

「New testing strategy of COVID-19 detection with limited resources: The role of pool testing」

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While the Japanese government reopened most schools and economic activities, the COVID-19 pandemic is accelerating and the world has not reached the peak of the global outbreak.

In terms of overall numbers, Africa currently accounts for only a small proportion of total global cases, but the acceleration in rates of infection in some countries is of increasing concern to health authorities in the region. By 8 July, total confirmed COVID-19 cases in Africa passed 500,000. "With more than a third of countries in Africa doubling their cases over the past month, the threat of Covid-19 overwhelming fragile health systems is escalating," says Dr Matshidiso Moeti, the WHO director for Africa. The true number of cases among Africa's 1.3 billion people is unknown as its 54 countries continue to face a serious shortage of testing materials for the virus. [1,2]

In Rwanda, they have been investigating how they can scale up testing significantly. But instead of testing every person - which would require millions of tests - they have turned to a different strategy: pooled testing (also called group testing). Pooled testing is when samples of several people are combined in a single tube and tested using molecular biology detection methods all at once: if the results from the pool test are negative, all patients in the pooled sample are declared not to have COVID-19; if the results of the pool are positive, each patient sample is tested individually. [3]

The pooled testing was initially developed, in 1943, by Robert Dorfman, a Harvard economist to test US army drafts for Syphilis during World War II. The strategy has since then been used to test for sexually transmitted infections, malaria, as well as in blood banking. [3]

The pooled testing strategy is appealing, particularly when test availability and financial resources are limited. The detection methods used for SARS-CoV-2 testing are expensive, a test in most countries ranges from US\$30 to US\$100. By pooling, for instance, 20 to 50 samples together, you save a lot of resources. Secondly, SARS-CoV-2 testing is time-consuming because of the fairly complex molecular biology approach. Therefore, by combining several samples, there is a possibility to reduce the turnaround time drastically when pooling 20 samples together. Another advantage of pooled testing is that it permits detection of asymptomatic people, which leads to early management and breaks the chain of transmission of the virus. Because pooled testing allows you to test many people, you can have a clearer picture of your epidemiological data profile. [3,4]

The disadvantage of pooled testing is that there might be a decrease in the test sensitivity. For instance,

patients with a recent infection tend to have a low viral load, and because of the dilution effects of mixing samples, there is a possibility to miss a positive case. However, false negatives are possible with any PCR based test used for SARS-CoV-2 testing. [3,4]

Resource shortage is not occurring only in Arica. The United States has just reached more than 3 million confirmed cases of the coronavirus and is still facing the same problems from the early days of the pandemic, including a lack of PPE (Personal Protective Equipment), slow testing and not enough contact tracing. "Pooling would give us the capacity to go from half a million tests per day to potentially 5 million individuals tested per day," said Dr. Deborah Birx, a White House coronavirus task force official. The US Food and Drug Administration (FDA) has published on June 16 the guidance for test developers to design and seek approval for such protocols for pooled samples. [5]

A recent study in Israel recently demonstrated that, for Covid-19 pool testing, a test could evaluate pools of at least 32 nasal samples without losing sensitivity, or the ability to correctly identify true positives. But US health officials generally have been talking about pools of lower numbers. "Samples from five to 10 individuals could be tested once as a single "pooled" sample." Dr. Brett Giroir, deputy secretary of Health and Human Services, said in a press briefing on June 23. Generally speaking, the greater the disease's prevalence in a population, the smaller your pools have to be. [6, 7]

While the method only works under certain scenarios, as long as test developers acknowledge those limitations, pooled testing offers an effective strategy for spotting outbreaks before they run out of control. In particular, pooled testing could help control viral spread in vulnerable communities, including health care workers, nursing home residents and prison populations. Therefore, it could be a key tool for schools, organizations or workplaces that want to stay open safely, by monitoring their people periodically.

Reference:

1. World Health Organization: WHO: www.who.int
2. Peter Mwai and Christopher Giles. July 8, 2020. "Coronavirus: How fast is it spreading in Africa?" BBC press.
3. "Rwanda's COVID-19 Pool Testing - a Savvy Option Where There's Low Viral Prevalence" July 3, 2020. AllAfrica Global Media (allAfrica.com).
4. James Dzansi "Ramping up early detection of COVID-19 with limited resources: The role of pool testing" 22 June, 2020. International Growth Center Press.
5. FDA STATEMENT: Coronavirus (COVID-19) Update: Facilitating Diagnostic Test Availability for Asymptomatic Testing and Sample Pooling. June 16, 2020
6. Idan Yelin et al. May 2020, "Evaluation of COVID-19 RT-qPCR test in multi-sample pools" Clinical Infectious Diseases. ciaa531, <https://doi.org/10.1093/cid/ciaa531>
7. Jason Hanna, Jul 6, 2020 "Here's what pooled testing is and how it can be used for the coronavirus" CNN press.

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