

First name  
**John**  
Last name  
**Doe**

Date of Birth

Gender  
**Male**

Patient ID

Ordering Physician  
**Dr.**

Pathology  
**Colorectal cancer**

Specimen selected by  
**Laboratory Clinic**

Specimen ID:  
Specimen Type: Excisional Biopsy  
Preservation method: FFPE  
Specimen Collected: - Specimen  
Received: -

// Conclusion

Given the actionable biomarkers identified in the patient, a suggested therapy can be combination of Cetuximab and Encorafenib, Ipilimumab and Nivolumab, and Pembrolizumab. Additional systemic therapy to be considered. Patient needs to be re-assessed for clinical progression.

// Overview

Result <b>Actionability identified</b>	Tumor cell % <b>40%</b>	MSI status <b>High</b>	TMB (all) <b>46.2 mut/Mb</b>	TMB (non-synonymous) <b>36.2 mut/Mb</b>
<b>3</b> Actionable biomarkers	<b>4</b> Therapies with potential benefit <b>in tumor</b>	<b>0</b> Therapies with potential benefit <b>in different tumor</b>	<b>0</b> Therapies with lack of potential benefit	

// Summary

SOPHiA application: TruSight Oncology 500

About the test: -

Referral reason: Colorectal cancer

Actionable biomarkers	Therapies with potential benefit <b>in tumor</b>	Therapies with potential benefit <b>in different tumor</b>	Therapies with lack of potential benefit
BRAF V600E	<b>Cetuximab + Encorafenib</b>	-	-
MSI high	<b>Ipilimumab + Nivolumab, Pembrolizumab</b>	-	-
TMB high	<b>Pembrolizumab</b>	-	-

**0** Prognostic biomarkers

**0** Diagnostic biomarkers

**0** Biomarkers with potential clinical significance

// Patient clinical history

John is a 56 years old male with metastatic colorectal cancer. This patient presented with a 2-month history of bloating and abdominal discomfort. His last colonoscopy was about 2 years ago and was negative, and he also had some unintentional weight loss. With regard to his past medical history, it's significant only because of high blood pressure, which is controlled with lisinopril.

// Reported variants

Actionable variants in patient's tumor type

**BRAF** NM\_004333.5:c.1799T>A, p.(Val600Glu)

BRAF V600E

Variant fraction

16.5%

Exon

15

Coding consequence

missense

Depth

2208

Genomic position

GRCh37/hg19

Chr7:140453136

Classification

Pathogenic

ClinVar

Drug response

[rs1219913440](#)

Association type

Therapeutic

AMP/ASCO/CAP Classification

IA

Actionable variants in different tumor type

None reported

Other variants with potential clinical significance

None reported

// Other reported variants

None reported

// Reported therapies

Patient's tumor type

**Cetuximab + Encorafenib** (IMC-C225, LGX818)

EGFR Antibody  
BRAF Inhibitor

Approval status  
**FDA approved - On  
Companion Diagnostic**

Molecular profile  
**BRAF V600E**

Disease  
**Colorectal cancer**  
sensitive

Reference  
**PMID: [31566309](#)**

**Ipilimumab + Nivolumab** (BMS-734016 + MDX-1106, BMS-936558)

CTLA4 Antibody, Immune Checkpoint Inhibitor  
Immune Checkpoint Inhibitor, PD-L1/PD-1 antibody

Approval status  
**FDA approved**

Molecular profile  
**MSI high**

Disease  
**Colorectal cancer**  
sensitive

Reference  
**PMID: [29355075](#)**

**Pembrolizumab** (MK-3475)

Immune Checkpoint Inhibitor, PD-L1/PD-1 antibody

Approval status  
**FDA approved**

Molecular profile  
**MSI high**

Disease  
**Colorectal cancer**  
sensitive

Reference  
**PMID: [33264544](#)**

Approval status  
**FDA approved - On  
Companion Diagnostic**

Molecular profile  
**TMB high**

Disease  
**Advanced Solid Tumor**  
sensitive

Reference  
**PMID: [30787022](#)**

**Vemurafenib** (RO5185426|PLX4032)

RAF Inhibitor (Pan)

Approval status  
**Phase II**

Molecular profile  
**BRAF V600E**

Disease  
**Colorectal cancer**  
no benefit

Reference  
**PMID: [20179705](#)**

Different tumor type

None reported

// Interpretation

## BRAF V600E

Tier IA

Clinical Associations

### Cetuximab + Encorafenib

In a Phase III (BEACON CRC) trial that supported FDA approval, Braftravi (encorafenib) and Erbitux (cetuximab) combination treatment (n=113) resulted in improved median overall survival (8.4 vs 5.4 months, HR=0.60, p<0.001), confirmed response rate (20% vs 2%, p<0.001), and median progression-free survival (4.2 vs 1.5 months, HR=0.40, p<0.001) compared to control (n=107) in patients with metastatic colorectal cancer harboring BRAF V600E (PMID: 31566309; NCT02928224).

### Vemurafenib

In a Phase II trial (MyPathway), Zelboraf (vemurafenib) treatment resulted in an objective response of 46% (12/26, 2 complete response, 10 partial response) in patients with advanced solid tumors harboring BRAF V600E, but only 4% (1/23, 1 partial response) in patients harboring non-V600 BRAF mutations (PMID: 29320312; NCT02091141).

Biomarker Description(s)

BRAF V600E (previously reported as V599E) lies within the activation segment of the kinase domain of the Braf protein (PMID: 15035987). V600E confers a gain of function to the Braf protein as demonstrated by increased Braf kinase activity, downstream signaling, and the ability to transform cells in culture (PMID: 15035987, PMID: 29533785).

BRAF NM\_004333.5:c.1799T>A, p.(Val600Glu)

## MSI high

Tier IA

Clinical Associations

### Ipilimumab + Nivolumab

In a Phase II (CheckMate 142) trial that supported FDA approval, Opdivo (nivolumab) and Yervoy (ipilimumab) combination treatment resulted in an objective response rate of 54.6% (65/119), 4 complete response, 61 partial response, and disease control for more than 12 weeks in 80% of patients with DNA mismatch repair-deficient (dMMR), microsatellite instability-high (MSI-H) metastatic colorectal cancer, regardless of BRAF and KRAS mutational status (PMID: 29355075; NCT02060188).

### Pembrolizumab

In a Phase II (KEYNOTE-164) trial that supported FDA approval, Keytruda (pembrolizumab) treatment resulted in an objective response rate of 32% (20/63, 2 complete responses, 18 partial responses), a median progression-free survival of 4.1 months in patients with advanced microsatellite instability-high (MSI-H) colorectal cancer whose disease progressed after more than 1 line of therapy (Annals of Oncology, Volume 29, Issue suppl\_5; NCT02460198).

Biomarker Description(s)

MSI high indicates a high level of microsatellite instability.

MSI high

## TMB high

Tier IA

Clinical Associations

Pembrolizumab

In a retrospective analysis of a Phase II trial (KEYNOTE-158) that supported FDA approval, Keytruda (pembrolizumab) treatment resulted in superior objective response rate (28.3% vs 6.5%) in adult and pediatric patients with TMB high (TMB  $\geq$  10 mut/Mb, n=120) advanced solid tumors compared to patients with TMB low (TMB  $<$  10 mut/Mb, n=635) tumors (Ann Oncol, 30 (Suppl 5), Oct 2019, v477-v478; NCT02628067).

### Biomarker Description(s)

TMB high indicates a high tumor mutational burden.

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### Gene description(s)

#### **BRAF**

BRAF, serine/threonine-protein kinase B-raf, is a member of the Raf family of serine/threonine protein kinases, which signals through the MAP kinase pathway to regulate cell proliferation and cell growth (PMID: 24737949, PMID: 29540830). BRAF mutations and fusions have been identified in a variety of cancers, including, colorectal (PMID: 30122982), lung (PMID: 29729495), thyroid (PMID: 12970315), and melanoma (PMID: 24737949), and a number of mutations have also been demonstrated to confer drug resistance (PMID: 27478040).

// Methodology

SOPHiA application

**TSO500**

SOPHiA DDM

**5.10.4--b131-b74ec54**

Pipeline ID/Revision number/Splitting ID

**LL1XG1G2\_CNV\_exome\_1 / v5.5.34 /**

**GEN1GN1FSQ2**

Reference genome

**GRCh37/hg19**

Sequencer

**Illumina NextSeq 2000**

Run date

Run name

**Oncology Application**

Analysis ID

MID

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Somatic gene variant annotations and related content have been powered by, without limitation, The Jackson Laboratory Clinical Knowledgebase (JAX-CKB™).

Variant classifications present in the report are the responsibility of the report author and approver.

Signature \_\_\_\_\_

Analyzed by

Date

Signature \_\_\_\_\_