



THE BIRCHALL CENTRE



Innovations in Inorganic and Materials Chemistry

Aluminium is Toxic!

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<http://www.keele.ac.uk/aluminium/>

Aluminium Adjuvants in Human Vaccinations

Brand	AIH	ADJ	AAHS	Total Al mg/0.5mL
Daptacel	0	0.33	0	0.33
Infanrix	<0.63	0	0	<0.63
DT	0	0.33	0	0.33
Havrix	0.25	0	0	0.25
Vaqta	0	0	0.23	0.23
Energix B	0.25	0	0	0.25
Recombivax HB	0	0	0.25	0.25
Gardasil 9	0	0	0.50	0.50
Bexsero	0.50	0	0	0.50
Trumenba	0	0.25	0	0.25
Prevenar 13	0	0.13	0	0.13
Adacel	0	0.33	0	0.33
Boostrix	<0.39	0	0	<0.39
Tenivac	0	0.33	0	0.33
Pentacel	0	0.33	0	0.33
Kinrix	<0.6	0	0	<0.6
Quadracel	0	0.33	0	0.33
Twinrix	0.05	0.4	0	0.45 mg/mL
TD Vax				<0.53
Pediarix				<0.85

AIH – AlHydrogel; aluminium oxyhydroxide
 ADJ – AdjuPhos; aluminium hydroxyphosphate
 AAHS – amorphous aluminium hydroxy sulphate

Concentration Range at Injection Site?

0.13 mg/0.5mL (Prevenar 13) is equivalent to 260 mg/L or 9.63 mmol/L

0.85 mg/0.5mL (Pediarix) is equivalent to 1700 mg/L or 62.96 mmol/L

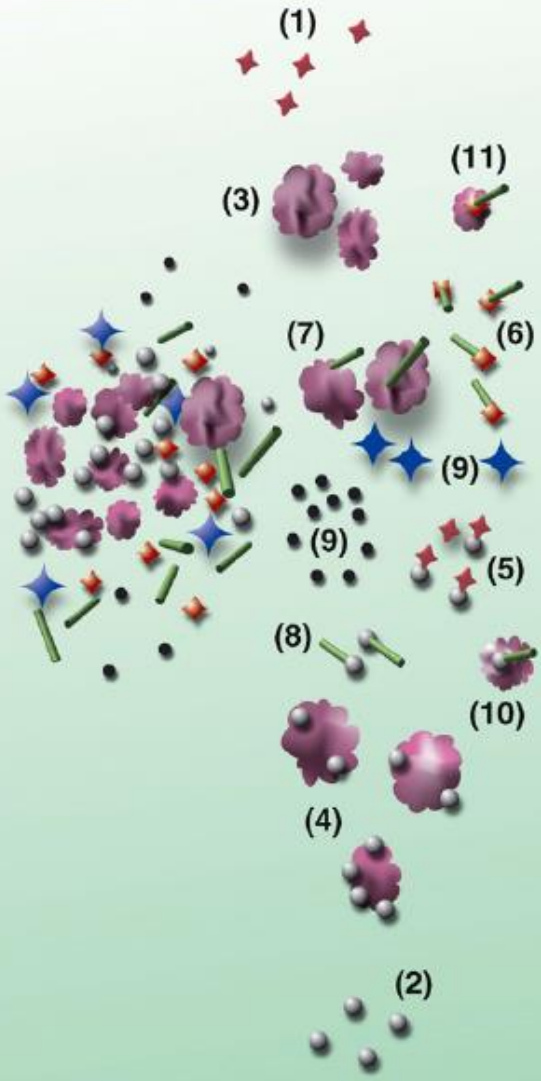
Aluminium Adjuvant Reference Range

9.63 – 62.96 mmol/L

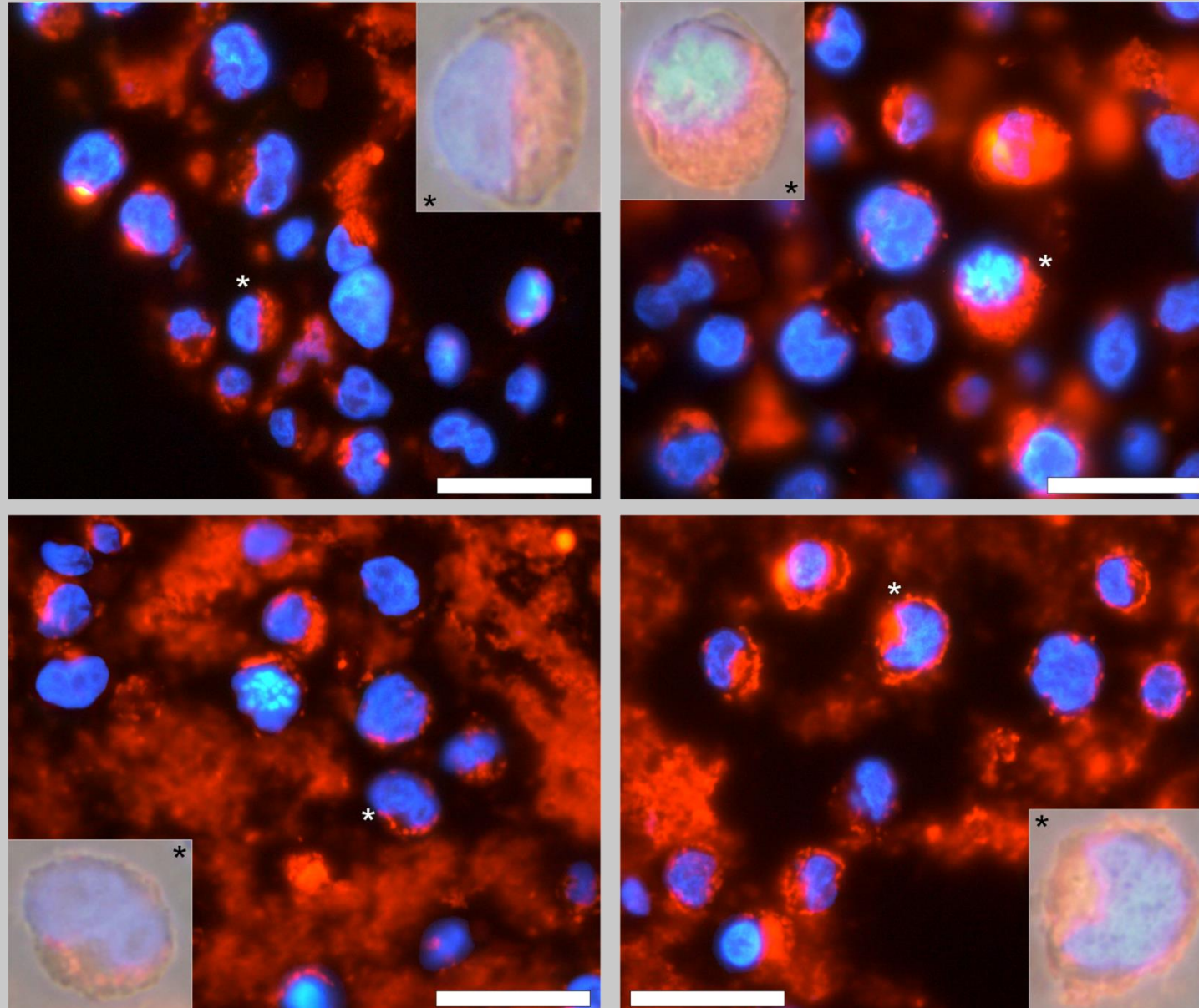
The Critical Environment of the Injection Site

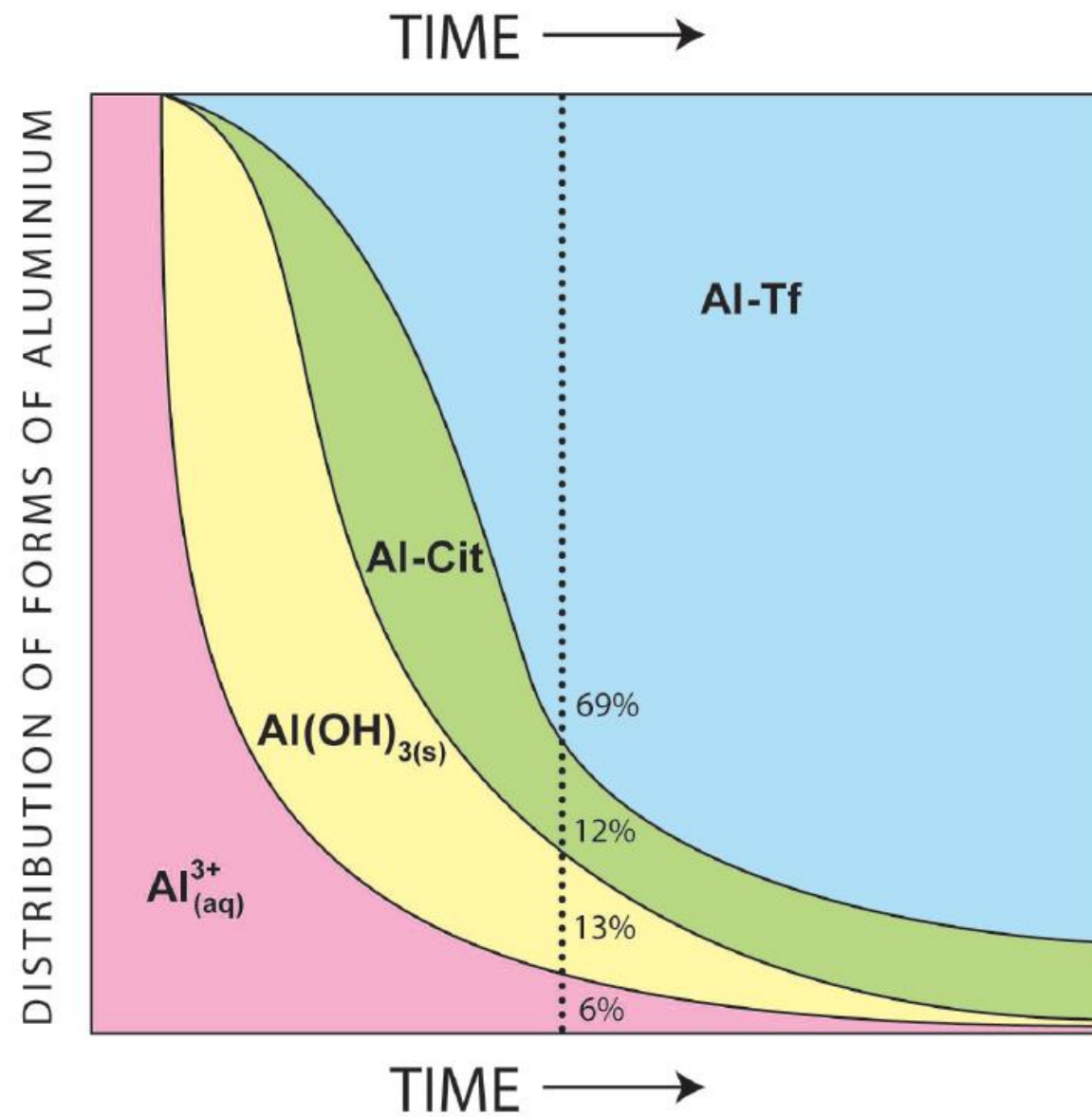
(1) $\text{Al}^{3+}_{(\text{aq})}$; (2) free antigen (AG); (3) particulate adjuvant (ADJ); (4) ADJ with associated AG; (5) AG-Al complex; (6) MIF ligand-Al complex; (7) ADJ with associated MIF ligand; (8) MIF ligand-AG complex; (9) particulate iron (as contaminant of adjuvant) either free or with adsorbed Al/AG and resultant reactive oxygen species (ROS); (10) ADJ with associated MIF ligand-AG complex; (11) ADJ with associated MIF ligand-Al complex. MIF ligands might include biomolecules such as; ATP, albumin, transferrin, citrate, fibrinogen.

(a)



So What Might The Injection Site Look Like Following Infiltration By Immune-Reactive Cells? (What's All That Red Stuff?)

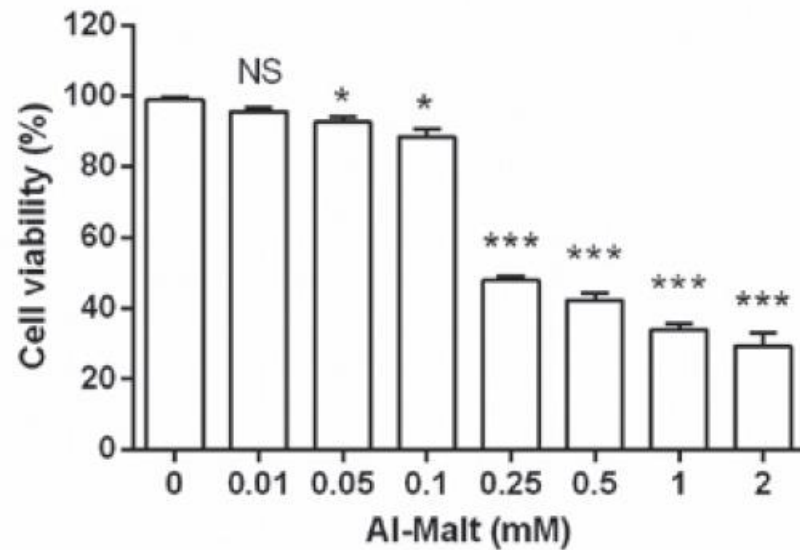




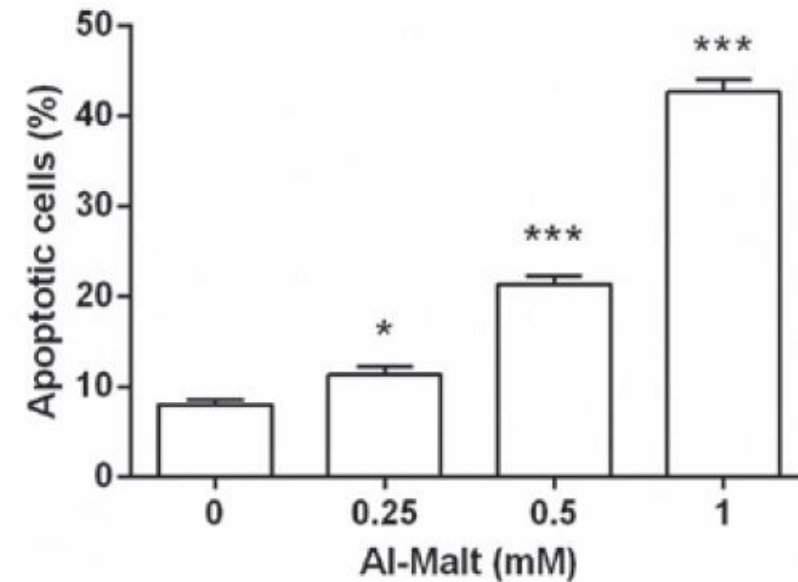
MicroRNA-322 attenuates aluminum maltolate-induced apoptosis in the human SH-SY5Y neuroblastoma cell line

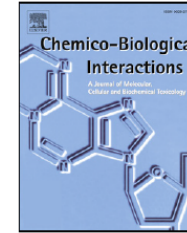
XINLONG MA^{1*}, FENG SHANG^{1*}, QIUXIA ZHANG², QINGTANG LIN¹, SHUO HAN³,
YONGZHI SHAN¹, JIANXIN DU¹, FENG LING¹, HONGQI ZHANG¹ and GENG XU¹

A



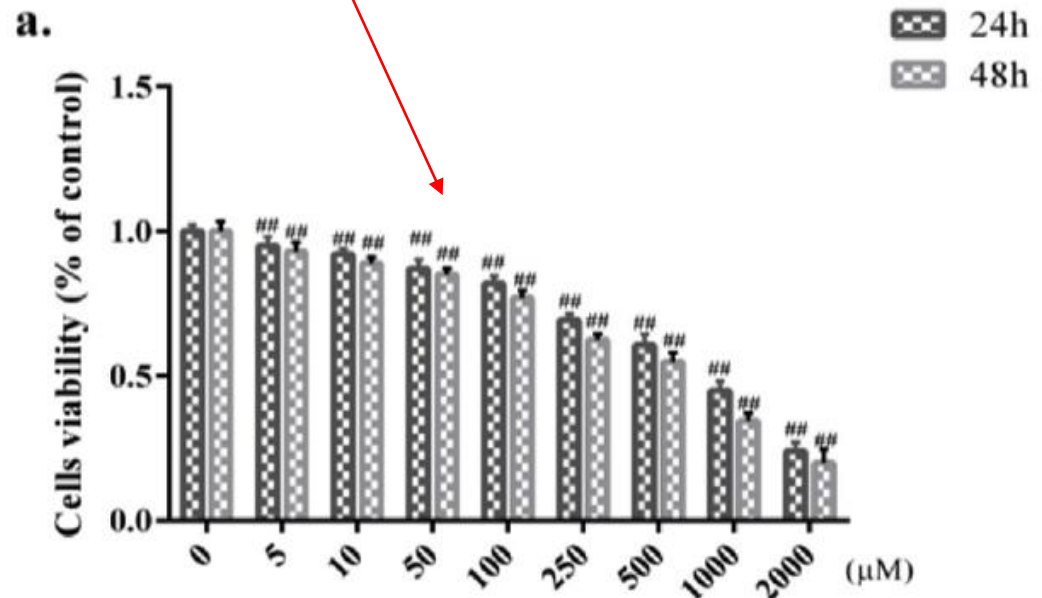
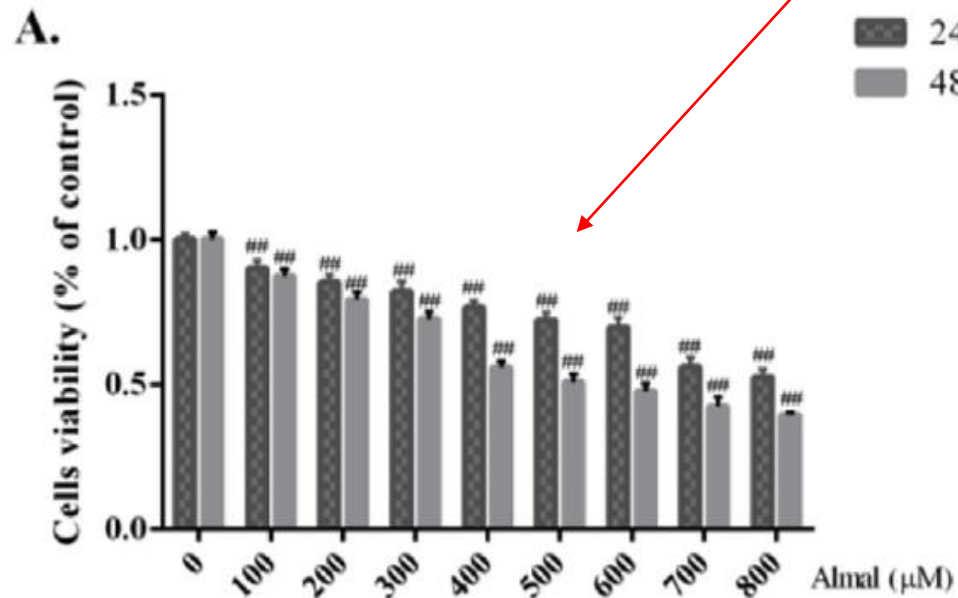
B





Neuroprotective role of hyperforin on aluminum maltolate-induced oxidative damage and apoptosis in PC12 cells and SH-SY5Y cells

Haoran Wang, Bing Shao, Hongyan Yu, Feibo Xu, Peiyan Wang, Kaiyuan Yu, Yanfei Han, Miao Song, Yanfei Li*, Zheng Cao**



Aluminium Adjuvant Reference Range 9.63 – 62.96 mmol/L



Evaluation of *in vivo* and *in vitro* toxicological and genotoxic potential of aluminum chloride

Letícia Nazareth Fernandes Paz ^a, Laís Mesquita Moura ^a, Danielle Cristinne A. Feio ^{a,*},
Mirella de Souza Gonçalves Cardoso ^a, Wagner Luiz O. Ximenes ^a, Raquel C. Montenegro ^b,
Ana Paula N. Alves ^c, Rommel R. Burbano ^b, Patrícia Danielle L. Lima ^a

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Table 6

Mean and Standard Deviation of the frequency and number of micronuclei (MN) by binucleated cell in human blood samples submitted to 3 different concentrations of Al chloride.

Treatments	Number of MN	Frequency of MN/ Binucleated cell			Mean±SD
		M ₁	M ₂	W	
AlCl ₃ 5 μM	1	82	79	91	84 ± 6.2*
	2	4	4	8	5.3 ± 2.3
	3	2	2	3	2.3 ± 0.6
	4 or more	0	1	0	0.3 ± 0.6
AlCl ₃ 10 μM	1	78	90	112	93.3 ± 17.2*
	2	30	12	10	17.3 ± 11**
	3	30	2	5	12.3 ± 15.4
	4 or more	5	2	1	2.7 ± 2.1
AlCl ₃ 20 μM	1	94	114	90	99.3 ± 12.9*
	2	30	17	26	24.3 ± 6.7**
	3	12	16	30	19.3 ± 9.4
	4 or more	2	4	14	6.7 ± 6.4
Negative Control	1	16	13	20	16.3 ± 3.5
	2	4	3	6	4.3 ± 1.5
	3	0	0	2	0.7 ± 1.1
	4 or more	0	0	0	0 ± 0
Positive Control	1	27	-	33	30 ± 4.2
	2	7	-	11	9 ± 2.8
	3	10	-	4	7 ± 4.2
	4 or more	4	-	5	4.5 ± 0.7

M1: Man 1; M2: Men 2; W: Woman; MN: Micronuclei; (*) p < 0.01 - ANOVA/ Dunnett (p = 0.0002).

LYMPHOCYTES

Aluminium Adjuvant Reference Range 9.63 – 62.96 mmol/L



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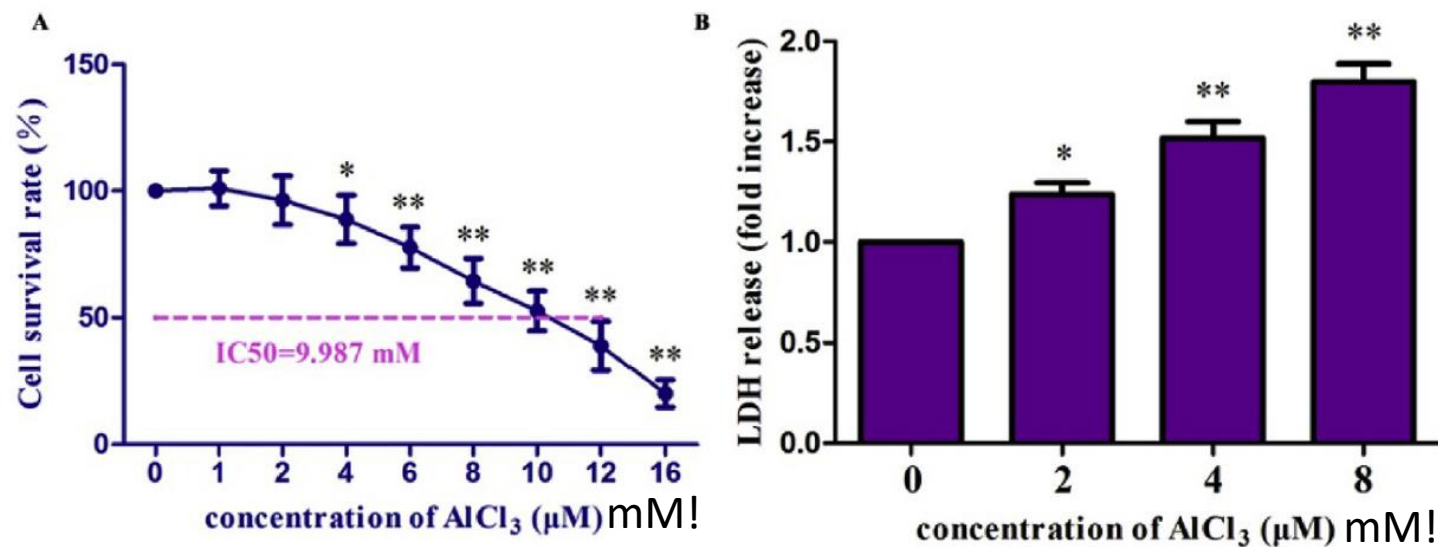
AlCl₃ inhibits LPS-induced NLRP3 inflammasome activation and IL-1 β production through suppressing NF- κ B signaling pathway in murine peritoneal macrophages



Feibo Xu ^{a, b}, Qiang Ji ^{a, b}, Jian Zhang ^{a, b}, Wanyue Huang ^{a, b}, Zheng Cao ^{a, b, *}, Yanfei Li ^{a, b, **}

^a College of Veterinary Medicine, Northeast Agricultural University, Harbin 150030, China

^b Key Laboratory of the Provincial Education, Department of Heilongjiang for Common Animal Disease Prevention and Treatment, Northeast Agricultural University, Harbin 150030, China



Aluminium Adjuvant Reference Range 9.63 – 62.96 mmol/L



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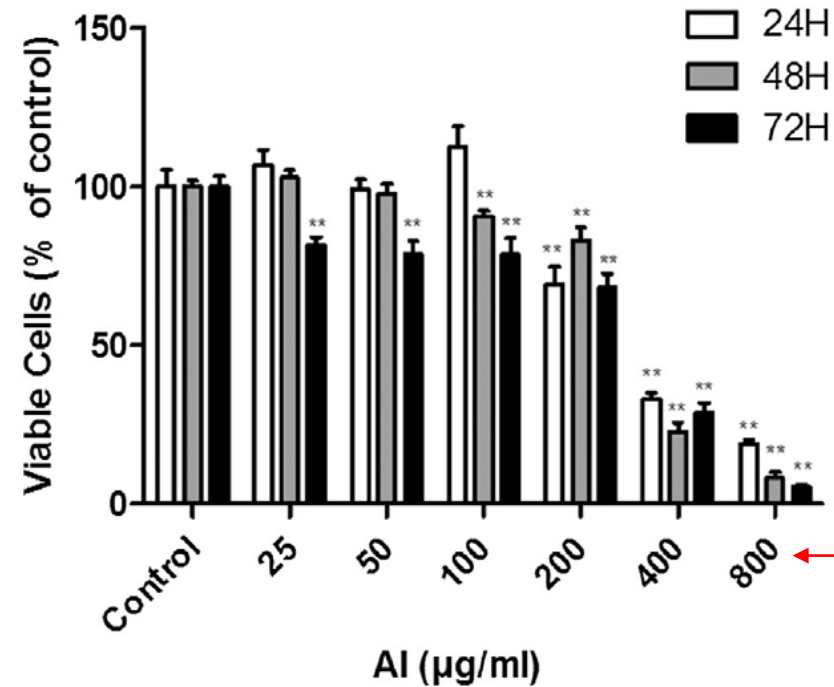


Toxicological consequences of experimental exposure to aluminum in human intestinal epithelial cells



M. Djouina¹, N. Esquerre¹, P. Desreumaux, C. Vignal, M. Body-Malapel*

Univ. Lille, Inserm, CHU Lille, U995



0.8mg/mL = 29.63 mmol/L

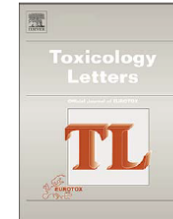
Aluminium Adjuvant Reference Range 9.63 – 62.96 mmol/L



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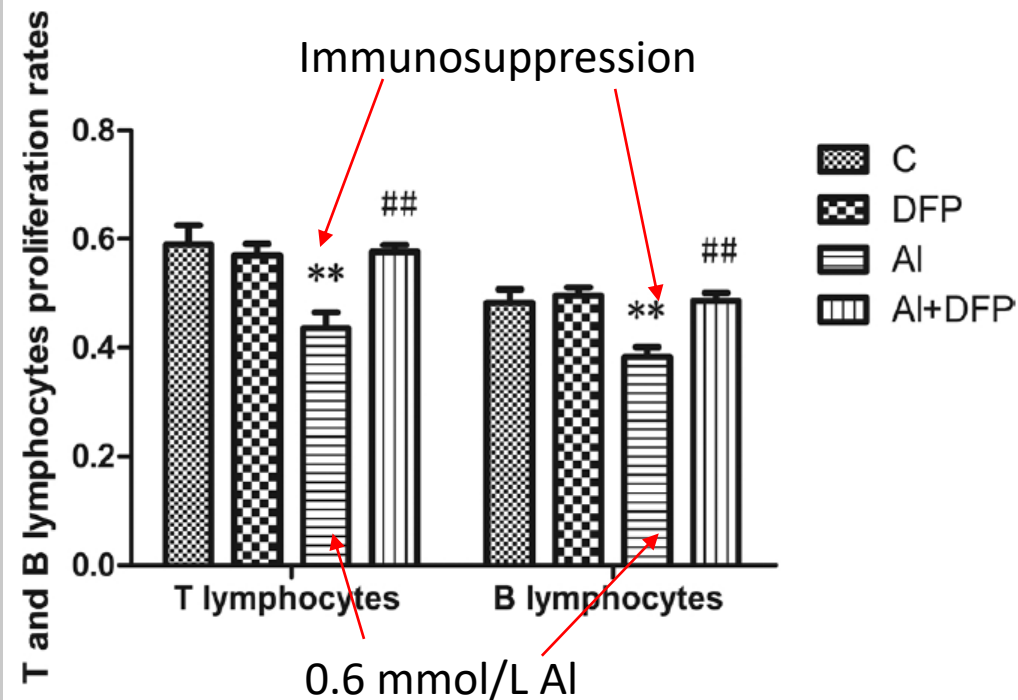
Toxicology Letters

journal homepage: www.elsevier.com/locate/toxlet



Cytoprotective effect of deferiprone against aluminum chloride-induced oxidative stress and apoptosis in lymphocytes

Cuicui Zhuang^{a,1}, Yue She^{b,1}, Haiyang Zhang^a, Miao Song^a, Yanfei Han^a, Yanfei Li^{a,*},
Yanzhu Zhu^{c,**}



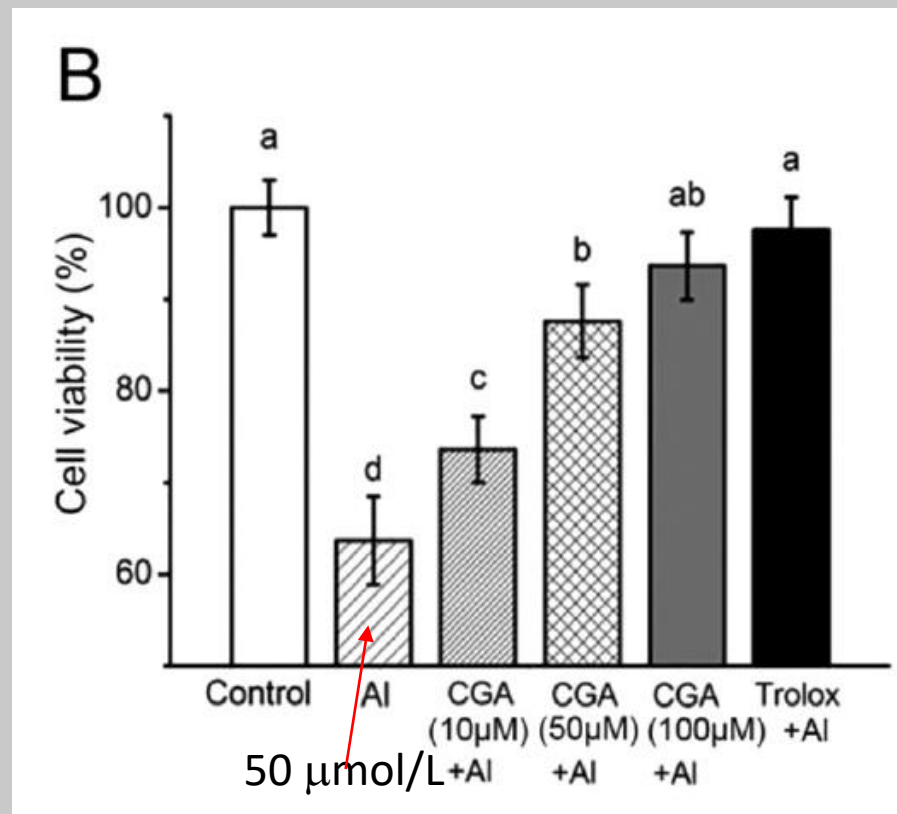
Aluminium Adjuvant Reference Range 9.63 – 62.96 mmol/L



Cite this: *Food Funct.*, 2017, 8, 2924

Chlorogenic acid protects against aluminium-induced cytotoxicity through chelation and antioxidant actions in primary hippocampal neuronal cells

Xiaomei Wang, Xinguang Fan, Shuzhi Yuan, Wenxiao Jiao, Bangdi Liu, Jiankang Cao and Weibo Jiang *†

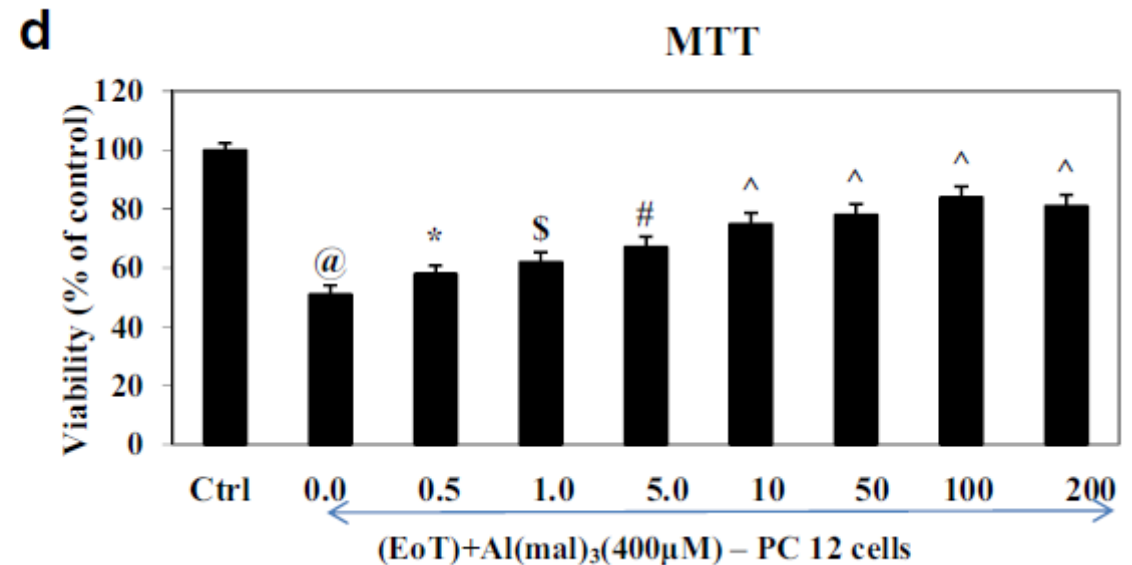
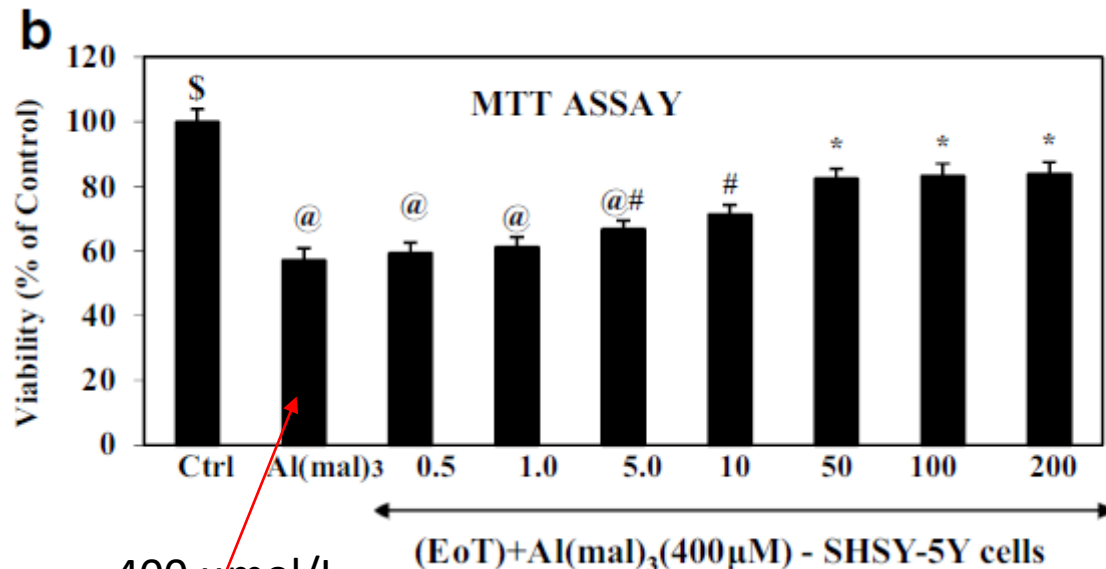


Aluminium Adjuvant Reference Range 9.63 – 62.96 mmol/L



Amelioration of Aluminum Maltolate-Induced Inflammation and Endoplasmic Reticulum Stress-Mediated Apoptosis by Tannoid Principles of *Emblica officinalis* in Neuronal Cellular Model

Mathiyazahan Dhivya Bharathi¹ · Arokiasamy Justin-Thenmozhi¹ · Thamilarasan Manivasagam¹ · Mashoqque Ahmad Rather¹ · Chidambaram Saravana Babu² · Musthafa Mohamed Essa^{3,4,5} · Gilles J. Guillemin⁶



Aluminium Adjuvant Reference Range 9.63 – 62.96 mmol/L

So, Aluminium is Toxic!