

## Neuro-Oncology Expanded Panel with Rearrangement, Tumor (NONCP): Gene Mutations and Rearrangements by Tumor Type

### ADULT AND PEDIATRIC GLIOMAS

#### IDH-Mutant and 1p/19q Codeleted Oligodendroglioma

ARID1A	CDKN2C	CIC
CREBZF	DNMT3A	FUBP1
IDH1	IDH2	NIPBL
NOTCH1	SETD2	TCF12
TERT promoter		

#### IDH-Mutant Infiltrating Astrocytomas (including Secondary Glioblastoma)

ARID2	ATRX	BCOR
DNMT3A	HMCN1	IDH1
IDH2	NOTCH1	PIK3CA
PIK3R1	SMARCA4 (BRG1)	TCF12
TP53	PTPRZ1-MET	

#### IDH-Wild-Type Glioblastoma (Primary Glioblastoma)

ACAN	AOX1	ATRX
BCOR	BRAF	CACNG6 promoter
COL6A3	DNMT3A	EEF1A1
EGFR	F5	GABRA6
HDAC2	HDAC9	HMCN1
IL4R	KEL	LZTR1
MDM2	MLH1	MSH2
MSH3	MSH6	MUC17
NF1	NUP210L	PIK3C2G
PIK3CA	PIK3R1	PLCG1
PTEN	PTPN11	PTPRD
QK1	RB1	RPL5
SEMG1	SETD2	STAG2
TERT promoter	TP53	TPTE2
TRIM28 promoter	TRPA1	BCAN-NTRK1
BTBD1-NTRK3	EGFRvIII	EGFR-SEPT14
ETV6-NTRK3	FGFR1-TACC1	FGFR3-ELAVL3
FGFR3-TACC3	NAV1-NTRK2	NFASC-NTRK1

#### IDH-Wild-Type Lower-Grade Infiltrating Astrocytomas (WHO Grade II and III)

ACAN	AOX1	ATRX
BCOR	BRAF	COL6A3
EEF1A1	EGFR	F5
GABRA6	HMCN1	IL4R
KEL	LZTR1	MUC17
NF1	NUP210L	PIK3C2G
PIK3CA	PIK3R1	PLCG1
PTEN	PTPN11	QKI
RB1	RPL5	SEMG1
SETD2	STAG2	TP53
TPTE2	TRPA1	AFAP1-NTRK2
PTPRZ1-MET		

#### Pediatric High-Grade Diffuse Astrocytic Tumors (including Glioblastoma)

ACVR1 (ALK2)	ATRX	BCOR
BCORL1	BRAF	EGFR
HIST1H3B (H3.1)	HIST1H3C (H3.1)	H3F3A (H3.3)
NF1	PDGFRA	PIK3CA
PIK3R1	POLE (pediatric giant-cell high-grade glioma)	PPM1D
SETD2	TP53	AGBL4-NTRK2 (grade III)
CLIP2-MET (grade IV)	ETV6-NTRK3 (grade III)	TFG-MET (grade IV)
TPM3-NTRK1 (grade III)		

#### Diffuse Midline Gliomas (including Pediatric Diffuse Intrinsic Pontine Glioma)

ACVR1 (ALK2)	ATM	ATRX
BCOR	BCORL1	CHEK2
HIST1H3B (H3.1)	HIST1H3C (H3.1)	H3F3A (H3.3)
NF1	PDGFRA	PIK3CA
PIK3R1	PPM1D	TP53
BTBD1-NTRK3	DIP2C-PDGFRA	VCL-NTRK2

#### Pediatric Low-Grade Diffuse Gliomas

BRAF	FGFR1	FGFR2
FGFR3	GNAQ	KRAS
HIST1H3B (H3.1)	HIST1H3C (H3.2)	H3F3A (H3.3)
MYB	MYBL1	MYB-PCDHGA1
MYBL1-MMP16	SRGAP3-RAF1	

#### Familial IDH-Mutant Diffuse Gliomas

POT1 (germline)
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#### Pilocytic Astrocytoma

ATRX (anaplastic features)	BRAF	CBL
KRAS	NF1	NRAS
PTPN11	RAF1	SHOC2
SOS1	BCAN-NTRK1	CLCN6-BRAF
FAM131B-BRAF	FGFR1-FGFR1 (spinal cord)	FGFR1-TACC1
FYCO1-RAF1	GNAI1-BRAF	KIAA1549-BRAF
MKRN1-BRAF	NACC2-NTRK2	PKD1-SLIT1
QKI-NTRK2	QKI-RAF1	RNF130-BRAF
SRGAP3-RAF1	ST6GAL1-WHSC1	UBE2J2-PKD1

#### Pleomorphic Xanthoastrocytoma

BRAF	TERT promoter (anaplastic)	PCSK5-PCSK5
PCSK5-RECK	NRF1-BRAF	ATG7-RAF1
ETV6-NTRK3		

#### Angiocentric Glioma

C8orf34-MYBL1	FGFR1-TACC1	FGFR3-TACC3
MYB-ESR1	MYB-PCDHGA1	MYB-QKI
NAV1-NTRK2		

#### Ependymoma

KMT2C (MLL3)	NF2	C11orf95-RELA (supratentorial)
YAP1-FAM118B (supratentorial)	YAP1-MAMLD1 (supratentorial)	

Indicates gene mutations

Indicates gene fusions

## NEURONAL AND MIXED NEURONAL-GLIAL TUMORS

### Ganglioma

<i>BRAF</i>	<i>NF1</i> (germline)	<i>BRAF-MACF1</i>
<i>FXR1-BRAF</i>		

### Dysembryoplastic Neuroepithelial Tumor

<i>BRAF</i>	<i>FGFR1</i> (somatic/germline)
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### Low-Grade Glionuronal Tumor

<i>FGFR1-FGFR1</i>
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### Papillary Glioneuronal Tumor

<i>SLC44A1-PRKCA</i>
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### Multinodular and Vacuolating Neuronal Tumor of the Cerebrum

<i>BRAF</i>	<i>MAP2K1</i>
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## EMBRYONAL TUMORS

### Atypical Teratoid/Rhabdoid Tumor

<i>SMARCA4 (BRG1)</i>	<i>SMARCB1</i>
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### CNS High-Grade Neuroepithelial Tumor with *MN1* Alteration

<i>MN1-BEND2</i>	<i>MN1-CXXC5</i>
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### CNS Neuroblastoma with *FOXR2* Activation

<i>JPX-FOXR2</i>	<i>LOC550643-FOXR2</i>
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### Medulloblastoma, Desmoplastic/Nodular

<i>DDX3X</i>	<i>GLI2</i>	<i>LDB1</i>
<i>MYCN</i>	<i>PTCH1</i>	<i>SHH</i>
<i>SMO</i>	<i>SUFU</i>	<i>TERT</i> promoter

### Medulloblastoma

<i>APC</i> (germline)	<i>ARID1A</i>	<i>CTNNB1</i>
<i>GLI3</i>	<i>KDM6B</i>	<i>PTCH1</i>
<i>PTCH2</i>	<i>SMO</i>	<i>SUFU</i>
<i>TSC1</i>		

### Medulloblastoma with Extensive Nodularity

<i>PTCH1</i>	<i>SMO</i>
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### Medulloblastoma, Non-WNT/Non-SHH Group 3

<i>CTDNEP1 (DULLARD)</i>	<i>DDX3X</i>	<i>GPS2</i>
<i>KMT2B (MLL4)</i>	<i>KMT2D (MLL2)</i>	<i>SMARCA4 (BRG1)</i>
<i>DDX31-GF11B</i>	<i>PVT1-MYC</i>	<i>PVT1-NDRG1</i>
Enhancer-Hijacking- <i>GF11</i>		

### Medulloblastoma, Non-WNT/Non-SHH Group 4

<i>BCOR</i>	<i>GPS2</i>	<i>KDM6A</i>
<i>KMT2B (MLL4)</i>	<i>KMT2D (MLL2)</i>	<i>DDX31-GF11B</i>

### Medulloblastoma, SHH-Activated and TP53 Mutant

<i>TP53</i>
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### Medulloblastoma, SHH-Activated and TP53 Wild Type

<i>BCOR</i>	<i>DDX3X</i>	<i>KMT2D (MLL2)</i>
<i>LDB1</i>	<i>PTCH1</i> (somatic/germline)	<i>SMO</i> (in adults)
<i>SUFU</i> (somatic/germline in infants)		<i>TERT</i> promoter

### Medulloblastoma, WNT-Activated

<i>CSNK2B</i>	<i>CTNNB1</i>	<i>DDX3X</i>
<i>KMT2D (MLL2)</i>	<i>SMARCA4 (BRG1)</i>	<i>TP53</i>

## MENINGIOMAS

### Meningioma

<i>AKT3</i>	<i>POLR2A</i>	<i>PRKAR1A</i>
<i>PTCH1</i>	<i>SUFU</i> (somatic/germline)	<i>TERT</i> promoter (atypical/anaplastic)

### Meningioma, Anaplastic

<i>NF2</i> (somatic/germline)
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### Meningioma, Atypical

<i>AKT1</i>	<i>NF2</i> (somatic/germline)	<i>TRAF7</i>
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### Meningioma, Clear Cell

<i>SMARCE1</i> (germline)
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### Meningioma, Fibroblastic

<i>NF2</i> (somatic/germline)	<i>SMARCB1</i>
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### Meningioma, Meningothelial

<i>AKT1</i>	<i>PIK3CA</i>	<i>POLR2A</i>
<i>SMO</i>	<i>TRAF7</i>	

### Meningioma, Psammomatous

<i>NF2</i> (somatic/germline)
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### Meningioma, Rhabdoid

<i>BAP1</i>
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### Meningioma, Secretory

<i>KLF4</i>	<i>TRAF7</i>
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### Meningioma, Transitional

<i>AKT1</i>	<i>NF2</i> (somatic/germline)
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## OTHER CNS AND PNS TUMORS

### Ewing Sarcoma

<i>EWSR1-FLI1</i>
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### Neurofibroma/Malignant Peripheral Nerve Sheath Tumor

<i>NF1</i>
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### Solitary Fibrous Tumor/Hemangiopericytoma

<i>NAB2-STAT6</i>
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### Hybrid Neurofibroma/Schwannoma

<i>NF1</i>	<i>NF2</i>
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### Pituitary Adenoma

<i>GNAS</i>	<i>PRKAR1A</i> (germline)
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### Craniopharyngioma

<i>BRAF</i> (papillary)	<i>CTNNB1</i> (adamantinomatous)
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### Germinoma

<i>LAMA4</i>
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### Primary CNS Melanocytic Tumors

<i>BRAF</i> (neurocutaneous melanosis)	<i>GNA11</i>	<i>GNAQ</i>
<i>NRAS</i> (neurocutaneous melanosis)		

### Schwannoma

<i>LZTR1</i> (vestibular) (germline)	<i>NF2</i>	<i>PRKAR1A</i> (psammomatous melanotic schwannoma)
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Indicates gene mutations

Indicates gene fusions