World Health Organization

WHO R&D Blueprint
COVID-19

Consultation on the use of trained dogs for screening COVID-19 cases

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INTRODUCTION

Reports on the capacity of trained dogs to detect specific odors associated with a SARS-CoV-2 infection are prompting an increasing number of countries to deploy dogs for the screening of SARS-CoV-2 infected cases in mass gathering environments and other settings. While dogs have already been tested for their capacity to detect other infectious and non-infectious pathologies, the application to SARS-CoV-2 infected cases could potentially complements the diagnostic tools currently available and have multiple applications in public health.

The use of dogs for initial screening could have several advantages: The approach is non-invasive, results are obtainable in real time, no close contact is required with infectious samples, costs are low and large numbers of individuals can be screened quickly. Despite these clear advantages, limits and challenges in operationalizing dogs screening methods do exist and have been explored during the consultation.

OBJECTIVES OF THE CONSULTATION

- To review what is known about the screening capacity of trained dogs and how they could potentially complement the currently existing tools to detect SARS-CoV-2 infected cases;
- To learn more about practical operationalisation of the method and some of the challenges met;
- To share the experience of countries already implementing dogs screening programs and be informed about their protocols, successes, challenges and future plans;
- To discuss the need for practical guidelines for the training and validation of SARS-CoV-2 detection dogs.

AGENDA ITEMS

1. Welcome and goals of the consultation
2. Review of knowledge, current evidences and the possible use of dogs to complement the currently available approaches
3. Operationalisation in various contexts
4. Return of experience from countries implementing dogs screening programs
5. Recommendations and next steps

PRESENTERS

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The recording of the consultation is available under the following link: http://bit.ly/K9screening - Password: #!Pwy3%J

WHAT IS KNOWN AND WHAT ARE THE POSSIBLE APPLICATIONS

Current results

Different studies to train dogs for screening SARS-CoV-2 infected cases converge to confirm the capacity of these animals to detect specific odours in various body fluids associated with active infection of SARS-CoV-2 with high level of sensitivity and specificity. While the exact nature of the Volatile Organic Components (VOC) is not fully identified, candidate molecules have been associated with SARS-CoV-2 infection.

The table below summarise some of these results known from the literature and conferences (as on 08th March 2021).

Country	Success rate	Sensitivity	Specificity	Ref.
France Sweat	90.5 % 76-100*	-	-	Grandjean and coll, , PLOS One, 2020
France Sweat		89.8	90.2	Preprint
France Sweat		88	85.2	Preprint
Germany Inactivated saliva and/or tracheobronchial secretion	94 %	82.6% (82.02– 83.24)	96.35% (96.31-96.39)	Jendry and coll, , BMC Inf. Dis., 2020
Inactivated saliva		84% (62.5–94.44)	95% (93.4–96)	Jendry and coll, 2021
Non inactivated Saliva		82% (64.29–95.24)	96% (94.95–98.9)	
Sweat		91% (71.43–100)	94% (90.91–97.78)	
Urine		95% (66.67–100)	98% (94.87–100)	
Iran Nasopharyngeal		65.4%	88.9%	Eskandari and coll, BMC Inf. Dis., 2021
Masks & clothes		86%	92.9%	

Colombia Saliva and/or respiratory secretions		88.8%	97.4%	Vesga, Preprint
Brazil	97.4			Preprint
UAE		91.5%	96.3%	Grandjean, Preprint
Argentine		93	88.8	Preprint
Australia		99.6	94.5	Conference
Lebanon Sweat		99.8%	92%	Sarkis, Preprint
Lebanon Sweat -airport		96%	90%	Conference
Chile Sweat		89.5% (83.8–93.4)	97.2% (95-98.5)	*Conference*
Finland Sweat urine, saliva		100%	90.7%	*Conference*
Belgium Sweat	95%	81%	98%	*Conference*

*: Interval of success; Between brackets: 95% confidence interval
Note: this list is not exhaustive.

Possible applications

The dogs screening approach could be an interesting complement to the detection tools currently used. It is not seen as an alternative of molecular or serological diagnostic methods, but its performance, its high levels of specificity and sensibility, plus other advantages described below need to be considered:

- Early-stage of infection, pre-symptomatic and asymptomatic cases are detected. At this stage, no difference in performance has been detected between variants. Current studies are exploring the possible influence of vaccines.

- the method is rapid (a few seconds) and the results are immediately available, without resorting to laboratory services, as PCR based tools do; In this perspective, it has the benefits of the serological antibody tests, but for active infections;

- The method is non-invasive, without contact with infectious material;

- One dog is able to screen 250 – 300 persons a day, could be higher depending on test scenario, and direct contact with dogs can be avoided when sample are presented to the dogs;

-the cost is low, A recent study conducted in France indicate that once dog are trained, costs are limited to running costs (sampling material, dog handler salary, rent for working station, treats/toys for the dog etc.), amounting to an average cost of 1 Euros per person tested. As a dog easily can pre-screen hundreds of persons per day and if only those found positive by the dogs would be screened by the more cost-intensive RT-PCR, the societal monetary savings would be significant.

Practically, the dog screening approach could also be a complement for mass screening and iterative screening in close settings, with a facility of use similar to tests on saliva but with immediate results. The method could also be of particular interest for persons reluctant to nasopharyngeal swab, and in hospitals, health care centres, nursing and retirement homes, disabled homes. Massive screenings with needs for real-time response could also be established at schools and Universities (currently being studied), at airports, for sporting and cultural events and more widely all kinds of meetings. Interestingly, preliminary results indicate that dogs can also be used in pre-testing for zones with a high level of contamination of waste waters.

DOGS TRAINING AND CONSIDERATION LINKED TO THE DOGS

Training protocols

Multiple breeds of dogs can be trained, the common ones at the moment seem to be Belgium and German Shepherds, Labrador, Golden retriever, Beagle, Border Collie, Springer spaniel and mixed breeds. However, all dogs that have a strong motivation for a reward, (food, toy, play), have a keen olfactory ability and good working focus are suitable.

Training of a naive dogs will require 6-8 weeks and this duration will be reduced for the reorientation of already experienced dogs trained for other scents (medical assistance and rescue dogs, explosives, drugs…). However, the deployment of these dogs could be confounded if they are trained for other medical tasks or drugs and therefore is not recommended. Furthermore, this timeline is dependent on the prior knowledge of both dog handler and trainer, the history of the dog and the availability of samples (both positive and negative SARS-CoV-2 samples).

One of the main constrains for training is the access of samples collected from people with or without SARS-CoV-2 infection, collected from a variety of background and optimally including asymptomatic, mildly symptomatic and symptomatic individuals from the same variety of source along with SARS-CoV-2 negative sample from the same source. This helps to ensure that dogs are effectively detecting SARS-CoV-2 infected cases and not scents associated with medication, hospital odours etc. While this access can be facilitated for research projects, it is more problematic for wider scale operational

program. Repeated exposure to the same sample should be avoided during the dog training and on average about 80-100 positive and 150-200 negative samples (all confirmed by PCR) are needed to train one dog. Furthermore, reinforcement samples are needed for continued training and performance monitoring.

This difficulty to access sufficient positive and negative samples is a continuous challenge reported by almost all the participants. This is linked to the additional sampling work requested in health care premises, with all safety and ethical appropriate procedures, but also regulatory barriers limit access to medical samples in certain countries.

Various training protocols are being used, all of them insisting on the need for calibration and standardization of the methods to limit the impact of individual factors and to ensure the quality, reproductivity and comparability of results. A system of standards and validation/certification of the trained animals has also been suggested.

Animal safety and welfare

While neutralising antibodies have been detected in dogs living in homes of SARS-CoV-2 infected people, experimental infections have confirmed that dogs do not covert or transmit SARS-CoV-2. Direct contact with infectious material should still be avoided during the training and the operations.

Animal welfare should be ensured. Training is based on good practices which include the respect of animal freedom (e.g. freedom from fear and distress, freedom to express normal behaviour) and recognized practice to improve performance (e.g. modern positive training methods, no kennel policy but foster families are promoted). A thorough understanding of canine psychology and behaviour, positive training methods and reinforcement is needed to maximise canine performance.

Recruitments of dogs can be done through various types of detection dogs institutions (police, army, firefighters, customs, etc...), through private companies training and using detection dogs, through kennel clubs who have detection dogs competitions, or even through simple owners as seen in certain countries where privately owned dogs are used to look for survivors after earthquakes, tsunamis, landslides etc. However, these animals will need specialist handling for appropriate performance. Dogs are selected based on internal assessment of their individual capacity and suitability for the task.

OPERATIONALISATION OF THE APPROACH

Acceptability

Studies have been conducted on the acceptability of the dog screening approach, including in medical settings and hospitals (Belgium), in the population in general and at airports in particular (Finland) (unpublished).

- In hospitals, patients are usually cooperative and willing to participate. Hospitals have been quick to accept the approach as a complement when recurrent sampling is difficult, especially for old or painful patients. Time efficiency was also a positive aspect mentioned by the medical staff.
- An online study has recently been conducted in Belgium and gathered more than 1200 responses, with a majority (73%) of females and similar rate of health (48%) and non-health (52%) professionals. Overall, the approach is broadly (68,6%) accepted, even more (76.3%) when people are asked if they would agree to use it on themselves. Reasons for not accepting include 1) lack of trust or non-acceptance as a valid method; 2) lack of information; 3) reluctance to provide sample (in this case, sweat samples); or 4) fear of dogs (10,8%, in which 2.6 % are very afraid). Interestingly, 63% of respondents confirmed they would prefer the dog screening method if they had to be tested in airports (reaching 86% of acceptance if associated with PCR). Other preferred implementation opportunities include, in hierarchical order, cultural event, sporting event and school or university.

The cumulating evidence of the efficiency of the methods and of its scientific robustness will assuredly improve awareness and trustworthiness of the people. Finally, if detection dogs is broadly accepted as a screening approach in Belgium and Finland, such studies have to be repeated in different contexts where perception of dogs differs for cultural or religious reasons. When reluctance to be in contact with the animals exist, alternative solution can be proposed, such as complete separation between passengers and dogs with their handlers in airports. In Finland and in Lebanon, at the International airport the traveller does not come in contact with the dogs. Even those that were afraid of dogs, reported that the dog COVID-19 test had been a positive addition. Various operationalisation approaches are already been observed in countries, as described during the last session of the Consultation.

3. Challenges from countries experience

Several challenges have been reported by participants implementing dog screening programs in different countries. In addition to the cultural and religious aspects mentioned in the previous paragraph, additional factors include:

- Perception of working dogs: many people associate working dogs with police, security or inspection dogs, especially when accompanied with a handler in uniform. In some settings, there may be a need to change this perception and shift to the image of rescue and medical dogs. The choice of breeds may also contribute here.

- The firm recognition as a valid detection method by health authorities would greatly facilitate the deployment, and could also be a unique opportunity to highlight the value of coordination with the animal health sector, animal associated non-governmental organizations or initiatives (e.g. medical assistance/animal assisted therapy (AAT)) and the civil society, through a One Health approach. The use of dogs benefit from a high level of acceptance in a large part of the world. In addition, the psychological support

that patients felt they got from dogs was seen in several studies conducted in health care facilities.

- Access to a regular supply and adequate number of samples for training and maintain the performance of dogs remains one of the main challenges. In addition to possible challenges mentioned earlier, the additional workload of nurses/doctors for sampling is a limiting factor. Proper management of sample is crucial to avoid rapid spoiling. A uniform coding system need to be implemented for samples, covering elements such as hospital name, patient code and test results (positive or negative). Access to these sample and their data has ethical dimensions to consider.

- In many countries, there is shortage in well trained handlers and monitors, and sometime no personnel with relevant experience. Several options are being explored, including involvement of the private sector. The need for clear standardization of the training and qualification of dogs would be critical here, since inappropriate practices will directly impact performance and finally, the credibility of the approach.

Conclusion

There is already a large body of evidence that dogs are able to detect SARS-CoV2 infected cases from various body fluids, as they are for other both infectious and non-infectious diseases. Based on the preliminary findings, the approach is currently being used for screening people for possible SARS-CoV-2 infection in some countries, while other national authorities are supporting pilot studies before proposing the approach as a complement to currently available diagnostic tools.

During this consultation, scientists from veterinary and public health schools, medical experts involved in developing research protocols and operators from nine countries deploying trained dogs in various contexts shared their knowledge and experience. Limitations and potential challenges discussed included the need for standardization and validation of approaches, various factors affecting collection of sample, acceptability and uptake, and other considerations around ethics and animal welfare.

Given that detection capacities of dogs have been confirmed for other infectious or non-infectious diseases, dogs could potentially complement currently available diagnostic tools and approaches for COVID-19 but also other pathologies and provide new applications for public health. WHO will continue to follow developments and, through the R&D Blueprint and its Tripartite+ partnership for promoting One Health (FAO, OIE, UNEP, WHO), will identify areas where support to countries and partners would be appropriate.