A cost-utility analysis of *Treponema pallidum* haemagglutination (TPHA) testing for syphilis screening of blood donors: is the TPHA test useful for syphilis screening in a blood centre?

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Syphilis is a disease caused by the spirochaete, *Treponema pallidum*. Generally considered to be a sexually transmitted disease, this infection can also be transmitted *in utero*, and rarely by blood transfusion or non-sexual contact[1]. In many countries it is required that blood banks screen every donation for syphilis[2]. The most widely used classical screening tests for syphilis in blood banks are the Venereal Disease Research Laboratory (VDRL) and the rapid plasma reagin (RPS) tests, two reaginic assays. Since non-venereal treponematoses produce a serological response similar to that of syphilis[3], and biological false positives occur for a variety of reasons, a confirmatory test is required[4]. The *Treponema pallidum* haemagglutination (TPHA) test is used in Thailand for any general cases that give a positive result to a screening test; it is not, however, recommended for use in blood centres. An alternative treponemal test, the TPHA, has been proposed, but it is costly, thus controversial.

Another strategy that has been used recently for the diagnosis of syphilis is automated enzyme immunoassays (EIA), which are easier to use and safer for staff. Because of false negative tests using the VDRL, the alternative use of new assays[5,6] is being considered. I would like to report results of a cost-utility analysis of these alternative tests.

As described, there are two standard screening methods and two alternative confirmatory tests for the laboratory diagnosis of syphilis:

a) VDRL (sensitivity = 86%, specificity = 85%);
b) RPR (sensitivity = 78%, specificity = 85%);
c) TPHA (sensitivity >95%, specificity >99%) and
d) automated EIA (sensitivity >95%, specificity >99%).

The cost of diagnosing syphilis with each of these methods can be calculated. The cost in baht (1 US dollar = 39 baht) for performing each test was reviewed. The cost was the price of each test at the reference laboratory in Thailand (Special Laboratory, Bangkok, Thailand). The utility of each method is defined as the rate of case detection, which varies with the prevalence of disease in the screened population. Using this information, a cost-utility analysis can be performed. The working definition of cost utility is the cost of the test multiplied by the number tested per positive test, then compared to false and true positives. This work follows the standard protocol previously used in the assessment of the appropriateness of syphilis tests in other situations in previously published papers[7,8].

The cost and utility of each method are shown in Table I. The cost utility is highest for the TPHA test and lowest for the VDRL test. Additional analyses were performed to determine the point of equivalence between non-treponemal and treponemal tests.

The cost per detection by VDRL testing would be equal to that for TPHA or EIA if the cost of TPHA or EIA testing were to be reduced to 60.4 baht and the cost per detection by the RPR test would be equal to that of TPHA or EIA testing if the cost of these latter tests were to be reduced to 60.4 baht and 137.5 baht.

Here, it is shown that VDRL is the least expensive choice for the accurate diagnosis of syphilis. This means that VDRL is better than another non-treponemal test, RPR, and is, therefore, the best alternative for serological diagnosis of syphilis in blood banks, based on medical

Table I - Cost-utility analysis

Alternative	Cost (baht)	Utility (rate)*	Cost-utility (baht)
VDRL	40	0.051	784.3
RPR	50	0.028	1785.7
TPHA	190	0.077**	2467.5
Automated EIA	100	0.077**	1298.7

* The utility or detection rate is quoted in a previous report by Wiwanitkit[8]
** The rate is that of the actual disease (*T. pallidum* infection) prevalence (7.7 %).

economical principles. From further analysis, the cost of TPHA or EIA testing needs to be reduced to one-third and two-thirds to achieve the same cost-utility as VDRL and RPR, respectively.

Some important considerations on this analysis are, however, necessary. While this approach gives scientific evidence on the increasing cost per case detected by using more sensitive, but more expensive, assays, several points need to be addressed. Basically, reaginic assays have a very limited sensitivity for late secondary syphilis and are not able to recognise old infections which do not in themselves represent a substantial risk for transfusion recipients but are an important indicator of risk behaviours.

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