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Title:	Lignin- based carbon dots selectively kill cancer cells through enhanced ROS production via differential cellular uptake
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Abstract:	Lignin is the most abundant natural aromatic polyphenol found in nature, constituting around 15-30% of biomass in trees. Research in recent years has shown it to be a promising compound in biomedical research, with its antioxidative, anti- microbial and mechanical properties. Carbon dots, which are small nanoparticles with sizes less than 10 nm have been an active area of research due to their intrinsic photoluminescence and have been widely used in biological applications like biosensing, bioimaging and drug delivery. In this study, we synthesised carbon dots using citric acid and lignin to explore its biomedical uses. Our findings reveal that lignin-based carbon dots exhibit exceptional biocompatibility with normal cells, while displaying cytotoxicity towards cancer cells. In contrast, widely studied citric acid carbon dots demonstrate consistent cytotoxicity levels across both normal and cancerous cell line. We hypothesise that the differential cellular uptake and intracellular distribution of these carbon dots in cancer cells lead to an elevated production of reactive oxygen species (ROS) within malignant cells, leading to their cytotoxic effects. Our study highlights the promising role of lignin-based carbon dots in biomaterials and cancer research and pave the way for further exploration of them for targeted cancer therapy and other biomedical uses.
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