

# Heroin

Clearly, the fact heroin was legal and widely prescribed for common use such as coughs and colds, as well as a pain killer, had not led to the sort of widespread dependency those opponents of legalization fear it would do if legalized today.

In fact, heroin's emergence on to the medical stage was so low-key it effectively sat on the shelf for 20 years. First synthesized in 1874 by an English chemist, from morphine (an opiate) and acetic anhydride, and medically known as diacetylmorphine, it was picked up by the German drugs firm Bayer in 1898.

The name heroin probably derives from the German word heroisch, which means powerful. And it certainly was, with tests proving it was up to two times stronger a painkiller than morphine.

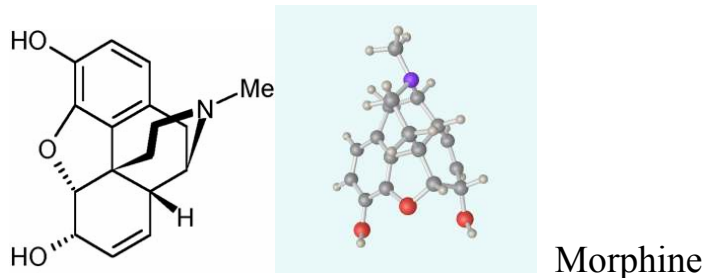
## Lead compound discovery

Heroin (diacetylmorphine) was first synthesized in 1874 by C. R. Alder Wright, an English chemist working at St. Mary's Hospital Medical School in London. He had been experimenting with combining morphine with various acids. He boiled anhydrous morphine with acetic anhydride for several hours and produced a more potent form of morphine, now called diacetylmorphine. The compound was sent to F. M. Pierce of Owens College in Manchester for analysis. Owens told Wright that injection of diacetylmorphine in dogs and rabbits gave the following general results: great depression, fear, and sleepiness speedily following the administration, the eyes being sensitive, and pupils constrict, considerable salivation being produced in dogs, and slight tendency to vomiting in some cases. Respiration was at first quickened, but subsequently reduced, and the heart's action was diminished, and rendered irregular.

From 1898 through to 1910 diacetylmorphine was marketed under the name heroin as a non-addictive morphine substitute and cough suppressant. Bayer marketed heroin as a cure for morphine addiction before it was discovered that it rapidly metabolizes into morphine. As such, heroin is essentially a quicker acting form of morphine. The company was embarrassed by the new finding, which became a historic blunder for Bayer.

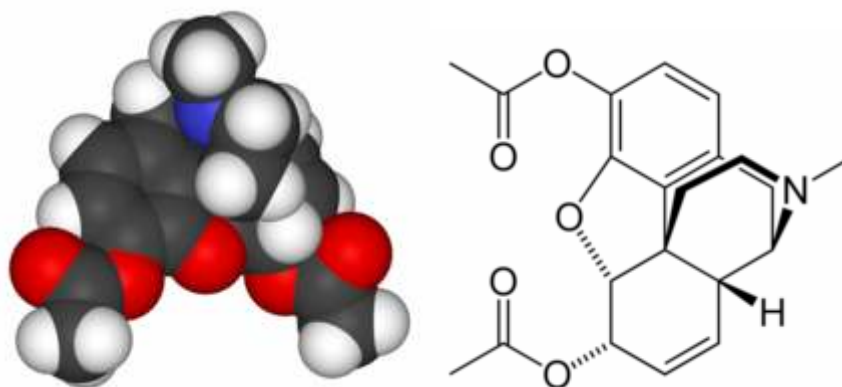
## Molecular modification

Diacetylmorphine was synthesized from morphine in 1874 and brought to market by Bayer in 1898. Heroin is approximately 1.5–2 times more potent than morphine on a milligram-for-milligram basis. Using a variety of subjective and objective measures, one study estimated the relative potency of heroin to morphine administered intravenously to post-addicts to be 1.80–2.66 mg of morphine sulfate to 1 mg of heroin.



## Formulation development

Heroin, or diacetylmorphine (INN), also known as diamorphine (BAN), is a semi-synthetic opioid drug synthesized from morphine, a derivative of the opium poppy. It is the 3,6-diacetyl ester of morphine (hence diacetylmorphine). The white crystal form is commonly the hydrochloride salt diacetylmorphine hydrochloride; however heroin freebase may also appear as a white powder.



## Safety test and human trials

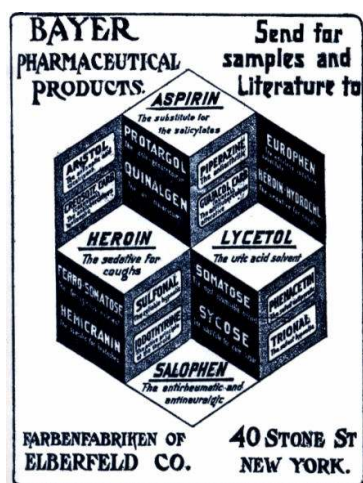
A clinical trial was performed in the Netherlands to evaluate the effect of medical prescription of heroin on mental and physical health and social functioning of long term, treatment-resistant, heroin-dependent patients. Some trial patients received injectable heroin, the other were prescribed pharmaceutical heroin to be inhaled after volatilization. For the latter, we developed a dosage form: diacetylmorphine for inhalation, which consisted of a mixture of 75% with diacetylmorphine base and 25% with caffeine anhydrate. Diacetylmorphine base was preferred to diacetylmorphine hydrochloride, since the diacetylmorphine base has a lower melting point (173 °C) than the hydrochloride salt (243–244 °C). Caffeine was added as it was suggested to increase the recovery of diacetylmorphine base and hydrochloride after volatilization and to reduce degradation upon heating. It was therefore considered to be relatively safe to use heroin for inhalation.

Moreover, safer means of taking the drug, such as smoking or nasal, oral and rectal insertion are encouraged, due to injection having higher risks of overdose, infections and blood-borne viruses. Where the strength of the drug is unknown, users are encouraged to try a small amount first to gauge the strength, to minimize the risks of overdose.

## Approval for market

Diacetylmorphine was widely used in palliative care in the United Kingdom in late 19 century, where it is commonly given by the subcutaneous route, often via a syringe driver, if patients could not easily swallow oral morphine solution. The advantage of diacetylmorphine over

morphine is that diacetylmorphine is more soluble and smaller volumes of diacetylmorphine are needed for the same analgesic effect. That was why diacetylmorphine was a common substitute of morphine.



Old advertisement for Bayer Heroin

Bayer Heroin bottle.

However, in the U.S.A. the Harrison Narcotics Tax Act was passed in 1914 to control the sale and distribution of heroin, which allowed the drug to be prescribed and sold for medical purposes. In 1924 the United States Congress banned its sale, importation or manufacture. It is now a Schedule I substance, which makes it illegal for non-medical use in signatory nations of the Single Convention on Narcotic Drugs treaty, including the United States.