Calcinated Clay

SYNONYMS

Calcinated Kaolin
Calcined Kaolin
Anhydrous aluminium silicate
Calcined china clay

CHEMICAL STRUCTURE

Unknown

CHEMICAL FORMULA

$Al_2Si_2O_7$

IDENTIFIER DETAILS

CAS Number	:	92704-41-1
CoE Number	:	-
FEMA	:	-
EINECS Number	:	296-473-8
E Number	:	-

CLP CLASSIFICATION

Ingredient CLP Classification: No

Endpoint	Classification	Category
Acute Oral Toxicity	-	-
Acute Dermal Toxicity	-	-
Acute Inhalation Toxicity	-	-
Skin Corrosive/irritant	-	-
Eye Damage/Irritation	-	-
Respiratory Sensitisation	-	-
Skin Sensitisation	-	-
Mutagenicity/Genotoxicity	-	-
Carcinogenicity	-	-
Reproductive Toxicity	-	-
Specific Target Organ Toxicity	-	-
Aspiration Toxicity	-	-

REACH Statement

This ingredient has been registered under REACH. Under REACH, registrants have an obligation to provide information on substances they manufacture or import. This information includes data on hazardous properties (covering

various toxicological endpoints), guidance on safe use and classification and labelling. The European Chemicals Agency (ECHA) makes this information publicly available on its website: http://echa.europa.eu/.

SPECIFICATIONS

Melting Point: >1700°C

Boiling point: Not known

STATUS IN FOOD AND DRUG LAWS

CoE limits:

Beverages (mg/kg)	Food (mg/kg)	Exceptions (mg/kg)
-	-	-

Acceptable Daily Intake:

ADI (mg/kg)	ADI Set by	Date Set	Comments
-	-	-	-

FDA Status:

Section Number	Comments
-	-

HUMAN EXPOSURE

Natural Occurrence:
Does not occur in nature [MSDS for Calcinated Clay, 2008].

Reported Uses:
Mineral pigment extender, filler or binding aid used in rubber and plastic formulations [MSDS for Calcinated Clay, 2008].

TOXICITY DATA

Calcined clay is an anhydrous aluminium silicate produced by heating ultrafine natural kaolin to temperatures between 700 – 1100ºC [Imery's, viewed 23/09/09]. This ultra heating removes water and increases the brightness and hardness of the original compound [Imery's, viewed 23/09/09]. Toxicological data for Kaolin has also been presented.

***In Vivo* Toxicity Status**

Species	Test Type	Route	Reported Dosage
Rat	LD_{50}	Oral	5g/kg
Rat	LD_{50}	Dermal	5g/kg

[MSDS for Calcinated Clay, 2008]

Carcinogenicity / Mutagenicity
Calcinated clay is not listed as a carcinogen by the International Agency for Research on Cancer (IARC), the National Toxicology Program (NTP) or the Occupational Safety and Health Administration (OSHA) [MSDS for Calcinated Clay, 2008].

Dermal toxicity / Irritation studies
Kaolin
No dermal irritation was reported in rabbits treated with 0.5 g kaolin for 4 hours. No toxicity or any other clinical abnormalities were observed throughout the study [USEPA/Office of pesticide Programs, 2000].

Inhalation toxicity
Kaolin
Guinea pigs and rats were exposed to airborne kaolin dust for 6 hours/day, 5 days/week for 1 year. Guinea pigs exposed at 23.4 mg/m^3 showed slight pleural mottling. The lymph nodes contained large masses of dust cells. Rats exposed at 27.1 mg/m^3 developed scattered dust foci; collagenous fibres were observed between the cells and the lymph nodes contained large masses of dust. Intratracheal injection of rats with kaolin dust was associated with similar reactions, but the coarser particles elicited a large number of foreign body giant cells [HSDB, 2008].

Reproductive / Developmental toxicity
Kaolin
The intent of this study was to determine the effects of kaolin ingestion on the maternal blood and embryonic development of the pregnant rat. Thirty-six Sprague-dawley female rats were divided into three groups: control diet, 20% kaolin diet, and iron-supplemented 20% kaolin diet. The diets were fed 37 to 68 days, 69 to 95 days, and 96 to 117 days prior to fertilization, and the same diets were fed for the duration of the gestation period. The rats fed the kaolin diet exhibited significant reductions in haemoglobin, haematocrit, and red blood cell levels, thus indicating maternal anaemia. There was also a significant reduction in the birth weight of the pups born to kaolin fed rats. The kaolin fed rats receiving an iron supplement maintained haematocrit, haemoglobin, red blood cell levels, and pup weight within the normal range [Patterson et al., 1977].

Other relevant studies
Kaolin
Female Sprague Dawley rats were administered 0.1 mL Kaolin (250 mg/mL) into cisterna magna. 1, 4 and 8 weeks later, brains were analyzed using antibodies against MHC class I (OX18), MHC class II (OX6), CD4 (OX38), CD8 (OX8), OX42, ED1, NF, GFAP, AChE and TH. Remarkably high numbers of T lymphocytes, and OX42- and ED1-positive macrophages were found aggregated in subarachnoid spaces, and in the third and fourth ventricles. Marked aggregations of ED1-positive reactive microglial cells were also found in paraventricular structures, medial septum, retrosplenic cortex and commissural structures. However, no such cells were found in hippocampus. ED1-positive areas were also positive for round cells with a rim

of MHC I fluorescent cytoplasm as well as for OX42-positive cells and MHC II positive microglial cells. At week 1, in ventro-frontal areas of cortex, CD8-positive cells and MHC I positive astroglial fibres were detected. At week 1, MHC I positive ramified microglial cells were also recognized in almost the entire brain. These positive cells gradually decreased with time and finally remained rounded with a rim of fluorescent cytoplasm. In addition, ED1 positive partly ramified microglial cells could be recognized in corpus callosum, probably representing cells in transition between ramified and reactive microglia. CD8+ cells entered ventral brain structures, and were found in the horizontal diagonal band at week 4, and had disappeared at week 8. Finally in cortex, ED1 positive microglial cells could be identified only in the retrosplenic cortex, and there were also "dark shrunken neurons" in light microscopic stainings. However, there was only a moderate GFAP positive gliosis. The authors concluded kaolin-induced hydrocephalus leads to immune reactions in several defined areas such as cholinergic systems, corpus callosum, circumventricular organs, pontine cerebellar peduncles and the vestibular nucleus [Shinoda & Olson 1997].

Behavioural data

Kaolin

Chronic hydrocephalus was studies in rats, 9 months after induction by kaolin injection into the cisterna magna, and in humans. In both circumstances, destruction of periventricular white matter structures was worst in those with the largest ventricles. Structures damaged include the corpus callosum, corticospinal tract, and fimbria/fornix projections from the hippocampus. Myelin turnover was increased. These changes were associated with deficits of motor and cognitive function. The cerebral cortex was largely spared [Del Bigio *et al.,* 2003].

In Vitro Toxicity Status

Carcinogenicity/Mutagenicity

Kaolin

To examine genotoxic effects by C60, CB and kaolin, an *in vitro* micronuclei (MN) test was conducted with human lung cancer cell line, A549 cells. In addition, DNA damage and mutations were analyzed by *in vivo* assay systems using male C57BL/6J or gpt delta transgenic mice which were intratracheally instilled with single or multiple doses of 0.2 mg per animal of particles. *In vitro* genotoxic analysis revealed increased MN frequencies in A549 cells treated with C60, CB and kaolin in a dose-dependent manner. These three nano/microparticles also induced DNA damage in the lungs of C57BL/6J mice measured by comet assay. Moreover, single or multiple instillations of C60 and kaolin, increased either or both of gpt and Spi- mutant frequencies in the lungs of gpt delta transgenic mice. Mutation spectra analysis showed transversions were predominant, and more than 60% of the base substitutions occurred at G:C base pairs in the gpt genes. The G:C to C:G transversion was commonly increased by these particle instillations. It was concluded manufactured nano/microparticles, CB, C60 and kaolin, were shown to be genotoxic in *in vitro* and *in vivo* assay systems [Totsuka *et al*, 2009]

REFERENCES

Del Bigio *et al*., (2003). Chronic hydrocephalus in rats and humans:white matter loss and behavior changes. *Ann Neurol.* **53(3)**:337-46.

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