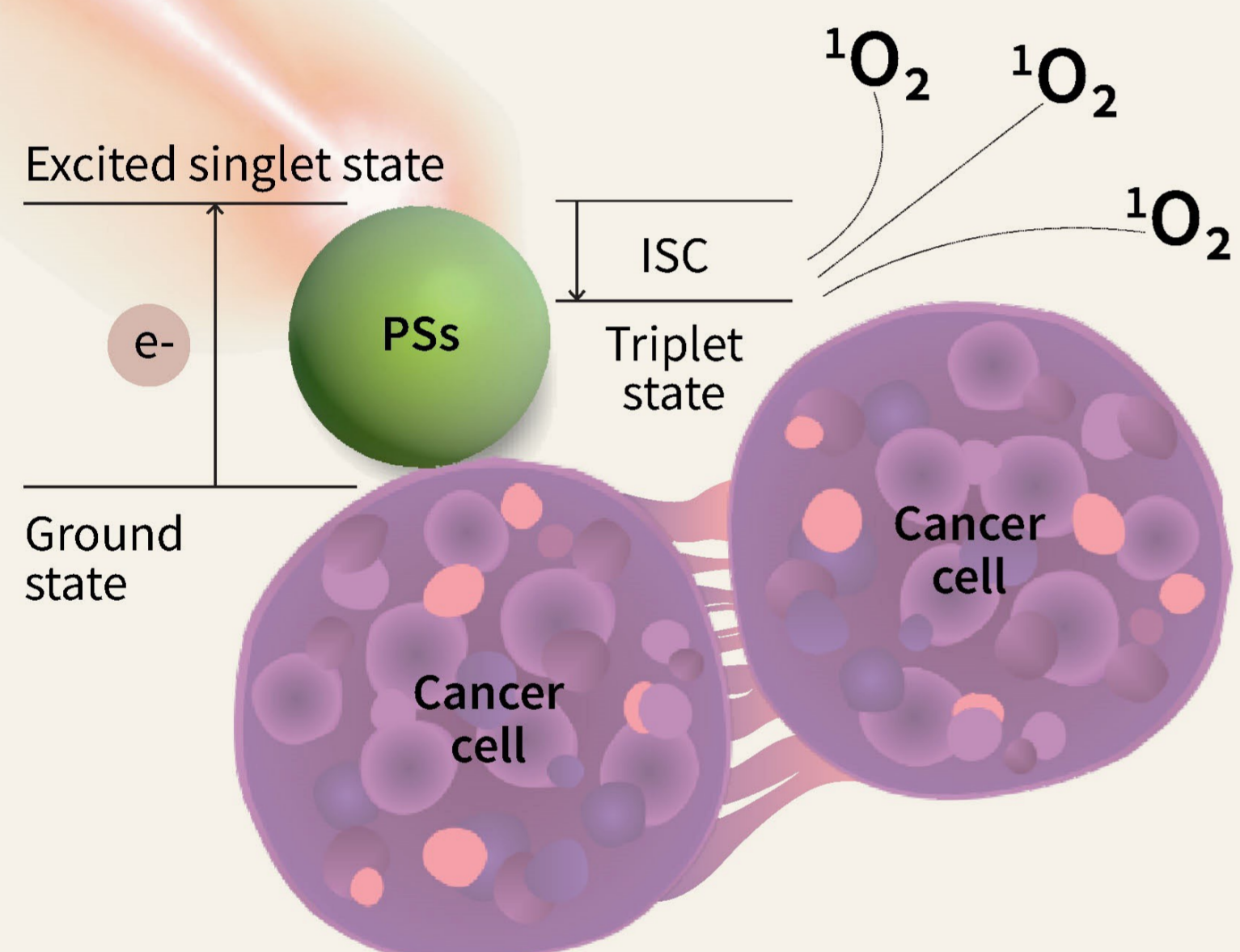


Introducing Electron-withdrawing Groups to Thio-pentamethine Cyanine Dye Photosensitizer to Suppress Tumor Growth

Chemical
Science

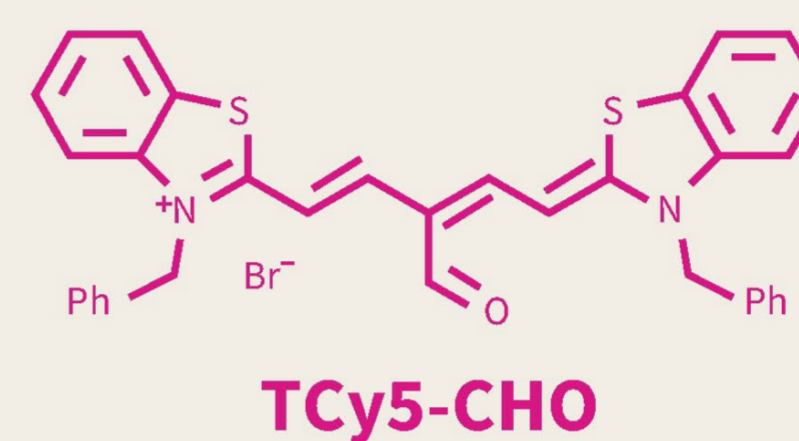


Photosensitizers (PSs) absorb light energy to generate reactive oxygen species (ROS) that can destroy cancer cells



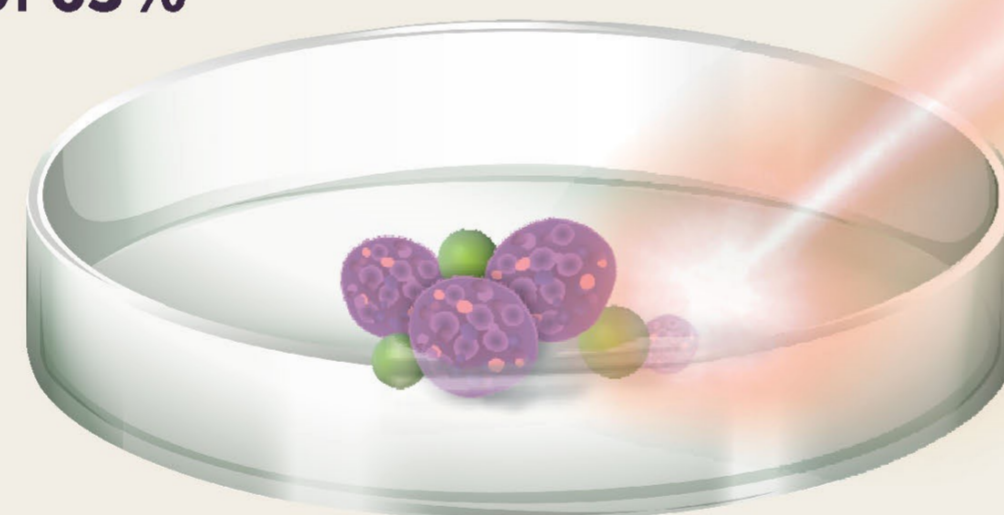
But most PSs display low intersystem crossing (ISC) efficiency, low ROS yield, and poor tumor cell growth inhibition, necessitating the identification of newer strategies to improve phototherapy efficiency

A novel photosensitizer, thio-pentamethine cyanine dye (TCy5) with electron withdrawing groups at the meso-position, is proposed to improve ROS yield



In vitro tests on MCF7 cells
(human breast cancer cell line)

- ✓ Nontoxic in the dark
- ✓ Phototoxic to cancer cells in the light
- ✓ $^1\text{O}_2$ quantum yield improvement of 63%



In vivo tests on mice with 4T1 cells
(mouse breast cancer cells)

- ✓ Tumor controlled by 85%
- ✓ No major cell damage



- ✓ Radiation intensity for activation: 500 nm to 750 nm
- ✓ Effective tumor suppression
- ✓ Biocompatible
- ✓ Achievable $^1\text{O}_2$ yield ~99% with strong electron withdrawing groups

Adding powerful electron withdrawing groups to the meso-position of thio-pentamethine can help develop cyanine photo-sensitizers for safe and effective tumor growth suppression