Molecular In My Pocket™…

ONCOLOGY: Pediatric Solid Tumors

Prepared by the Association for Molecular Pathology Training and Education Committee

Tissue Type	Tumor Type	Gene/Biomarker	Alteration	Significance	Primary Assays
Thyroid	Papillary Thyroid Carcinoma	*BRAF*	sequence variants, fusions	diagnosis, treatment	sequencing
		RET	fusions (usually *RET-PTC*)	diagnosis, treatment	NGS (RNA)
		NTRK1, NTRK2, NTRK3	fusions	diagnosis, treatment	IHC (screening), NGS (RNA)
		ALK	fusions	diagnosis, prognosis	NGS (RNA), FISH
		RAS	sequence variants	diagnosis	sequencing
		DICER1	sequence variants	familial cancer risk	sequencing
		AKT1	sequence variants	diagnosis, prognosis	sequencing
		TERT	sequence variants	diagnosis, prognosis	sequencing
		TP53	sequence variants	diagnosis, prognosis	sequencing
	*Cribiform Morular Variant	*APC*	loss-of-function variants	diagnosis, familial cancer risk	sequencing
		CTNNB1	sequence variants	diagnosis	sequencing
	Follicular Thyroid Carcinoma	*PPARG*	fusions	diagnosis, treatment	NGS (RNA)
		RAS	sequence variants	diagnosis, treatment	sequencing
		PIK3CA	sequence variants	diagnosis	sequencing
	With Multiple Adenomas/Adenomatous Nodules	*PTEN*	sequence variants	diagnosis, familial cancer risk	sequencing
	Medullary Thyroid Carcinoma	*RET*	sequence variants	diagnosis, familial cancer risk, treatment	sequencing
		ALK	fusions (*CCDC6*)	diagnosis, treatment	NGS (RNA)
	NIFTP	*RAS*	sequence variants	diagnosis	sequencing
Lung	Pleuropulmonary Blastoma	*DICER1*	loss-of-function sequence variant or deletion + hotspot sequence variant	diagnosis, familial cancer risk	NGS (DNA)
GI	Gastrointestinal Stromal Tumor	*SDHB, KIT* exon 9/11, *PDGFRA*	sequence variants	diagnosis, familial cancer risk, treatment	IHC, NGS (DNA)
Liver	Hepatoblastoma	*CTNNB1*	activating sequence variants, deletion of exon 3	diagnosis (more common in hepatoblastoma than in hepatocellular carcinoma)	IHC, NGS (DNA)
	Fibrolamellar Hepatocellular Carcinoma	*DNAJB1-PRKACA*	fusion	diagnosis	FISH, NGS (DNA or RNA)
Kidney	Wilms Tumor	1q gain, 1p/16q LOH	copy gain, LOH	prognosis	CMA, NGS (DNA)
	Clear Cell Sarcoma of Kidney	*BCOR, YWHAE*	*BCOR* internal tandem duplication (ITD), *YWHAE* fusion	diagnosis	NGS (RNA or DNA)
	Congenital Mesoblastic Nephroma	*NTRK3*	ETV6-NTRK3 fusion, alternate NTRK fusions	diagnosis, treatment	*ETV6* FISH or RT-PCR for classic fusion, NGS (RNA or DNA) for classic or alternate fusions
	Translocation Renal Cell Carcinoma	*TFE3, TFEB*	fusion	diagnosis	FISH, NGS (RNA or DNA)

Kidney *(continued…)*	Metanephric Adenoma	*BRAF*	V600E, other exon 15 mutations	diagnosis	IHC, sequencing
	Rhabdoid Tumor	*SMARCB1 (INI1), SMARCA4 (BRG1)*	loss (sequence variant, partial deletion)	diagnosis	IHC, CMA, NGS, MLPA
	Pediatric Cystic Nephroma	*DICER1*	loss-of-function mutations	familial cancer risk	NGS (DNA)
Ovary tumors	Juvenile Granulosa Cell Tumor	*AKT1*	in-frame duplication, sequence variants	diagnosis	sequencing
Eye	Retinoblastoma	*RB1*	inactivating mutation, loss, or loss of heterozygosity (LOH)	diagnosis, familial cancer risk if germline	Sanger sequencing, MLPA, CMA, NGS (DNA)
PNS	Paraganglioma	*SDHA, SDHB, SDHC, SDHD*	sequence variants, loss of protein expression	diagnosis, familial cancer risk	IHC, NGS (DNA)
Adrenal	Neuroblastoma	*MYCN*	amplification	prognosis	FISH, NGS (DNA)
		ALK	mutation, amplification	prognosis, treatment	NGS
		ATRX	mutations	prognosis	NGS
		1p/11q LOH	LOH	prognosis	CMA, NGS
Multi-system	DICER1 Syndrome	*DICER1*	loss-of-function sequence variant or deletion + hotspot sequence variant	diagnosis, familial cancer risk	NGS (DNA)
	CMMRD	*MLH1, MSH2, PMS2, MSH6*	loss-of-function sequence variant or deletion	diagnosis, familial cancer risk, treatment	IHC, NGS (DNA), MSI
	Gorlin	*SUFU, PTCH1*	loss-of-function sequence variants, deletion/duplication	diagnosis, familial cancer risk	sequencing, CMA, MLPA
	MEN 2A/2B	*RET*	gain-of-function sequence variants	diagnosis, familial cancer risk	sequencing
	Li Fraumeni Syndrome	*TP53*	loss-of-function sequence variant or deletion	diagnosis, familial cancer risk	NGS (DNA)

Abbreviations:

CGH Comparative Genomic Hybridization
FISH Fluorescent *in situ* Hybridization
MSI Microsatellite Instability
RT-PCR Reverse Transcription PCR
CMA Chromosomal Microarray Analysis
IHC Immunohistochemistry
NGS Next Generation Sequencing
ddPCR Digital Droplet PCR
MLPA Multiplex Ligation-dependent Probe Amplification
PCR Polymerase Chain Reaction