Technical Briefing
NG Carba-5

Purpose

The aim of this document is to provide a summary of the key features and benefits of using the CARBA-5 test from NG Biotech (Guipry, France) to detect the 'big 5' carbapenemase families (KPC, OXA-48-like, IMP, NDM, VIM).

The need for rapid detection of carbapenemases

Rapid detection of antimicrobial resistance (AMR) is essential to prompt infection prevention interventions and inform appropriate antibiotic treatment, both of which promote patient outcomes.

Guidance in the UK (Treatment of infections caused by multidrug-resistant Gram-negative bacteria) recommends that all Enterobacterales with resistance to imipenem or meropenem should be investigated to determine the mechanism responsible for carbapenem resistance. Among carbapenemase-producers there are different treatment options according to the carbapenemase present; some antimicrobial agents are only active against KPC or OXA-48-like-producers, whereas others may be suitable for treatment of bacteria producing metallo-β-lactamases (IMP, NDM, or VIM).

The UK Standards for Microbiological Investigation [UK SMI B 60: detection of bacteria with carbapenem hydrolysing β-lactamases (carbapenemases)], recommends that diagnostic laboratories use a molecular or immunochromatographic assay for detection of the 'big 4' carbapenemase families (KPC, OXA-48-like, NDM, VIM) in any isolate of Enterobacterales resistant to an indicator carbapenem.

From 1 October 2020, diagnostic laboratories in England have the duty to report acquired carbapenemase-producing Gram-negative bacteria isolated from human samples to PHE.

Description

NG CARBA-5 lateral flow technology reliably detects the presence of the 'big 5' carbapenemases direct from bacterial cultures of Enterobacterales and Pseudomonas aeruginosa within 15 minutes.

The NG CARBA-5 single use cassettes fit into existing laboratory workflows without the need for expensive equipment or extensive training.

Key Benefits

CE marked

Simple to use, easy to interpret

Rapid: results in 15 minutes

Economical

Single cassette: minimal waste, reduced disposal costs

High sensitivity and specificity for the 'big 5' carbapenemases

5 in 1 testing capability – KPC, OXA-48-like, VIM, IMP, NDM

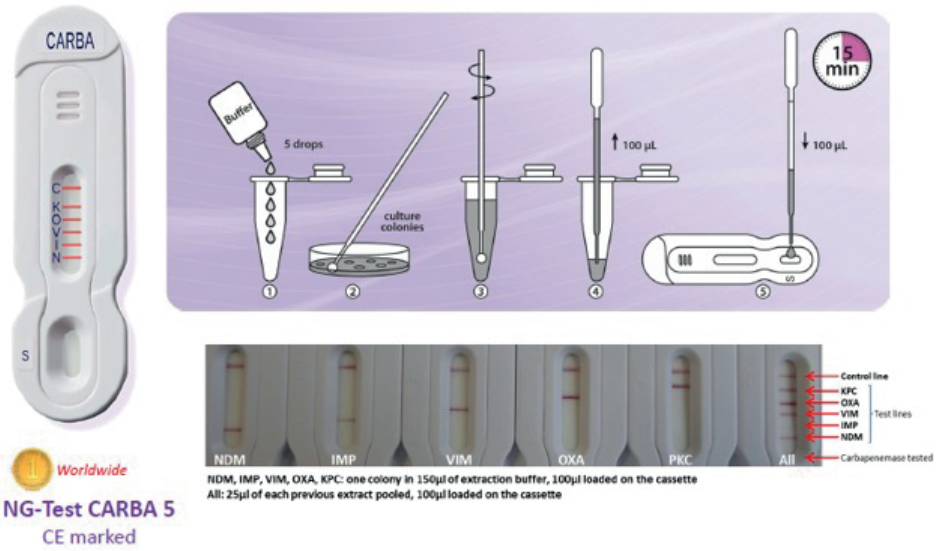
Results from bacterial cultures grown on a range of selective and non-selective media

Option available to use the kit direct from positive blood cultures

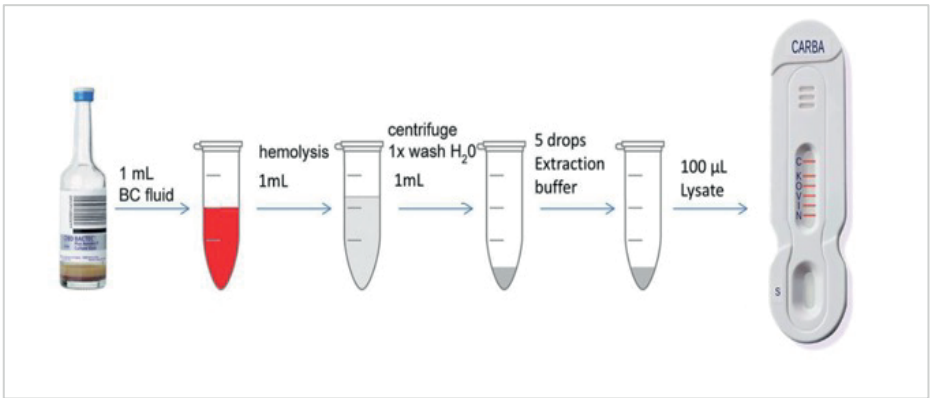
CPE: carbapenemase-producing Enterobacterales
CPO: carbapenemase-producing organism (Enterobacterales, *Pseudomonas* and *Acinetobacter*

How it works

The NG-Test CARBA-5 test platform is a visual, multiplex lateral flow immuno-chromatographic assay, developed using patented technology. Each single use cassette offers rapid, qualitative detection, and differentiation, of the 'big 5' carbapenemases.
The NG Biotech lateral flow kits offer equivalent results to molecular detection methods in a fraction of the time, with no need for additional equipment and associated maintenance costs. Hands on preparation for the test is minimal and results are available to read in 15 minutes.
The general procedure for all the NG AMR tests is similar (see diagram)



The test can also be used direct from positive blood cultures



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Results are easy to interpret:

A positive result: a red line appears on the control region (C) and one or more lines appear in the test regions and indicates that the bacterial suspension contains the particular antimicrobial degrading enzyme under investigation (K, O, V, I, or N).

A negative result: red line appears on the control region (C) with no lines in any of the test regions and indicates that the bacterial suspension does not contain the antimicrobial degrading enzyme under investigation.

If the control line does not appear, the test result is invalid.

Variants detected by NG-Test CARBA 5:

Type NDM: NDM-1-2-3-4-5-6-7-8-9-11-19

Type KPC: KPC-1-2-3-4-5-6-7-12-14-23-28-39

Type IMP: IMP-1-2-4-5-6-7-8-10-11-13-14-15-16-18-19-22-26-29-31-37-39-46-47-56-58-61-63-71-79

Type VIM: VIM-1-2-4-5-6-19-23-26-27-31-39-46-51-52-54-56-58-59

Type OXA-48-like: OXA-48-58-162-181-204-232-244-245-370-436-484-515-517-519-535-793

Non-carbapenemases (cross-reactivity): OXA-163 and OXA-405 (OXA-48-like extended spectrum oxacillinases with very weak carbapenemase activity).

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Evidence in support of NG Carba-5 for rapid detection of carbapenemases

The NG CARBA-5 test was included alongside comparator products in a report compiled by PHE (2019):

Commercial assays for the detection of acquired carbapenemases

Peer reviewed published work

Reference	Sensitivity	Specificity	Notes
Vasilakopoulou *et al.* (2021)	80-100%*	100%	Direct from rectal swabs *Sensitivity varied according to incubation (80%, no incubation; 100%, 3-hour incubation)
Volland *et al.* (2020	100%	98.6%*	Improved detection of IMP variants *detected OXA-163 and -405, both ESBL-type OXA-48-like enzymes with weak carbapenemase activity
Jenkins *et al.* (2020)	PPA 100%	NPA 100%	Multi-centre evaluation (USA)
Takissian *et al.* (2019)	97.7%	96.1%	Direct from blood cultures
Hopkins *et al.* (2018)	97.3%*	99.8%	Bacterial cultures *missed IMP-13, -14, which are now included variants
Boutal *et al.* (2018)	100%	95.3%*	Bacterial cultures *detected OXA-163 and -405, both ESBL-type OXA-48-like enzymes with weak carbapenemase activity

Key: PPA: positive percent agreement; NPA, negative percent agreement.

Pricing

NGB-CAR-S23: NG Carba-5 Test Kit (1x20)
£280

Ordering

enquiries@unahealth.co.uk
01782 575180

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Una Health AMR Webinar: Detection of Carbapenemases

On Tuesday 29 June 2021, Una Health held a webinar showcasing a selection of customer experiences using the NG CARBA-5 kit.

Programme

Overview of the current AMR products available from NG Biotech
Carolyne Horner; Scientific Lead, Una Health

Validating an alternative method to reporting carbapenemase-producing Enterobacterales across two NHS trusts
Kerryanne Brown and Lydia Newall; Senior Biomedical Scientist and Biomedical Scientist, Whiston Hospital

Rapid carbapenemase detection using the NG CARBA-5 lateral flow device
Holly Ciesielczu; Clinical Scientist, Barts Health NHS Trust (London)

CARBA-5: The Sheffield Way
Jo Fowler; Advanced Biomedical Scientist,
Sheffield Teaching Hospitals NHS Trust

Detection of CPE in a Specialist Tertiary Paediatric Hospital
Francis Yongblah; Clinical Scientist, Great Ormond Street Hospital for Children

Developments from NG Biotech
Boris Crepey; International Sales Manager, NG Biotech

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Key messages

The NG CARBA-5 test can be integrated into routine CPO screening/testing clinical sample algorithms according to laboratory workflow.

Integration of the NG CARBA-5 test into a laboratory workflow can save time to a result and make a crucial difference to infection prevention interventions.

The key to prevention of CPO outbreaks is a detection and confirmation method with high sensitivity, as the consequences of missing a potential CPO are serious.

"The seminar was useful as it gave insight into how other sites were using the lateral flow in the context of their CPE screening/-testing algorithm."

"The webinar was really good, very informative"

Q&A from the event

Where can I find more information about the NG Biotech direct method of detection from clinical samples?

NG Biotech are working with EIT Health (European Institute of Innovation and Technology) to develop the AMR-DetecTool. You can find out more here: https://amrdetect.eu/ and here: https://eithealth.eu/project/amr-detectool/ Some groups have evaluated the ability of the NG-Test CARBA-5 to detect carbapenemase-producing Enterobacterales direct from blood cultures and rectal swabs.

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We use a molecular method to confirm CPE – why should we change to the CARBA-5 kit?

Whether the CARBA-5 kit is right for your laboratory will depend on a multitude of factors, including workflow, staffing, throughput of samples, prevalence of CPO, turnaround times, and budget.
If your laboratory has a high throughput of samples and already has molecular diagnostics in place, the NG CARBA-5 may have a place out-of-hours or weekends or when an isolate has missed the main CPO molecular run.

How often do you need to complete QC?

Quality Control requirements vary according to laboratory. It is common for laboratories to complete QC when the lot number of the kit changes, or once a month if the lot number remains the same. Typically, a single positive control is completed that contains each of the five target enzymes, plus a negative control.

How are results of the kit recorded in patient records?

How results are recorded will depend on the capability of the LIMS. One method might be to add a code that corresponds to the carbapenemase detected, with the capacity to add more than one code if more than one carbapenemase is detected.
In some laboratories results are read independently by two Biomedical Scientists and then recorded on LIMS.

Are there free-of-charge kits available for evaluations?

Una Health have a limited number of free-of-charge kits available for laboratories to complete evaluation. These are available on a first-come, first served basis. Please contact Una Health to discuss this offer.

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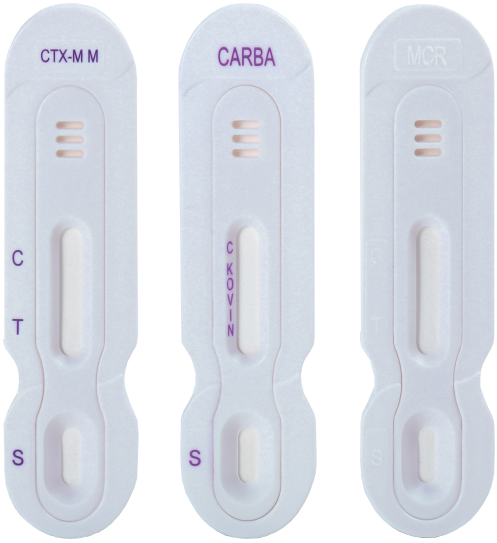
Other AMR kits available from NG Biotech



NG-Test MCR-1: for rapid detection of mobilised colistin resistance

The NG-Test MCR-1 aids in the rapid identification of bacteria carrying the mobilised colistin resistance gene, mcr-1, in Enterobacterales, Pseudomonas aeruginosa and Acinetobacter spp. in healthcare settings

NG-Test CTX-M and CTX-M M: for rapid detection of extended-spectrum β-Lactamases (ESBL)

The NG Biotech CTX-M & CTX-M MULTI tests are important tools that identify one of the important mechanisms of resistance to cephalosporins commonly found in Enterobacterales

NG-Test CTX-M detects the presence of variants belonging to group 1 CTX-M enzymes, including CTX-M-15, considered the most common in many global locations

NG-Test CTX-M multiplex detects variants belonging to all five known CTX-M groups: 1, 2, 8, 9 & 25

To find out more, please visit the Una Health website:
https://unahealth.co.uk/

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