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Influence of Anti-Comintern Pact, German-Soviet War and Capture of Cinchona and Quinine Factory in Java on the Distribution Plans for Quinine by the Japanese Army

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日独防共協定、独ソ戦、日本軍によるジャワのキナ資源及びキニーネ工場の獲得が日本陸軍のキニーネ配分計画に与えた影響

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Abstract

Malaria became a severe problem for the Japanese military since the landing of Shanghai in the summer of 1937. Therefore, the Japanese Government and Army started to prepare distribution plans for quinine, the most important anti-malarial drug made from cinchona bark, primarily produced in Dutch East Indies. The analysis of these plans should show the influence of the Anti-Comintern Pact, the outbreak of the German-Soviet War, and the capture of cinchona and quinine resources in the Dutch East Indies on the military hygiene policy of Japan. As the first step in this regard, the present article summarizes the Army's planning of cinchona and quinine distribution to their units and different sectors of the world with a particular interest in its change before and after the Japanese invasion of Java. Reviewing materials in the JACAR (Japan Center for Asian Historical Records) Archive, Okamoto Minoru Archive of Modern Japanese Political History Materials Room (Kensei-shiryôshitsu), National Diet Library of Japan, and other sources indicated the followings. The outbreak of the German-Soviet War stopped the import of anti-malarial drugs to Japan and halved the supply of quinine to Japanese units in China. According to the Anti-Comintern Pact, Japan started to prepare distribution plans to supply quinine to the Axis countries. The Japanese Army began to formulate plans in August 1941 to distribute quinine, assuming the capture of cinchona resource and Bandung Quinine Factory more-or-less intact. The plan after the landing of Java allocated approximately half of quinine as the previous plan to the Axis countries and the Great East Asia Co-prosperity Sphere other than occupied China and Manchuria. That for Japan, occupied China, and Manchuria remained more-or-less unchanged. Japan optimistically made the anti-malaria strategy for both Chinese and Pacific theaters, assuming the intact capture of cinchona and quinine resources in Java.

Key words: Quinine, Japanese Army, Axis Countries, Great East Asia Co-prosperity Sphere, Java, Bandoengsche Kinine Fabriek

和文要約

1937年夏の上海上陸以来、日本軍にとってマラリアがとくに深刻な問題となった。そのため、日本政府と陸軍はオランダ領東インドを主産地とするキナ皮から作られる、最も重要な抗マラリア薬であるキニーネの配布計画の準備を開始した。配布計画は何回も改訂されたが、この間の経過を分析すれば、日独防共協定の締結、独ソ戦争の勃発、オランダ領東インドにおけるキナとキニーネ資源の捕獲などが日本の軍事衛生政策に与えた影響を明らかにできると期待される。その第一段階として、日本軍のジャワ島侵攻前後の計画の変化に特に注目して、軍の部隊や世界各国へのキナ皮とキニーネの配布計画を検討した。JACAR（日本アジア歴史資料センター）や国会図書館憲政資料室岡本実文書などの資料を調べたところ、以下のことが明らかになった。独ソ戦の勃発により日本への抗マラリア薬の輸入が停止し、中国戦線の日本陸軍部隊へのキニーネの供給が半減した。防共協定の締結により、日本は枢軸国にキニーネを供給するための計画の準備を始めた。日本陸軍は、遅くとも1941年8月に、ジャワへの進攻によって同地のキナ資源とバンドン・キニーネ工場をほぼ無傷で手に入れられると仮定して、キニーネの配布計画を策定し始めた。ジャワ島上陸後の計画では、上陸前の計画の約半分のキニーネを中国占領地・満州以外の大東亜

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共栄圏ならびに枢軸国に配分することとなった。日本、中国占領地、満州への割り当ては、ほぼ変わらなかった。これらから、日本はジャワのキナおよびキニーネ資源を無傷で捕獲できるという楽観的な前提のもとに、中国戦線、太平洋戦線でのマラリア対策を作成したことが明らかになった。

Introduction

Japan had malaria for more than 1000 years[1]. However, malaria became a recognizable national problem after the merges of Ryukyu and Taiwan[1]. Japan began to suffer seriously from malaria just after the landing of the Japanese forces in Shanghai in the summer of 1937[1]. Malaria was the most significant cause of hospitalization in the Chinese theater in 1939. (Table 1)

Accordingly, the supply of anti-malarial drugs became an essential issue for the Japanese armed forces for the battle in China, and the expected war in the southern theater. Quinine was the most important anti-malarial drug besides newly developed anti-malarial synthetic medicines such as plasmochin and atebrin during this time.

Quinine salts are produced from cinchona bark by a relatively simple process (Figure 1) Dutch East Indies supplied more than 90% of the world's supply of cinchona bark and quinine (Figure 2). A significant part of the harvested cinchona bark was processed into quinine salts in Bandung Quinine Factory (Bandoengsche Kinine Fabriek N.V.)[1].

Accordingly, the Cabinet Planning Board of Japan (Kikakuin) began to prepare plans to secure the import from the Dutch East Indies and promote cinchona production in Taiwan and quinine production in Japan in January 1941[3]. At the same time, the Japanese Army prepared distribution plans for quinine and other anti-malarial drugs for the units in China[4]. Then, the Army prepared more global supply plans for quinine, expecting the capture of cinchona plantations and the Bandung Quinine Factory in Java. The analysis of these Army plans should tell us (1) the dependency of the Japanese Government and Army on the cinchona and quinine factory in the Dutch East Indies, (2) Japan's role in supplying anti-malarial materials to the Axis countries, and (3) if there were alternative plans to accommodate the failure in capturing the expected resource/facilities.

As the first step along this line, the present article analyses the Army's planning of cinchona and quinine distribution to their units and different sectors of the world with a particular interest in its change before and after the Japanese invasion of Java. I shall discuss the governmental planning prepared by the Cabinet Planning

Table 1. Cause of hospitalization in the Japanese army hospitals in China in December 1939. Malaria was the most significant cause of hospitalization. There were approximately 160,000 malaria cases in the Army in FY 1939[2].

Cause	Number of patients	%
Wounded	3,410	25
Malaria	4,652	34
Beri beri	1,081	8
Venereal diseases	720	5
Tuberculosis	714	5
Infectious diseases	670	5
Others	2,515	18

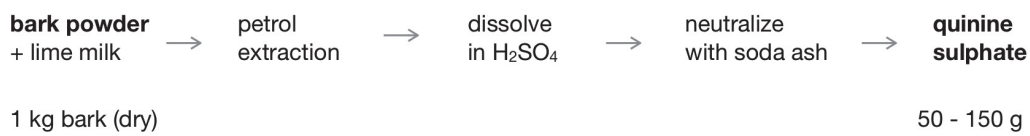

Figure 1. Scheme of quinine production from cinchona bark powder.

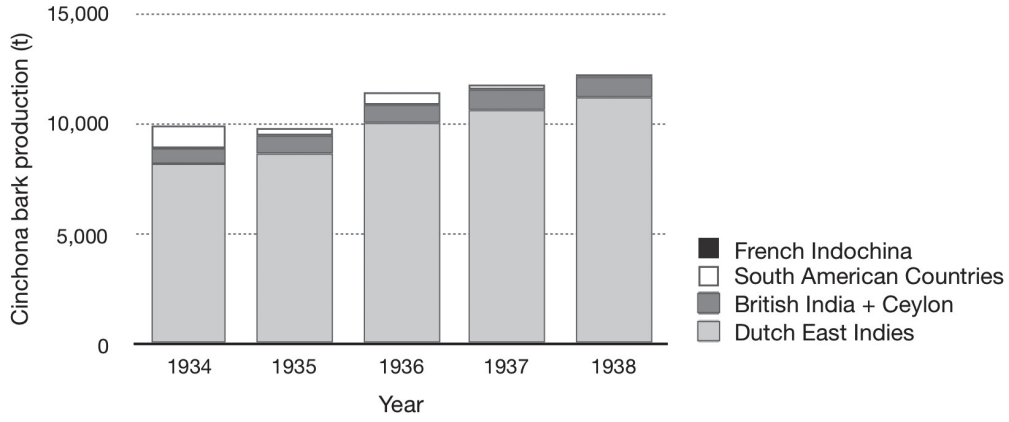

Figure 2. Share of cinchona bark production in the world from 1934 to 1938[5)]

Board elsewhere. The author orally presented a part of this article at the Euro SEAS 2022 congress in Paris, 28 June – 1 July 2022.

Import of cinchona bark and quinine salts to Japan before the Japanese invasion of Java

Japanese pharmaceutical companies tried to cultivate cinchona in Taiwan. However, it was in November 1942 when the first lot of cinchona bark from Taiwan arrived in inland Japan[4)]. The production of cinchona bark in Taiwan was just 30 tons (approximately equivalent to 1.5 tons of quinine salt) in 1943[4)], while Japan had been importing cinchona bark to produce about 22 to 74 tons of quinine salts from the Dutch East Indies between 1936 and 1940[5)]. (Figure 3)

Under such a circumstance, the Japanese Government conducted a survey on the world trade of cinchona bark and quinine based on statistical yearbooks of the Netherlands and Dutch East Indies at the end of the 1930s[5)]. (Table 2)

Army distribution plans for anti-malarial drugs based on the survey in the expected Great East Asia Co-prosperity Sphere

To know the prevalence of malaria and the actual demand for anti-malarial drugs in the expected Great East Asia Co-prosperity Sphere,

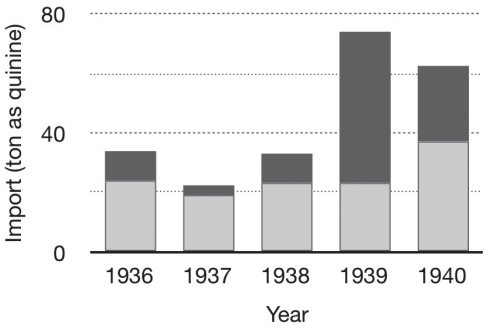

Figure 3 Import of cinchona bark (light grey) and quinine salts (dark grey) by Japan, including Manchuria[5)]

the Japanese Army sent medical officers to Taiwan and China to survey hygienic conditions, including malaria in 1939[6–9)] and 1940[10)]. The Army also sent medical officers to French Indochina in 1940[11–12)] and 1941[13)]. Further, a medical officer was dispatched to Dutch East Indies to survey the prevalence and treatment of malaria and cinchona production in October 1940[14)]. The Japanese Army sent medical officers to Thailand, Malay, and Burma in the latter half of 1941[15)]. Thus, the Japanese Army made a significant effort to obtain medical/hygienic information in South East Asian countries/areas for the forthcoming invasion.

The Japanese Army prepared a plan to supply

Table 2. Export of cinchona bark and quinine salts from Dutch East Indies and the Netherlands to various countries (as quinine kg). Note that the classification into Great East Asia Prosperity Zone, friendly, neutral, and enemy countries was likely made when these data were re-compiled for publication in 1942[5].

	Indies Bark	Dutch Bark	Indies quinine	Dutch quinine	Sum as quinine
Japan & Manchukuo	447,008		16,464		38,814
China			4,383	6,061	10,444
Southern countries		16	23,445	10,137	33,583
Hong Kong			13,982	5,815	19,797
F. Indochina + Port. Asia			1,141	179	1,320
Phillipines			1,530	193	1,725
Dutch East Indies		16		3,950	3,951
Thailand			3,073		3,073
British Malay			3,336		3,336
Others			383		383
Sum of Great East Asian Co-Prosperity Sphere	447,008	16	44,292	16,198	82,841
Germany		1,266,545			63,527
Belgium	247,697	5,361		61,010	18,663
Netherlands	5,375,778		134,593		403,582
France	3,599	721,089		267	36,501
Sweden				308	308
Poland				1,671	1,671
Greece		2,574		54,320	54,449
Italy	295,840	31,197		83,033	99,385
Others		16,285		1,987	2,801
Sum of Friendly Countries	5,922,914	2,043,051	134,593	147,593	680,487
Portugal				4,847	4,847
Turkey		7,862		30,287	30,680
Argentine + Chille				1,388	1,388
Others		257,857		1,592	14,485
Sum of Neutral Countries		265,719		38,114	51,400
North America		558,626		70,721	98,652
Britain	552,238	254		43,153	70,778
Soviet Union		2,030		113,516	113,618
India			3,147	14,354	17,501
Belgic Congo				11,449	11,449
Iran				4,750	4,750
Peru				4,024	4,024
Egypt		2,647		4,914	5,046
Others			255	28,331	28,586
Sum of Enemy Countries	552,238	1,115,795	3,402	295,012	394,404

anti-malarial drugs to their units, including those to be sent to the Southern theater In July 1940 [16]. This plan allocated 9.2 and 4.8 tons of quinine sulfate to the Chinese theater and Japan (plus Manchuria) for 1942. The planned supply for the first three months of southern operation was 6 tons of quinine sulfate, equivalent to 1 tablet daily for 250 thousand personnel. A tablet contained 0.2 g of quinine sulfate, which was the recommended dose for the prevention of malaria. Three to five times more quinine sulfate was necessary for the treatment by quinine alone or with atebrin[4].

The outbreak of the German-Soviet war in June 1941 and the failure of the second negotiation between Japan and the Dutch East Indies stopped the Japanese import of anti-malarial drugs from Europe and the Dutch East Indies[17]. This situation obliged the Japanese Army to cut down the supplies of quinine and atebrin to their units in China to 24% and 42% of the original plan, respectively[4]. (Figure 4) It should have been challenging to prepare an anti-malarial plan for the expected southern operation by the Japanese Army and Navy under such a situation.

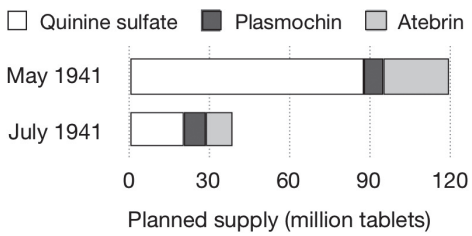

Figure 4. The distribution plan of anti-malarial drugs for Army units in China for FY 1941 issued in May and revised in July 1941, before and after the outbreak of the German-Soviet war[4]

The Army considered that it was possible to squeeze 6 tons of quinine sulfate for the planned southern operation if the Army reduced the supply to the Chinese theater by 1/2[18]. Nevertheless, the Army still needed to import 30 tons of quinine sulfate before the southern operation because there was no stock of quinine for FY 1942[18].

Under such a situation, the Japanese Army revised the distribution plan of anti-malarial drugs for their units in Chinese, Southern, and other theaters in August 1941[19]. (Table 3)

The sum of quinine (37 or 52.8 tons) was within the achievement of Japanese imports from the Dutch East Indies in 1939 or 1940. (Table 4) Accordingly, this should have been a realistic plan if the same import level from the Dutch East Indies continued. The amount 16 ton in the Table 3 was equivalent to 16,000,000 (g) / 0.2 (g/tablet) = 80,000,000 (tablet). Considering the preventive dose of 1 tablet/day[4], This should have supplied the 250,000 personnel for 80,000,000 (tablet)/250,000 (capita) = 320 days. Another 6 tons were allocated for the treatment of the same personnel. One cycle of malaria treatment required approximately 15 g of quinine sulfate[4]. Therefore, the 6 tons should have treated 6,000,000 (g) / 15 (g) = 400,000 (personnel), or a little more if other anti-malarial drugs were used. Thus, the plan in Table 3 was acceptable for the prevention if some personnel was with-

Table 3. The distribution plan of the Japanese Army for anti-malarial drugs to their units in various theaters in 1942 issued on 15 August 1941[19].

	China	Other	South (for 250,000)	(for 400,000)
Quinine sulfate (t)	9	6	preventive 16	28.8
			remedial 6	9
Atebrin (10^6 tablets)	15	5	30	45
Plasmochin (10^6 tablets)	10	5	30	45

Table 4. Japanese export of quinine and cinchona bark during the WW2[4)]

Category	Country/Area	Year	t as quinine	Price (Yen/kg)	Transport by
Greater East Asia	Thailand	1942	3	Gift	Japan
Co-prosperity Sphere	Phillipines	1943	3	Gift	Japan
Axis countries/area	Germany	1942	47.6	51	Germany & Japan
		1943	10	?	Germany & Japan
	Italy	1943	15	?	Italy
	Indochina	1942	3	Gift	Japan
	Bulgaria	1943	5*	150	Bulgaria
Neutral countries	Portugal	?	declined		
	Spain	1943	declined		
	Afghanistan	1944	0.5	200	Afghanistan**
		1945	0.5*	280	Afghanistan**

* Very likely not realized.

** Japan arranged the transport from Osaka to Manzhouli on Afghan cost.

drawn after the first phase, but may have underestimated the infection rate in the southern theater. Further, the anti-malarial operation of the Japanese Army and Navy should have entirely perished if the production of the cinchona and quinine in the Dutch East Indies were insufficient.

In January 1942, after the outbreak of the Pacific War but before the landing in Java, the Japanese Ministry of Army and Army Medical Materials Main Depot[20)] independently prepared plans of quinine supply to Japan (incl. Manchuria), occupied Republic of China, the Southern region, and Axis countries[21)]. (Figure 5, left two columns) The Ministry plan required 530 tons, and the Depot plan required 430 tons. The Ministry's plan was the same as the plan suggested by the Ministry of Health and Welfare on 31 January 1942[22)]. The Ministry of Army allocated approximately three times as much quinine to Japan as the Depot. The Depot plan assigned 50 t of quinine to Japan, including the military. This amount was at the same level as the plan prepared on 15 August 1941 (Table 3).

These amounts markedly exceeded the level of the Japanese import. Accordingly, it was evident that Japan planned to capture the cinchona resource in Dutch East Indies and Bandung Quinine Factory in January 1942[17)]. Clearly, the Japanese military expected the increased demand for quinine for the Chinese and Pacific operations and to maintain the hygienic standard of the Great East Asian Co-Prosperity Sphere. It is also evident that Japan recognized the role of supplying quinine to the Axis countries.

The Director of the Army Medical Materials Main Depot planned to produce 140 tons of quinine sulfate for Japan, occupied China, and Manchuria from 2,800 t of cinchona bark from Java[21)]. The Director expected the Bandung Quinine Factory to produce 100 t and 200 t of quinine sulfate for Greater East Asia Co-prosper-

ity Area and axis countries from 3,400 t and 4,000 t of barks, respectively. Thus, the Director set the goal of the factory to produce 370 t of quinine sulfate a year before the landing.

The Japanese 16th Army took over the Bandung Quinine factory almost intact just after the landing on 1 March 1942[23]. The 16th Army captured quinine salts (58,498 kg), selected cinchona bark (2,250,402 kg), powdered cinchona bark (ca. 160 ton), potassium iodide (220,000 pieces), solvent for quinine production (3,489 kg), and petrol to extract quinine[21]. The amount of captured quinine salts and cinchona bark was equivalent to a year's product. The Chief of the Staff of the 16th Army reported to the Vice Minister of Army within ten days of landing[24] that it was possible to supply 1,000 tons of cinchona bark and to produce 300 tons/year of quinine sulfate at Bandung Quinine Factory. The factory officially became under the direct control of the Military Administration of the 16th Army on 25 September 1942[25]. The Military Administration expected the factory to produce 300 t and 600 t of quinine in fiscal years 1942 and 1943, respectively.

Under such a circumstance, the Ministry of Army informed the revised distribution plan to Army Medical Materials Main Depot[21] at the end of March or early April 1942. (Figure 5. right-most column) The sum of 460 tons may fall within the annual production capacity of the Bandung factory and pharmaceutical companies in Japan[26].

Realization of the distribution plan

The attainment of the above plan is yet unclear. However, materials in the JACAR archive showed that Japan presented 3 ton each quinine to Thailand, the Philippines, and French Indochina in 1942 or 1943[27]. Japan also sold 57.6 ton, 15 ton, and 0.5 ton of quinine to Germany in 1942 and 1943, Italy in 1943, and Afghanistan in 1944, respectively[27]. (Table 4) These figures may indicate that the Army partly realized the plan to supply quinine to Axis countries and countries in Greater East Asia Co-Prosperity Spheres. However, the scale was far smaller than planned. The difference between the plan and attainment was mainly due to the difficulty in over-sea transport[27].

Conclusion

The Japanese Army started to prepare plans in August 1941, at the latest, to distribute quinine

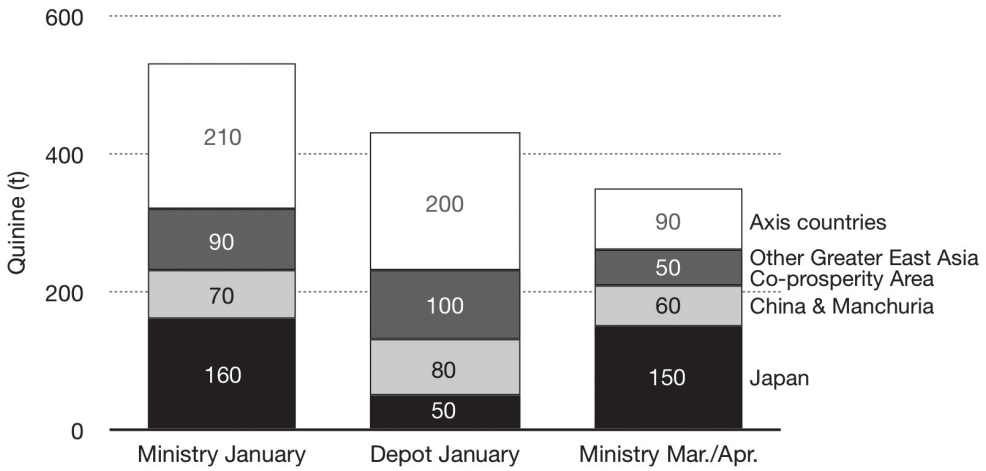

Figure 5. Global quinine distribution plan of the Japanese Ministry of Army and Army Medical Materials Main Depot before (January 1942) and after (March/April 1942) the landing of Java[5]

assuming the capture of cinchona resource in Java and Bandung Quinine Factory more-or-less intact. The plan after the landing of Java allocated approximately half of quinine as before to the Axis countries and Great East Asia Co-prosperity Sphere other than occupied China and Manchuria, while that for Japan, occupied China and Manchuria was not much modified. Japan supplied some of the quinine from occupied Java to Axis countries, countries in Greater East Asia Co-Prosperity Spheres, and even to a neutral country, Afghanistan[27]; however, not so much as planned due to the difficulty in sea transport. We may reasonably say that the cinchona and quinine from occupied Java played a crucial role in the anti-malarial operation of the Japanese military. At the same time, cinchona bark and quinine were a tool to maintain a good relationship with Axis countries, countries in Greater East Asia Co-Prosperity Spheres, and a neutral country. We may also say that Japan made its anti-malaria strategy both in Chinese and Pacific theaters heavily depending on the optimistic assumption of the intact capture of cinchona and quinine resources in Java.

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