needed now, without further unconscionable delays, is a
military plane that can be deployed to any potential area
where a new threat may emerge (3). Because Angola is
capable of identifying new foci or areas where cases
might emerge (2), such inactivity suggests that many
more cases and deaths have already occurred (4). What
is needed now, without further unconscionable delays, is a
proper vaccination campaign, one that has been unachiev-
able to now. We here reaffirm what has been suggested by
the WHO Strategic Advisory Group of Experts on Immu-
nization and by others, but as of June 20, 2016, not applied
by WHO: that the YF vaccine administered at one fifth of
the regular dose could be used until the epidemic ends (5).

Despite vaccination campaigns in various provinces in
Angola, circulation of YF virus (YFV; family Flaviviridae,
genus Flavivirus) in some districts persists. Attempts to
control this epidemic are being made by application of the
effective YFV 17D vaccine that has been used for many de-
cades worldwide. Whereas recognition of cases of YF has
decreased in Angola, cases continue to occur there, and iso-
lated cases have been detected in persons who have visited
Angola as tourists or for business purposes. Furthermore,
cases in nearby Democratic Republic of the Congo have
increased. Because YF is not endemic to Asia, such patients
have the potential to serve as primary sources of YFV and
as index sources for subsequent clusters, outbreaks, or epi-
demics, not only in China, but elsewhere in Asia, which is
a nightmare scenario.

The principal mosquito vector of YFV is *Aedes aegypti*,
which is found in southern China and elsewhere in
Asia, as are *Ae. albopictus* mosquitoes (6), which can also
transmit YFV and serve as a bridging vector between jungle
and urban cycles of YFV in a variety of ecosystems (7).
These mosquitoes feed on humans and are found perido-
mestically. Mosquitoes of these species also are capable of
transmitting dengue viruses, chikungunya virus, Zika virus,
and other human pathogens. Their presence should serve as
a warning to local health authorities of potential arbo-
virus disease outbreaks and, therefore, to maintain or initi-
ate mosquito vector control programs. Most industrialized
countries are aware of these warnings; the 40 YF-endemic
countries, predominantly tropical areas in Africa and Cen-
tral and South America (~90% of cases reported every year
occur in sub-Saharan Africa), maintain diagnostic compet-
ence and surveillance systems, including clinical findings,
testing of sick nonhuman primates and arthropods, and oth-
er indicators. Four countries that produce YF vaccine have
purchased stocks or have arrangements in place to obtain
sufficient doses in instances of immediate need.

Because destinations of an increasing number of trav-
ellers include YF-endemic areas, national and international
regulations require a recent (<10 years) verified history of
vaccination against this virus; China does not have such
regulations. If a person traveling to a recognized YF-en-
demic area is not required to be vaccinated in advance,
then they are essentially on their own with regard to self-
protection, but the greater threat is to their own country, if
and when they return.

Of ostensibly great concern has been 11 unvaccinated
YF-infected Chinese residents and workers who returned

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**Yellow Fever—More a Policy and Planning Problem than a Biological One**

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To the Editor: The recent and ongoing outbreak (epi-
demic) of yellow fever (YF) in Angola is cause for concern,
not only in West Africa, but also in contiguous and other
nearby countries (1). As of June 21, 2016, the World Health
Organization (WHO) had reported 3,137 cases (847 labora-
tory-confirmed) and 350 deaths (2), but at the present time,
it is not cause for panic or for extravagant claims of an “im-
pending global health threat” (3). As long as the Angola
Ministry of Health reports that there have been <400 deaths
from YF since it declared the outbreak 4 months ago, and
because there is an effective vaccine against this disease, it
is difficult to understand dire warnings of a global threat.

WHO considers the situation of high concern because of
the inadequate surveillance system in Angola, one that
is incapable of identifying new foci or areas where cases
might emerge (2). Such an inability suggests that many
more cases and deaths have already occurred (4). What
is needed now, without further unconscionable delays, is a
from Angola to China; others probably returned elsewhere, including to the Democratic Republic of the Congo, where 1,400 suspected cases (53 imported from Angola), including 82 deaths, have occurred, including some secondary cases, and to Kenya (1). Several YF cases have been detected recently in Uganda but are not related to the Angola outbreak. In China, all recognized YF patients have been isolated and given appropriate medical care; secondary cases have not been detected. Thus, all cases of YF in China were imported. Nonetheless, should secondary cases begin to be detected in areas in Asia to which *Ae. aegypti* or *Ae. albopictus* mosquitoes are endemic, a door would open for more widespread extension of YFV and for establishment of enzootic and endemic situations, which are unheard of in most parts of the temperate world. The last thing China in particular and Asia in general need to be endemic for YF.

The question “why has there been no YF in Asia?” has been asked for decades, even before global climate change was recognized, and various hypotheses have been put forward. *Ae. aegypti* mosquitoes from various geographic sources and with corresponding genetic variations at different isozyme loci were infected orally with YF virus (8). Subsequent infection rates suggested that *Ae. aegypti* mosquito populations with genetic similarities had similar rates of infection with the virus. Tabachnick et al. concluded that there are differences between New World and Asian mosquito populations in this regard (8). Whether such differences might account for preclusion of YFV from Asia has not been proven. Antibodies against dengue viruses, which are widely present in Southeast Asia, might be protective against YFV infections, but studies by Izurieta et al. (9), Weiland et al. (10), and Agampodi and Wickramage (11) suggest otherwise. Because YFV is a zoonotic agent whose natural cycle involves nonhuman primates and mosquitoes other than *Ae. aegypti*, it is not possible to eradicate these mosquitoes by using available tools; thus, we rely on application of YF vaccine to protect humans.

Countries in YF-endemic areas or with a history of YF and that do not have adequate resources to enable them to set aside funds for controlling diseases, or that do not request assistance in formulating expanded childhood immunization programs, or that spend the funds they have available on other projects must be clearly informed that they are potential dangers to the rest of us. Obviously, not all countries need to vaccinate their residents against all viruses for which vaccines are available. However, countries not vaccinating when there are potential risks might seriously consider reevaluating their requirements for persons traveling to or returning from YF-endemic areas and for protecting key population groups, such as health and essential services workers, the adult work force, and adult females (to keep families together and take care of orphans) for postepidemic recovery.

It is self-evident to us that dose-sparing (diluting the vaccine) and postponing the next round of vaccinations (until more vaccine is produced), are the best solutions to the YF vaccine shortage. Even the 17 million doses WHO projects to be produced over the next few months will not fill current demand. From an abundance of caution, we recommend authorizing the use of a one fifth dose (12), before any more of the inadequate stocks are irrevocably depleted. WHO has indicated its approval to use such fractional dosage; application of this plan should be instituted immediately.

References


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