USE OF SEARCH DOGS FOR THE DETECTION OF SARS-COV-2

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1. Context

The use of search dogs in detecting COVID-19 has been tested in several countries. Some of these tests have shown promising results. In some countries, the use of search dogs in a real-life situation is being piloted, such as at Helsinki airport in Finland, Dubai airport in the UAE and Beirut, Libanon. Search dogs could also be used for COVID-19 screening of visitors at large events, busy public places or potentially in nursing homes and hospitals. Some hospitals, for example in Liège, have already shown interest.

A Belgian consortium, uniting the academic world with the principal actors on the ground (army, fire brigade, police), therefore **finalized a protocol to train dogs in Belgium and is requesting funding (€50,000) to go ahead with the project.** They have selected 13 dogs, already highly trained to detect explosives/drugs, that could be trained for COVID-19 as soon as the project receives a "go". **The RAG is asked to provide input on whether or not there is a sound scientific basis to pursue this project**. Potential integration in testing strategy will be dependent on the results of the training program and are beyond the scope of this advice.

2. Recommendations

- **Based on the currently available evidence, the use of dogs for detection of COVID-19 seems a promising route that should be further explored. We therefore advice to grant the funding** on the condition that a more detailed and clearly written-out protocol is presented (currently only as powerpoint presentation).
- A diversified testing strategy is needed. Search dogs could be an additional tool in circumstances when quick results and high-throughput are required.
- The requesting consortium is internationally well-connected and unites expertise from different sectors.

3. Scientific evidence

1.1. DOGS AND COVID-19

The use of search dogs for COVID-19 detection has been tested or is being tested in five studies in Europe (two in France, and one in Germany, the UK and Finland) and three studies outside

Europe (in the US, the UAE and Lebanon). Samples tested include sweat armpits odors, saliva & nasal swabs and urine. Of two of these studies, results have been published.

In one study in France (pre-print), 18 dogs were trained for detecting COVID-19 in 198 armpits sweat samples obtained from different hospitals (1). After a first test, eight dogs were retained. **The percentage of success to find the positive sample in a line containing several other negative samples (2 to 6) were 100% for four dogs, and ranged from 83% to 94% for the other four dogs.** The authors concluded that there is a very high evidence that the armpits sweat odor of COVID-19+ persons is different, and that dogs can detect a person infected by the SARS-CoV-2 virus.

In the German study, eight dogs were trained to detect COVID-19 in saliva or tracheobronchial secretions of SARS-CoV-2 infected patients (2). **The dogs were able to discriminate between 187 samples of infected and 825 samples of non-infected individuals with an average diagnostic sensitivity of 82.6% (95% CI: 82.02–83.24%) and a specificity of 96.4% (95% CI: 96.31–96.39%).** Sensitivity ranged from 67.9 to 95.2% and specificity from 92.4 to 98.9% among the dogs. The overall average detection rate was 94% (±3.4%).

A quick literature search identified an additional study in Columbia. Six dogs were trained to detect SARS-CoV-2 in respiratory secretions of 12 infected patients and 100 healthy volunteers (3). The **overall sensitivity in detecting SARS-CoV-2 in 1000 samples per dog (780 negative and 220 positive samples) was 95.5% (ranging among dogs from 77.3% to 100%) and the specificity 99.6% (ranging from 99.2% to 99.9%).** In a prevalence of 7.6%, the negative predictive value was 99.9%.

Other studies, including one in the UK led by the London School of Hygiene and Tropical Medicine, have not yet published their results.

1.2. DOGS AND OTHER DISEASES

The detection of diseases by dogs is based on the detection of volatile organic components that are produced by the body in response to the disease. Previous studies have shown that dogs can adequately detect malaria (4), specific types of cancer (5,6) or Clostridium Difficile (7).

4. Elements to consider

- Level of infectiousness of detected cases. The studies do not specify the level of viral shedding of the COVID-19 cases from which the samples were taken. We do therefore not know if missed cases differ from detected cases, and to what extent it are mostly low-infectious cases that are missed/detected. According the researchers, even cases with low viral shedding are detected. The proposed protocol does address these questions.
- Interference by other (respiratory) infections like Influenza. This has not been studied as such, but according to the French researchers is unlikely to be a problem. The proposed validation protocol does include samples that are negative for COVID-19 but positive for Influenza.
- Usefulness in detecting COVID-19 in pre-and a-symptomatic cases. The French and German study only used samples from symptomatic COVID-19 patients. The French researchers claim

it is effective in detecting COVID-19 in samples from asymptomatic cases. According media sources, the Helsinki experience has shown that also asymptomatic cases are being detected. Again, the proposed protocol aims to include both symptomatic and asymptomatic cases.

- Amount of dogs that can be trained. The pilot project aims to train 13 dogs. Depending on the results, this could potentially be scaled up, but it is unclear how much time it will take.
- Some studies have used saliva/urine samples. For practical reasons and to avoid infection of the dog itself, the proposed protocol has chosen to use armpit sweat.
- When implementing into test strategy: what are the legal implications of being 'flagged' by a dog. Can this be enough reason to refuse someone e.g. the entry to the territory? A 'positive result' will most probably need to be confirmed by a second-line test.

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5. References

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