Supplementary Table 1: In vitro and in vivo DNA-PK phosphorylation sites in NHEJ proteins.

The table lists several DNA-PKcs substrates that are NHEJ proteins, focusing primarily on work from the authors laboratory but is not an exhaustive list of DNA-PK substrates. The phosphorylated and adjacent amino acid in each amino acid sequences are indicated in bold face.

	In vitro DNA-PK phosphorylation sites			***In vivo phosphorylation (conditions and kinase, where known)***
Substrate	***Phosphorylated residue***	***SQ/TQ site***	***Non-SQ/TQ site***	
Artemis	Thr-91	IETP**TQ**ISLV (Ma et al., 2005)		
	Thr-251	TDRN**TQ**IHAC (Ma et al., 2005)		
	Ser-362	LCRS**SQ**STEP (Ma et al., 2005)		
	Ser-385		VHRD**SE**EEDD (Ma et al., 2005)	
	Thr-410		PYPE**TF**HPEV (Ma et al., 2005)	
	Ser-417 or 419		PEVF**SM**TAVS (Ma et al., 2005)	
	Ser-503		ITDE**SL**ENFP (Goodarzi et al., 2006; Ma et al., 2005)	
	Ser-509/Ser-510/Thr-511		ENFP**SST**VAG G (Ma et al., 2005)	
	Ser-516	VAGG**SQ**SPKL (Goodarzi et al., 2006; Ma et al., 2005; Soubeyrand et al., 2006).		ATM dependent after low doses of IR (Geng et al., 2007). DNA-PK dependent after high doses of IR (Geng et al., 2007) and after bleomycin (Soubeyrand et al., 2006).
	Ser-518		GGSQ**SP**KLFS (Ma et al., 2005)	
	Ser-534	THIS**SQ**NSSQ (Goodarzi et al., 2006; Ma et al., 2005)		ATM dependent after low doses of IR but DNA-PK dependent after high doses of IR (Geng et al., 2007).
	Ser-538	SQNS**SQ**STHI (Goodarzi et al., 2006; Ma et al., 2005)		ATM dependent after low doses of IR but DNA-PK dependent after high doses of IR (Geng et al., 2007).
	Ser-548	TEQG**SQ**GWDS (Goodarzi et al.,		

		2006; Ma et al., 2005)		
	Ser-553	QGWD**SQ**SDTV (Goodarzi et al., 2006; Ma et al., 2005)		
	Ser-562	VLVS**SQ**ERNS (Goodarzi et al., 2006)		
	Ser-572		GDIT**SL**DKAD (Ma et al., 2005)	
	Ser-589		NIPA**SL**MEQN (Ma et al., 2005)	
	Thr-601		CPKD**TY**SDIK (Ma et al., 2005)	
	Ser-645	TNAD**SQ**SSSD (Chen et al., 2005b; Goodarzi et al., 2006; Ma et al., 2002; Soubeyrand et al., 2006).		ATM dependent after low doses of IR (Chen et al., 2005b; Geng et al., 2007; Goodarzi et al., 2006). DNA-PK involved at high doses of IR (Geng et al., 2007).
	Ser-655/Thr-656		FEVP**STP**EAEL (Ma et al., 2005)	
	Thr-676		EKLA**TG**ESLA (Ma et al., 2005)	
	Ser-679		ATGE**SI**AVKK (Ma et al., 2005)	
	Ser-688		KRKC**SL**LDT (Ma et al., 2005)	
	Thr-692		SLLD**T** (Ma et al., 2005)	
DNA ligase IV	Thr-650		APNL**TN**VNKI (Wang et al., 2004)	
DNA-PKcs	Ser-2023		SDGP**SY**MSSL (Cui et al., 2005)	
	Ser-2029		MSSL**SY**LADS (Cui et al., 2005)	
	Ser-2041	SEEM**SQ**FDFS (Cui et al., 2005)		
	Ser-2053		YQSY**SY**SSQD (Cui et al., 2005)	
	Ser-2056	YSYS**SQ**DPRP (Cui et al., 2005)		DNA-PK dependent after DNA damage (Chen et al., 2005a; Meek et al., 2007) and mitosis (Douglas et al., 2014; Lee et al., 2011)
	Thr-2609	MFVE**TQ**ASQG (Douglas et al., 2002) (Chan et al., 2002)		Okadaic acid induced (Douglas et al., 2002). IR induced (Douglas et al., 2007); IR induced, inhibited by NU7441 (Meek et al., 2007); DNA-PK dependent after IR (Chan et al., 2002); ATM dependent after IR (Chen et al., 2007); ATR dependent

				after UV radiation (Yajima et al., 2009); DNA-PK dependent in mitosis (Douglas et al., 2014; Lee et al., 2011).
	Ser-2612	ETQA**SQ**GTLQ (Douglas et al., 2002)		Okadaic acid induced (Douglas et al., 2002); IR induced (Douglas et al., 2007); IR induced, inhibited by NU7441 (Meek et al., 2007).
	Thr-2620	LQTR**TQ**EGSL (Douglas et al., 2002)		IR induced (Douglas et al., 2007); IR induced, inhibited by NU7441 (Meek et al., 2007); DNA-PK dependent in mitosis (Douglas et al., 2014; Lee et al., 2011; Shang et al., 2010)
	Ser-2624		TQEG**SL**SARW (Douglas et al., 2002)	IR induced (Douglas et al., 2007). IR induced, inhibited by NU7441 (Meek et al., 2007).
	Thr-2638	QIRA**TQ**QQHD (Chen et al., 2007; Douglas et al., 2002).		Okadaic acid induced (Douglas et al., 2002); IR induced (Douglas et al., 2007); IR induced, inhibited by NU7441 (Meek et al., 2007) ATM dependent after IR (Chen et al., 2007); DNA-PK dependent in mitosis (Douglas et al., 2014; Lee et al., 2011; Shang et al., 2010)
	Thr-2647	DFTL**TQ**TADG (Chen et al., 2007; Douglas et al., 2002).		Okadaic acid induced (Douglas et al., 2002); IR induced (Douglas et al., 2007); IR induced, inhibited by NU7441 (Meek et al., 2007) ATM dependent after IR (Chen et al., 2007). DNA-PK dependent in mitosis (Lee et al., 2011; Shang et al., 2010).
	Ser-3205		PEDN**SM**NVDQ (Douglas et al., 2002)	ATM-dependent after DNA damage (Neal et al., 2011) and PLK1-dependent in mitosis (Douglas et al., 2014).
	Ser-3821	LNTM**SQ**EEKA (Ma et al., 2005)		
	Thr-3950	FGSA**TQ**FLPV (Douglas et al., 2007; Meek et al., 2007)		IR induced (Douglas et al., 2007). IR induced, inhibited by NU7441 (Meek et al., 2007); DNA-PK dependent in mitosis (Douglas et al., 2014).
	Ser-4026		KKGG**SW**IQEI (Ma et al., 2005)	
	Thr-4102	LSEE**TQ**VKCL (Ma et al., 2005)		
GOLPH3	Thr-143	GDKE**TQ**PPET (Farber-Katz et al., 2014)		IR, bleomycin and doxorubicin dependent, inhibited by NU7441 (Farber-Katz et al., 2014)
	Thr-148		QPPE**TVQ**NWI	IR, bleomycin and doxorubicin

			(Farber-Katz et al., 2014)	dependent, inhibited by NU7441 (Farber-Katz et al., 2014)
Hsp90-alpha	Thr5	MPEE**TQ**TQPQ (Lees-Miller and Anderson 1989)		
	Thr-7	EETQ**TQ**PQPM (Lees-Miller and Anderson 1989)		DNA-PK dependent after DNA damage (Quanz et al., 2012).
Ku70	Ser -6		SGWE**SY**YKTE (Chan et al., 1999)	Okadaic acid induced (Douglas et al., 2005).
Ku80	Ser-577		GAHF**SV**SSLA (Chan et al., 1999)	Okadaic acid induced (Douglas et al., 2005).
	Ser-580		FSVS**SL**AEGS (Chan et al., 1999)	Okadaic acid induced (Douglas et al., 2005).
	Thr-715		PSGD**TA**AVFE (Chan et al., 1999)	Okadaic acid induced (Douglas et al., 2005).
P53	Ser-15	EPPL**SQ**ETFS (Lees-Miller et al., 1992)		ATM-dependent after DNA damage (Siliciano et al., 1997).
	Ser-37	SPLP**SQ**AMDD (Lees-Miller et al., 1992)		
PNKP	Ser-114	RTPE**SQ**PDTP (Segal-Raz et al., 2011; Zolner et al., 2011)		ATM-dependent after IR (Segal-Raz et al., 2011; Zolner et al., 2011).
	Ser-126	TPLV**SQ**DEKR (Segal-Raz et al., 2011; Zolner et al., 2011)		ATM and DNA-PK-dependent after IR (Segal-Raz et al., 2011; Zolner et al., 2011).
SAF-A/ hnRNPU	Ser-59		PGNG**SL**DLGG (Berglund and Clarke, 2009; Britton et al., 2009)	DNA-PK-dependent after calicheamicin and (in DNA ligase-deficient cells) after IR (Berglund and Clarke, 2009; Britton et al., 2009).
XRCC4	Ser-260		SIIS**SL**DVTD (Lee et al., 2004; Yu et al., 2003)	
	Thr-318		AENM**SL**ETLR (Lee et al.,	IR induced (Yu and Lees-Miller, unpublished).

			2004; Yu et al., 2003)	
XLF	Ser-245		SNSA**SL**QGID (Yu et al., 2008)	DNA-PK-dependent after IR (Yu et al., 2008)
	Ser-251	QGID**SQ**CVNQ (Yu et al., 2008)		ATM-dependent after IR (Yu et al., 2008)
WRN	Ser-440		YVIE**SD**EDLE (Kusumoto-Matsuo et al., 2014).	DNA-PK-dependent following bleomycin treatment using NU7026 and wortmannin (Kusumoto-Matsuo et al., 2014).
	Ser-467		YVIE**SD**EDLE (Kusumoto-Matsuo et al., 2014).	DNA-PK-dependent following bleomycin treatment using NU7026 and wortmannin (Kusumoto-Matsuo et al., 2014).

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