ABSTRACT SUBMISSION FORM

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SEX + GENDER

Exploring the role of sex and gender on health research

CHRD
CHILD HEALTH RESEARCH DAYS

CHRD 2020: Abstract Submission Form

Submitter Name
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Title
Synthesis of Water-dispersible Indium-based Quantum Dots – Efficient and Stable Nano-diagnostic Tool

Background
Quantum dots (QDs) are semiconductor nanocrystals with high potential as a fluorescent probe in biomolecular and cellular imaging, particularly during pregnancy, where fetal safety is paramount. Toxicity of cadmium based QDs impose risks and limit their utility in biological applications. A novel class of QDs with indium phosphide (InP) core and zinc sulphide (ZnS) shell has been proposed as a safe alternative but requiring surface modification for dispersion into non-cytotoxic aqueous media.

Objective
Design stable hydrophilic Indium-based QDs.

Methods
We synthesized InP core and grew ZnS shell under an inert atmosphere at 260℃, yielding hydrophobic InP/ZnS QDs. Two capping agents, 3-mercaptopropionic acid (MPA) and 11-mercaptoundecanoic acid (MUA), at a series of concentrations were used to render the QDs hydrophilic. We characterized QDs for their charge, optical and fluorescence properties. The stability of the QDs was investigated over time in physiological buffers and culture media by tracking the fluorescence intensity, absorbance peaks and zeta potential.

Results
The synthesized QDs were highly water-soluble, demonstrated good colloidal stability and a high emission quantum yield. InP/ZnS has max fluorescence intensity at 590nm. QDs decorated with MPA at concentrations of 546.5mM and 800mM were stable in borate buffer over 30 days and for two weeks in cell culture media with and without added albumin and growth factors. QDs capped with MUA (50-800mM) exhibited peak absorbance at 575nm and peak emission fluorescence at 625nm. QD transfer efficiency was dependent on the concentration of the capping agent. The stability of MUA-capped QDs is still under

study.

Conclusion
We have successfully designed fluorescent InP/ZnS QDs that are dispersible in aqueous media, with high colloidal stability and a high emission quantum yield. The presence of carboxyl groups on the QD surface makes them excellent candidates for further functionalization. These properties enable their use in vulnerable populations such as unborn babies and pregnant women.

Theme:
Basic Science

Do you have a table/figure to upload?
No

Are you willing to participate in Goodbear's Den?
No

Presenter Status:
Masters Student

What was your role in the project?
Perform Experiments

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