

## Sodium Carbonate Anhydrous

Carbonato de sodio anhidro; Cenizas de Soda; E500; Exsiccated Sodium Carbonate; Natrii Carbonas; Natrii carbonas anhydricus; Natrio karbonatas, bevandenis; Natrium Carbonicum Calcinatum; Natrium Carbonicum Siccatum; Natriumkarbonaatti, vedetön; Natriumkarbonat, vattenfritt; Sodium (carbonate de) anhydrous; Uhlíčitan sodný; Uhlíčitan sodný bezvodý; Vízmentes nátrium-karbonát.

$\text{Na}_2\text{CO}_3 = 106.0$ .  
CAS — 497-19-8.

NOTE. Soda ash is a synonym for the technical grade of sodium carbonate anhydrous.

**Pharmacopoeias.** In *Eur.* (see p.vii) and *Jpn. USNF* allows the anhydrous substance or the monohydrate.

**Ph. Eur. 6.2** (Sodium Carbonate, Anhydrous). A white or almost white, slightly granular, hygroscopic powder. Freely soluble in water; practically insoluble in alcohol. A 10% solution in water is strongly alkaline. Store in airtight containers.

**USNF 26** (Sodium Carbonate). Colourless crystals, or white, crystalline powder or granules. Soluble 1 in 3 of water and 1 in 1.8 of boiling water.

## Sodium Carbonate Decahydrate

Carbonato de sodio decahidratado; Cristales de Sosa; E500; Natrii Carbonas; Natrii carbonas decahydricus; Natrio karbonatas decahidratas; Natrium Carbonicum Crystallisatum; Natriumkarbonaattidekahydraatti; Nátrium-karbonát-dekahidrátt; Natriumkarbonatdekahydrát; Sodium (carbonate de) décahydraté; Uhlíčitan sodný dekahydrát.

$\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O} = 286.1$ .  
CAS — 6132-02-1.

NOTE. Washing soda is a synonym for the technical grade of sodium carbonate decahydrate.

**Pharmacopoeias.** In *Eur.* (see p.vii) and *Jpn.*

**Ph. Eur. 6.2** (Sodium Carbonate Decahydrate). Colourless, efflorescent, transparent crystals or a white or almost white crystalline powder. Freely soluble in water; practically insoluble in alcohol. A 10% solution in water is strongly alkaline. Store in airtight containers.

## Sodium Carbonate Monohydrate

Carbonato de sodio monohidratado; E500; Natrii carbonas monohydricus; Natrio karbonatas monohidratas; Natriumkarbonaattimonohydraatti; Nátrium-karbonát-monohidrátt; Natriumkarbonatmonohydrát; Sodium (carbonate de) monohydraté; Sodu węglan jednowodny; Uhlíčitan sodný monohydrát.

$\text{Na}_2\text{CO}_3 \cdot \text{H}_2\text{O} = 124.0$ .  
CAS — 5968-11-6.

**Pharmacopoeias.** In *Eur.* (see p.vii). *USNF* allows the anhydrous substance or the monohydrate.

**Ph. Eur. 6.2** (Sodium Carbonate Monohydrate). A white or almost white, crystalline powder or colourless crystals. Freely soluble in water; practically insoluble in alcohol. A 10% solution in water is strongly alkaline. Store in airtight containers.

**USNF 26** (Sodium Carbonate). Colourless crystals, or white, crystalline powder or granules. When exposed to dry air above 50°, it effloresces and at 100° it becomes anhydrous. Soluble 1 in 3 of water and 1 in 1.8 of boiling water.

## Profile

Sodium carbonate is used in antacid preparations. Anhydrous sodium carbonate and the monohydrate are also used as reagents. The decahydrate has been used in alkaline baths. Sodium carbonate in its anhydrous or hydrated form is also used as a water softener.

Sodium carbonate may be irritating or mildly corrosive to skin, mucous membranes, and eyes.

## Preparations

**BPC 1973:** Surgical Chlorinated Soda Solution;

**USP 31:** Citric Acid, Magnesium Oxide, and Sodium Carbonate Irrigation.

**Proprietary Preparations** (details are given in Part 3)

**Multi-ingredient:** **Arg.:** Alikal; Otolcalmia Biotici; Otolcerol; Otolclean Gotas Oticas; Sal de Fruta Eno; Sincerum; Uvasal; **Austral.:** Eno; **Braz.:** Digestem; Sal de Fruta Eno; Sonrisal; **Fr.:** Bactident; Hydralin; **Hong Kong:** Eno; Hydralin; **Irl.:** Cymaloni; **Israel:** Eno; Unikal; **Ital.:** Gastrotuss; **Port.:** Eno; **Spain:** Sal de Fruta Eno; **Tanasid.:** **Switz.:** Salt-rates Rodell; **UK:** Cymalon; Eno; Resolve; **Venez.:** Eno.

## Sodium Chlorate

Clorato de potasio; Natrium Chloricum; Sodii Chloras.

$\text{NaClO}_3 = 106.4$ .  
CAS — 7775-09-9.

## Profile

Sodium chlorate closely resembles potassium chlorate (p.2371) in its properties and has been used as an astringent. Its main use is as a weedkiller and it is therefore a common household chemical. Poor storage conditions can lead to explosions.

The symbol † denotes a preparation no longer actively marketed

## Preparations

**Proprietary Preparations** (details are given in Part 3)

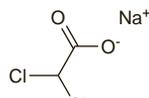
**Multi-ingredient:** **Spain:** Co Bucal.

## Sodium Dichloroacetate (USAN)

CPC-211; DCA; Dichloroacetato de sodio.

$\text{C}_2\text{HCl}_2\text{NaO}_2 = 150.9$ .

CAS — 2156-56-1 (sodium dichloroacetate); 79-43-6 (dichloroacetic acid).



## Profile

Dichloroacetic acid activates pyruvate dehydrogenase, a mitochondrial enzyme that catalyses metabolism of pyruvate and lactate, and it inhibits glycolysis. It also stimulates myocardial contractility. Sodium dichloroacetate has been used for the treatment of congenital lactic acidosis, lactic acidosis in patients with severe malaria, homozygous familial hypercholesterolaemia, and for severe brain injury. It is also under investigation for stroke.

**Adverse effects.** Adverse effects reported with sodium dichloroacetate have mainly involved the central and peripheral nervous systems.<sup>1</sup> Anxiolytic or sedative effects are common. Reversible polyneuropathy has been reported after chronic use, as has asymptomatic elevation of serum transaminases. Reduced urate clearance and elevated serum urate levels have been reported in patients with type 2 diabetes mellitus. See also under Use in Metabolic Acidosis, below for reference to early termination of a study due to development of peripheral neuropathy.

1. Stacpoole PW, *et al.* Pharmacokinetics, metabolism, and toxicology of dichloroacetate. *Drug Metab Rev* 1998; **30**: 499–539.

**Pharmacokinetics.** References.

- Henderson GN, *et al.* Pharmacokinetics of dichloroacetate in adult patients with lactic acidosis. *J Clin Pharmacol* 1997; **37**: 416–25.
- Shangraw RE, Fisher DM. Pharmacokinetics and pharmacodynamics of dichloroacetate in patients with cirrhosis. *Clin Pharmacol Ther* 1999 **66**: 380–90.

**Use in metabolic acidosis.** In a study<sup>1</sup> in 29 patients with lactic acidosis (p.1667), sodium dichloroacetate 50 mg/kg given by intravenous infusion over 30 minutes, followed by a second dose 2 hours after beginning the first infusion, produced a metabolic response in 23 patients with a short-term increase in survival. However, a subsequent study<sup>2</sup> found that, while dichloroacetate infusion did reduce blood-lactate concentrations, it did not alter haemodynamics or survival in patients with severe lactic acidosis. A review<sup>3</sup> of these and other controlled studies in the treatment of acquired and congenital lactic acidosis concluded that the maximum lactate-lowering effect is dose-dependent but independent of time after dosing. Whether lowering lactate levels contributes to reducing morbidity and mortality in hyperlactaemia remains controversial, although data from recent studies suggest that treatment in mild cases may reduce the risk of death. A review<sup>4</sup> of the treatment of children with dichloroacetate for congenital lactic acidosis hypothesised that it might improve quality of life by reducing the frequency of acid-base decompensations, improving neurological function, and stimulating linear growth. A randomised controlled study<sup>5</sup> of dichloroacetate for the treatment of congenital lactic acidosis in 43 patients ranging in age from 3 months to 18 years found that dichloroacetate for 6 months was well tolerated and reduced blood-lactate response to a carbohydrate challenge but had no effect on basal-lactate concentrations nor did it improve neurologic or other measures of clinical outcome. In another randomised controlled study<sup>6</sup> of the effects of dichloroacetate in the treatment of the multisystem syndrome of mitochondrial myopathy, encephalopathy, lactic acidosis, and stroke-like episodes (MELAS), 13 of 15 patients given the study medication developed peripheral neuropathy, displaying either clinical signs and symptoms or electrophysiological evidence. The study was therefore stopped early, and on this basis, the authors concluded that dichloroacetate could not be recommended for the treatment of MELAS.

In a randomised, double-blind, placebo-controlled study<sup>7</sup> in 124 West African children with severe *Plasmodium falciparum* malaria, a single intravenous infusion of sodium dichloroacetate in a dose of 50 mg/kg given at the same time as quinine increased the rate and magnitude of fall in blood-lactate levels without compromising the plasma kinetics of quinine.

In the UK, the *BNFC* includes the following doses for neonates and children with pyruvate dehydrogenase defects: 12.5 mg/kg 4 times daily by mouth, adjusted according to response up to 200 mg/kg daily.

Sodium dichloroacetate has also been studied<sup>8</sup> in patients with traumatic brain injury for its lactate-lowering effect in cerebrospinal fluid.

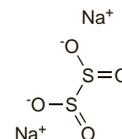
1. Stacpoole PW, *et al.* Dichloroacetate in the treatment of lactic acidosis. *Ann Intern Med* 1988; **108**: 58–63.

- Stacpoole PW, *et al.* A controlled clinical trial of dichloroacetate for treatment of lactic acidosis in adults. *N Engl J Med* 1992; **327**: 1564–9.
- Stacpoole PW, *et al.* Efficacy of dichloroacetate as a lactate-lowering drug. *J Clin Pharmacol* 2003; **43**: 683–91.
- Stacpoole PW, *et al.* Treatment of congenital lactic acidosis with dichloroacetate. *Arch Dis Child* 1997; **77**: 535–41.
- Stacpoole PW, *et al.* Controlled clinical trial of dichloroacetate for treatment of congenital lactic acidosis in children. *Pediatrics* 2006; **117**: 1519–31.
- Kaufmann P, *et al.* Dichloroacetate causes toxic neuropathy in MELAS: a randomized, controlled clinical trial. *Neurology* 2006; **66**: 324–30.
- Agbenyega T, *et al.* Population kinetics, efficacy, and safety of dichloroacetate for lactic acidosis due to severe malaria in children. *J Clin Pharmacol* 2003; **43**: 386–96.
- Williams PJ. Dichloroacetate: population pharmacokinetics with a pharmacodynamic sequential link model. *J Clin Pharmacol* 2001; **41**: 259–67.

## Sodium Dithionite

Ditionito de sodio; Natrii Dithionis; Sodium Hydrosulfite; Sodium Hydrosulphite; Sodium Sulphoxylate; Sodu ditionian; Sodu podsiarczyn.

$\text{Na}_2\text{S}_2\text{O}_4 = 174.1$ .  
CAS — 7775-14-6.



NOTE. The name sodium hydrosulfite is also applied to  $\text{NaHSO}_2 = 88.06$ .

**Pharmacopoeias.** In *Pol.*

## Profile

Sodium dithionite is used as a reducing agent. It may be used in the form of a simple urine test in the detection of paraquat poisoning. A 0.25% solution has been used to remove phenazopyridine stains from fabric. It is irritant to the skin.

## Sodium Gluconate

E576; Gluconato de sodio. Monosodium D-gluconate.

$\text{C}_6\text{H}_{11}\text{NaO}_7 = 218.1$ .  
CAS — 527-07-1.

**Pharmacopoeias.** In *US.*

## Profile

Sodium gluconate is a food additive.

Gluconates act as acceptors of hydrogen ions produced by metabolic processes and are an indirect source of bicarbonate ions.

## Sodium Humate

CAS — 1415-93-6 (humic acids); 68131-04-4 (sodium humates).

## Profile

Humic acids are mixtures of complex macromolecules derived from the decomposition of organic material and are found in soils and peats. They have been used topically, usually as sodium humate, for musculoskeletal and joint disorders. They also have industrial applications.

## Preparations

**Proprietary Preparations** (details are given in Part 3)

**Ger.:** Leukona-Sulfomoor-Bad F†; Rheumasan Moor-Bad S†.

**Multi-ingredient:** **Austria:** Humal; Leukona-Sulfomoor-Bad†; Salhumini; **Ger.:** Salhumini Rheuma-Bad; Salhumini Sitzbad N†; Salhumini Teilbad N†.

## Sodium Hydroxide

Átznatron; Caustic Soda; E524; Hidróxido de sodio; Hydroxid sodný; Natrii hydroxidum; Natrio hidroksidas; Natrium Hydricum; Natrium Hydroxydatum; Nátrium-hydroxid; Natriumhydroxid; Natriumhydroxid; Soda Lye; Sodium, hydroxyde de; Sodu wodorotlenek; Sosa cáustica.

$\text{NaOH} = 40.00$ .  
CAS — 1310-73-2.

**Pharmacopoeias.** In *Chin., Eur.* (see p.vii), *Int.,* and *Jpn.* Also in *USNF*.

**Ph. Eur. 6.2** (Sodium Hydroxide). White or almost white, crystalline masses supplied as pellets, sticks, or slabs. It is deliquescent and readily absorbs carbon dioxide. Very soluble in water; freely soluble in alcohol. A 0.01% solution in water has a pH of not less than 11.0. Store in airtight, nonmetallic containers.

**USNF 26** (Sodium Hydroxide). White or practically white fused masses, small pellets, flakes, sticks, or other forms. It is hard and