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The role of culture collections in clinical diagnostics and medical research

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Invasive fungal infections (IFIs) cause 1.6 million deaths/year globally and account for 10% of all hospital-acquired infections. At least 15-25% of pneumonia, 40-60% of meningitis/ encephalitis and 20% of fever/sepsis cases are due to unknown causes, with IFIs suspected in many instances. Transplant, haematology, cancer, immunocompromised and cystic fibroses patients are at a particular risk. Recently pulmonary aspergillosis and mucormycoses have risen dramatically in COVID-19 ICU patients. New IFIs are emerging, e.g., candidemia due to multidrug-resistant Candida auris, spreading rapidly and persisting in health care environments. If diagnosed in a timely manner, IFIs are treatable. However, despite available effective antifungal therapies, the death rate from IFIs still can reach 50%, largely because fungal infections are under-recognized and conventional techniques currently used for diagnosis take days to weeks for results and lack specificity and sensitivity. Antifungal sensitivity testing is equally cumbersome. Unacceptable treatment delays, sub-optimal therapy, increased morbidity and mortality, prolonged hospitalisation, productivity loss, and sky-rocketing healthcare costs (e.g., $11.5 billion/year in the US) are common. With this background in mind fungal culture collections are an indispensable bioresource, having a critical role in providing quality-controlled reference strains for the clinical microbiology diagnostics laboratories as well as for development of new diagnostic methods, such as next generation sequencing and metagenomics, antifungal susceptibility testing, and medical research aimed to gain a better understating of mycoses. They are also the fundamental basis for the establishment of reference databases of fungal DNA barcode e.g. the (ISHAM)-ITS database for human/animal pathogenic fungi, http://its.mycologylab.org containing ITS1/2 and TF1alfa reference sequences and in the future whole genome sequences or protein spectra. Their major role is to provide an accurate taxonomy and maintaining nomenclature stability in view of clinical relevance. Increasingly it is also important to maintain not only fungal strains (culture collections) but also store associated clinical samples (e.g. sputum, blood, tissue, faces) (Biobank/Bioresource Centre) to conduct retro- and prospective clinical studies, including epidemiology, molecular and metagenomics research to understand the biological interactions between fungi and with other microorganism (bacteria parasites, viruses, etc.) and to establish the source and the spread of particular genetic clones , caring either high virulence/pathogenicity treats or antifungal resistance markers. They form a basic role in understanding links between the environment, agriculture, and human health (One Health Concept).