

Povidone-iodine

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Povidone-iodine (**PVP-I**), also known as **iodopovidone**, is an [antiseptic](#) used for [skin disinfection](#) before and after [surgery](#).^{[1][2]} It may be used both to disinfect the skin of the patient and the hands of the healthcare providers.^[2] It may also be used for minor [wounds](#).^[2] It may be applied to the skin as a liquid or a powder.^[2]

Side effects include skin irritation.^[1] If used on large wounds [kidney problems](#), [high blood sodium](#), and [metabolic acidosis](#) may occur.^[1] It is not recommended in people who are less than 32 weeks [pregnant](#) or are taking [lithium](#).^[2] Frequent use is not recommended in people with [thyroid problems](#).^[2] Povidone-iodine is a [chemical complex](#) of [povidone](#), [hydrogen iodide](#), and elemental [iodine](#).^[3] It contains from 9% to 12% available iodine.^[3] It works by releasing iodine which results in the death of a range of [microorganisms](#).^[1]

Povidone-iodine came into commercial use in 1955.^[4] It is on the [World Health Organization's List of Essential Medicines](#), the most effective and safe medicines needed in a [health system](#).^[5] Povidone-iodine is available [over the counter](#).^[6] The wholesale cost in the [developing world](#) is about US\$3.30 to US\$11.40 per liter of 10% solution.^[7] This amount in the United Kingdom cost the [NHS](#) about £10.86.^[2] It is sold under a number of brand names including [Betadine](#).^[2]

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Medical uses [edit]

Povidone-iodine is a broad spectrum antiseptic for topical application in the treatment and prevention of [wound infection](#). It may be used in first aid for minor cuts, grazes, burns, abrasions and blisters. Povidone-iodine exhibits longer lasting antiseptic effects than [tincture of iodine](#), due to its slow absorption via soft tissue, making it the choice for longer surgeries. [Chlorhexidine](#) provides similar results, but with equal toxicity concerns.

Bacteria do not develop resistance to PVP-I.^[8]

Povidone-iodine



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

Clinical data	
Trade names	Betadine, Wokadine, Pyodine, others
Synonyms	polyvidone iodine, iodopovidone
AHFS/Drugs.com International Drug Names [edit]	
Routes of administration	Topical
ATC code	D08AG02 (WHO [edit]) D09AA09 (WHO [edit]) (dressing) D11AC06 (WHO [edit]) G01AX11 (WHO [edit]) R02AA15 (WHO [edit]) S01AX18 (WHO [edit]) QG51AD01 (WHO [edit])
Legal status	
Legal status	US: OTC
Identifiers	
IUPAC name	[show]
CAS Number	25655-41-8 [edit] [check]
PubChem CID	410087 [edit]
ChemSpider	none
UNII	85H0HZU99M [edit]
ChEMBL	CHEMBL1201724 [edit] [check]
ECHA InfoCard	100.110.412 [edit] [delete]
Chemical and physical data	
Formula	(C ₆ H ₉ NO) _{<i>n</i>} ·xI
Molar mass	variable
[check] [what is this?] [verify]	

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 [vaginits](#) 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.



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

Because of these critical indications, only sterile povidone-iodine should be used in most cases. Non-sterile product can be appropriate in limited circumstances in which patients have intact, healthy skin that will not be compromised or cut. It should be noted that the non-sterile form of Povidone iodine has a long history of intrinsic contamination with *B. cepacia*, and other opportunistic pathogens. Its ability to harbor such microbes further underscores the importance of using sterile products in any clinical setting.

Eyes [\[edit\]](#)

A [buffered](#) PVP-I [solution](#) of 2.5% concentration can be used for prevention of [neonatal conjunctivitis](#), especially if it is caused by [Neisseria gonorrhoeae](#), or [Chlamydia trachomatis](#). It is currently unclear whether PVP-I is more effective in reducing the incidence of conjunctivitis in neonates over other methods.^[9] 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](#)).^[10]

Pleurodesis [\[edit\]](#)

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.^[11]

Alternatives [\[edit\]](#)

There is tentative evidence that [chlorhexidine](#) and [denatured alcohol](#) used to clean skin prior to surgery is better than povidone-iodine with alcohol; however, the evidence is not strong enough as of 2015 to determine routine practice.^[12]

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).^[13]

Side effects [\[edit\]](#)

The [sensitization](#) rate to the product is 0.7%.^[14]

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.^[13]

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.^[13]

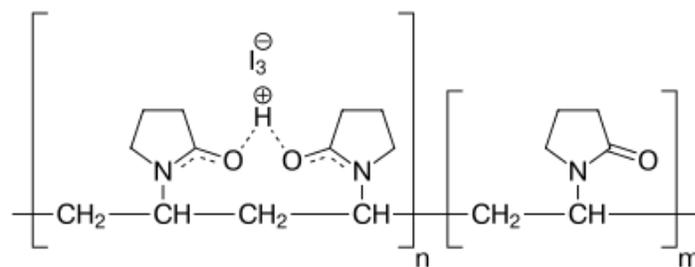
Chemistry [\[edit\]](#)

Povidone-iodine is a [chemical complex](#) of [povidone](#),

[hydrogen iodide](#), and elemental [iodine](#). It 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.

PVP-I can be loaded into [hydrogels](#), which can be 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.



Chemical model

History [[edit](#)]

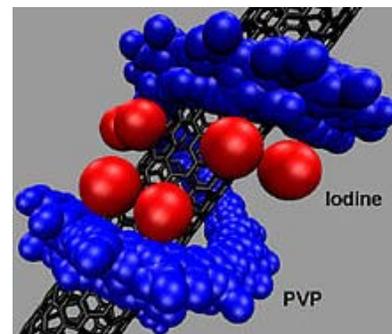
It was discovered in 1955 at the Industrial Toxicology Laboratories in Philadelphia by H. A. Shelanski and M. V. Shelanski.^[15] They carried out tests *in vitro* to demonstrate anti-bacterial activity, and found that the complex was less toxic in mice than [tincture of iodine](#). Human clinical trials showed the product to be superior to other iodine formulations.^[16]

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 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](#).

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.^[17]

Research has previously found that the polymer polyvinylpyrrolidone (PVP, povidone) can coil around individual carbon nanotubes to make them water-soluble.^[18]



Schematic of povidone-iodine complex wrapping a single wall carbon nanotube (black).^[17]

See also [[edit](#)]

- [Cadexomer iodine](#)
- [Iodophor](#)
- [Inadine](#)
- [Lugol's iodine](#)
- [Tincture of iodine](#)

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