

Povidone-iodine

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Povidone-iodine (PVP-I), brand name **Wokadine**, **Pydine**, and **Betadine** is a stable chemical complex of **polyvinylpyrrolidone** (povidone, PVP) and elemental **iodine**. It contains from 9.0% to 12.0% available iodine, calculated on a **dry basis**.^[1]

This unique complex was discovered in 1955 at the Industrial Toxicology Laboratories in Philadelphia by H. A. Shelanski and M. V. Shelanski.^[2] They carried out tests *in vitro* to demonstrate anti-bacterial activity, and found that the complex was less toxic in mice than **tincture of iodine**.

Human clinical trials showed the product to be superior to other iodine formulations.^[3]

Betadine was immediately marketed, and has since become the universally preferred iodine antiseptic.

It is on the **WHO Model List of Essential Medicines**, the most important products needed in a basic health system.^[4]

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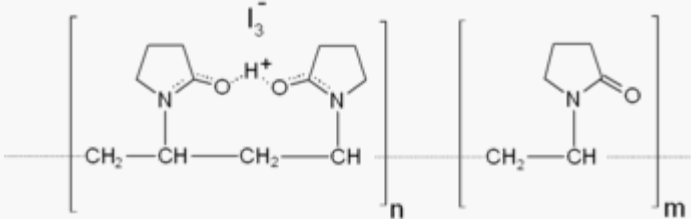
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Medical uses [edit]

Povidone-iodine is a broad spectrum antiseptic for topical application in the treatment and prevention of infection in wounds. It may be used in first aid for minor cuts, grazes, burns, abrasions and blisters.

Following the discovery of **iodine** by **Bernard Courtois** in 1811, it has been broadly used for the prevention and treatment of skin infections, as well as the treatment of wounds. Iodine has been recognized as an effective broad-spectrum **bactericide**, and is also effective against yeasts, molds, fungi, viruses, and protozoans. Drawbacks to its use in the form of aqueous solutions include

Povidone-iodine



Systematic (IUPAC) name

2-Pyrrolidinone, 1-ethenyl-, homopolymer, compd. with iodine.

Clinical data



AHFS/Drugs.com **International Drug Names**








Routes of administration topical


Legal status

Legal status US: OTC



Identifiers



CAS Number 25655-41-8  

ATC code D08AG02 (**WHO** ) D09AA09 (**WHO** ) (dressing) D11AC06 (**WHO** ) G01AX11 (**WHO** ) R02AA15 (**WHO** ) S01AX18 (**WHO** ) QG51AD01 (**WHO** )

PubChem CID 410087 

ChemSpider none

UNII 85H0HZU99M  

ChEMBL ChEMBL1201724  

Chemical data

Formula (C₆H₉NO)_n·xI

Molar mass variable

  (what is this?)  (verify)

irritation at the site of application, toxicity, and the staining of surrounding tissues. These deficiencies were overcome by the discovery and use of PVP-I, in which the iodine is carried in a [complexed](#) form and the concentration of free iodine is very low. The product thus serves as an [iodophor](#).

In addition, it has been demonstrated that bacteria do not develop resistance to PVP-I,^[5] and the [sensitization](#) rate to the product is only 0.7%^[6] Consequently, PVP-I has found broad application in medicine as a surgical scrub; for pre- and post-operative skin cleansing; for the treatment and prevention of infections in wounds, ulcers, cuts and burns; for the treatment of infections in [decubitus ulcers](#) and [stasis ulcers](#); in [gynecology](#) for [vaginitis](#) associated with [candidal](#), [trichomonal](#) or mixed infections. For these purposes PVP-I has been formulated at concentrations of 7.5–10.0% in solution, spray, surgical scrub, ointment, and swab dosage forms. It is available without a prescription under the generic name povidone-iodine or the brand name [Betadine](#).

It is used in [pleurodesis](#) (fusion of the pleura because of incessant pleural effusions). For this purpose, povidone-iodine is equally effective and safe as [talc](#), and may be preferred because of easy availability and low cost.^[7]

2.5% [buffered](#) PVP-I [solution](#) can be used for [prophylaxis](#) of [neonatal conjunctivitis](#) (*Ophthalmia neonatorum*) which can lead to [blindness](#), especially if it is caused by *Neisseria gonorrhoeae*, or *Chlamydia trachomatis*. PVP-I appears to be very suitable for this purpose because, unlike other substances, it is also efficient against [fungi](#) and [viruses](#) (including [HIV](#) and *Herpes simplex*).^[8]

PVP-I can be loaded into [hydrogels](#) (based on [carboxymethyl cellulose](#) (CMC), [poly\(vinyl alcohol\)](#) (PVA) and [gelatin](#), or on crosslinked [polyacrylamide](#)). These hydrogels can be used for [wound dressing](#). The rate of release of the iodine in the PVP-I is heavily dependent on the hydrogel composition: it increases with more CMC/PVA and decreases with more gelatin.

Alternative [\[edit\]](#)

In a clinical study of approximately 850 patients which compared the efficacy of pre-operative skin cleansing using [chlorhexidine-alcohol](#) vs. povidone-iodine (PVP-I) in preventing post-operative infection, the rate of surgical-site infection was significantly lower in the chlorhexidine-alcohol group than in the PVP-I group (overall, 9.5% vs. 16.1%).^[9] Chlorhexidine-alcohol was significantly more protective than PVP-I against both superficial incisional infections (4.2% vs. 8.6%) and deep incisional infections (1% vs. 3%).

The incidence of organ-space infections was, however, not significantly different between the groups (4.4% vs. 4.5%). The team performing the study believes that, although both of the antiseptic preparations possess broad-spectrum antimicrobial activity, the more effective protection provided by chlorhexidine-alcohol may be due to its more rapid action, its persistent activity (even when exposed to bodily fluids), and some residual effect.^[10] An alternative explanation is the dilution of the active antimicrobial agent (chlorhexidine) in [isopropyl alcohol](#) rather than water (iodine).

In a separate study a lower infection rate was seen with iodine povacrylex in isopropyl alcohol



Wound area covered in povidone-iodine. [Gauze](#) has also been applied.



Povidone-iodine applied to an [abrasion](#) using a [cotton swab](#).

(DuraPrep) than with chlorhexidine in isopropyl alcohol (ChloraPrep) (3.9% compared with 7.1%; P = .002).^[11]

Contraindications [edit]

PVP-I is contraindicated in patients with **hyperthyroidism** (overactive **thyroid gland**) and other diseases of the thyroid, after treatment with **radioiodine**, and in patients with **dermatitis herpetiformis**^[*why?*] (Duhring's disease).^[12]

Interactions [edit]

The iodine in PVP-I reacts with **hydrogen peroxide**, **silver**, **taurolidine** and proteins such as enzymes, rendering them (and itself) ineffective. It also reacts with many **mercury** compounds, giving the corrosive compound **mercury iodide**, as well as with many metals, making it unsuitable for disinfecting metal piercings.^[12]

Iodine is absorbed into the body to various degrees, depending on application area and condition of the skin. As such, it interacts with diagnostic tests of the thyroid gland such as radioiodine diagnostics, as well as with various diagnostic agents used on the urine and stool, for example *Guaiacum* resin.^[12]

Properties [edit]

PVP-I is completely soluble in cold and mild-warm water, **ethyl alcohol**, **isopropyl alcohol**, **polyethylene glycol**, and **glycerol**. Its stability in solution is much greater than that of tincture of iodine or **Lugol's solution**.

Free iodine, slowly liberated from the povidone-iodine (PVP-I) complex in solution, kills **eukaryotic** or **prokaryotic** cells through iodination of **lipids** and oxidation of **cytoplasmic** and membrane compounds. This agent exhibits a broad range of microbicidal activity against **bacteria**, **fungi**, **protozoa**, and **viruses**. Slow release of iodine from the PVP-I complex in solution minimizes iodine toxicity towards mammalian cells.

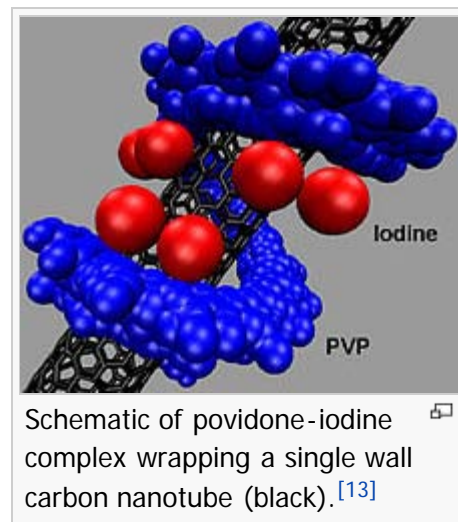
Research [edit]

Povidone-iodine has found application in the field of nanomaterials. A wound-healing application has been developed which employs a mat of single wall carbon nanotubes (SWNTs) coated in a monolayer of povidone-iodine.^[13]

Research has previously found that the polymer polyvinylpyrrolidone (PVP, povidone) can coil around individual carbon nanotubes to make them water-soluble.^[14]

See also [edit]

- Antiseptic**
- Cadexomer iodine**
- Chlorhexidine**
- Iodophor**
- Inadine**
- Lugol's iodine**
- Tincture of iodine**



References [edit]

1. [^] [United States Pharmacopeia](#) Archived July 11, 2007, at the Wayback Machine.

2. [^] U.S.patent 2,739,922

3. [^] Sneader, Walter (2005). *Drug Discovery: A History*. New York: John Wiley & Sons. p. 68. ISBN 0-471-89979-8.

4. [^] "19th WHO Model List of Essential Medicines (April 2015)" (PDF). WHO. April 2015. Retrieved May 10, 2015.

5. [^] Fleischer, W.; Reimer, K. (1997). "Povidone-iodine in antiseptis — State of the art". *Dermatology* **195** (Suppl 2): 3–9. doi:10.1159/000246022.

6. [^] Niedner, R. (1997). "Cytotoxicity and sensitization of povidone-iodine and other frequently used anti-infective agents". *Dermatology* **195** (Suppl 2): 89–92. doi:10.1159/000246038.

7. [^] Das SK, Saha SK, Das A, Halder AK, Banerjee SN, Chakraborty M (September 2008). "A study of comparison of efficacy and safety of talc and povidone iodine for pleurodesis of malignant pleural effusions". *J Indian Med Assoc* **106** (9): 589–90, 592. PMID 19552086.

8. [^] Najafi Bi, R.; Samani, S. M.; Pishva, N.; Moheimani, F. (2003). "Formulation and Clinical Evaluation of Povidone-Iodine Ophthalmic Drop". *Iranian Journal of Pharmaceutical Research* **2** (3): 157–160.

9. [^] Rabihi, O.; Darouiche, M. D.; et al. (2010). "Chlorhexidine-Alcohol versus Povidone-Iodine for Surgical-Site Antisepsis". *New England Journal of Medicine* **362** (1): 18–26. doi:10.1056/NEJMoa0810988. PMID 20054046.

10. [^] Denton GW: Chlorhexidine, Disinfection, sterilization, and preservation **321** (5th ed.) 36 (2001)

11. [^] Swenson, B. R.; Hendrick, T. L.; Metzger, R.; Bonatti, H.; Pruett, T. L.; Sawyer, R. G. (2009). "Effects of preoperative skin preparation on postoperative wound infection rates: a prospective study of 3 skin preparation protocols" . *Infect Control Hosp Epidemiol* **30** (10): 964–971. doi:10.1086/605926. PMC 3371364. PMID 19732018.

12. [^] ^{*a*} ^{*b*} ^{*c*} Jasek, W, ed. (2007). *Austria-Codex* (in German) (62nd ed.). Vienna: Österreichischer Apothekerverlag. pp. 983–5. ISBN 978-3-85200-181-4.

13. [^] ^{*a*} ^{*b*} Simmons, Trevor; Lee, S.-H.; Park, T.-J.; Hashim, D.P.; Ajayan, P.M.; Linhardt, R.J. (2009). "Antiseptic Single Wall Carbon Nanotube Bandages" (PDF). *Carbon* **47** (6): 1561–1564. doi:10.1016/j.carbon.2009.02.005.

14. [^] Simmons, Trevor; Hashim, D; Vajtai, R; Ajayan, PM (2007). "Large Area-Aligned Arrays from Direct Deposition of Single-Wall Carbon Nanotubes" . *J. Am. Chem. Soc.* **129** (33): 10088–10089. doi:10.1021/ja073745e. PMID 17663555.

Further reading [edit]

- Randolph H.L. Wong; Emily C.W. Hung; Vivien W.Y. Wong; Innes Y.P. Wan; Calvin S.H. Ng; Song Wan; Malcolm J. Underwood (2009). "Povidone-iodine wound irrigation: A word of caution". *Surgical Practice* **13** (4): 123–4. doi:10.1111/j.1744-1633.2009.00461.x.
- Randolph H.L. Wong; Vivien W.Y. Wong; Emily C.W. Hung; Ping Yin Lee; Calvin S.H. Ng; Innes Y.P. Wan; Song Wan; Malcolm J. Underwood (2011). "Topical application of povidone-iodine before wound closure is associated with significant increase in serum iodine level". *Surgical Practice* **19**: 79–82.
- Randolph H.L. Wong; Calvin S.H. Ng; Malcolm J. Underwood (2011). "Iodine pleurodesis--a word of caution". *European Journal of Cardio-Thoracic Surgery*. doi:10.1093/ejcts/ezr137.

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