



LIÈGE université

**Center for Interdisciplinary  
Research on Medicines**

# **White analytical chemistry evaluation of medicines quality screening devices**

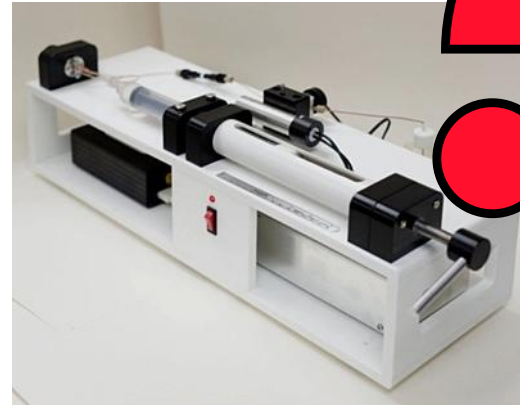
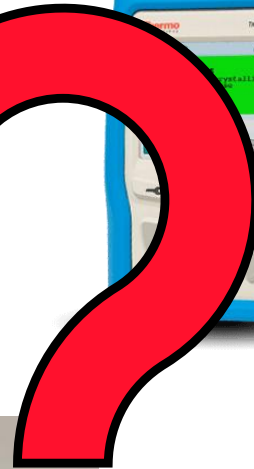
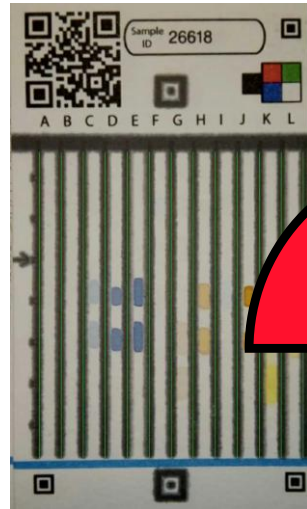
Medicine Quality, Innovation & Policy Conference

Oxford, 13-15 April 2026

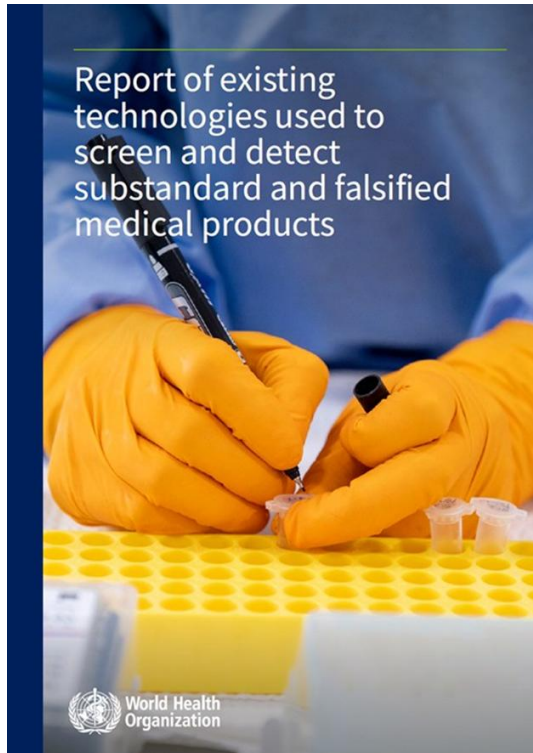
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CENTER FOR INTERDISCIPLINARY  
RESEARCH ON MEDICINES

# Screening technologies



# Selection of screening technology



2025 report

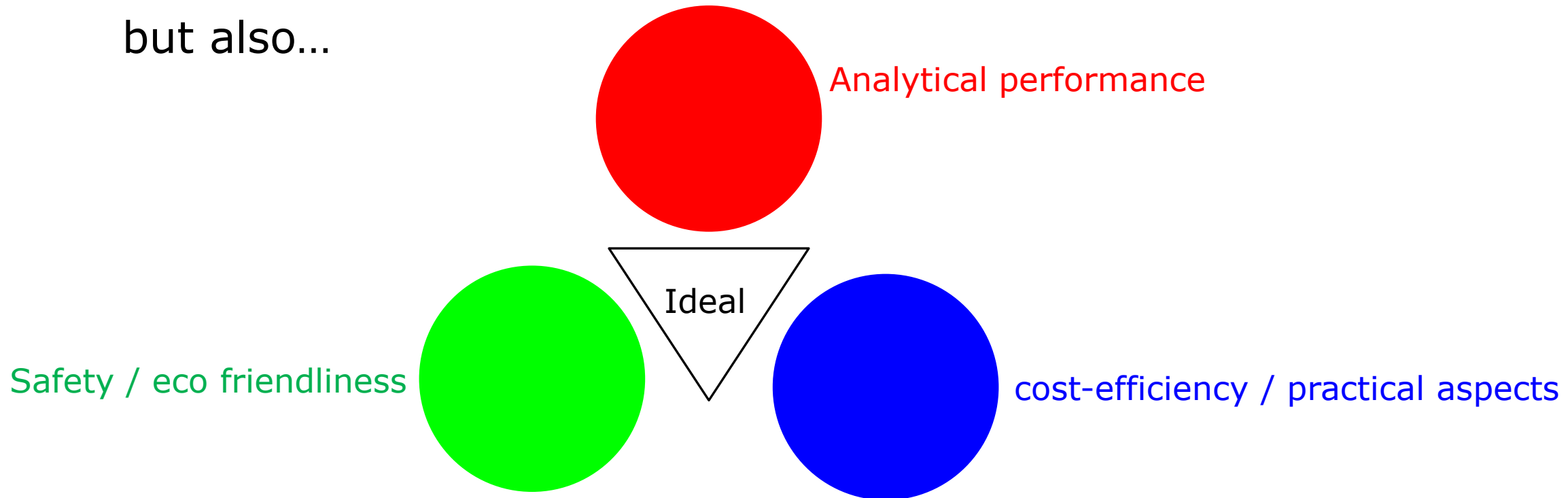
**Table 2.** Challenges/obstacles experienced or anticipated when establishing a system for detection of substandard and falsified medical products

Challenge	Responses
<b>Technical knowledge</b>	31
Not enough technical knowledge to know how to develop a system for detection of substandard and falsified medical products	13
Not enough technical knowledge in the government to know how to develop a workable regulation	10
Confusion over which system approach and/or which laboratory technique will yield the best results at the lowest cost	8
<b>Insufficient awareness</b>	8
Not enough recognition or understanding of the problems or how they might be solved by an established system for detection of substandard and falsified medical products	8
<b>Funding</b>	12
Not enough funding to implement enforcement	12
<b>Supply chain not regulated</b>	11
Our healthcare supply chains are not fully regulated in general	11

# Selection of screening technology

- Selection of appropriate technology

but also...



## **FIT FOR PURPOSE**

Same device = different scores → depends on purpose

Evaluated items depends on purpose

Different items importance

## **FIT FOR PURPOSE**

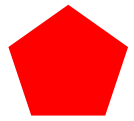
Same device = different scores → depends on purpose

Usually performed for a specific analysis

→ EX-POST evaluation

For the selection of a screening device

→ EX-ANTE evaluation



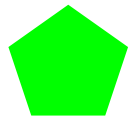
## Analytical performance:

**Qualitative:** sensitivity / specificity / MCC

**Quantitative:** Accuracy index (but possible  $R^2$ , SEV, bias, ...)

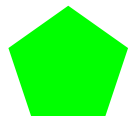
Data from literature / reasonable and supported estimates

sensitivity			specificity		
total	0		total	0	



*"Greenness is a measure of the destructive impact that humans have on the environment and themselves."*

*"A green ( product, process, method) is one that does not cause any destructive impact on the environment and human."*



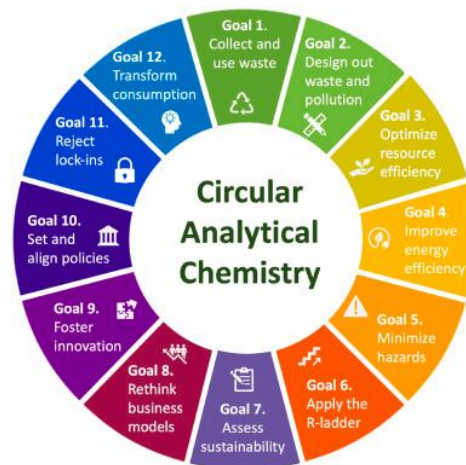
# Greenness

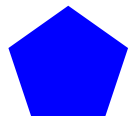
use of chemicals	weight =	1
no sample clean-up	0	40
no chemical reaction	0	30
no sample dilution	0	20
total	10	

analytical waste	weight =	1
no hazardous waste	0	40
no sample waste	0	30
reusable or no consumables	0	20
total	10	

use of resources	weight =	1
no electricity when not in use	0	40
no electricity when in use	0	30
no water needed	1	20
total	10	

safety of operator	weight =	1
no biological hazard	0	40
no chemical hazard	0	30
no physical hazard	0	20
total	10	





# Bluiness

sample throughput	weight =	5
< 1h/sample	0	22.5
< 30 min/sample	0	22.5
<15 min/sample	0	22.5
<5 min/sample	0	22.5
total	10	

cost effectiveness	weight =	10
annual cost ≥ \$15,000	0	10
annual cost < \$15,000	0	30
annual cost < \$5,000	0	30
annual cost < \$1,000	0	30
total	0	

sample destruction	weight =	5
non-invasive analysis	0	45
non-destructive analysis	0	45
destructive analysis	0	10
total	0	

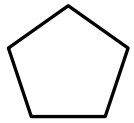
versatility	weight =	5
qualitative analysis possible	0	30
quantitative analysis possible	0	30
dosage forms score	0	20
several API with the same device	0	20
total	0	

formation	weight =	1
long (> 1 day)	0	20
medium (< 1 day)	0	30
minimal (< 1/2 day)	0	50
total	0	

portability	weight =	10
miniature	0	22.5
handheld	0	22.5
portable	0	22.5
transportable	0	22.5
total	10	

usability	weight =	5
does not require reference when analysing sample	0	33
automatic interpretation of results score	0	33
pre-calibration possible	0	33
total	1	

calibration/maintenance	weight =	5
does not require previous calibration	0	45
does not need maintenance	0	45
total	10	



# Final WAC scoring

$$CS_{colour} = \sqrt{(w_1+w_2+\dots+w_n)} \sqrt{item_1^{w_1} \times item_2^{w_2} \times \dots \times item_n^{w_n}}$$

$$CS_{white} = \sqrt{(W_{red}+W_{green}+W_{blue})} \sqrt{CS_{red}^{W_{red}} \times CS_{green}^{W_{green}} \times CS_{blue}^{W_{blue}}}$$

For ex-ante evaluation,  $W_{red} = 1$  and  $W_{green} = W_{blue} = 2$

For ex-post evaluation,  $W_{red} = W_{green} = W_{blue} = 1$

# Evaluated devices

- Reference:
  - HPLC-UV
- NIR spectroscopy:
  - Reflectance: NIR-S-G1
- Raman spectroscopy:



- Truscan



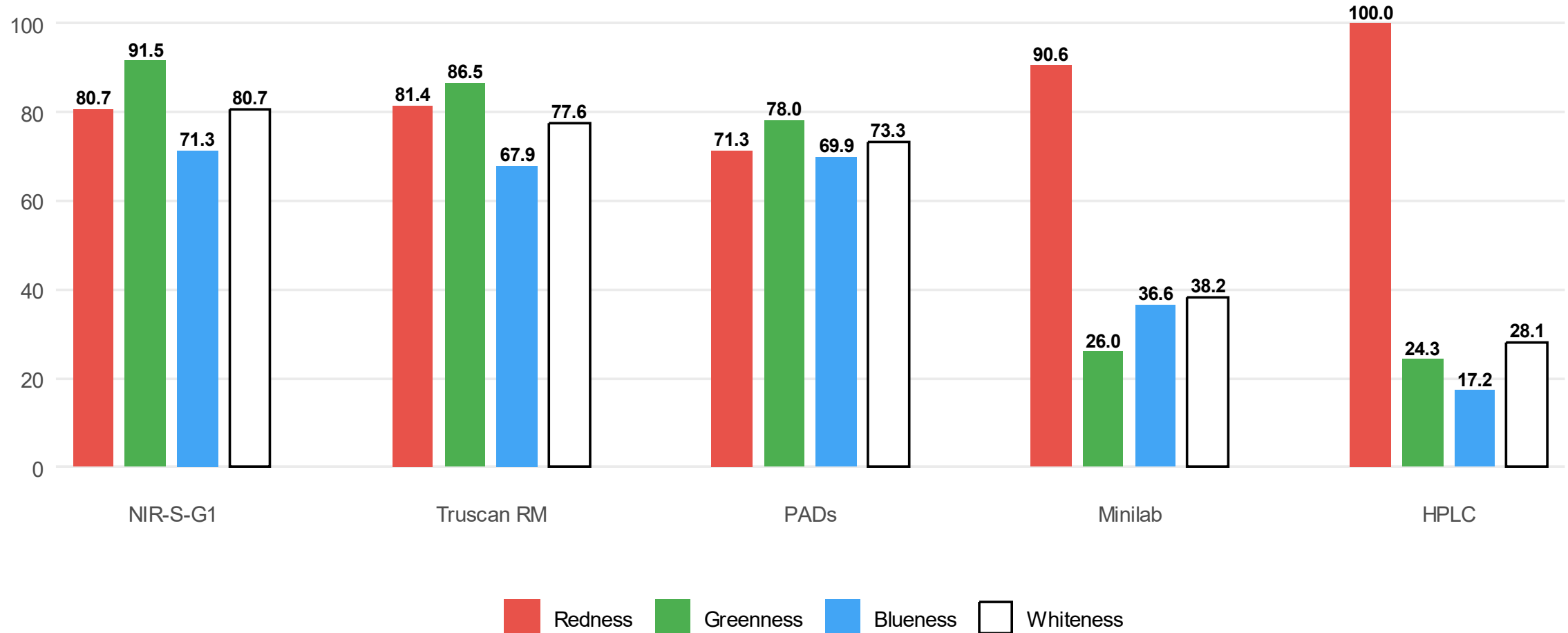
- PADs

- Minilab



# Ex-ante evaluation

Qualitative screening devices ex-ante comparison



White analytical chemistry enables a **holistic evaluation**

May **serve as a guide** for device's selection reflexion

Weights may be **adapted to specific needs/situations**

**Not an oracle**

Reliable / comparable literature data required

→ A consensus testing protocol could be considered for  
evaluation / development studies



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Green Analytical Chemistry 11 (2024) 100158



ELSEVIER

Contents lists available at [ScienceDirect](https://www.sciencedirect.com)

Green Analytical Chemistry

journal homepage: [www.elsevier.com/locate/greac](http://www.elsevier.com/locate/greac)



White analytical chemistry evaluation of medicines quality screening  
devices in low- and middle-income countries field settings

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10.1016/j.greac.2024.100158



# Thank you

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