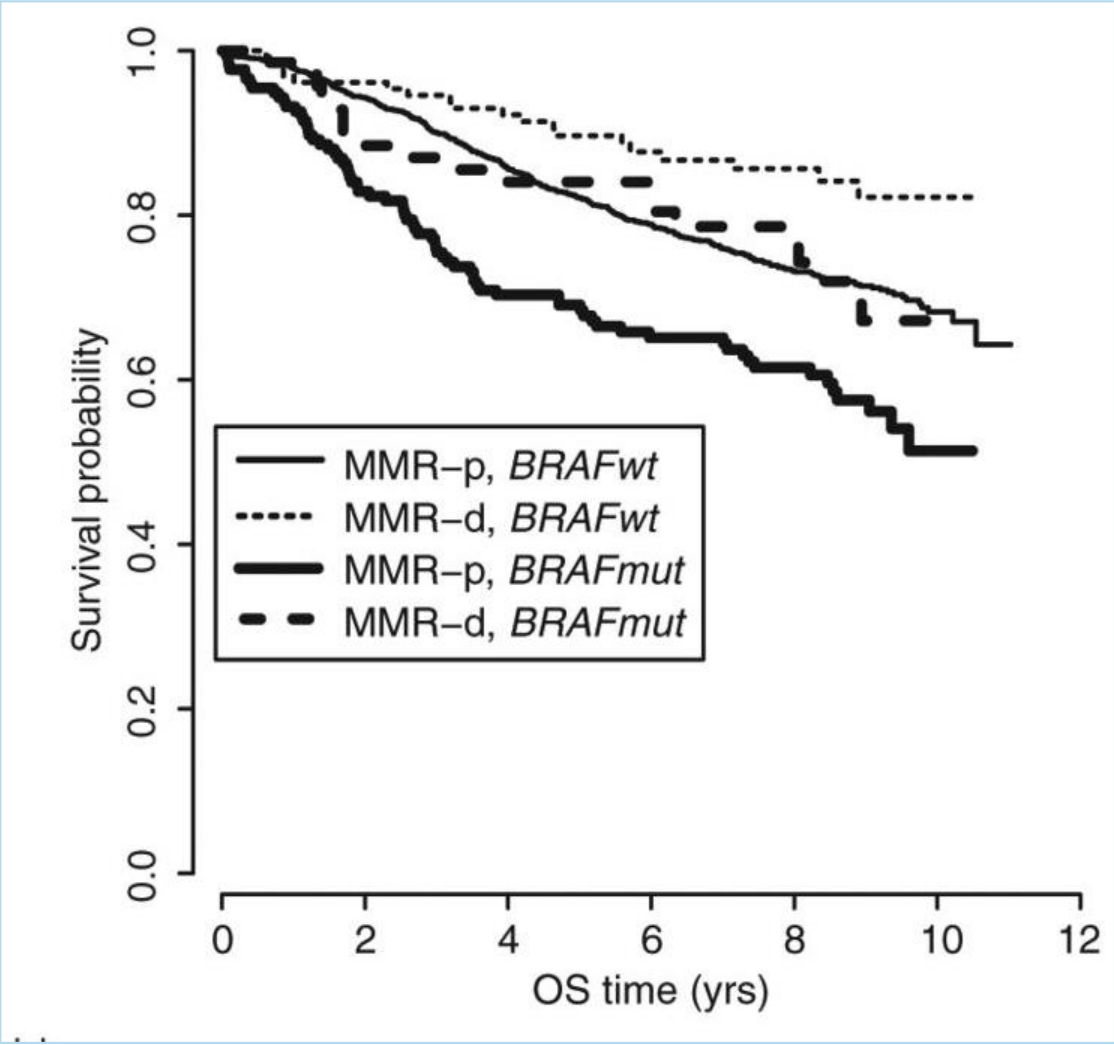


Challenges with IHC

Role for BRAF V600E testing to rule out LS in MLH1 deficient CRC



BRAF V600E negatively affects prognosis in CRC



MMR	BRAF	Prognosis
Deficient	WT	Good
Deficient	Mutant	Intermediate
Proficient	WT	Intermediate
Proficient	Mutant	Worse

Gavin, P., CCR, V18(23), pp. 6531-6541, 2012

Conventional MSI Testing and Reporting

Technology Type:

- Most labs use commercial kits or LDT
- PCR followed by capillary electrophoresis

Technique Basics:

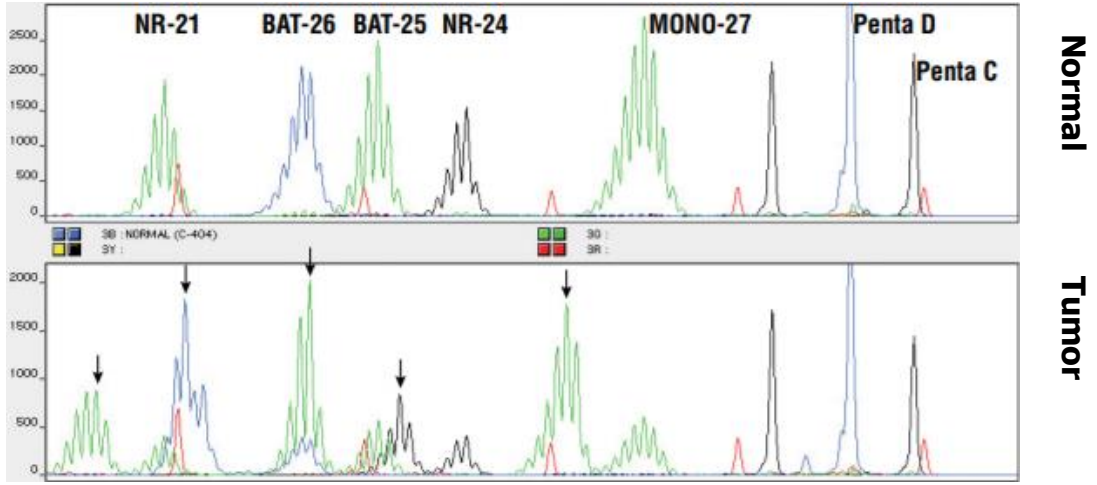
Determine if MSI is present at microsatellite loci

Mononucleotide markers: NR-21, NR-24, BAT-25, BAT-26, MONO-27

LDTs normally use a similar set of markers

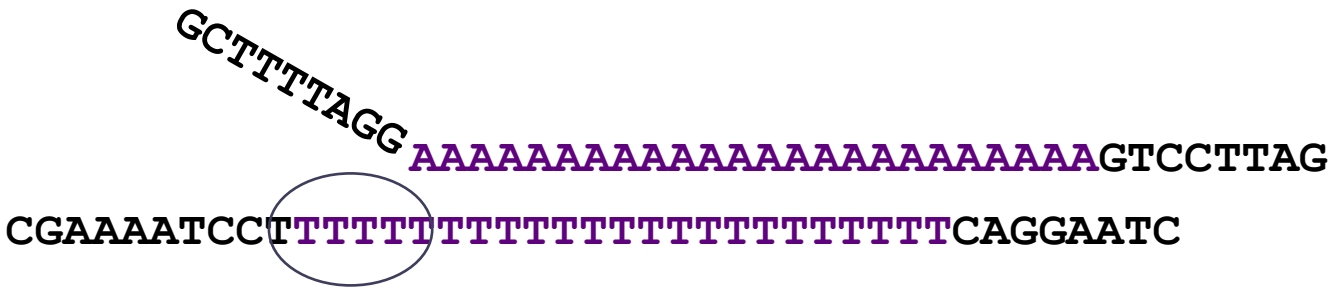
Test Result Outcomes:

- MSS: 0 markers have MSI
- MSI-L: 1 marker has MSI
- MSI-H: ≥ 2 markers have MSI



Normal or Tumor Cell with Intact MMR System: Repairs the mismatch error

Tumor Cell with DEFECTIVE MMR System: Mutations accumulate



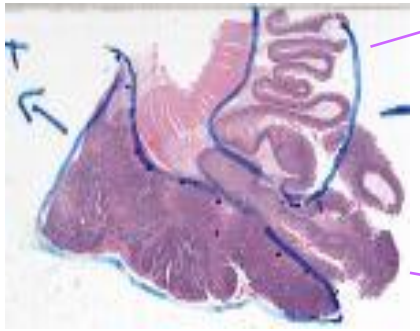
Loss of TTTTT

Deficient MMR
No repair of deletion
MSI is observed

GCTTTTAGGAAAAAAAAAAAAAAAAAAAGTCCTTAG
CGAAAATCCTTTTTTTTTTTTTTTTTTTTTTTTCAGGAATC

Microsatellite is shortened by -5 bp (19 A's)

Microsatellites are sensitive markers of defective MMR function



Normal tissue

GCTTTTAGGAAAAAAAAAAAAAAAAAAAAAAGTCCTTAG
CGAAAATCCTTTTTTTTTTTTTTTTTTTTTTTCAGGAATC

20 A's

Tumor tissue

GCTTTTAGGAAAAAAAAAAAAAAAAAGTCCTTAG
CGAAAATCCTTTTTTTTTTTTTTTTTTCAGGAATC

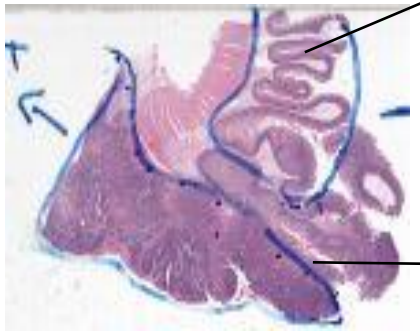
15 A's

Testing of Mononucleotide Microsatellites

Examine 5 mononucleotide microsatellite markers

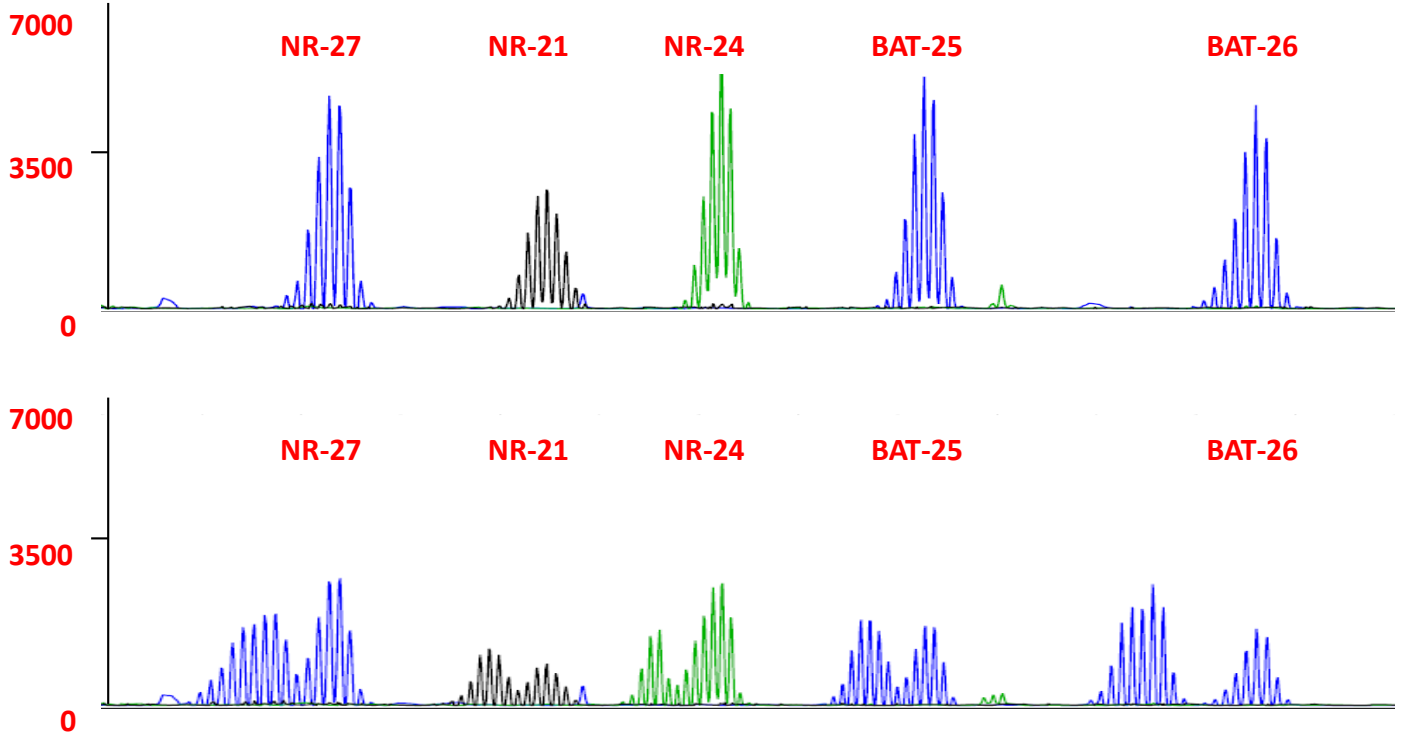
Two tissue samples are tested: Normal and Tumor

Compare the lengths of the tumor and normal microsatellites



Normal

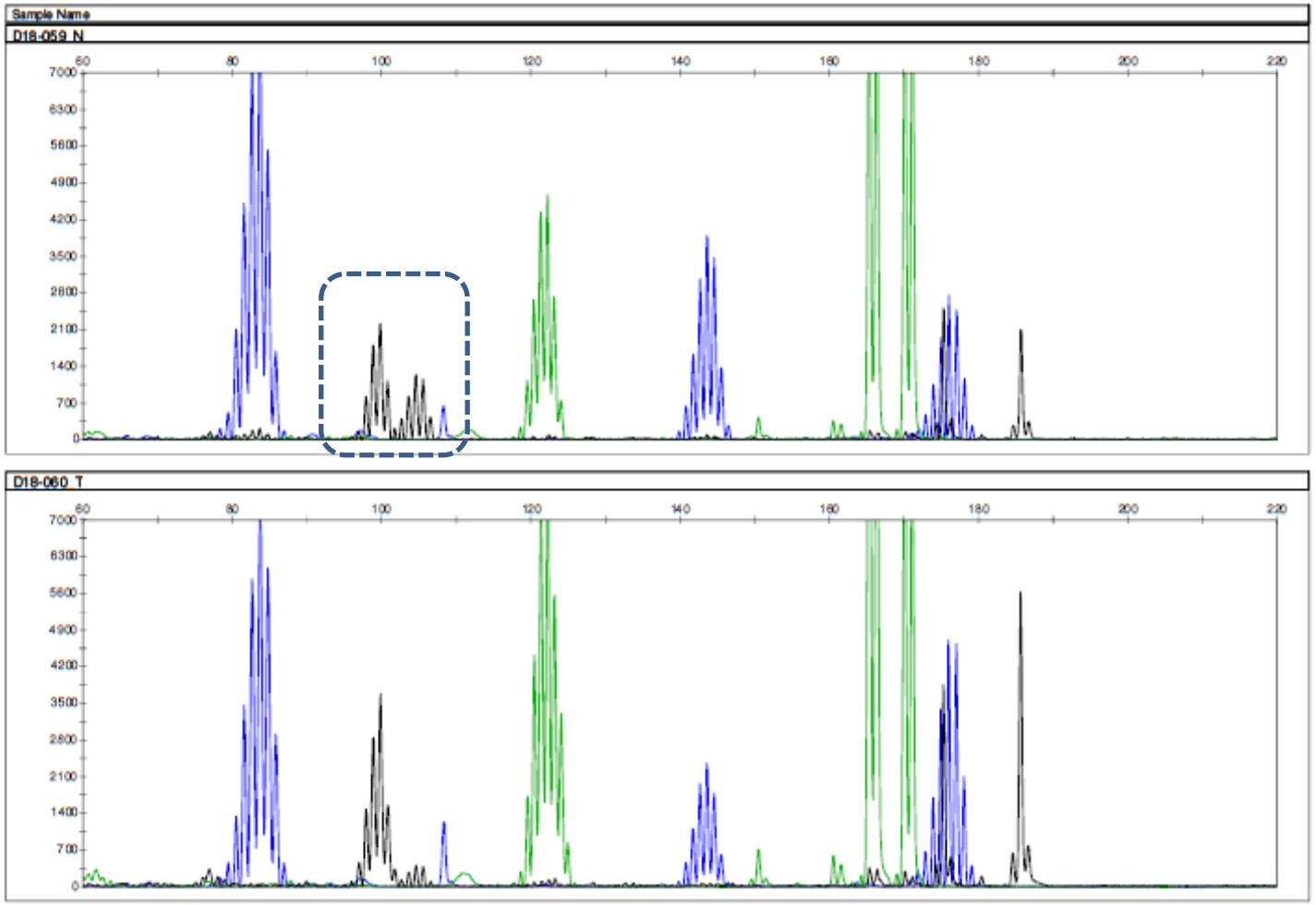
Tumor



Testing of Normal and Tumor Tissue

Normal

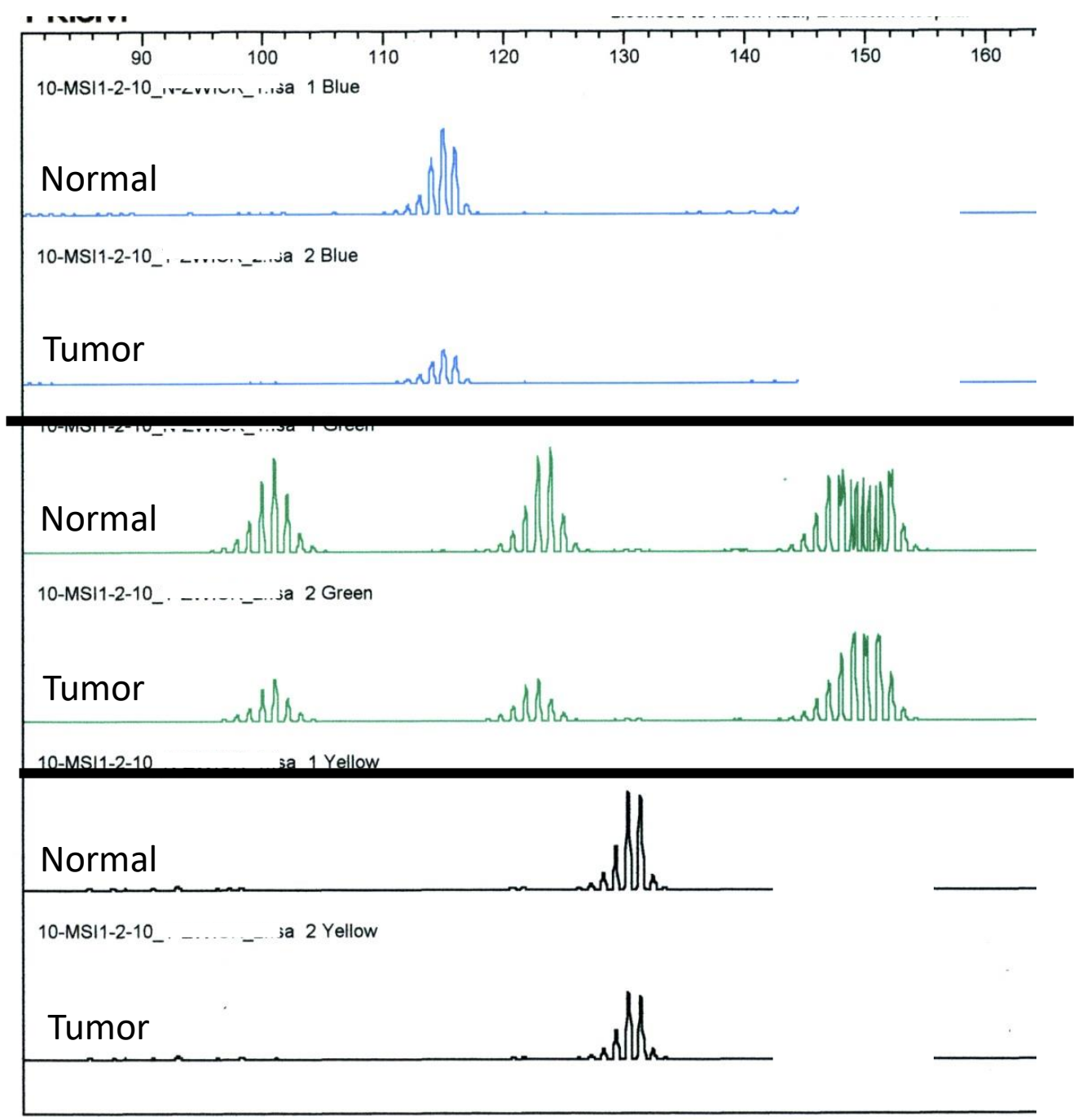
Tumor



Rarely, individuals are heterozygous: 2 differently sized microsatellite alleles

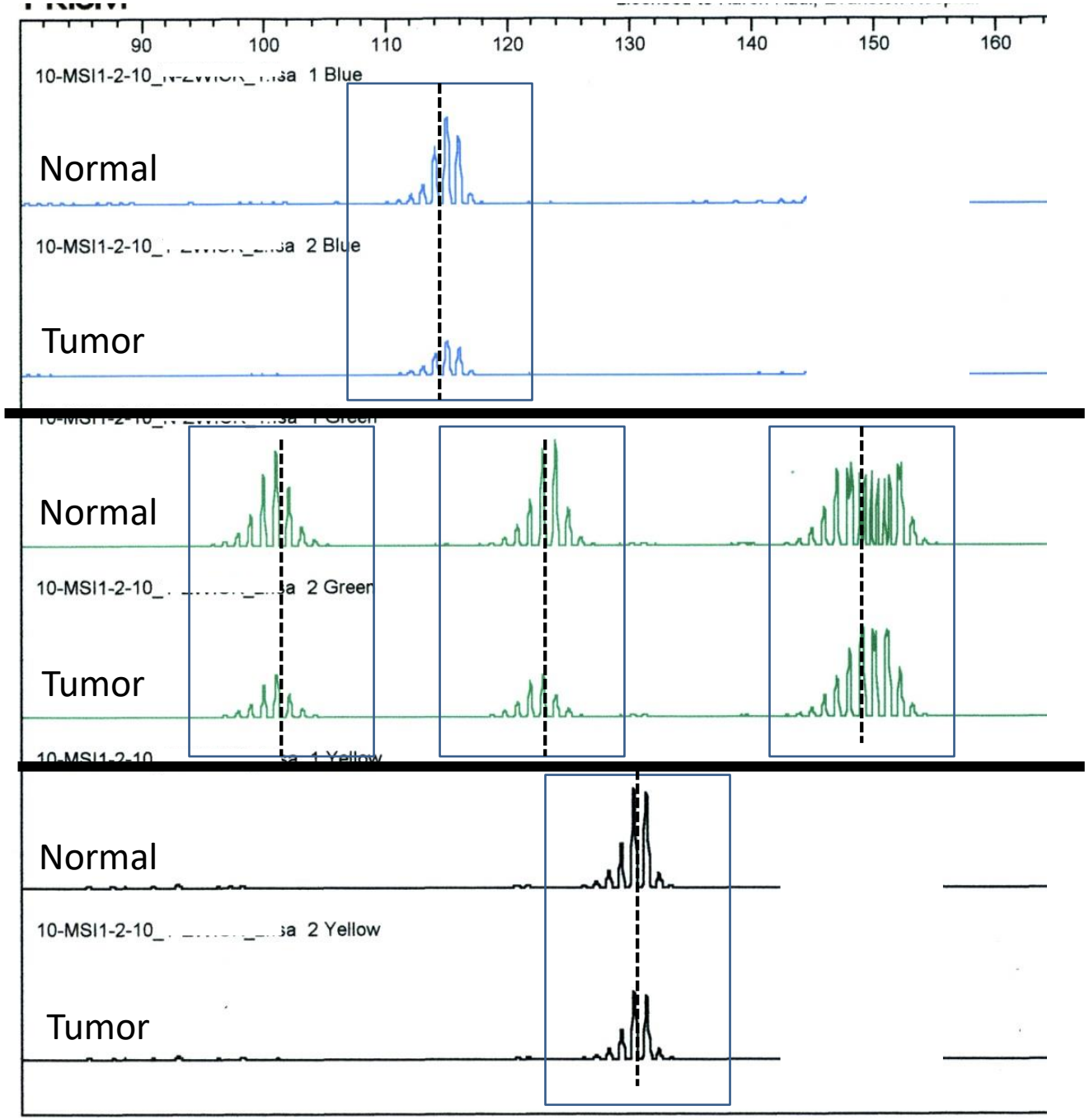
Case 1

41 year old male with rectal adenocarcinoma



Microsatellite stability is observed in all 5 markers

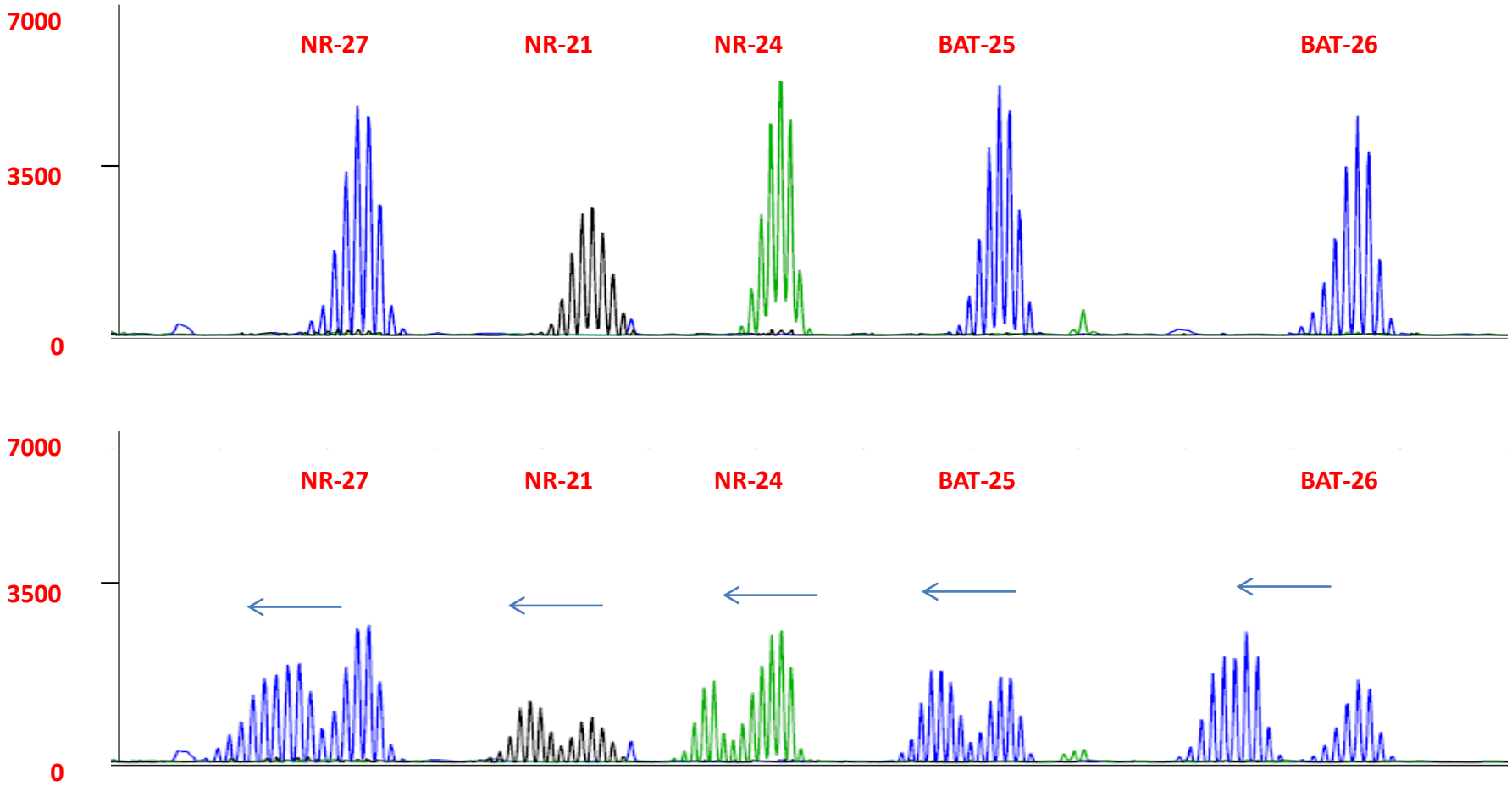
MSS



Case Example 2

- 47 year old female
- Adenocarcinoma in proximal colon
- Poorly differentiated with mucinous features

Microsatellite Instability at 5 out of 5 loci



Traditional PCR Based Diagnostic Testing

Pre-analytical

Analytical (1-2 days)

Post-analytical

Indication for testing

Surgical Pathologist
Molecular Pathologist

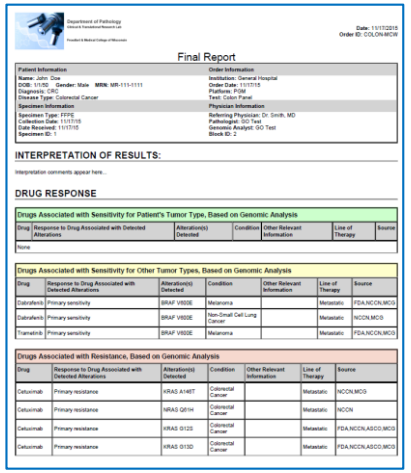
DNA Prep — *Molecular Technician*

PCR — *Reagents*

Analysis — *Equipment*

Review — *Computers*

Clinical
Interpretation



Final Report

INTERPRETATION OF RESULTS:

DRUG RESPONSE

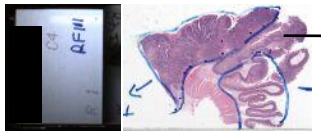
Idylla real time PCR system: Rapid Molecular Diagnostic Testing

Pre-analytical

Analytical (2-3 hours)

Post-analytical

Indication for testing



Tumor

Surgical Pathologist
Molecular Pathologist

DNA Prep — *Molecular Technician*

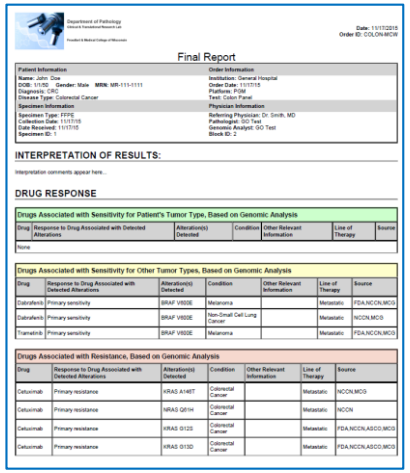
Testing — *Reagents*

Test Analysis — *Equipment*

QC review — *Computers*, *Software*

Analytics — *Database*, *IT Support*

Clinical
Interpretation



Final Report

INTERPRETATION OF RESULTS:

DRUG RESPONSE

Tissue → ***On-board*** → ***Results***

The Idylla MSI Test

Key Characteristics

1. MSI detection based on 7 novel biomarkers
2. Results available in 150 minutes
3. Less than 2 minutes of hands-on time
4. Directly on FFPE tissue sections
5. No need for normal tissue sample
6. PCR based assay

Specimen Requirements

5 µm FFPE glass mounted tissue section

10 µm FFPE tissue section (CURLS)

Neoplastic cell content

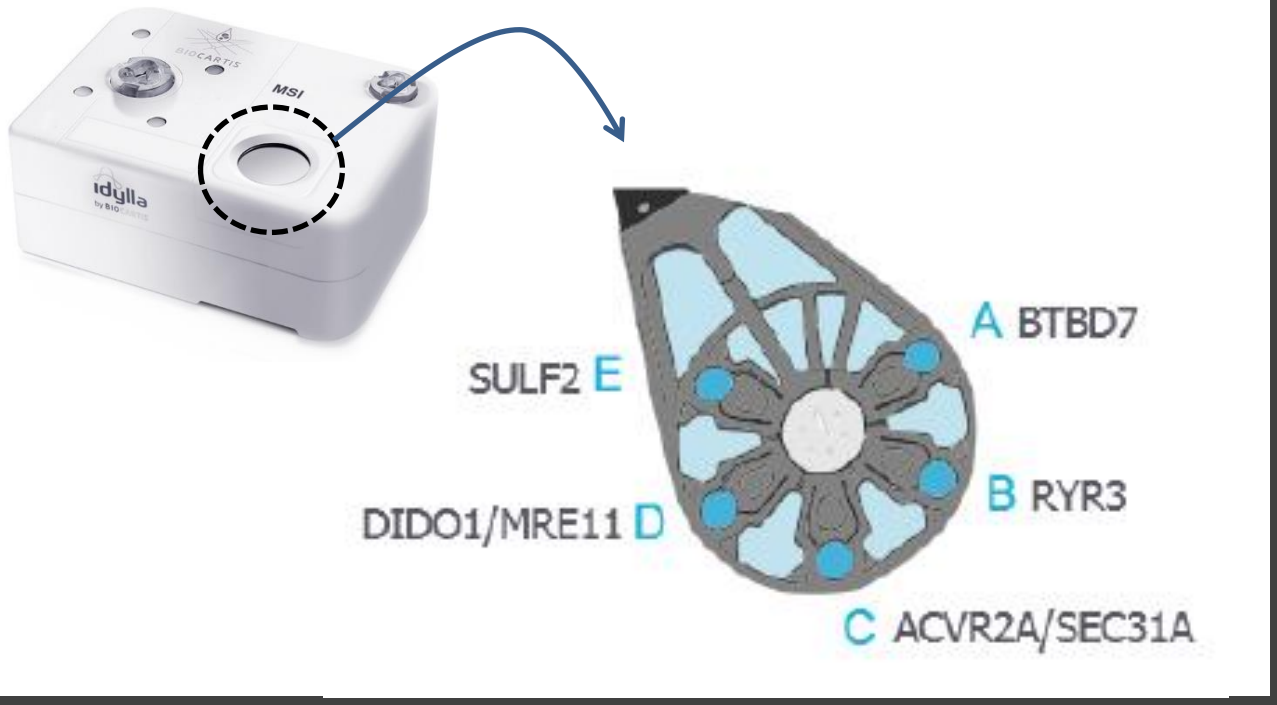
(if < 20%, macro-dissection needed)

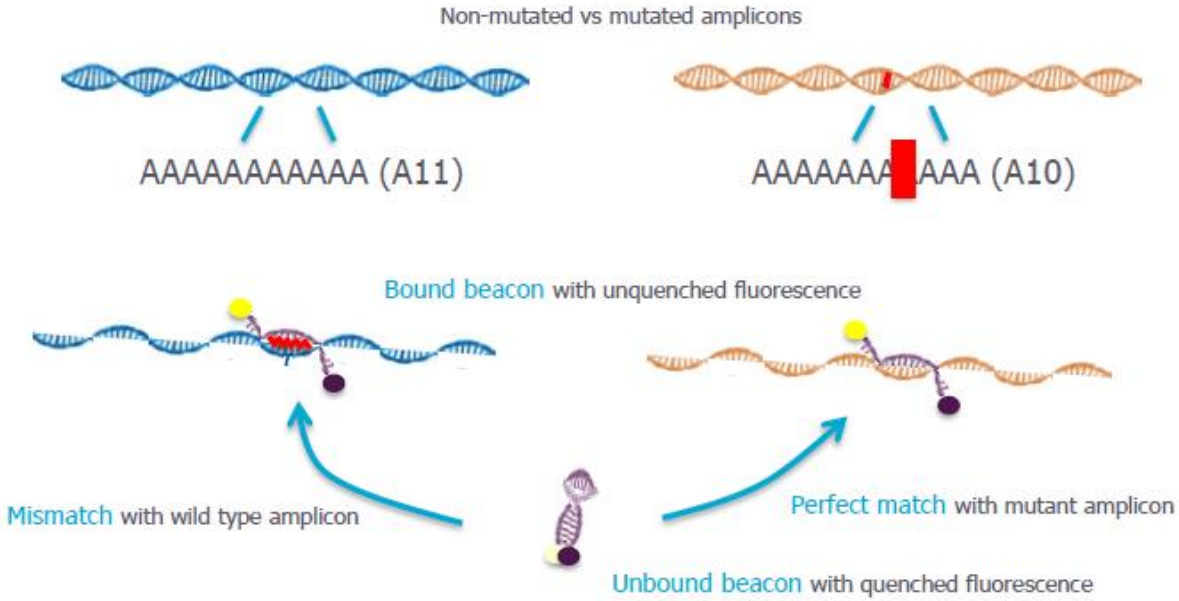
Idylla MSI Biomarkers

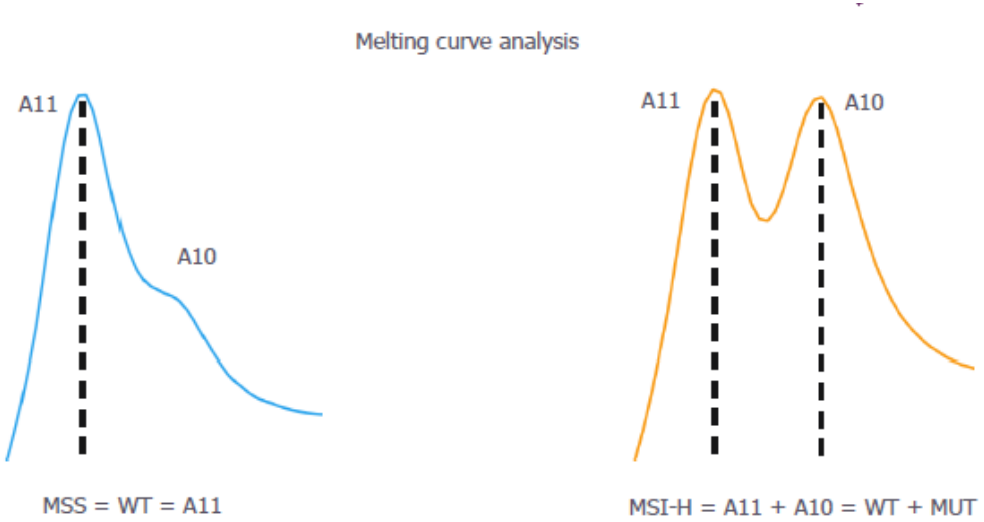
7 homopolymers frequently mutated in MSI-H cancers

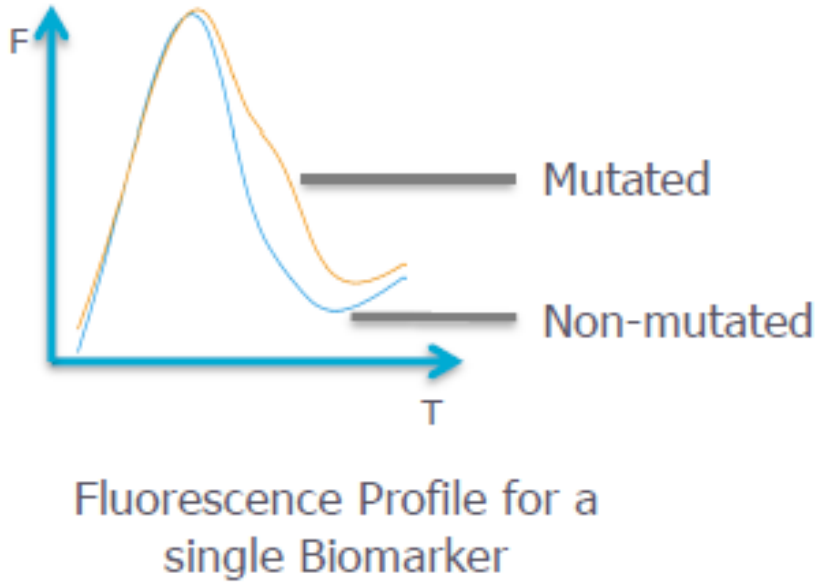
ACVR2A	*SULF1*	
SEC31A	*BTBD7*	*MRE11*
DIDO1	*RYR3*	

These biomarkers are different from the Bethesda markers


MSI
idylla
A BTBD7
B RYR3
C ACVR2A/SEC31A
D DIDO1/MRE11
E SULF2


Non-mutated vs mutated amplicons
AAAAAAAAAAA (A11)
AAAAAAAAAA (A10)
Bound beacon with unquenched fluorescence
Mismatch with wild type amplicon
Perfect match with mutant amplicon
Unbound beacon with quenched fluorescence


Melting curve analysis
A11
A10
MSS = WT = A11
A11
A10
MSI-H = A11 + A10 = WT + MUT


F
T
Mutated
Non-mutated
Fluorescence Profile for a single Biomarker

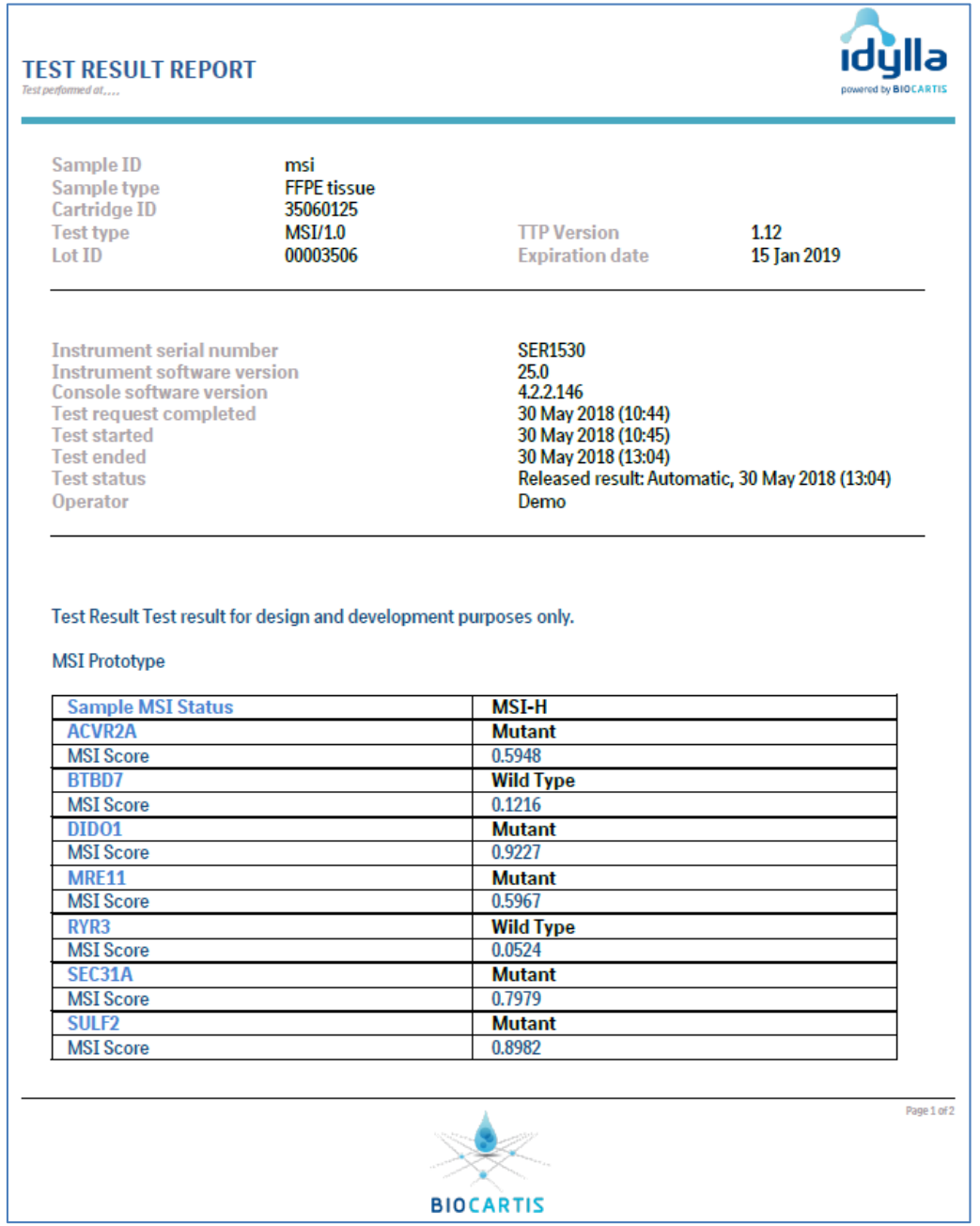
Idylla™ MSI Result Report

The Idylla™ MSI Assay will make an individual mutation call for each of the 7 biomarkers

- Mutation Detected
- No Mutation Detected
- Invalid

The Idylla™ MSI Assay will also make an overall MSI determination:

- **MSI-H** → ≥2 of the 7 markers are mutant
- **MSS** → <2 of the 7 markers are mutant
- **Invalid** → >2 of the 7 markers are invalid



TEST RESULT REPORT

Test performed at,...,

idylla powered by BIOCARTIS

Sample ID	msi		
Sample type	FFPE tissue		
Cartridge ID	35060125		
Test type	MSI/1.0	TTP Version	1.12
Lot ID	00003506	Expiration date	15 Jan 2019

Instrument serial number	SER1530
Instrument software version	25.0
Console software version	4.2.2.146
Test request completed	30 May 2018 (10:44)
Test started	30 May 2018 (10:45)
Test ended	30 May 2018 (13:04)
Test status	Released result: Automatic, 30 May 2018 (13:04)
Operator	Demo

Test Result Test result for design and development purposes only.

MSI Prototype

Sample MSI Status	MSI-H
ACVR2A	Mutant
MSI Score	0.5948
BTBD7	Wild Type
MSI Score	0.1216
DIDO1	Mutant
MSI Score	0.9227
MRE11	Mutant
MSI Score	0.5967
RYR3	Wild Type
MSI Score	0.0524
SEC31A	Mutant
MSI Score	0.7979
SULF2	Mutant
MSI Score	0.8982

Page 1 of 2

BIOCARTIS

1

MCW Idylla MSI Validation Data

Idylla vs. MCW Lab Developed MSI and MMR IHC Colorectal Cancer Sample Comparison

Validation Design:

- 50 CRC FFPE samples were analyzed by Idylla MSI and MCW MSI and MMR IHC
- All samples analyzed by three methods

Study Results:

- MSI results were available for 50 samples – Overall concordance was 100% (50/50)
  - PPA = 100% (40/40)
  - NPA = 100% (10/10)
- Comparison to IHC: 100% (10/10) samples were concordant
- Overall Failure Rates:
  - MCW Assays = 0%
  - Idylla = 0%

Idylla™ MSI Data Overview: All Centers

Over 3,000 clinical samples tested to date

Study	Format	Cancer Type	# Samples	Comparison Technology	Overall Concordance	Invalid Rates (Idylla vs. Promega)
MCW, 2018	**Abstract**	**CRC**	**N=50**	**LDT**	**100%**	**0%**
Claes B. et al. ASCO 2015	*Abstract*	*CRC*	*N = 70*	*Promega*	*98.3%*	*9% vs 16%*
De Craene B. et al. ESMO 2017	*Poster*	*Gastric*	*N = 85*	*Promega*	*100%*	*0% vs 10.6%*
Maertens G. et al. ESMO 2017	*Poster*	*CRC*	*N = 201*	*Promega*	*93.6%*	*4% vs 11.9%*
De Craene B. et al. ASCO 2018	*Online Abstract*	*CRC*	*N = 348*	*Promega*	*96.1%*	*3.4% vs 3.4%*

Summary of Idylla™ MSI Test

- >95% concordance of the 7 novel MSI biomarkers with commercial and LDT PCR tests and IHC
- Fast and reliable information on MSI status
- Unbiased result reporting
- Significantly lower failure rate compared to standard of care molecular methods
- No need for normal tissue samples

The MSI Test is currently in development. Product characteristics mentioned are anticipated but not yet validated.

(1) De Craene B. et al. Idylla MSI in gastric samples. ESMO 2017 poster 697P
(2) Maertens G. et al. Idylla MSI in CRC. ESMO 2017 poster 138P
(3) Data based on internal research data

Thank you very much!

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