

**WDCM GCM 2.0 Type Strain Sequencing
Training Course**

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WDCM, Institute of Microbiology

Chinese Academy of Sciences

Beijing

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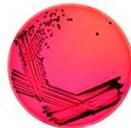
Report by

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Personal introduction

I have been with Public Health England (PHE) National Collection of Type Cultures (NCTC) for over 5 years working as a Molecular Microbiologist within the Microbial Projects team working on various projects including the NCTC 3000 sequencing project as well as developing molecular products for NCTC to customers worldwide. Currently I am involved in the GCM 2.0 on providing DNA from NCTC type strains which have no sequence information. I am also involved in working towards reviving the NCTC plasmids and bacteriophage collections and providing these as a resource to researchers and laboratories.

National Collection of Type Cultures (NCTC)

Abstract

Established in 1920 at the Lister Institute in London, the National Collection of Type Cultures (NCTC) is one of the oldest collections in the world. Currently the collection comprises over 5000 bacteria of clinical importance, including over 900 type strains that are readily available and listed in NCTC's online catalogue. During the course I gained valuable information on the bioinformatics pipelines set up by WDCM for the Global Catalogue of Microorganisms (GCM) 2.0 sequencing project. The course also provided the opportunity to network with collections around

the world and to know further information on their collections and their activities. NCTC welcomes the opportunity to take part in the GCM 2.0 project and establishing a fruitful relationship with WDCM and other member collections.

Keywords: National Collection of Type Cultures (NCTC), World Data Centre for Microorganisms (WDCM), Global Catalogue of Microorganisms (GCM) 2.0 project, bioinformatics, sequencing.

1. Brief introduction of your Culture Collection.

Established in 1920 at the Lister Institute in London, the National Collection of Type Cultures (NCTC) is one of the oldest collections in the world. It was created with the specific purpose of providing microorganisms for other scientists to use and has been a trustworthy source of authentic clinically relevant bacteria for use in scientific studies. NCTC is one of four collections of biological resources operated by Public Health England (figure 1), the other three being the National Collection of Pathogenic Fungi (1947), the European Collection of Authenticated Cell Cultures (1985) and the National Collection of Pathogenic Viruses (2001). The biological resources available from these collections are used by scientists who need to reassure themselves and others that the materials they are using are authentic, so the conclusions to their studies are valid

and relevant. This is particularly important where research may lead to peer-reviewed publications, for example, in drug discovery and vaccine efficacy studies. Authenticated reference strains are also of paramount importance for clinical diagnostic testing, food, water and environmental microbiology testing and validation studies.



Figure 1. Current location of NCTC at PHE in North London.

Currently the collection comprises over 5000 bacteria of clinical importance, including over 900 type strains that are readily available and listed in NCTC's online catalogue. NCTC strains are preserved in glass ampoules by freeze – drying (figure 2) and the process was utilised in 1949 by the then curator Dr Samuel T Cowan, together with the introduction of a manual data recording system using individual hand-written cards prepared for every strain to record colony morphology, biochemical test results and freeze-drying records.



Figure 2. NCTC strains preserved in glass ampoules by the process of freeze-drying.

Strains within the NCTC collection represent many different species from specific disease conditions and widespread geographical locations; many have known antimicrobial resistance mechanisms/patterns and some contain specific plasmids.

The collection is of fundamental importance to the life science community and many of the strains are stipulated in internationally recognised standard methods as definitive control strains for various microbiological testing procedures such as recommended on EUCAST guidelines.

NCTC continuously adds strains to the collection continuously to ensure we deliver vital biological resources necessary for researchers gathering new data on microbial biodiversity, studying the similarities and differences between historical and modern strains and advancing global

knowledge about the epidemiology, virulence, prevention and treatment of infectious diseases.

In addition to providing authenticated strains to researchers worldwide NCTC also collaborates on various projects and has been involved in the NCTC 3000 project in together with the Wellcome Trust Sanger Institute (WTSI) delivering on a five-year project funded by a Wellcome Trust Biological Resource Grant. The project began in 2014 and will produce a unique electronic resource that will bring together the complete strain information for NCTC type and reference strains. As part of the project we are sequencing and assembling the genomes of 3000 NCTC strains using long read (Pacific Bioscience) technology and progress of the project can be followed on our twitter page **@NCTC_3000** and our website www.phe-culturecollections.org.uk.

2. Benefit from the training courses.

During the course I gained valuable information on the bioinformatics pipelines set up by WDCM for the GCM 2.0 sequencing project. From the practical tutorials I learnt how to use the web based tools and its parameters and the purpose of the tools designed. This will be very valuable for me and NCTC once the sequence data is generated.

The training course is a good platform for culture collection to get information of the activities and pipelines developed by WDCM in relation to the GCM 2.0 project. The course also provided the opportunity to network with collections around the world and to know further information on their collections and their activities and locations. This not only allows for communications but also opened up collaborative opportunities in the future.

As someone who hasn't worked with fungi, it was very informative and interesting to visit the Fungi museum at the institute. I gained knowledge about the difficulties in assigning fungi taxonomically as well as sequencing issues related to genes used for identification.

It was equally interesting to see the sequencing facility at the Institute and the sequencing platform available to sequence the DNA/strains sent by participating collections. It was good to have a look at the bacterial archive for China General Microbiological Culture Collection Centre (CGMCC) (figure 3) and a tour of the laboratory where freeze drying is carried out.



Figure 3. China General Microbiological Culture Collection Centre (CGMCC) bacteria strain archive at the Institute of Microbiology Chinese Academy of Science.

3. Suggestion on WDCM work.

The GCM project WDCM has embarked upon is valuable and will look to complete the outstanding sequencing of all Type strains of bacterial collections. However the project will benefit from providing complete genetic information including any plasmid data if available within the strain by employing long read sequencing. This will provide the complete and closed genome information to researchers and customers.

4. Comments or suggestion on the training courses.

The training course was very useful for me and to see the developed pipelines for sequence information. It would be beneficial for representatives from various different collections to be able to practice using the tools using their own sequence data. The course would benefit from having increased practical session and the theory condensed.

It would also be informative to have talks from various representative collections regarding their in house DNA extraction and sequencing approaches and any lessons learnt to benefit both WDCM and the course participants.

5. Suggestion on further cooperation between WDCM and your collections.

NCTC will be involved in the GCM 2.0 project by supplying DNA from around 90 Type strains in 2019. In addition to sending DNA samples for sequencing, we would like to be involved in data mining and any subsequent joint publications with WDCM and other collaborators on data generated. NCTC would also like to be a representative on the GCM 2.0 bacterial sequencing working groups to help drive the project to successful completion.

NCTC will also be involved in updating and passing through meta-data and catalogue data to WDCM for updating various databases and resources WDCM maintains.

NCTC are hopeful of establishing long term cooperation with WDCM with regards genome sequencing, data mining, training course and networking opportunities and student/staff exchange program to benefit both institutions.