Improving access to antidotes and antivenoms, Thailand
Netnapi Suchonwanich and Winai Wananukul

**Problem** Historically in Thailand, access to poison antidotes was limited and antivenom stock management was inefficient.

**Approach** In 2010, the country established a national antidote programme, which created national and subnational antidote stocks, managed their distribution and trained health-care providers on clinical management and antivenom use. In 2013, the programme incorporated antivenoms to improve stock management and avoid wastage due to stock expiry.

**Local setting** Before the programme, health-care providers consulted poison centres on clinical management of poisoning and some antivenoms were not available. Individual hospitals stocked antivenoms, which often expired before use.

**Relevant changes** Today, the National Health Security Office finances and manages the centralized procurement of antidotes and antivenoms and all Thai patients have a right to antivenoms regardless of health insurance. National and subnational stock levels are determined based on demand, treatment urgency and cost. A web-based system, which incorporates geographical information, was introduced for requesting antivenoms. Poison centres provide training, 24-hour consultation services and outcome monitoring. Antidotes and antivenoms are now readily available and used correctly and clinical management has improved. Moreover, better stock and distribution control has helped avoid antivenom wastage and reduced antivenom costs, from US$ 2.23 million United States dollars (US$) to US$ 1.2 million.

**Lessons learnt** The programme's success depended on strong and sustained policy support, adequate funding, improved operational capacity, training for health-care professionals and the provision of 24-hour online consultation services. A web-based centralized procurement and distribution ensured these essential medicines were available, minimized costs, reduced waste and saved lives.

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### Introduction

According to the Ramathibodi Poison Center in Thailand, there are more than 15 000 cases of poisoning in the country each year. However, the true figure may be higher because consultations with poison centres are optional. Antidotes are important for treatment and, when they are unavailable, treatment efficacy may be reduced and outcomes compromised. Unfortunately, many antidotes are not readily available. In fact, they have been referred to as orphan drugs due to their scarcity.

In 2002, Thailand achieved universal health coverage when the whole population gained access to three public health insurance systems. The National Health Security Office was established by law to manage the Universal Health Coverage Scheme, which caters for 75% of the population and receives an annual budget funded through general taxation. Although the scheme is comprehensive and includes high-cost medicines, ensuring access to antivenoms was initially a challenge since supplies were limited and there was no active management system. In contrast, antivenoms were readily available throughout the country because all hospitals held stocks. However, management was inefficient and some antivenoms passed their expiry dates before they could be used.

The need to improve access to antivenoms has been recognized as a major challenge for low- and middle-income countries and in 2018, the World Health Assembly adopted a resolution on the burden of snakebite envenoming. Here we describe the lessons learnt in Thailand with a programme designed to increase access to both antidotes and antivenoms and to improve the efficiency of antivenom stock management.

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### National antidote programme

In 2010, the National Health Security Board established a national antidote programme to ensure equitable access to antivenoms for the whole population, not only members of the Universal Health Coverage Scheme. The programme made extensive use of information and communications technology, not only to support procurement and supply chain manage-
Box 1. Components of the Thai national antidote programme, 2010

Financing
• Continued political support ensured that the National Health Security Office received full funding for antidotes and antivenoms for the whole population, thereby protecting against financial risks and saving lives.

Design and operations
• Antidotes and antivenoms were stocked nationally and subnationally, as guided by epidemiological evidence.
• Procurement and supply chain management became more efficient: antidotes and antivenoms were provided rapidly following web-based requests and delivered through vendor-managed inventory systems.
• Efficient procurement and management of antivenoms resulted in substantial cost savings compared with the previous system in which individual hospitals purchased and stocked antivenoms, with the danger of stock expiring.

Capacity building
• Staff capacity was increased through: (i) the circulation of manuals and guidelines; (ii) annual in-service training for health-care professionals; (iii) the establishment of a 24-hour, online, real-time, clinical consultation service to support case management remotely; and (iv) outcome monitoring.

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Before the programme, individual hospitals procured and stocked snake antivenom themselves without adequate data on poisonous snakes in their localities. Consequently, supply exceeded demand and antivenom was wasted. In response, antivenom was integrated into the programme in 2013 and subnational stocks were adjusted in accordance with local epidemiological data on snake bite cases. This improved the efficiency of stock management and minimized waste. The Queen Saovabha Memorial Institute plays a principal role in producing antivenoms.

General and regional hospitals were invited to serve as subnational centres for stocks of antidotes and antivenoms. In addition, these drugs were included in the national list of essential medicines, which means they are covered by all three public health insurance schemes and their cost is incorporated into annual budgets. As clinical management is as important as the availability of antidotes, annual training for health-care professionals on the use of antivenoms was initiated and guidelines on antivenom use were distributed. Importantly, poison centres were made responsible for supervising treatment with antidotes and for monitoring clinical outcomes. The operation of the programme is continually being improved with the help of evaluations and reviews. Currently, the programme covers nine antidotes and seven antivenoms.

Relevant changes

Since the programme was implemented in 2011, there has been no shortage of any antidote or antivenom covered. Previously, almost no antidotes were available and deaths occurred. Between 2011 and 2017, 1800 patients who were poisoned benefited from the programme. In addition, 25 636 patients exposed to snake venom had access to any antidote or antivenom covered.

The programme involves close collaboration between several agencies: (i) the National Health Security Office allocates the annual budget and steers and monitors the programme; (ii) the Queen Saovabha Memorial Institute produces antivenom and some antidotes; (iii) the Government Pharmaceutical Organization is responsible for procurement and for managing the supply chain; (iv) the Thai Food and Drug Administration registers medical products; (v) the Thai Society of Clinical Toxicology provides clinical expertise and training; (vi) poison centres at Siriraj and Ramathibodi Hospitals provide clinical consultations; and (vii) the Ramathibodi Poison Center is responsible for monitoring treatment outcomes.
improving access to antidotes in Thailand

Lessons from the field

The programme ensured timely access to essential antidotes and antivenoms, which saved lives even though the production and supply of these orphan drugs were limited and there were few clinical toxicologists in the country. Three factors contributed to the programme’s success (Box 2).

First, government policy was strong and sustained across different administrations, annual national budgets allocated full funding to the National Health Security Office for antidotes and antivenoms, which ensured an adequate supply of these essential medicines.

Second, the availability of antidotes and antivenoms was improved operationally by: (i) the use of central procurement; (ii) direct delivery from suppliers to national and subnational stocks; (iii) the creation of a management information system that included the number of doses available and their expiry dates; (iv) use of a web-based system to deal with requests from hospitals; and (v) timely delivery from stocks. These factors combined to ensure the timely use of antidotes and antivenoms and saved lives, even in very remote areas. In addition, the programme discouraged individual hospitals from purchasing and stocking these medicines, thereby decreasing wastage and substantially reducing costs.

Third, the manuals and clinical guidelines produced by poison centres and the annual training provided for clinicians improved case management and confidence in the use of antidotes and antivenoms. In addition, these centres provided 24-hour online consultation services to support case management remotely; therefore clinical toxicologists at the centres could observe patients’ clinical symptoms in real time.

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Competing interests: None declared.

Table 1. Patients treated and annual budget of the Thai national antidote programme, 2011–2017

| Year | Antidotes | Antivenoms | Total |
|------|-----------|------------|-------|
|      | No. of patients treated | Budget, US$ | No. of patients treated | Budget, US$ | No. of patients treated | Budget, US$ |
| 2011 | 49        | 142,000    | NA    | ND | 49        | 142,200    |
| 2012 | 106       | 422,000    | NA    | 2,233,357 | 106       | 422,000    |
| 2013 | 402       | 407,000    | 964   | 651,393   | 1366      | 1,058,393  |
| 2014 | 466       | 204,000    | 4966  | 1,675,677 | 5432      | 1,879,677  |
| 2015 | 191       | 252,000    | 6234  | 1,114,286 | 6425      | 1,366,286  |
| 2016 | 317       | 283,000    | 6824  | 1,140,286 | 7141      | 1,423,286  |
| 2017 | 269       | 223,000    | 6648  | 1,450,690 | 6917      | 1,673,690  |

Box 2. Summary of main lessons learnt

- Strong and sustained policy support and full funding from the national budget ensured adequate supplies of essential antidotes and antivenoms.
- Improvements in operational capacity, which included central procurement, national and subnational antidote and antivenom stocks, and distribution aided by information and communication technologies, ensured these medicines were rapidly available for patients and minimized waste due to expired products.
- In-service training and 24-hour online consultations provided by poison centres improved clinical management and helped ensure antidotes and antivenoms were used correctly.

Summary of main lessons learnt

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NA: not applicable; ND: not determined; US$: United States dollar.

a One United States dollar was equivalent to approximately 35 Thai baht between 2011 and 2017.

b The average total annual cost of individual hospitals purchasing antivenoms during 2011 and 2012.

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Improving access to antidotes in Thailand

Netnaps Suchonwanich & Winai Wananukul

Améliorer l’accès aux antidotes et aux antivenins, Thaïlande

Résumé

Les antidotes et antivenins sont essentiels pour traiter les accidents toxiques et éviter la mort. Le gouvernement thaïlandais a mis en place un programme national pour améliorer l’accès à ces médicaments. En 2010, le pays a mis en place un programme national pour améliorer l’accès à ces médicaments. En 2013, le programme a été intégré à la gestion des stocks nationaux et internationaux d’antidotes, de gérer leur distribution et de former les prestataires de soins à l’usage des antidotes et à la prise en charge clinique des patients. Les centres antipoison assurent des formations, des consultations 24 h/24 ainsi qu’un suivi des patients. Des antidotes et des antivenins sont désormais rapidement disponibles et correctement utilisés, et la prise en charge clinique s’est améliorée. Par ailleurs, le meilleur contrôle des stocks et de la distribution a permis d’éviter le gaspillage des antidotes et de réduire les coûts associés, qui sont passés de 2,23 millions de dollars des États-Unis ($ US) à 1,2 million de $ US.

Les changements significatifs

Aujourd’hui, le Bureau national de sécurité sanitaire et gère l’approvisionnement centralisé en antidotes et en antivenins et tous les patients thaïlandais peuvent bénéficier d’antidotes, quelle que soit leur assurance maladie. Les quantités des stocks nationaux et infranationaux sont déterminées en fonction de la demande, de l’urgence des traitements et des coûts. Un système en ligne intégrant des informations géographiques a été mis en place pour demander des antidotes et antivenins. Les centres antipoison assurent des formations, des consultations 24 h/24 ainsi qu’un suivi des patients. Des antidotes et des antivenins sont désormais rapidement disponibles et correctement utilisés, et la prise en charge clinique s’est améliorée. Par ailleurs, le meilleur contrôle des stocks et de la distribution a permis d’éviter le gaspillage des antidotes et de réduire les coûts associés, qui sont passés de 2,23 millions de dollars des États-Unis ($ US) à 1,2 million de $ US.

Leçons tirées

La réussite du programme a découlé du soutien politique fort et constant, du financement adéquat, de l’amélioration des capacités opérationnelles, de la formation des professionnels de santé et de la prestation de services de consultation en ligne 24 heures sur 24. Un système en ligne d’approvisionnement et de distribution centralisés a permis d’assurer la disponibilité de ces médicaments essentiels, de réduire les coûts ainsi que le gaspillage et de sauver des vies.

Résumé

Improving access to antidotes in Thailand

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Améliorer l’accès aux antidotes et aux antivenins, Thaïlande

Problème

Historiquement, en Thaïlande, l’accès aux antidotes était limité et la gestion des stocks d’antidotes peu efficace.

Approche

En 2010, le pays a mis en place un programme national relatif aux antidotes, qui a permis de créer des stocks nationaux et internationaux d’antidotes, de gérer leur distribution et de former les prestataires de soins à l’usage des antidotes et à la prise en charge clinique des patients. En 2013, le programme a intégré les antidotes afin d’améliorer la gestion des stocks et d’éviter le gaspillage dû à leur expiration.

Environnement local

Avant la mise en place du programme, les prestataires de soins consultaient les centres antipoison au sujet de la prise en charge clinique des intoxications et certains antidotes n’étaient pas disponibles. Les hôpitaux stockaient des antidotes, qui expiraient souvent avant d’être utilisés.

Changements significatifs

Aujourd’hui, le Bureau national de sécurité sanitaire finance et gère l’approvisionnement centralisé en antidotes et en antivenins et tous les patients thaïlandais peuvent bénéficier d’antidotes, quelle que soit leur assurance maladie. Les quantités des stocks nationaux et infranationaux sont déterminées en fonction de la demande, de l’urgence des traitements et des coûts. Un système en ligne intégrant des informations géographiques a été mis en place pour demander des antidotes et antivenins. Les centres antipoison assurent des formations, des consultations 24 h/24 ainsi qu’un suivi des patients. Des antidotes et des antivenins sont désormais rapidement disponibles et correctement utilisés, et la prise en charge clinique s’est améliorée. Par ailleurs, le meilleur contrôle des stocks et de la distribution a permis d’éviter le gaspillage des antidotes et de réduire les coûts associés, qui sont passés de 2,23 millions de dollars des États-Unis ($ US) à 1,2 million de $ US.

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La réussite du programme a découlé du soutien politique fort et constant, du financement adéquat, de l’amélioration des capacités opérationnelles, de la formation des professionnels de santé et de la prestation de services de consultation en ligne 24 heures sur 24. Un système en ligne d’approvisionnement et de distribution centralisés a permis d’assurer la disponibilité de ces médicaments essentiels, de réduire les coûts ainsi que le gaspillage et de sauver des vies.
Mejorar el acceso a los antídotos y antisueros, Tailandia

Resumen

Problema Históricamente en Tailandia, el acceso a los antídotos venenosos era limitado y la gestión de las existencias de antisueros era ineficaz.

Enfoque En 2010, el país estableció un programa nacional de antídotos, que creó reservas nacionales y subnacionales de antídotos, gestionó su distribución y formó a los profesionales sanitarios en la gestión clínica y el uso de antídotos. En 2013, el programa incorporó antisueros para mejorar la gestión de las existencias y evitar el despilfarro debido a la expiración de las existencias.

Entorno local Antes del programa, los profesionales sanitarios consultaron a los centros de intoxicación sobre el tratamiento clínico de la intoxicación y algunos antídotos no estaban disponibles. Los hospitales individuales almacenaban antisueros, que a menudo expiraban antes de su uso.

Cambios relevantes En la actualidad, la Oficina Nacional de Seguridad Sanitaria financia y gestiona la adquisición centralizada de antídotos y antisueros, y todos los pacientes tailandeses tienen derecho a los antídotos, independientemente del seguro médico. Los niveles de existencias nacionales y subnacionales se determinan en función de la demanda, la urgencia del tratamiento y el coste. Se introdujo un sistema basado en la web, que incorpora información geográfica, para solicitar antídotos y antisueros. Los centros de intoxicación ofrecen formación, servicios de consulta las 24 horas del día y seguimiento de los resultados. Los antídotos y los antisueros están ahora disponibles y se utilizan correctamente y la gestión clínica ha mejorado. Además, un mejor control de las existencias y la distribución ha contribuido a evitar el despilfarro de antisueros y a reducir los costos de los mismos, de 2,23 millones de dólares a 1,2 millones de dólares estadounidenses.

Lecciones aprendidas El éxito del programa dependía de un apoyo político sólido y sostenido, de una financiación adecuada, de una mayor capacidad operativa, de la formación de los profesionales sanitarios y de la prestación de servicios de consulta en línea las 24 horas del día. La adquisición y distribución centralizadas a través de Internet garantizaron la disponibilidad de estos medicamentos esenciales, minimizaron los costos, redujeron los desechos y salvaron vidas.

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