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Opium Poppy Cultivation and Heroin Processing in Southeast Asia



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OPIUM POPPY CULTIVATION
and
HEROIN PROCESSING
in
SOUTHEAST ASIA

141189

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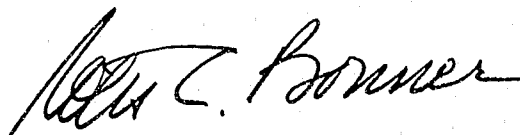
**U.S. Department of Justice
Drug Enforcement Administration
Office of Intelligence
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ADMINISTRATOR'S MESSAGE

Opium Poppy Cultivation and Heroin Processing in Southeast Asia reviews in detail several complex natural and chemical procedures linked with heroin production. It further explains how the opium poppy plant of Southeast Asia is grown and harvested, how the poppy's opium is chemically converted into morphine, and finally, how that morphine is then refined into "China White" heroin by Southeast Asian "cooks" and "chemists." The report will interest a wide audience: those studying "source country" issues, those determining opium poppy crop estimates in mainland Southeast Asia, and those monitoring and controlling the international import and export of chemicals.

Opium Poppy Cultivation and Heroin Processing in Southeast Asia also presents the technical relationship between opium poppy cultivation in the Golden Triangle (the mountainous region where Burma, Laos, and Thailand share common borders) and heroin production in the laboratories of Southeast Asia.



Robert C. Bonner
Administrator of
Drug Enforcement

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EXECUTIVE SUMMARY

The opium poppy has been cultivated in China and mainland Southeast Asia for more than two centuries. The mature plant produces a highly addictive latex which may be refined to produce opium for smoking, or treated with certain chemicals to produce morphine or heroin. This report focuses on the necessary steps in this process—taking a mature but raw opium poppy plant and synthesizing its contents into finished heroin.

This report gives a brief history of the opium poppy plant and analyzes the plant in botanical detail. Cultivation methods are described, to include field selection, land clearing and soil preparation. It further explains the method of extracting morphine from opium, as the operation typically occurs in clandestine jungle laboratories in Southeast Asia. Finally, the intricate procedures used by heroin chemists to convert morphine to heroin are depicted step-by-step.

A glossary of terms related to opium poppy cultivation and heroin processing in Southeast Asia is included for reference.

ORIGIN AND HISTORY OF THE OPIUM POPPY

The sole source of opium is the opium poppy. The plant is believed to have evolved from a wild strain, *Papaver setigerum*, which grows in coastal areas of the Mediterranean Sea. Through centuries of cultivation and breeding for its opium, a species of the plant evolved that is now known as *somniferum*. Today, *Papaver somniferum* is the only species of *Papaver* which produces opium. The genus, *Papaver*, is the Greek word for "poppy." The species, *somniferum*, is Latin for "sleep inducing."

The psychological effects of opium may have been known to the ancient Sumerians (circa 4000 B.C.) whose symbol for the poppy was *hul* ("joy") and *gil* ("plant"). The plant was known in Europe at least 4,000 years ago as evidenced by fossil remains of poppy seed cake and poppy pods found in the Swiss Lake Dwellings of the Neolithic Age. Opium was probably consumed by the ancient Egyptians and was known to the Greeks as well. The poppy is also referred to in Homer's works *The Iliad* and *The Odyssey*. In addition, Hippocrates (460-357 B.C.), the father of medicine, recommended drinking the juice of the white poppy mixed with the seed of nettle.

The opium poppy probably reached China about the 7th century A.D. through the efforts of Arab traders who advocated its use for medicinal purposes. In Chinese literature, however, there are earlier references to its use. The noted Chinese surgeon Hua To of the Three Kingdoms (220-264 A.D.) used opium preparations and *Cannabis indica* for his patients to swallow before undergoing major surgery.

The beginning of widespread opium use in China has been associated by some historians with the introduction of tobacco into that country by the Dutch from Java in the 17th century. The Chinese were reported to mix opium with tobacco. The practice was adopted throughout the area and eventually resulted in increased opium smoking, both with and without tobacco.



Flowering poppy plant with two younger flower buds.

In 1803, the German pharmacist Serturmer isolated and described the principal alkaloid in opium, which he named *morphium* after Morpheus, the Greek god of dreams. The invention of the syringe and the discovery of other alkaloids of opium soon followed: *codeine* in 1832 and *papaverine* in 1848. By the 1850s, the medical use of pure alkaloids rather than crude opium preparations was common.

In the United States, opium preparations became widely available in the 19th century and morphine was used extensively as a painkiller for wounded

soldiers during the Civil War. The inevitable result was opium addiction, contemporarily called "the army disease" or "soldier's disease." These opium and morphine abuse problems prompted a scientific search for potent but nonaddictive painkillers. In the 1870s, chemists developed an opium-based and supposedly non-addictive substitute for morphine. The Bayer pharmaceutical company of Germany was the first to produce the new drug in large quantities under the brand name *Heroin*. This product was obtained by the acetylation of morphine. Soon thereafter studies showed heroin to have narcotic and addictive properties far exceeding those of morphine.

Although heroin has been used in the United Kingdom in the treatment of the terminally ill, its "medical value" is a subject of intense controversy.

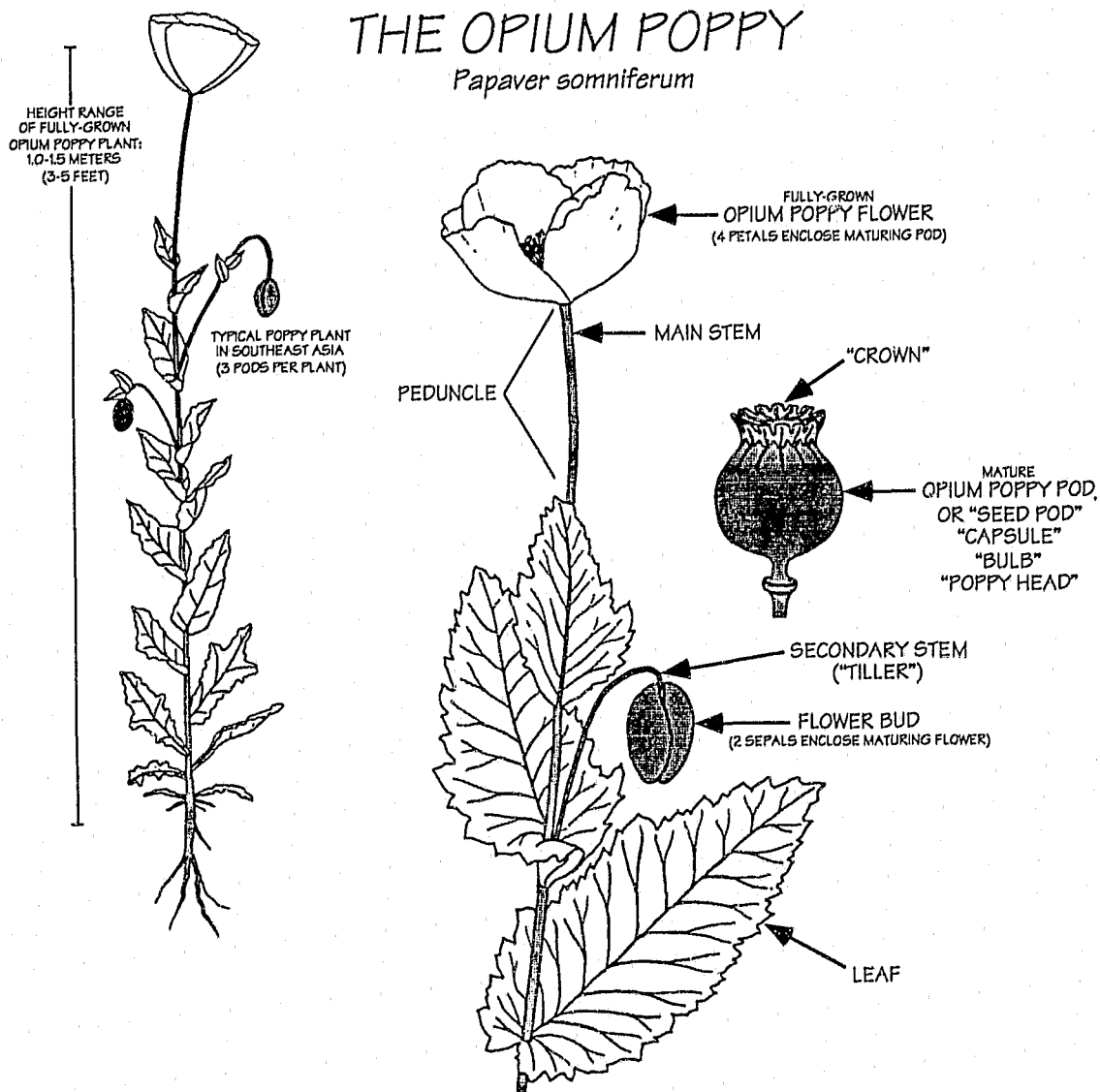


Figure No. 1. Basic Parts of the Opium Poppy Plant.

THE OPIUM POPPY PLANT

The opium poppy, *Papaver somniferum*, is an annual plant. From a small seed, it grows, flowers, and bears fruit (a "pod") only once. The entire growth cycle for most varieties of this plant takes about 120 days. The tiny seeds, like the seeds on a poppy seed roll, germinate quickly in warmth and sufficient moisture. In less than six weeks, the young plant emerges from the soil, grows a set of four leaves, and resembles a small cabbage in appearance. The lobed, dentate leaves are glaucous green with a dull gray or blue tint.

Within two months, the plant will grow from one to two feet in height, with one primary, long, smooth stem. The upper portion of this stem is without leaves and is called the "peduncle" (see Figure 1). One or more secondary stems, called "tillers," may grow from the main stem of the plant. Single poppy plants in Southeast Asia often have one or more tillers.

The main stem of a fully-matured *Papaver somniferum* ranges between two and five feet in height. The green leaves are oblong, toothed and lobed and vary between four to fifteen inches in diameter at maturity. The matured leaves have no commercial value except for use as animal fodder.

As the plant grows tall, the main stem and every tiller terminates in a flower bud. During the development of the bud, the peduncle portion of the stem elongates and forms a distinctive "hook" which causes the bud to be turned upside down. As the flower develops, the peduncle straightens and the buds point upward. A day or two after the buds first point upward, the two outer segments of the bud, called "sepals," fall away, exposing the flower petals. The exposed flower blossom is at first crushed and crinkled, but the petals soon expand and become smooth in the sun. Poppy flowers have four petals. The petals may be single or double and are either white, pink, reddish purple, crimson red, or variegated.

Opium poppies generally flower after about 90 days of growth and continue to flower for two to three weeks. The petals last for two to four days and then drop to reveal a small, round, green fruit which continues to develop. These fruits or pods (also called "seedpods," "capsules," "bulbs," or "poppy heads") are either oblate, elongated, or globular and mature to about the size of a chicken egg. The oblate-shaped pods are more common in Southeast Asia.

Only the pod portion of the plant can produce opium alkaloids. The skin of the poppy pod encloses the wall of the pod ovary. The ovary wall consists of three layers: the outer, middle and inner layers. The plant's latex (opium) is produced within the ovary wall and drains into the middle layer through a system of vessels and tubes within the pod. The cells of the middle layer secrete more than 95 percent of the opium when the pod is scored and harvested.

Cultivators tap the opium from each pod while it remains on the plant. After the opium is scraped, the pods are cut from the stem and allowed to dry. Once dry, the pods are cut open and the seeds are removed and dried in the sun before storing for the following year's planting. An alternative method of collecting planting seeds is to collect them from intentionally unscored pods, because scoring may diminish the quality of the seeds. Aside from being used as planting seed, the poppy seeds may also be used in cooking and in the manufacture of paints and perfumes. Poppy seed oil is straw-yellow in color, odorless, and has a pleasant, almond-like taste.

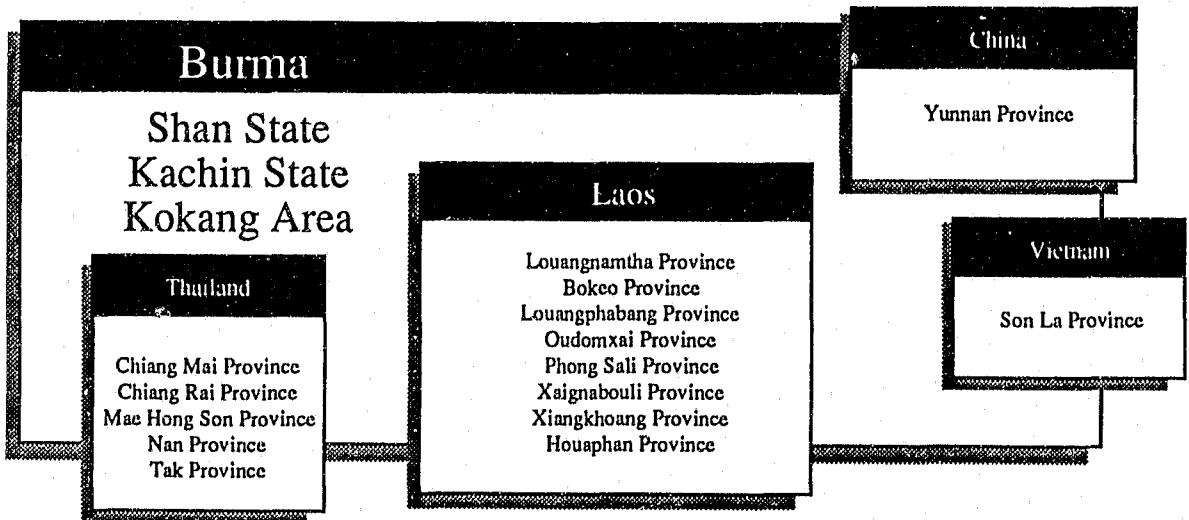
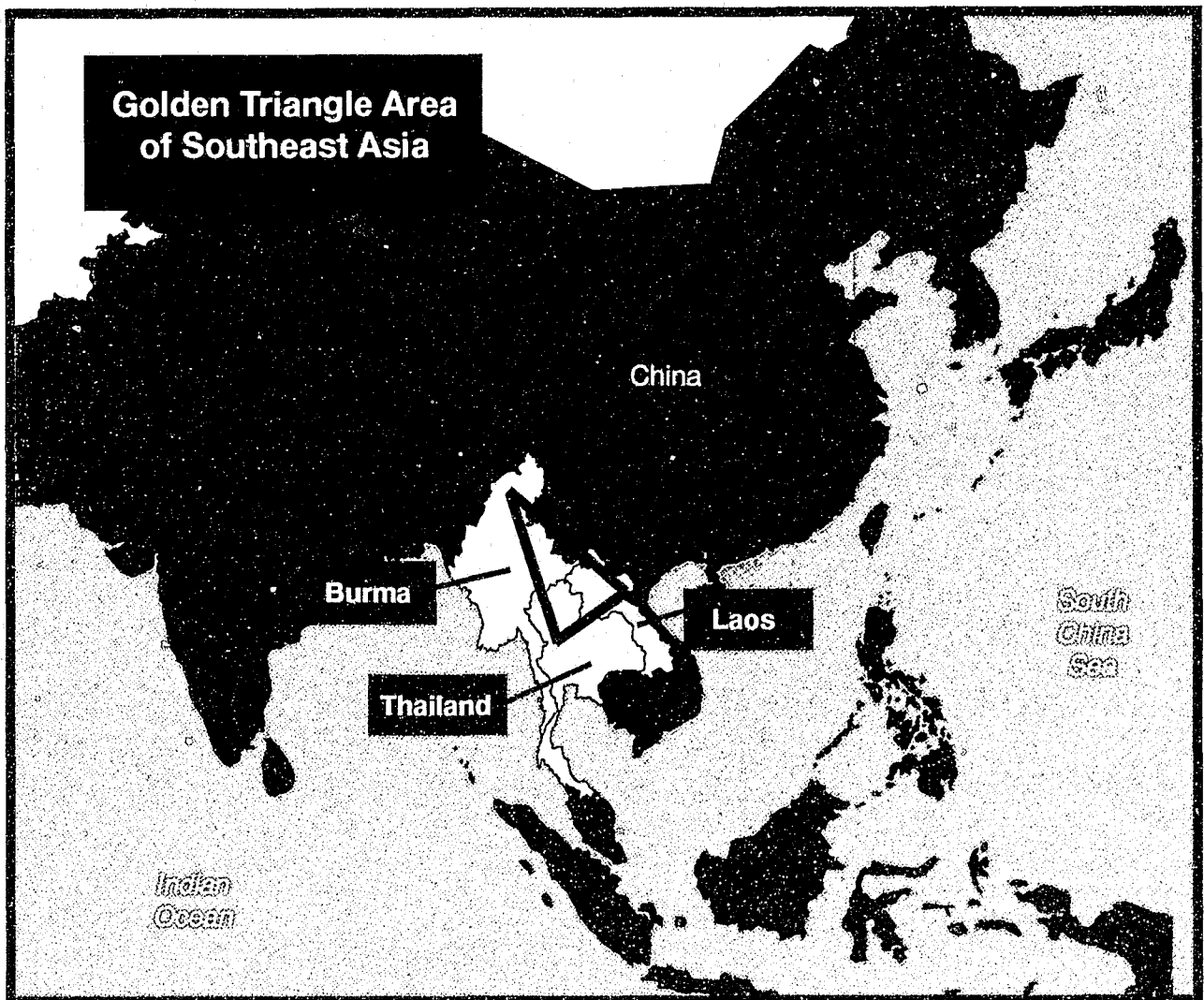


Figure No. 2. Major Opium Poppy Growing Areas in Southeast Asia.



OPIUM POPPY GROWING AREAS

The opium poppy does best in temperate, warm climates with low humidity and requires only a moderate amount of water before and during the early stages of growth. In addition, the opium poppy is a "long day" photo-responsive plant. As such, poppies require long days and short nights before they will develop flowers.

The opium poppy plant can be grown in a variety of soils—clay, sandy loam, sandy, and sandy clay—but it grows best in a sandy loam soil. This type of soil has good moisture-retentive and nutrient-retentive properties, is easily cultivated and has a favorable structure for root development. Clay soil types are hard and difficult to pulverize into a good soil texture. The roots of a young poppy plant cannot readily penetrate clay soils, and growth is inhibited. Sandy soil, by contrast, does not retain sufficient water or nutrients for proper growth of the plant.

Excessive moisture or extremely arid conditions will adversely affect the poppy plant's growth, thus reducing the alkaloid content. Poppy plants can become waterlogged and die after a heavy rainfall in poorly drained soil. Heavy rainfall in the second and third months of growth can leach alkaloids from the plant and spoil the harvest. Dull, rainy, or cloudy weather during this growth stage may reduce both the quantity and the quality of the alkaloid content.

The major legal opium poppy growing areas in the world today are in government-regulated opium farms in India, Turkey and Tasmania, Australia. The major illegal growing areas are in the highlands of mainland Southeast Asia, specifically Burma, Laos and Thailand (the Golden Triangle), as well as adjacent areas of southern China and northwestern Vietnam (see Figure 2 and Map 1); in Southwest Asia, specifically Pakistan, Iran, Afghanistan and in Mexico. Opium poppy is also grown in Lebanon, Guatemala, and Colombia.

Opium poppies were widely grown as an ornamental plant and for seeds in the United States until the possession of this plant was declared illegal in the Opium Poppy Control Act of 1942.

The highlands of mainland Southeast Asia, at elevations of 800 meters or more above sea level, are prime poppy growing areas. Generally speaking, these poppy-farming areas do not require irrigation, fertilizer, or insecticides for successful opium yields. Most of the opium poppies of Southeast Asia are grown in Burma (Myanmar), specifically in the Wa and Kokang areas which are in the northeastern quadrant of the Shan State of Burma. Laos is the second-largest illicit opium-producing country in Southeast Asia and third-largest in the world. In this country, poppy is cultivated extensively in Houaphan and Xiangkhoang Provinces, in addition to the six northern provinces of Bokeo, Louangnamtha, Louangphabang, Oudomxai, Phongsali and Xaignabouli. Poppy is also grown in many of the remote, mountainous areas of northern Thailand, particularly in Chiang Mai, Chiang Rai, Mae Hong Son, Nan and Tak Provinces.

In China, opium poppies are cultivated by ethnic minority groups in the mountainous frontier regions of Yunnan Province, particularly along the border area with Burma's Kachin and Shan States. Son La Province, situated between China and Laos, is a major opium poppy cultivation area in Vietnam.

It is noteworthy that the dominant ethnic groups of mainland Southeast Asia are *not* poppy cultivators. The Burmans and Shan of Burma, the Lao of Laos, the Thai of Thailand, the Han Chinese of Yunnan, China, and the Vietnamese of Vietnam are lowlanders and do not traditionally cultivate opium poppies.

Rather, it is the ethnic minority highlander groups, such as the Wa, Pa-O, Palaung, Lahu, Lisu, Hmong, and Akha who grow poppies in the highlands of the countries of Southeast Asia. (See Figure 3.)

A typical nuclear family of Southeast Asian highlanders ranges between five and ten persons, including two to five adults. An average household of poppy farmers can cultivate and harvest about one acre of opium poppy per year. Most of the better fields can support opium poppy cultivation for ten years or more without fertilization, irrigation, or insecticides, before the soil is depleted and new fields must be cleared.

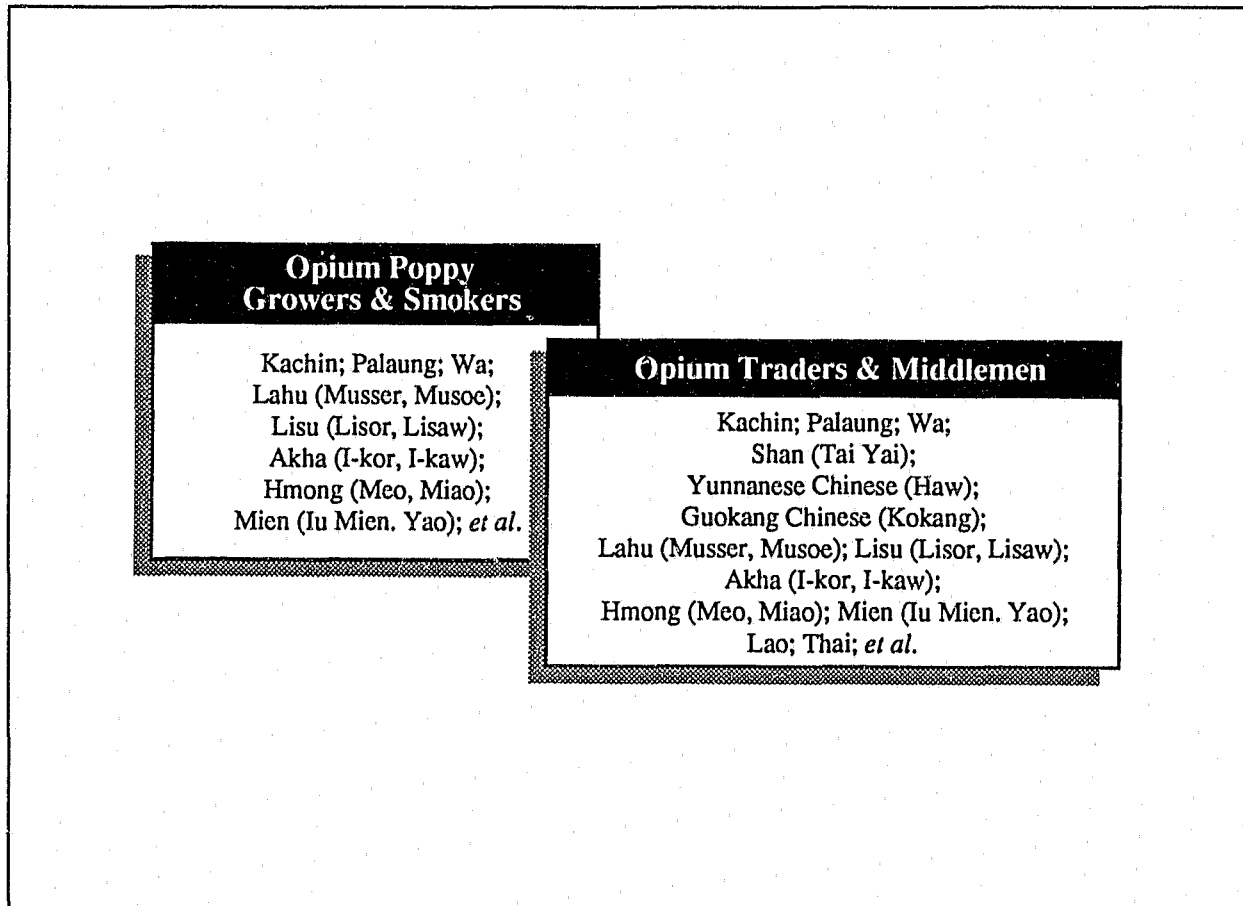


Figure 3. Ethnic groups involved in opium and heroin trafficking in Southeast Asia.

FIELD SELECTION AND LAND CLEARING

In choosing a field to grow opium poppy, soil quality and acidity are critical factors and experienced poppy farmers choose their fields carefully. In Southeast Asia, westerly orientations are typically preferred to optimize sun exposure. Most fields are on mountain slopes at elevations of 1,000 meters (3,000 feet) or more above sea level. Slope gradients of 20 degrees to 40 degrees are considered best for drainage of rain water.

In Mainland Southeast Asia, virgin land is prepared by cutting and piling all brush, vines and small trees in the field during March, at the end of the dry season. After allowing the brush to dry in the hot sun for several days, the field is set afire. This method, called "slash-and burn" or "swidden" agriculture, is commonly practiced by dry field farmers — both highland and lowland—throughout Mainland Southeast Asia in order to ready the land for a variety of field crops.

The slash-and-burn method is also used to clear fields for poppy cultivation. Before the rainy season in April, fields by the hundreds of thousands all over the region are set ablaze. A fog-like yellow haze hangs over the area for weeks, reducing visibility for hundreds of miles. In the mountains, the density of haze blocks out the sun and stings the eyes.

A typical highlander family will plant an area of two or three *rai* in opium poppy (2.53 *rai* is equivalent to one acre). (See Figure 4.)

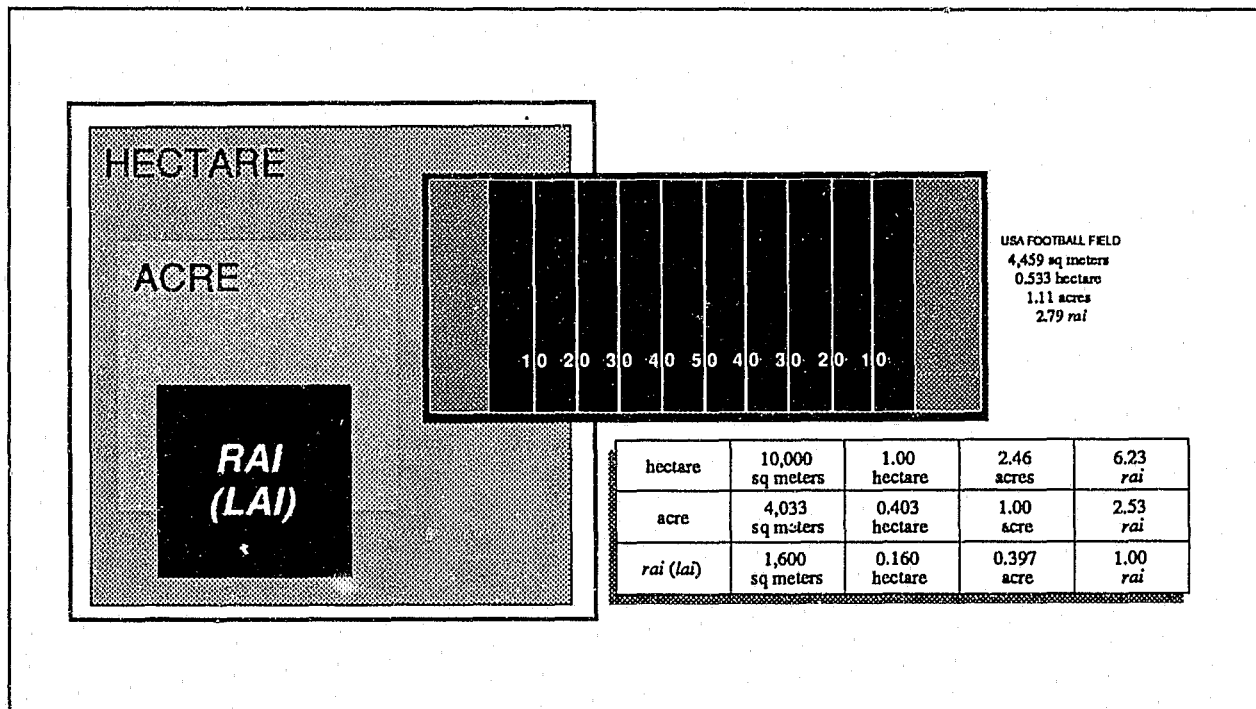


Figure 4. Relative sizes of land areas in mainland Southeast Asia.

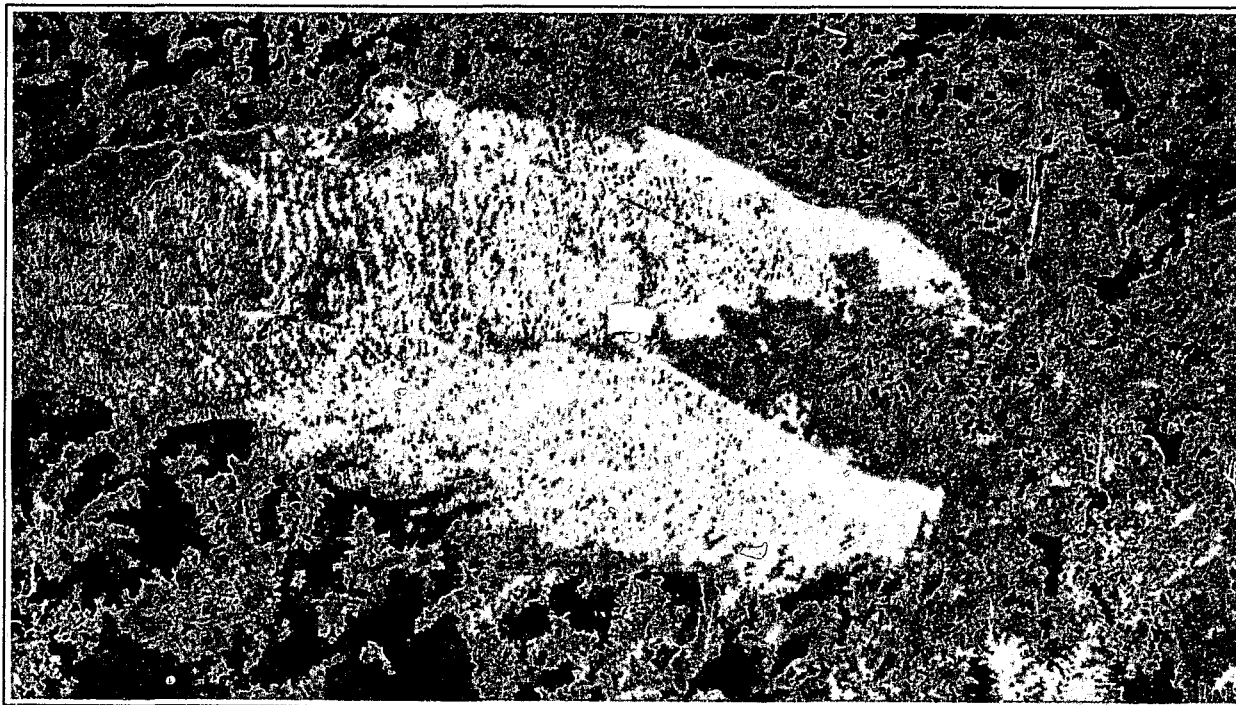
LAND PREPARATION AND CULTIVATION METHODS

In August or September, toward the end of the rainy season, highland farmers in Southeast Asia prepare fields selected for opium poppy planting. By this time, the ash resulting from the burn-off of the previous dry season has settled into the soil, providing additional nutrients, especially potash. The soil is turned with long-handled hoes after it is softened by the rains. The farmers then break up the large clumps of soil. Weeds and stones are tossed aside and the ground is leveled off.

Traditionally, most highland and upland farmers in Southeast Asia do not use fertilizer for any of their crops, including the opium poppy, but in recent years opium poppy farmers have started using both natural and chemical fertilizers to increase opium poppy yields. Chicken manure, human feces or the region's abundant bat droppings are often mixed into the planting soil before the opium poppy seed is planted. The planting must be completed by the end of October in order to take advantage of the region's "long days" in November and December. (See Figure 5.)

The opium poppy seed can be sown several ways: broadcast or tossed by hand; or fix-dropped by hand into shallow holes dug with a metal-tipped dibble stick. About one pound of opium poppy seed is needed to sow one acre of land. The seeds may be white, yellow, coffee-color, gray, black, or blue. Seed color is not related to the color of the flower petals. Beans, cabbages, cotton, parsley, spinach, squash or tobacco are usually planted with opium poppy. These crops neither help nor hinder the cultivation of the opium poppy, but instead are planted solely for personal consumption or as a cash crop.

In the highlands of Southeast Asia, it is also common practice to plant maize and opium poppies in the same fields each year. The maize keeps down excessive weeds and provides feed for the farmer's pigs and ponies. It is grown from April to August. After harvesting the maize, and with the stalks still standing in the fields, the ground is weeded and pulverized. Just before the end of the rainy season, in successive sowings throughout September and October, the poppy seed is broadcast among the maize stalks. These stalks can protect young opium poppy plants from heavy rains.



Opium poppy field cleared by "slash-and-burn" method.

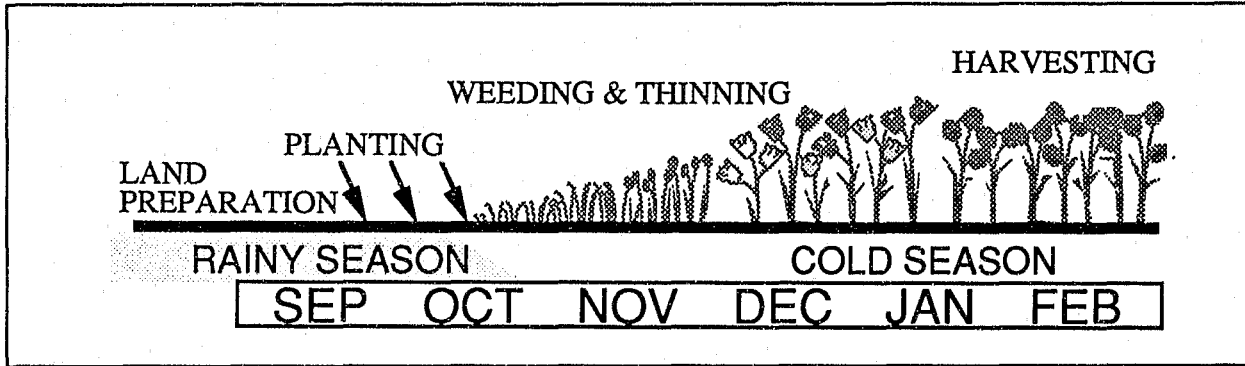


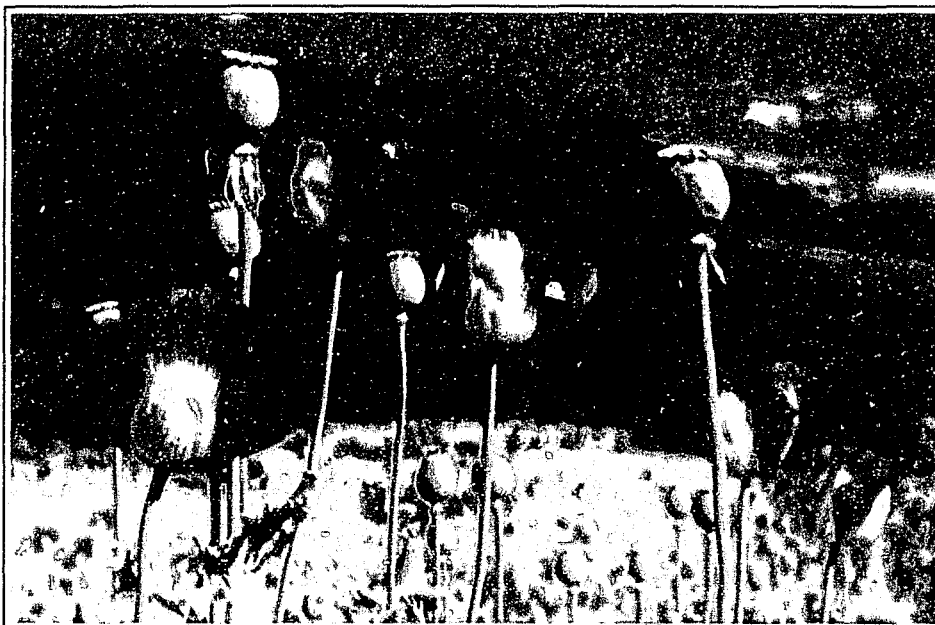
Figure 5. Opium poppy cultivation in Southeast Asia.

The opium poppy plants form leaves in the first growth stage, called the “cabbage” or “lettuce” stage. After a month of growth, when the opium poppy is about a foot high, some of the plants are removed (called “thinning”) to allow the others more room to grow. The ideal spacing between plants is believed to be 20 to 40 centimeters, or about eight to twelve plants per square meter, although some researchers in northern Thailand have reported as many as 18 plants per square meter.

During the first two months, the opium poppies may be damaged or stunted by nature through the lack of adequate sunshine, excessive rainfall, insects, worms, hail storms, early frost, or trampling by animals. The third month of growth does not require as much care as the first two months.

Three to four months after planting, from late December to early February, the opium poppies are in full bloom. Mature plants range between three to five feet in height. Most opium poppy varieties in Southeast Asia produce three to five mature pods per plant.

A typical opium poppy field has 60,000 to 120,000 poppy plants per hectare, with a range of 120,000 to 275,000 opium-producing pods. The actual opium yield will depend largely on weather conditions and the precautions taken by individual farmers to safeguard the crop. The farmer and his family generally move into the field for the final two weeks, setting up a small field hut on the edge of the opium poppy field.



Opium poppy field showing flowers, pods and leaves.

OPIUM HARVESTING METHODS



The scoring of the pods (also called “lancing,” “incising,” or “tapping”) begins about two weeks after the flower petals fall from the pods. The farmer examines the pod and the tiny crown (see Figure 1) portion on the top of the pod very carefully before scoring. The grayish-green pod will become a dark green color as it matures and it will swell in size. If the points of the pod’s crown are standing straight out or are curved upward, the pod is ready to be scored. If the crown’s points turn downward, the pod is not yet fully matured. Not all the plants in a field will be ready for scoring at the same time and each pod can be tapped more than once.

A set of three or four small blades of iron, glass, or glass splinters bound tightly together on a wooden handle is used to score two or three sides of the pod in a vertical direction. If the blades cut too deep into the wall of the pod, the opium will flow too quickly and will drip to the ground. If the incisions are too shallow, the flow will be too slow and the opium will harden in the pods. A depth of about one millimeter is desired for the incision. Using a blade-tool designed to cut to that depth, scoring ideally starts in late afternoon so the white latex-like raw opium can ooze out and slowly coagulate on the surface of the pod overnight. If the scoring begins too early in the afternoon, the sun will cause the opium to coagulate over the incision and block the flow. The opium oxidizes, darkens and thickens in the cool night air. Early the next morning, the opium gum is scraped from the surface of the pods with a short-handled flat, iron blade three to four inches wide.

Opium harvesters work their way backwards across the field scoring lower, mature pods before the taller pods, so as not to inadvertently spill the sticky ooze. The pods will continue to secrete opium for several days. Farmers will return to these plants—sometimes up to five or six times—to gather additional opium until the pod is totally depleted. The opium is collected in a container which hangs from the farmer’s neck or waist.

The opium yield from a single pod varies greatly, ranging from 10 to 100 milligrams of opium per pod. The average yield is about 80 milligrams. The dried opium weight yield per hectare of opium poppies ranges between eight and fifteen kilograms of opium.

As the farmers gather the opium, the larger or more productive pods are tagged with colored string or yarn. These pods will later be cut from their stems, cut open, dried in the sun and their seeds will be used for the following year’s planting.

The wet opium gum collected from the pods contains a relatively high amount of water and needs to be dried for several days. High-quality raw opium will be brown (rather than black) in color and will retain its sticky texture. Experienced opium traders can quickly determine if the opium has been mixed with tree sap, sand or other such materials.

Raw opium in Burma, Laos and Thailand is usually sun-dried, weighed in a standard 1.6 kilogram quantity (called a “viss” in Burma; a “choi” in Laos and Thailand), wrapped in banana leaf or plastic and then stored until ready to sell, trade, or smoke. Opium smoking is common among most adult opium poppy farmers, whereas heavy addiction is generally limited to older, male farmers. The average yearly consumption of cooked opium per smoker is estimated to be 1.6 kilograms.

A typical opium poppy farmer household in Southeast Asia will collect 2 to 5 *choi* or *viss* (3 to 9 kilograms) of opium from a year’s harvest of a one-acre field. That opium will be dried, wrapped and stacked on a shelf by February or March. If the opium has been properly dried, it can be stored indefinitely. Excessive moisture and heat can cause the opium to deteriorate but, once dried, opium is relatively stable. In fact, as opium dries and becomes less pliable, its value increases due to the decrease in water weight per kilogram.

*Standard Units of Weight used in
Opium Trafficking in Southeast Asia*



Opium poppy pod scored for harvesting.
Note the opium oozing from incisions.

<i>pong</i> (Thai-Shan-Lao)		375.0 gms.	13.23 ozs.
pound	lb.	453.592 gms.	16.0 ozs.
<i>jin/chin</i> (Chinese)		500.0 gms.	1.1023 lbs.
kilogram	kg.	1,000.0 gms.	2.2046 lbs.
<i>choi/joi</i> (Thai-Shan-Lao)		1.6 kgs.	3.528 lbs.
<i>viss</i> (Tamil-Burmese)		1.657 kgs.	3.652 lbs.
ton	T	907.184 kgs.	2,000.0 lbs.
metric ton	MT	1,000.0 kgs.	2,204.6 lbs.

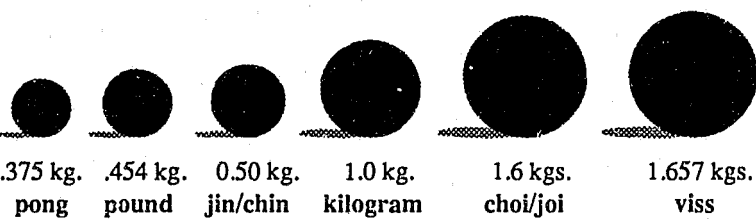


Figure 6. Units of opium weight in Southeast Asia.



Harvested pod with opium poppy seeds revealed prior to drying and storage for next year's planting.

COOKING OPIUM

Before opium is smoked, it is usually cooked. Uncooked opium contains moisture, vegetable matter and other impurities which detract from a smooth-smoking product. The raw opium which is collected from the opium poppy pod is placed in an open cooking pot of boiling water where the sticky glob of opium alkaloids quickly dissolve. The soil, twigs, plant scrapings, etc. remain undissolved. The solution is strained through cheesecloth to remove these impurities. The clear brown liquid, sometimes called "liquid opium," is actually opium in solution. This liquid is then re-heated over a low flame until the water turns to steam and is driven off into the air. When the water has evaporated, a thick paste remains. This paste is called "prepared opium," "cooked opium," or "smoking opium" and it is dried in the sun until it has a putty-like consistency. The net weight of the cooked opium is generally about twenty percent lighter than the original raw opium. Likewise, cooked opium is also more pure than in its original, raw form.

Cooked opium is suitable for smoking or eating by opium users. Traditionally there is only one group of opium poppy farmers, the Hmong, who prefer to not cook their opium before smoking. Most other ethnic groups, including Chinese opium addicts, prefer smoking cooked opium.

If the opium is to be sold to traders for use in morphine or heroin laboratories, it is not necessary to cook it first. The laboratory operators generally use 55-gallon oil drums or huge cooking vats to cook the raw opium before beginning the morphine extraction process (described in the next chapter).



Opium being cooked during the morphine extraction stage.

gram (gm.)	0.001 kg.	.0022 oz.
unit	0.700 kgs.	1.54 lbs.
kilogram (kg.)	1,000.0 gms.	2.2046 lbs.
ounce (oz.)	28.35 gms.	0.0625 lb.
pound (lb.)	453.59 gms.	16.0 ozs.

Figure 7. Units of heroin weight in Southeast Asia.

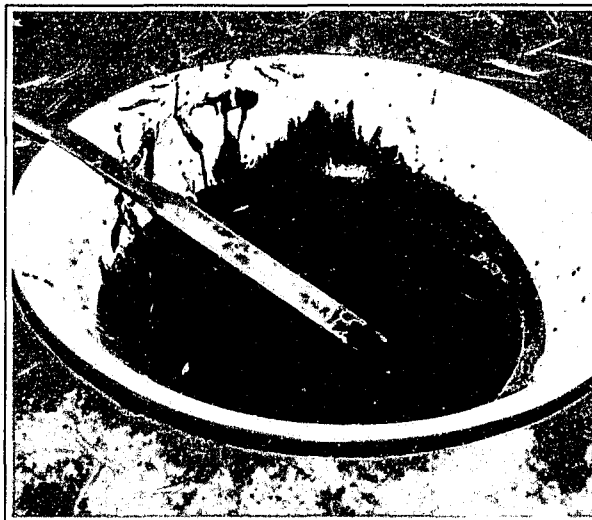
EXTRACTION OF MORPHINE FROM OPIUM

Raw or cooked opium contains more than 35 different alkaloids, including morphine, which accounts for approximately ten percent of the total raw opium weight. Heroin manufacturers must first extract the morphine from the opium, before converting the morphine to heroin. The extraction is a simple process, requiring only a few chemicals and a supply of water. Morphine is usually extracted from opium in small clandestine "laboratories" which are typically set up near the opium poppy fields. Since the morphine base is about one-tenth the weight and volume of raw opium, it is desirable to reduce the opium to morphine before transporting the product from the field to a heroin laboratory.

The process of extracting morphine from opium involves dissolving opium in hot water, adding lime to precipitate non-morphine alkaloids and then adding ammonium chloride to precipitate morphine from the solution. An empty oil drum and some cooking pots are needed.

Following is a step-by-step description of morphine extraction in a typical Southeast Asian laboratory:

1. An empty 55-gallon oil drum is placed on bricks about a foot above the ground and a fire is built under the drum. Thirty gallons of water are added to the drum and brought to a boil. Ten to fifteen kilograms of raw opium are added to the boiling water.
2. With stirring, the raw opium eventually dissolves in the boiling water, while soil, leaves, twigs, and other non-soluble materials float in the solution. Most of these materials are scooped out of the clear brown "liquid opium" solution.
3. Slaked lime (calcium hydroxide) or more often a readily available chemical fertilizer with a high content of lime is added to the solution. The lime will convert the water insoluble morphine into the water soluble calcium morphenate. The other opium alkaloids



Prepared (cooked) opium prior to the morphine extraction stage.

do not react with the lime to form calcium salts. Codeine is an opium alkaloid which is slightly water soluble and which will be carried over with the calcium morphenate in the liquid. For the most part, the other alkaloids will become a part of the "sluge."

4. As the solution cools, the morphine solution is scooped from the drum and poured through a filter of some kind. Burlap rice sacks are often used as filters and can then be squeezed in a press to remove most of the solution from the wet sacks. The solution is then poured into large cooking pots and re-heated, but not boiled.
5. Ammonium chloride is added to the heated calcium morphenate solution to adjust the alkalinity to a pH of 8 to 9, and the solution is then allowed to cool. Within one or two hours, the morphine base and the unreacted codeine base precipitate out of the solution and settle to the bottom of the cooking pot.
6. The solution is then poured off through cloth filters. Any solid morphine base chunks in the solution will remain on the cloth. The morphine base is removed from both the cooking pot and from the filter cloths, wrapped and

squeezed in cloth, and then dried in the sun. When dry, the crude morphine base is a coffee-colored powder.

7. This "crude" morphine base, commonly known by the Chinese term *pi-tzu* in Southeast Asia, may be further purified by its dissolution in hydrochloric acid, adding activated charcoal, re-heating and filtering. The solution is filtered several times, and the morphine (morphine hydrochloride) is then dried in the sun. (See Figure 8.)

8. Morphine hydrochloride (tainted with codeine hydrochloride) is usually pressed into small brick-sized blocks in a press and wrapped in paper or cloth. The most common block size is 2 inches by 4 inches by 5 inches weighing about 1.3 kilograms. The bricks are dried for transport to heroin processing laboratories.

Approximately 13 kilograms of opium, from one hectare of opium poppies, are needed to produce each morphine block of this size. The morphine blocks are then bundled and packed for transport to heroin laboratories by human couriers or by pack animals. Pack mules are able to carry 100-kilogram payloads over 200 miles of rugged mountain trails in less than three weeks.

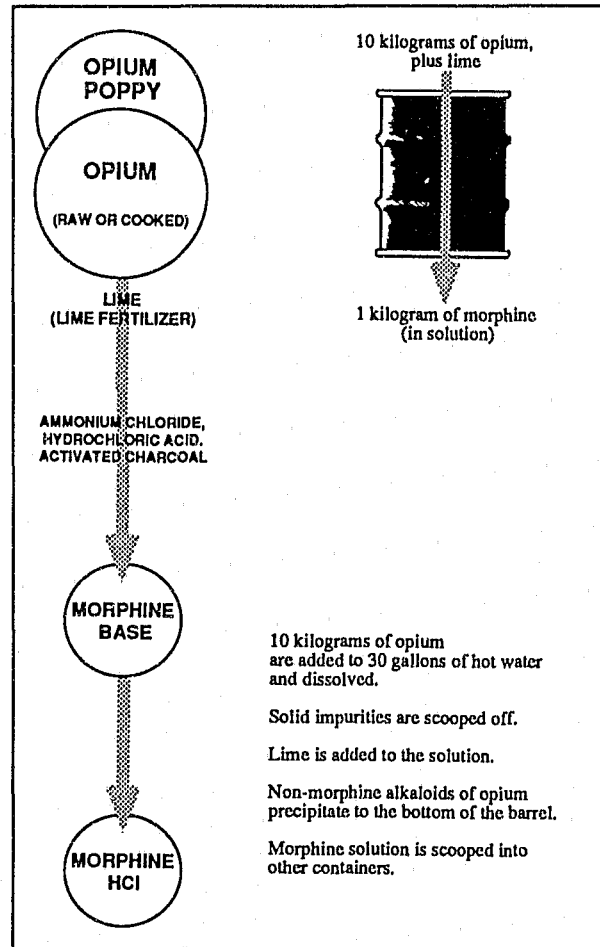


Figure 8. Morphine extraction process.

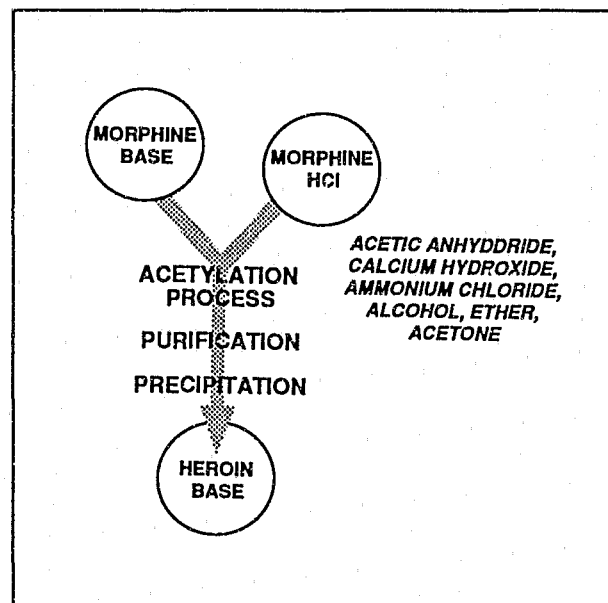


Figure 9. Process of Acetylation of Morphine.

CONVERSION OF MORPHINE TO HEROIN BASE

The conversion of morphine to heroin base is a relatively simple and inexpensive procedure. The necessary chemicals for conversion to heroin are commonly available industrial chemicals. (See Figure 10.) The equipment is very basic and quite portable. Heroin conversion laboratories are generally located in isolated, rural areas due to the telltale odors of the lab's chemicals. Acetic anhydride, in particular, is a key chemical with a very pungent odor resembling pickles.

Chemicals used to isolate the morphine from the opium include ammonium chloride, calcium carbonate (limestone) and calcium hydroxide (slaked lime). The precursor chemical normally used in the conversion of morphine to heroin is acetic anhydride. Chemical reagents used in the conversion process include sodium carbonate and activated charcoal. Chemical solvents needed are chloroform, ethyl alcohol (ethanol), ethyl ether and acetone. Other chemicals may be substituted for these preferred chemicals, but most or all of these preferred chemicals are readily available through smugglers and suppliers.

Laboratory equipment includes measuring cups, funnels, filter paper, litmus paper and a stainless steel pot. Only the most sophisticated heroin labs use glass flasks, propane gas ovens, Bunsen burners, vacuum pumps, autoclaves, electric blenders, venting hoods, centrifuges, reflux condensers, electric drying ovens and elaborate exhaust systems. It is also possible to find portable, gasoline-powered generators at clandestine heroin conversion laboratories used to power various electrical devices.

Heroin synthesis from morphine is a two-step process which requires twelve to fourteen hours to complete. Heroin base is the intermediate product. Typically, morphine hydrochloride bricks are pulverized and the dried powder is then placed in an enamel or stainless steel rice cook pot. Acetic

anhydride is then added. The acetic anhydride reacts with the morphine to form diacetylmorphine (heroin).

This acetylation process will work either with morphine hydrochloride or morphine base. The pot lid is tied or clamped on, with a damp towel for a gasket. The pot is carefully heated for about two hours, below boiling, at a constant temperature of 185° Fahrenheit. It is never allowed to boil or to become so hot as to vent fumes into the room. It is agitated by tilting and rotation until all of the morphine has dissolved. When cooking is completed, the pot is cooled and opened. During this step, morphine and the anhydride become chemically bonded, creating an impure form of diacetylmorphine (heroin). (See Figure 9.)

Water is added at three times the volume of acetic anhydride and the mixture is stirred. Activated charcoal is added and mixed by stirring and the mixture is then filtered to remove colored impurities. Solids remaining on the filter are discarded. Sodium carbonate at 2.5 pounds per pound of morphine is dissolved in hot water and added slowly to the liquid until effervescence stops. This precipitates the heroin base which is then filtered and dried by heating in a steam bath for an hour. For each pound of morphine, about 11 ounces of crude heroin base is formed.

The heroin base may be dried, packed and transported to a heroin refining laboratory or it may be purified further and/or converted to heroin hydrochloride, a water-soluble salt form of heroin, at the same site.

Southeast Asian heroin base is an intermediate product which can be further converted to either smoking heroin ("heroin no. 3") or injectable heroin ("heroin no. 4").

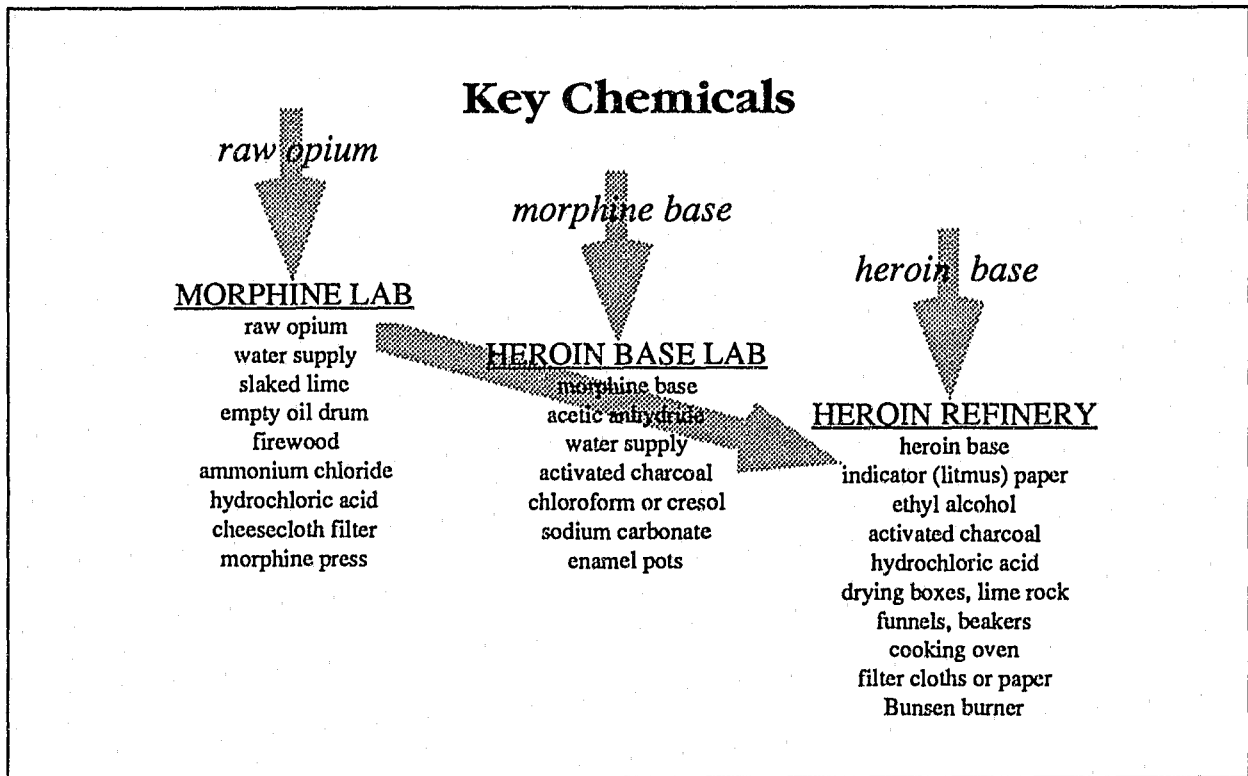


Figure 10. Key chemicals used in heroin processing.

Standard Units of Volume used in Heroin Manufacturing in Southeast Asia

Liquid Chemicals

liter (litre)	1,000.0 mls.	1.057 qts.
<i>thang</i> *	20.0 liters	5.285 gals.
barrel	136.26 liters	36.0 gals.
U.S. gallon (gal.)	3.785 liters	4.0 qts.

* Thai/Lao term, sometimes used informally to mean a "barrel-full" or "tank-full"

Key Liquid Chemicals, expressed in dry weight equivalents

acetic anhydride	500.0 gallons	4.09	1,500.0 kilograms	3,306.9 pounds
ether (ethyl ether)	500.0 gallons	2.728	1,364.0 kilograms	3,007.1 pounds

Figure 11. Units of liquid measurement.

CONVERSION OF HEROIN BASE TO HEROIN

Heroin No. 3 (Smoking Heroin) (Heroin hydrochloride)

To make heroin no. 3, the crude base is mixed with hydrochloric acid resulting in heroin hydrochloride. Adulterants including caffeine are added after this conversion. For each kilogram of crude heroin base about one kilogram of caffeine is used. Various "flavorings" such as *quinine hydrochloride* or *strychnine hydrochloride* may be added in 7 gram or 14 gram increments. Next, the wet paste mix is stirred to dryness over the steam bath.

The resulting dry heroin no. 3 will be in the form of coarse lumps. These are crushed and passed through a no. 8 to no. 10 mesh sieve, and the grains (pieces) are then packaged for sale.

The entire process takes about eight hours and requires only minimal skill. While extra attention to stirring is required to assure dryness, one man can prepare a one-kilogram block of heroin no. 3 during this time.

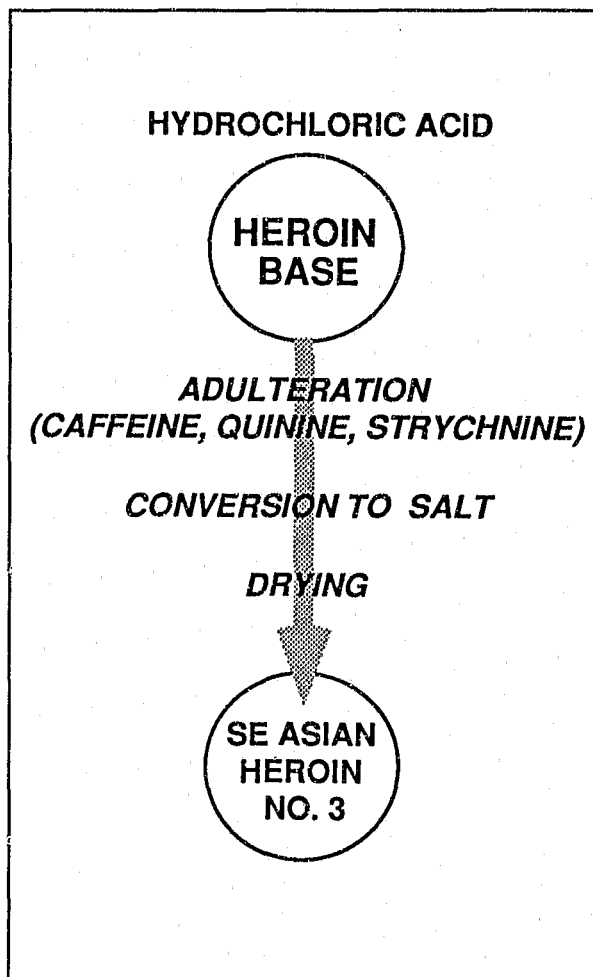


Figure 12. Conversion Process to Southeast Asian Heroin No. 3.

CONVERSION OF HEROIN BASE TO HEROIN

Heroin No. 4 (Injectable Heroin)

To the heroin base mixture in the pot, water is added at three times the volume of acetic anhydride and mixed by stirring. A small amount of chloroform is added. The mixture is stirred and then allowed to stand for twenty minutes. Doing so precipitates highly-colored impurities and a red, greasy liquid. The water layer is carefully poured off and saved in a clean pot, leaving the red grease in the pot.

In a clean pot, activated charcoal is stirred into the aqueous solution and is filtered to remove solid impurities. The decolorizing effects of the charcoal, combined with the chloroform treatment, will leave a light yellow solution. The use of charcoal is repeated one or more times, until the solution is colorless.

Approximately 1.1 kilograms of sodium carbonate per 0.5 kilograms of morphine is dissolved in hot water and added slowly to the mixture until the effervescence stops. This precipitates the heroin base which is then filtered and dried by heating on a steam bath. The heroin base is heated until dryness is complete, an imperative for the preparation of heroin no. 4. The powder should be very white at this stage. If not white, the base is redissolved in diluted acid, treated repeatedly with activated charcoal, reprecipitated and dried. The ultimate purity and color of the resulting heroin hydrochloride depends largely on the quality of the heroin base.

An optional step taken by skilled heroin chemists to increase the quality of the heroin follows:

For each pound of heroin base, 1,100 milliliters of ethyl alcohol is heated to boiling. The heroin base is added and stirred until completely dissolved. The heated solution is then quickly filtered through a Büchner funnel that has been preheated and poured into a heated flask. This hot

filtration removes the traces of sodium carbonate that remained in the base. The solution is quickly cooled in an ice bath, where it becomes very thick like ice cream. The substance is put into a pan and set in a large refrigerator. A fan is set to blow across the pan to cause slow evaporation of the alcohol while the paste crystallizes. After several hours, it is vacuum-filtered. The filtrate, pure ethyl alcohol, is re-used. The solid material, "alcohol morphine base," is actually re-crystallized heroin base.

The heroin product, either heroin base or re-crystallized heroin base, is weighed. For each pound of solid product, 3,000 milliliters of ethyl alcohol, 3,000 milliliters of ether, and 102 milliliters of concentrated hydrochloric acid are measured out. The solid is dissolved by heating with one-third of the alcohol and one-half of the acid. Another one-third of the acid is added and mixed by stirring. Next, acid is added slowly, drop by drop, until the product is completely converted to the hydrochloride. Two methods of testing this end product may be used. Either a drop of solution evaporates on a clean glass plate, leaving no trace of cloudiness in the residue, or a drop of the solution placed on Congo red paper causes the paper to turn blue.

Once the acid is added, the remaining alcohol is stirred in. Then, half of the ether is added with stirring and the mixture is allowed to stand for fifteen minutes. It must be examined with great care since it is extremely volatile and flammable. Once the first small crystals are detected, the remaining ether is added at once. The vessel is stirred, covered and allowed to stand for twenty minutes to one hour.

The mixture becomes nearly solid after an hour. At this point, it is filtered and the solids are collected on clean filter paper. The paper is wrapped around the crystals and placed on wooden trays, usually over lime rock, to dry. When the crystals of pure heroin hydrochloride are dry, they are packaged. Batches of 5 to 10 kilograms are commonly made at one time, the largest batch being an estimated 20 kilograms.

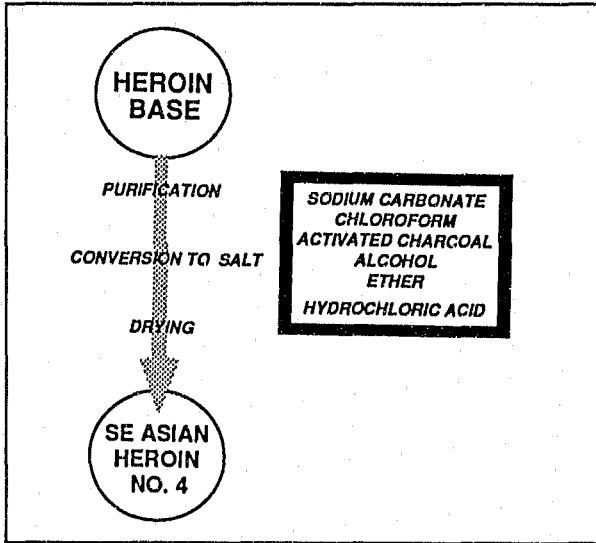


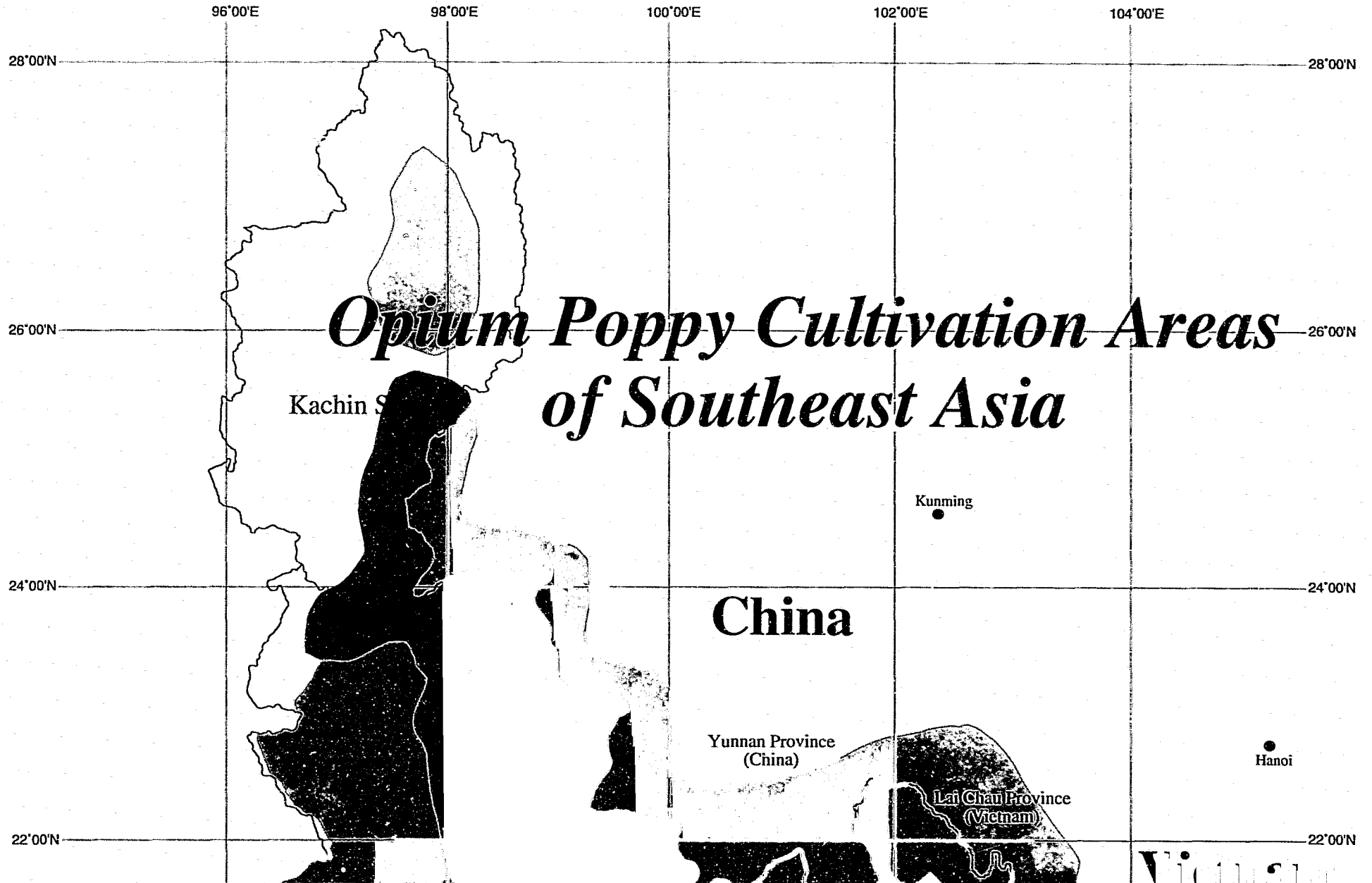
Figure 13. Conversion process to Southeast Asian heroin no. 4.

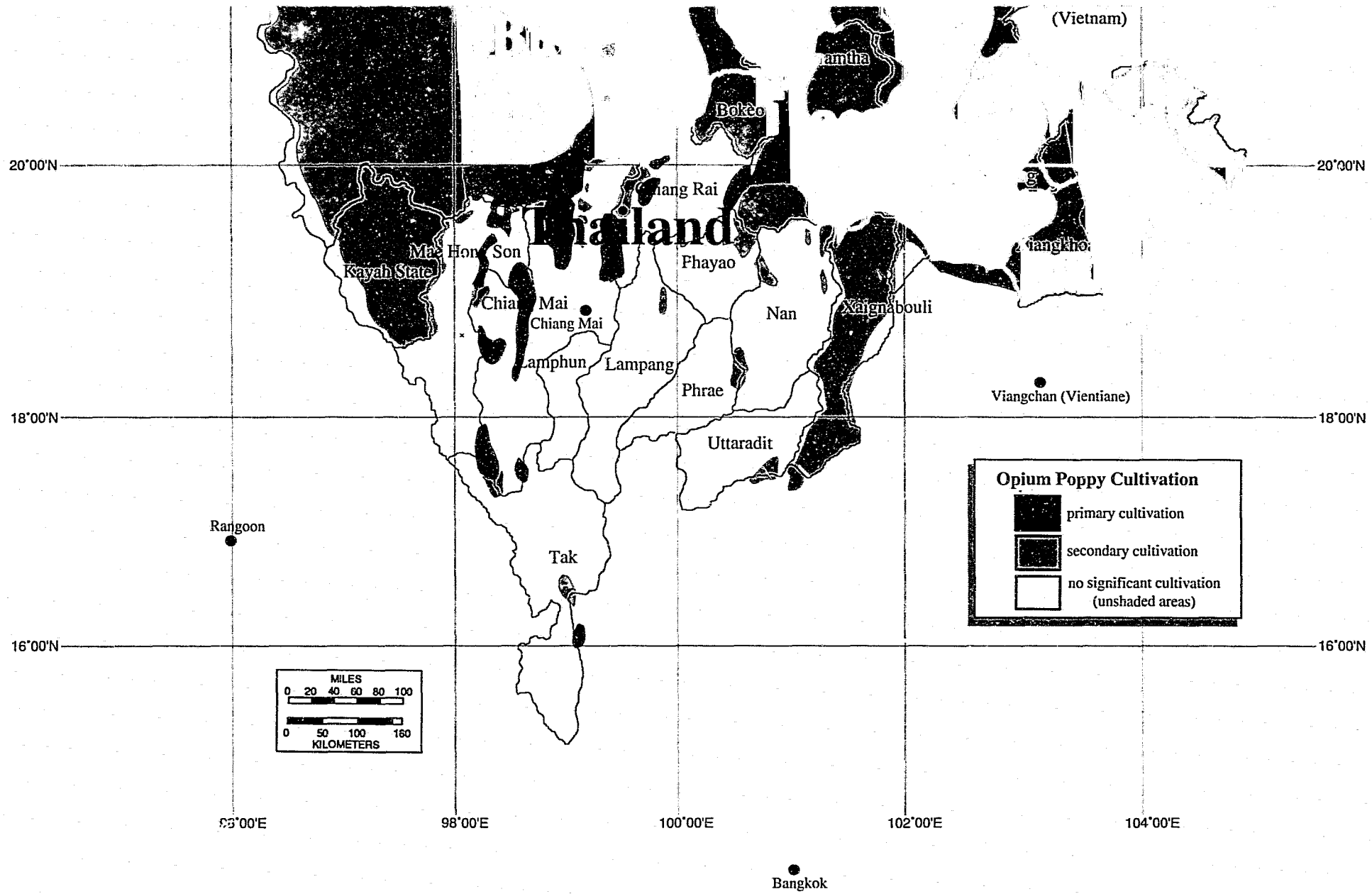


Steel press used to compact heroin into blocks. Note the dry chemical containers in foreground.

No. 4 heroin in cardboard drying box.







CONCLUSION

Southeast Asia, especially the Golden Triangle area, is ideally suited for the propagation and synthesis of the opium poppy—geographically, topologically and culturally.

Although the opium poppy plant will grow remarkably well with little tending, farmers in recent years have introduced the use of fertilizers that have produced bumper crop yields. In addition, the chemicals used in the synthesis of heroin are inexpensive and readily available. At the same, the time laboratory equipment needed to synthesize heroin is very basic and easily obtainable.

These factors, coupled with powerful financial incentives and an absence of cultural prohibitions, clearly suggest that opium poppy cultivation and heroin synthesis in Southeast Asia show no signs of abatement. ■



Figure 15. Double U-O Globe trademark of Southeast Asian heroin.

GLOSSARY OF TERMS

acetic acid, glacial

Also known as ethanoic acid or vinegar acid. Glacial acetic acid is the pure compound, as distinguished from the usual water solutions known as acetic acid. A clear, colorless liquid with a pungent odor. Miscible with water, alcohol, glycerin, and ether. Highly-concentrated, produces burns on the skin. Chronic exposure may cause erosion of dental enamel, bronchitis, eye irritation. Excellent solvent for many organic compounds. Widely used in commercial organic synthesis. Normally contained in 5-lb bottles (corrosive liquid). Can be used in place of ammonium chloride or ammonia solutions as a reagent to adjust alkalinity in the precipitation of morphine (as crude morphine base) from an opium solution.

acetic anhydride

Also known as acetic oxide; acetyl oxide. A colorless liquid with a strong, pickle-like odor. Fumes in moist air, and its vapor is extremely irritating to eyes, nose, and throat. Not readily miscible with water, forming a separate layer on the bottom, but will eventually form acetic acid. Soluble in chloroform or ether. Readily combustible (fire hazard). Normally contained in various sizes of glass or plastic bottles, 5-gallon glass carboys, and 55-gallon metal drums lined with stainless steel or polyethylene. Used in the textile, leather tanning, pharmaceutical (particularly aspirin), and photography industries. Under strict government regulation in some countries. Manufactured in United States, Western Europe, and Japan. Acetic anhydride is also the most commonly used acetylating agent in the acetylation of morphine. A key precursor chemical and reagent in heroin synthesis.

acetone

Also known as 2-propanone or dimethyl ketone; pyroacetic ether. A volatile, highly flammable liquid with a mildly pungent and somewhat aromatic odor. Acetone vapor is irritating to the eyes and nose in high concentrations. Miscible with water, alcohol, chloroform, ether, etc. Must be stored in closed containers and kept away from fire. Industrial uses

as a solvent include manufacture of rayon, photographic films, paint and varnish removers. Shipped in cans, steel drums, barrels, and tank cars. Can be used as a solvent in processing opium and in the purification of morphine base, but is not commonly used in Southeast Asia.

acetyl chloride

Also known as ethanoyl chloride. A flammable, fuming, colorless liquid with a pungent odor. Soluble in ether, acetone, acetic acid. Highly toxic and corrosive. Extremely irritating to the eyes. Dangerous fire risk. Reacts violently with water and alcohol. Used as an acetylating agent; in testing for cholesterol, determination of water in organic liquids. Shipped in polyurethane-lined iron drums and 110-lb glass carboys in cool, dry area with adequate ventilation. Protect from moisture. Controlled or regulated in Hong Kong and Thailand. Can be used in place of acetic anhydride as an acetylating agent in the acetylation of morphine, although it is more hazardous to use.

acetylation

The key chemical process in converting morphine base to heroin. Can be accomplished using either acetyl chloride or acetic anhydride. Acetyl chloride is flammable, irritating to the eyes, reacts violently with water or alcohol, and requires careful handling in laboratory processes. For these reasons, acetylation using acetyl chloride is not favored by processors of heroin. Although acetic anhydride is corrosive and requires care in handling, it is less hazardous to the user than acetyl chloride and hence is the key chemical used in processing of heroin.

adulterant

Substance added to heroin after the heroin conversion process is completed. Adulterants are pharmacologically active. Quinine and procaine are typical adulterants *added* to heroin.

alcohol (ethyl alcohol)

An anhydrous alcohol, also known as ethanol, grain alcohol, fermentation alcohol, "drinking alcohol," anhydrous alcohol, ethyl hydroxide, and methyl carbinol. A clear, colorless, volatile, flammable liquid with a pleasant, sweet odor. Absorbs water rapidly from air. Miscible with water. Must be stored in tightly closed container, cool, and away from flame. Most ethyl alcohol is used in alcoholic beverages in suitable dilutions. Shipped in metal or plastic containers, such as 55-gallon drums, gerry cans, etc. Some drums may be lined with phenolic resin. Used as a solvent during purification of heroin base and in conversion of heroin base to heroin hydrochloride.

alkaloid

Any of various physiologically active, nitrogen-containing organic bases derived from plants. Common alkaloids include atropine, caffeine, cocaine, codeine, mescaline, morphine, narcotine, nicotine, noscapine, papaverine, quinine, strychnine, and thebaine.

ammonium chloride

Also known as ammonium muriate, sal ammoniac, salmiac. Colorless, odorless crystals or crystalline chunks; may also be a white, granular powder. Tendency to cake. Soluble in ethanol; near-insoluble in acetone or ether. Cooling, saline taste. Major industrial uses are in manufacture of dry cell batteries; dyes; fertilizers; washing powders; etc. Medical use as an expectorant. Normally packaged in barrels or multiwall paper or polyethylene sacks. Ammonium chloride can be used as a reagent to adjust alkalinity in the precipitation of morphine (as crude morphine base) from an opium solution.

benzene

Also known as benzol. A colorless to light-yellow liquid with an aromatic odor. Its vapors burn with a smoky flame. Highly flammable; dangerous fire risk. Toxic by ingestion, inhalation, and skin absorption. A carcinogen. Commonly used in petroleum industry for use in anti-knock gasoline. Shipped in drums, tanks, and on barges with adequate ventilation. Can be used to initially extract morphine alkaloid from opium, but its high flammability and

acute toxic properties make it a poor choice for this process.

brown sugar heroin

A common name for heroin (any source) which has the appearance of light brown, granulated sugar. Used in contrast with the white, fluffy powder or crystals form of heroin, such as Southeast Asian "China White" heroin. Injected, snorted, or smoked.

caffeine

White, fleecy masses of long, flexible, silky crystals. A bitter, white alkaloid found in coffee, tea, and cola nuts. Caffeine is generally used in combined forms, as a monohydrate, acetate, or other compounds. In addition to its use as a stimulant and diuretic, crystalline caffeine is commonly used as an adulterant in heroin hydrochloride, or as a necessary ingredient in "smoking heroin" (e.g., Southeast Asian heroin no. 3).

calcium hydroxide

See "lime, slaked."

carbon, activated

See "charcoal, activated."

chandu

A Hindi-Bengali term for cooked opium ("smoking opium"). Term used in India and some parts of Burma. Term is used in some reports on Southeast Asian opium.

charcoal, activated

A fine black carbonaceous powder prepared commercially from wood and vegetables. Also known as "activated carbon" or "animal black." Highly adsorptive. Used in medicine as an antidote and in treatment of diarrhea. Used in laboratories for clarifying, deodorizing, decolorizing, and filtering various chemicals. Marketed under trade names as Norit, Carboraffin, Ultracarbon, Opocarbyl, etc. Used as a reagent in the purification of heroin.

China White

Southeast Asian heroin no. 4, in white powder form. Term is used by English-speaking westerners to contrast the white powder form with the light brown, granular form of heroin (see "brown sugar heroin," above). May be injected, snorted, or smoked. The term "China White" has also been used in recent years as an alternate name for fentanyl, a synthetically-produced compound with heroin-like properties.

chloroform

Also known as trichloromethane. A clear, colorless, heavy, and very volatile liquid with a characteristic sweet odor. It is an irritant to the skin and eyes and may also be carcinogenic. Not miscible with water, forming a separate layer on the bottom. Miscible with alcohol. Shipped in bottles, tins, or drums; stainless steel for very high-purity products. Used in industry as a solvent for fats, oils, rubber, alkaloids, waxes, and resins. Used extensively as a solvent in the rubber industry; used to make the refrigerant Fluorocarbon-22. Can be used as a solvent in the synthesis of heroin.

choi

A standard unit of weight used in Southeast Asia for opium (only). Equivalent to 1.60 kilograms (3.528 pounds). See Figure 7.

conversion (heroin conversion)

A chemical conversion process wherein heroin base is converted into a soluble salt form of heroin, generally heroin hydrochloride.

diluent

A chemical diluent is an ingredient used to reduce the concentration of an active material. Another common definition of diluent is a substance added to finished product (e.g., heroin) to increase bulk. In this sense, there is no clear distinction between a diluent and an extender. In heroin manufacture,

"diluent" refer to extenders. Typical diluents for heroin are mannitol, sucrose, lactose, and starch.

ether (ethyl ether)

Also known as diethyl ether; ethyl oxide; diethyl oxide; sulfuric ether, anesthetic ether, or simply "ether." A colorless, mobile, very volatile and highly flammable liquid. Characteristic, sweetish, pungent odor, more agreeable than chloroform. Ether vapors are heavier than air; tends to form explosive peroxides under the influence of air and light. When shaken under absolutely dry conditions, ether can generate enough static electricity to start a fire. Shipped in cans, drums, barrels, and tank cars. Not miscible with water, forming a separate layer on the surface. In addition to its well-known use as an anesthetic, ether is used as a solvent in fats, waxes, dyes, perfumes, oils, resins, etc. Ether is also used as a solvent in conversion of heroin base to heroin hydrochloride.

ethyl alcohol

See "alcohol."

ethyl ether

See "ether."

Golden Triangle

Area of mainland Southeast Asia comprising the Shan Plateau and Kachin Hills of northeastern Burma, the highlands of northwestern Laos, and the highlands of northern Thailand. Term was popularized by Western journalists in the 1970s to designate one of the principal source areas in the world for illicit opium and its derivatives, morphine and heroin.

gram

A standard unit of weight in the metric system equal to one-thousandth of a kilogram. 28.350 grams equal one ounce.

hai

Northern Thai-Shan term used with land areas. See "rai" and "lai" (Lao).

hectare

A metric unit of area equal to 2.471 acres (10,000 square meters). See Figure 4.

heroin

Also known as diacetylmorphine. A highly-addictive synthetic narcotic derived from morphine.

heroin base (Southeast Asia)

Diacetylmorphine. Also known as "crude heroin." Actually, is morphine base that has undergone acetylation. Formed as a precipitate (solid) by adding soda ash (sodium carbonate) to an acetylated morphine solution. Sometimes called Southeast Asian heroin no. 2. Not readily soluble in water, and therefore not injectable in this form. This form of heroin can be smoked. However, heroin base is generally considered an intermediate form of heroin which may be further refined to either no. 3 or no. 4 heroin.

heroin hydrochloride

A chemical salt form of heroin, usually powder or crystal, that is water soluble and therefore suitable for injection. Sometimes called Southeast Asian heroin no. 4. Formed when heroin base is treated with hydrochloric acid. This type of heroin is most commonly used by heroin abusers who inject the drug.

Southeast Asian heroin no. 3

A smokeable form of Southeast Asian heroin. Not as highly refined as no. 4. Color ranges from purple to tan to off-white. Although considered a smoking heroin, it may also be injected intravenously. Caffeine is a necessary component of heroin no. 3. In contrast, strychnine or quinine are adulterants which are sometimes added to heroin no. 3, allegedly to modify the taste of the product.

Southeast Asian heroin no. 4

An injectable form of Southeast Asian heroin. Also known as heroin hydrochloride or "China White." Highly refined heroin produced from Southeast Asian opium. Usually a fine white powder, flakes, or crystals. May be smoked or snorted, although, from the standpoint of the abuser, these are expensive and wasteful uses of this form of heroin. Diluents, such as lactose, are not normally added until the heroin is diluted, or "cut."

highlander (Southeast Asia)

A hill dweller. Hill tribesmen are a typical example of highlanders in Southeast Asia. However, some hill tribesmen have migrated into the lowlands, and are now permanent dwellers in lowland communities. Conversely, some members of ethnic groups which are generally lowland dwellers have permanently settled in highland areas in mainland Southeast Asia.

hill tribe (Southeast Asia)

Any one of numerous ethnic groups which share a distinct culture, language, and social structure and who are regarded, as a group, to be hill dwellers or *montagnards* (French). The Hmong (Miao), the Iu Mien (Yao), Lahu (Musoe), *inter alia*, are hill tribe groups in mainland Southeast Asia.

hydrochloric acid

A solution of hydrogen chloride gas (HCl) in water. Also known as muriatic acid. Fumes in the air. A colorless liquid (sometimes yellow) with an acrid odor. Acid is poisonous and corrosive. Shipped in glass bottles or glass carboys, or rubber-lined steel drums. Used in petroleum production, as a chemical intermediate, and in ore reduction, food processing, pickling, and metal cleaning. Hydrochloric acid is used to convert morphine base to morphine hydrochloride (e.g., '999' morphine blocks or bricks) or to convert heroin base to heroin hydrochloride.

jin

A metric unit of weight in Chinese system. Equivalent to one-half kilogram (500 grams). Chinese term, romanized: *jin* (Pinyin) or *chin* (Wade-Giles Mandarin). See Figure 7.

joi

Standard unit of weight for opium. See "choi."

kilogram

A metric unit of weight equal to 1,000 grams, or 2.2046 pounds.

lactose

Also known as milk sugar, saccharum lactis. Present in milk in mammals. White, hard crystalline mass or white powder; sweet taste, odorless. Stable in air. Soluble in water; insoluble in ether and chloroform; very slightly soluble in alcohol. Used commercially in infant foods, baking and confectionery, margarine and butter manufacture, etc. Shipped in multiwall paper sacks or bulk. Commonly used as a diluent (or "extender") by heroin dealers to increase bulk of "injectable heroin" (e.g., Southeast Asian heroin no. 4).

lai

A standard unit of land area measurement in Laos equivalent to 1,600 square meters. Corresponds to *rai* measurement used in Thailand (see below). See Figure 4.

lime, slaked

Also known as calcium hydroxide, calcium hydrate, caustic lime, hydrated lime. Crystals or soft, odorless, granules or powder, with a slightly bitter taste. Slightly soluble in water. Readily absorbs CO₂ from air, forming CaCO₃. Used in industry to manufacture cement, pesticides, fertilizers, and in water treatment. Normally packaged in tightly closed and dry containers, such as wooden barrels or multiwall paper sacks. Used as a reagent in the extraction of morphine from opium by forming an intermediate calcium salt (calcium morphenate).

liter

A metric unit of volume. Equivalent to 1.056 liquid quarts. See Figure 11.

lowlander (Southeast Asia)

A lowland dweller, in either a rural or urban community. The ethnic Lao are a typical example of lowlanders in Southeast Asia. However, some Lao have migrated into the highlands and are now permanent dwellers in highland communities. Conversely, some members of ethnic groups which are generally highland dwellers (e.g., the Hmong hill tribe) have permanently moved into lowland areas in Laos and Thailand.

mannitol

Also known as mannite, manna sugar. A white, crystalline, sweetish, water-soluble carbohydrate alcohol. Used as a nutrient, a dietary supplement, and as the basis of dietetic sweets. Mannitol is commonly used as a mild laxative for infants. Shipped in multiwall paper sacks or bulk. Commonly used as a diluent (or "extender") by heroin dealers to increase bulk of "injectable heroin" (e.g., Southeast Asian heroin no. 4).

morphine

An organic compound (alkaloid) found in the *Papaver somniferum* (opium poppy). Morphine must first be extracted from opium. The soluble salts of morphine (morphine carbonate, morphine sulfate, morphine hydrochloride, etc.) are used in human and veterinary medicine as a light anesthetic or as a sedative.

morphine base

Morphine base is an intermediate product between morphine alkaloid in opium and a morphine brick (morphine hydrochloride). The base is formed as a precipitate (solid) when ammonium chloride is added to a solution of calcium morphenate. This base is usually quite crude (50% to 70% pure) because of the marginal conditions under which it is prepared. Morphine base is not easily soluble in water, and thus is not readily absorbed by the human body. Morphine base must therefore be converted to a

(water-soluble) salt form, viz., morphine hydrochloride or heroin hydrochloride, by treating with hydrochloric acid.

morphine brick

Morphine hydrochloride, compressed (by a morphine press) into a standard-sized brick shape measuring approximately 2 inches by 4 inches by 5 inches and weighing approximately 1.3 kilograms (about 3 pounds). Also known as a morphine block. Properly compressed morphine hydrochloride is very dry and hard.

morphine press

A metal or wood piece of equipment which can squeeze water from morphine hydrochloride, leaving the morphine dry and in uniform, brick-sized blocks.

morphine salt

A water-soluble chemical form of morphine. In extracting morphine from opium, slaked lime (calcium hydroxide) powder is added to opium dissolved in water. Lime reacts with morphine in opium (morphine content ranges from 9% to 16% by weight of the opium) to form calcium morphenate in solution. Calcium morphenate is a chemical salt form of morphine. Other morphine salts include morphine sulfate, morphine hydrochloride, and morphine acetate — all legitimate compounds used in medicine.

nuai

A general, non-specific term in Thai-Lao-Shan which means "unit." However, has special meaning when used in reference to heroin. A *nuai* is a standard unit of weight for Southeast Asian heroin, equivalent to 700 grams (.7 kilogram).

opium

A bitter, yellowish-brown, strongly-addictive naturally-occurring narcotic derived from the dried latex juice of the opium poppy, *Papaver somniferum*. Source of morphine and heroin. Opium poppy is cultivated legally in India, Turkey, China, Commonwealth of Independent States (formerly the Soviet Union), and Tasmania, Australia; and is cultivated

illegally in Afghanistan, Burma, Colombia, Guatemala, Iran, Laos, Lebanon, Mexico, Pakistan and Thailand.

liquid opium

Also known as "opium solution." Refers to opium which has been dissolved in water, either to prepare the opium for smoking, i.e., "cooking" the opium, or as the first step in extracting morphine from the opium. Liquid opium is usually a clear, brown liquid.

prepared opium

Also known as "cooked opium," "processed opium," and "smoking opium." Raw opium is dissolved in hot water in order to remove impurities and vegetable matter. It is heated to reduce its water content. As the solution cools, the opium reverts to a solid. Most opium smokers prefer to smoke prepared opium. By contrast, morphine and heroin laboratory operators can process both cooked and raw opium.

raw opium

Also known as "opium gum," "crude opium," and "opium sap." Opium which has not been "cooked." Often contains plant scraping, leaf pieces, and other impurities. Initially, is soft and pliable due to high moisture content, but may be dried to a hard consistency. Has strong odor. Does not keep as well as prepared opium. Weighs more than prepared opium (contains more water). It is smoked or eaten by addicts.

pitzu

A Chinese term used to refer to impure, or "crude," morphine base. Romanized spellings include *pizi* (Pinyin) and *p'i-tzu* (Wade-Giles Mandarin).

pong

A standard unit of weight used in Southeast Asia for opium only. Equivalent to 0.375 kilogram (13.23 ounces). Thai-Shan-Lao term. See Figure 7.

poppy (opium poppy)

An annual plant, *Papaver somniferum*, originally of Asia Minor, having grayish-green leaves and variously colored flowers. The sole source of opium.

poppy pod

Sometimes called the "seedpod," "capsule," "bulb," or "head." Refers to the egg-sized fruit which enlarges as the flower petals fall from the plant. The poppy pod is the mature ovary of the opium poppy plant. The ovarian wall produces the white latex (opium).

scoring of poppy pod

Cutting into the surface of an opium poppy pod, using a sharp bladed instrument, in order to allow the opium to exude from the pod. Also known as "lancing," "incising," or "tapping."

scraping of poppy pod

Using flat-bladed instrument to collect gummy opium from pod surface.

weeding & thinning of poppies

Removing weeds, grasses, and some poppy plants in order to provide more growing space for remaining poppies.

precipitation (chemical precipitation)

The separation of a solid from a solution. The resulting solid is called the precipitate.

precursor

A precursor is a chemical that is the raw material for a new product. Morphine is a precursor in the production of heroin.

processing (heroin processing)

A general term which refers to the overall process of manufacturing heroin. Includes the acetylation process, a number of intermediate purification and

precipitation processes, and the process of chemically converting heroin base to a soluble salt form of heroin, generally heroin hydrochloride. Heroin processing can also include the extraction of morphine from opium, and may include other operations, such as filtering, drying, pressing, and packaging the finished heroin product.

purification (chemical purification)

The removal of extraneous materials (impurities) from a substance or a mixture by one or more separation techniques. Such techniques include crystallization, precipitation, distillation, adsorption, extraction, etc. For example, heroin base is usually treated with decolorizing charcoal (a purification process) after it is acetylated from morphine base.

rai

A standard unit of land area measurement in Thailand equivalent to 1,600 square meters. Corresponds to *lai* measurement used in Laos (see above). *Rai* is also a general term in Thai-Lao-Shan for cultivated land (except irrigated ricefields). Called *hai* in northern and northeastern Thailand. Called *hai* in Laos only when used to refer to cultivated fields. See Figure 4.

reagent (chemical reagent)

A reagent is a chemical which reacts with a precursor to form a new compound. For example, acetic anhydride is a reagent used in the manufacture of heroin.

slash-and-burn agriculture

Also known as "swidden" agriculture. Agricultural method of clearing farmland. Involves cutting down all the trees and underbrush on a wooded hillside and, when it is thoroughly dried, burning it off in preparation for planting. This type of shifting cultivation is widely used by highland tribal groups in Southeast Asia.

soda ash

Crude, anhydrous sodium carbonate. Also known as Solvay soda; washing soda; soda. A white or transparent, odorless, crystalline powder with a salty, bitter taste. Shipped in 25-lb, 50-lb, and 100-lb bags; 275-lb and 400-lb drums, or bulk. An industrial chemical used in manufacturing sodium bicarbonate, sodium nitrate, glass; ceramics; water softening agents; detergents; and soaps. An alkaline material commonly used in the production of heroin base.

solvent (chemical solvent)

A solvent does not react chemically with a precursor chemical or reagent and does not become part of the finished product. Solvents are used to dissolve solid precursors or reagents, to dilute reaction mixtures, and to separate and purify other chemicals.

strychnine

Strychnine, or its salts, has been used as an adulterant in the illicit manufacture of "smoking heroin" (e.g., Southeast Asian heroin no. 3). Strychnine salts most commonly used are the nitrate or sulfate.

swidden agriculture

An agricultural method. See "slash-and-burn" agriculture.

tua

See "nuai."

unit

Special meaning when used in reference to heroin. A "unit" is a standard unit of weight for Southeast Asian heroin. Called *nuai* in Thai and Lao; *chien* in Chinese. Equivalent to 700 grams (.7 kilogram). Derivation of use not known.

viss

A standard unit of weight used in southern India and Burma. Equivalent to 1.657 kilograms (3.652 pounds). Commonly used when weighing meat, flour, rice, and other such bulk items. In Burma, the *viss* is also used in the opium trade. Burmese term: *beittha*. (The term *viss* is not used in Thailand, Laos, or China.) Derived from Tamil term, *visai*. Also spelled *vise* (Telugu) and *vis*. Often rounded to 3.6 pounds in modern usage. See Figure 7.

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