APPENDIX 1

SUMMARY TABLES OF GENETIC AND RELATED EFFECTS

Nonmamm	nalian systems								Ma	mma	lian s	system	15										·						······				· · · · · · · · · · · · · · · · · · ·					···
Prokary- otes	Lower eukaryotes	Pla	ints		Ins	ects			Inv	vitro								<u> </u>						·		In	vivo					<u> </u>						
			T	Τ		Τ		1 1		imal							Hu	man	cells					·	<u> </u>	An	imal	s						Hur	nans			<u> </u>
D G	D R G A	D	G	C	R	G	С	A	D	G	s	м	C	Α	Т	I	D	G	S	М	С	A	1	т	I	D	G	s	N	1	с	DL	A	D	s	М	С	A
Cr[III] con	mpounds																									.							L	I		L	L	
Chromic ch	nloride [CrCl3.6H2O	1																																				
	$+^{1}$ $+^{1}$,							-		-		+		-		_		-		9	+	1															
	etate [Cr(CH ₃ COO)s]																			•	1				-												
? -	itrate [Cr(NO3)3.9H2	~								-	?		+						+ 1		+	1																
+ -		U		+1					_1		_																											
Chromic su	lfate [Cr2(SO4)3-4-8	H₂O]]	•					-		-		-								_1								-1	1								
											-		?																									
	otassium sulfate [Crl			H ₂ O]																																		
 Chromium	alum [Cr2(SO4))]3.K	+1 -SOU		1									+																									
-		2004.		1							-		+																									
Neochromiu	um [Cr ₂ (OH)SO4 Na	1 ₂ SO4	.H ₂ C)]																																		
-											_1		+1																									
Chromic oxi	ide [Cr ₂ O ₃]									+1	0	·																										
	re [Cr2O3.Fe2O3.Al2	O3.Si	O ₂ .C	aOl						+*	7																											
[+]		-									[+]		[+]																									
Cupric chroi	mite [Cr ₂ O ₃ .2CuO]																																					
									+1																													

Summary table of genetic and related effects of chromium compounds

Chromium compounds (contd)

Nonmam	malia	an sys	tems										Ma	amm	alian	syste	ms																								
Prokary- otes		ower ukaryo	otes		Pla	nts		I	nsect	ts			In	vitro															I	ı viv	0		<u> </u>				 .				
						T						Γ	An	ima	cells						Hu	ıman	cells						A	nim	als							н	uman	IS	
D G	D	R	G	A	D	G	С	F	2 0	0	с	A	D	G	S	М	С	A	T	I	D	G	s	М	С	A	Т	I	D		5	S	М	с	DL	. A	D	+	· · · · ·		A
Cr[VI] a	mp	ound	s																																			+		+	· +
Potassium					D ₇]																																	•			
+ +				. ₊ 1					-	+		+1	+	+	+		+		+		+		+		+				+	1 4	L 1	+ 1	+	+	+	+1					
Sodium d	ichro	omate	[Na ₂	Cr ₂ O ₇	.2H ₂ C)]																											•	•		,					
+ +										+1			+1		+		+								+1				+					+1							
Ammoniu	ım di	ichror	nate	[NH₄)	₂ Cr ₂ C	0,7]																							•					,							
+			•	,																																					
Potassium	chro	omate	[K ₂ (CrO₄]																																					
+ +							_ 1						+	+	4		+	_1	?		+		+		+							+1	+								
Sodium cl	nrom	iate []	Na ₂ Ci	rO₄]																																					
+ +		-		-									+	+	+		+		+1							+1															
Ammoniu + ¹ +	ım cł	hroma	te [(]	NH4)2	СгО₄]																																				
Chromiur	n tric	oxide	[CrO	3]																																					
+ +		+	_1				?		-	+1		_1	+1		+		+						+1		+1																
Calcium c	hron	nate [CaCr	O ₄]																																					
? +			+								+1	+ 1	+	+	+		+		+		+1		+1			+1						+1	-								
Strontium + 1	chro	omate	[SoC	CrO₄]											+ 1	ı			_1																						
Zinc yello	w [Z	Zn(Cr	D₄)-2	Zn(Oł	I) ₂ +1	.0%	CrO ₃]																																	
+															+		+1																								
Zinc chro	mate	e [Zn0	CrO₄]																																						
+1														+	+ '	L	+ 1		+1																						
Chromiur	n ora	ange [PbCr	O₄.Pt	0]																																				
+															+		+ 1																								

Chromium compounds (contd)

Nor	mamn	alian	syster	ms									Mamm	nalia	n syst	tems																						
Prol otes	ary-	Lov euk	ver агуоte	s		Pla	nts		Ins	ects			In vitro	,									,					In	vive	2								
								Τ	Γ		T	Τ	Anima	l cel	ls					Hu	man	cells						Ar	nima	als						Hu	mar	15
D	G	D	R	G	Α	D	G	С	R	G	c	Α	DG	5	S 1	мс	A	Т	I	D	G	s	М	С	A	Т	I	D	0	3 3	5	м	С	DL	A	D	S	М
Mol	ybdenu	ım or	ange [PbCr	O₄.Pt	SO₄.	SiO2.	Al₂O	3.PbN	[0O₄]																		_					1	L	.			
	+1						_							-	+	+	1																					
Bari	um chr	romat	te [Ba	CrO₄]																																		
Lea	 I chror	nate	[]]]}	0.1										-	+ 1																							
~	(+)	nate	(+) ¹	J 4]						(+) ¹			_1 _	-	+	+		+				(+)	۰ + ۱	(+)	1							+1						
Chr	mium	yello		CrO4.	PbSC	∙.SiC)2.Al	O3]		. ,												(.)		()														
	(+) ¹													÷	+	+	1																					
Chro	omyl cl	nlorid	e [Cl ₂	CrO ₂]																																		
	+																																					
Oth	er Cr	comj	pound	s																																		
Chro	mous[II] ch	loride	[CrC	1 ₂]																																	
+1	-			-	-								_1			_1									_1													
Chro	mium	[0] ca	rbonyl	l [Cr(CO)4]																																	
_1	-1																																					

A, an euploidy; C, chromosomal aberrations; D, DNA damage; DL, dominant lethal mutation; G, gene mutation; I, inhibition of intercellular communication; M, micronuclei; R, mitotic recombination and gene conversion; S, sister chromatid exchange; T, cell transformation

In completing the tables, the following symbols indicate the consensus of the Working Group with regard to the results for each endpoint:

+ considered to be positive for the specific endpoint and level of biological complexity

+ ' considered to be positive, but only one valid study was available to the Working Group

[+] results were available only for products contaminated with traces of Cr[VI]

(+) positive when artificially solubilized in acids or alkali

- considered to be negative

-' considered to be negative, but only one valid study was available to the Working Group

? considered to be equivocal or inconclusive (e.g., there were contradictory results from different laboratories; there were confounding exposures; the results were equivocal)

Nonmam	mal	lian sy	stems	_								Mar	nmalia	an sys	tems																									
Prokary- otes		Lowe cuka	r ryotes		Pla	nts		In	sects			In vi	itro																In s	vivo										
								T				Anii	nal ce	lls						Н	ıman (œlls							Ani	imals		• •					Hu	mans		•
DO		D	RC	A	D	G	с	R	G	С	A	D	G	s	м	c	A	Т	1	D	G	s	М	С	A	. 1	r	I	D	G	s	М	С	E	эL	A	D	s	М	С
Metallic	nic	kel																																						
Metume	- me																	+	1					_1	L															
Nickel o	xide	es																•																						
_1																		+						_1	ι		+ ¹													
Nickel s	ulfic	de (ar	norpho	us)																																				
Nickel s	ulfic	de (cr	vstallin	e)								-						-																						
		+1	/	-,								+	+1	+	1	+		+																						
Nickel s																																								
		+1										+ 14	+					+			_1	+	1				+ ¹													
Nickel c ? -			+ ¹ +	.1								+				+		+	1			+	,									_1								
Nickel s			ייי						-			Ŧ	Ŧ	+		+		+	•			Ť	•										+	-	•					
-									+	1	+1		+14	¢ +		+	1	+	. +1	_1		+		+	1		+						-							
Nickel n		te																																						
- ¹ -									-																							_1		-						
Nickel a		ate														+											+1													
Nickel c		onate														Ŧ										•	τ-													
																													+											
Nickel s	ubse	elenic	le																																					
																		+	1																					

Summary table of genetic and related effects of nickel compounds

Nickel compounds (contd)

Non	mamm	alian :	system	IS									Мал	nmali	ian sy	stems																							
Prok otes	ary-		wer aryot	es		Pla	nts		Ins	ects			In vi	tro															In 1	ivo	<u> </u>								
							Τ	Τ	1			T	Anir	nal c	ells						Hu	man c	cells						Ani	mals						Hu	mans		
D	G	D	R	G	Α	D	G	с	R	G	с	A	D	G	s	М	С	A	Т	1	D	G	s	м	c	A	Т	1	D	G	s	м	С	DL	A	D	s	м	С
Nick	elocen	e																											•	•		-							
Nick	el pota	ssium	cyani	de																																			

+1

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In completing the tables, the following symbols indicate the consensus of the Working Group with regard to the results for each endpoint:

+ considered to be positive for the specific endpoint and level of biological complexity

+ considered to be positive, but only one valid study was available to the Working Group

- considered to be negative

-1 considered to be negative, but only one valid study was available to the Working Group

? considered to be equivocal or inconclusive (e.g., there were contradictory results from different laboratories; there were confounding exposures; the results were equivocal)

"Negative result in one study for unscheduled DNA synthesis

"Negative result in one study for gene mutation to ouabain resistance in Syrian hamster embryo cells

Negative result in one study for differential toxicity in Escherichia coli

5	ummary	tab	e of	genetic	and	related	effects	of	welding fu	imes
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Non	mamr	naliar	a syste	ms									Ma	mma	lian sy	stems	5				 ·																					
Prol ryot		Lov euk	wer aryot	es		Pla	nts		Ins	ects			In	vitro							 								Ţ	In vi	0											
								Τ			Τ	Τ	Ani	imal (cells						Hum	an c	ells						+	Anim	als	•••••					1	Humar	ns			<u></u>
D	G	D	R	G	A	D	G	C	R	G	С	A	D	G	S	М	C	A	Т	1	D	G	s	м	C	A	Т	I		D	G	s	м	С	DL	A	T I	> s		м	с	A
Wek	ling	fume	s fror	n mil	d stee	e]																														_			******			·
	IG																																									
-1	-														_1		_1															_1		_								
	MA																															_		-								
_1	+	.													+1		-1															_1		-								
	ung i IG	ume	s fron	n stai	niess	steel																																?		_ 1	?	
	+																																									
	MA														+		+		+	. 1											•	_1		-								
+1														?	+		+		+	1											+1.	1										
Weld		umes	s fron	1 mik	d stee	l or d	cast in	on wi	ith ni	ckel-1	rich e	ectro	ode				•														· ·	•		-								
	_1													_1			_1						+1									1		-								

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