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# Letter to the Editor

## Anti-cancer effect of the polysaccharide extract from the *Ganoderma lucidum* against HeLa cell lines

Sir,

*Ganoderma lucidum* is an important Chinese medicinal mushroom which containing considerable amount of polysaccharides which has been reported to be effective as immunomodulation, antiviral, anti-oxidation, anti-bacterial, anti-cancer effects, etc., without toxic effects in animals (Zhang et al., 2002). It is known to possess various chemical compounds such as polysaccharides, triterpenoids, flavanoids, coumarins, quinones, carotenoids and amino acids as having antibacterial properties (Roberts, 2004). Polysaccharides are the best known and most potent mushroom-derived substances with antitumor and immunomodulating properties. Some recent studies described polysaccharide extracts of mushrooms, as *in vitro* inhibitors of various cancer cell lines such has colon, promyelocytic leukemia and gastric carcinoma (Masuda et al., 2009; Lavi et al., 2006; Wong et al., 2007). The present study was found to investigate the anti-cancer effect of the polysaccharide extract from the *G. lucidum* against HeLa cell lines.

Matured *G. lucidum* fruit bodies were collected from the Ooty Hill region and authenticated by the Mycology Division of the Indian Forest Genetics and Tree Breeding Institute, Coimbatore, Tamilnadu, India. Fruiting bodies of mushrooms were dried at 45–50°C for 48 hours and powdered. The *G. lucidum* polysaccharides were isolated according to Chen et al. (2009). Fruiting bodies of mushrooms were dried at 45–50°C for 48 hours and powdered. The powdered material (200 g) was extracted with petroleum ether in Soxhlet apparatus for 8–10 hours. The extraction was done in four batches of 500 g each. The precipitate was collected by centrifugation (20 min at 9,000 g) and redissolved in double distilled water, and treated with Sevag's reagent several times to remove protein and then dialyzed against deionised water for 48 hours at 4°C. It was then evaporated at low temperature and lyophilized to obtain *G. lucidum* polysaccharide (900 mg) as a light brown powder. HeLa cell lines were purchased from the National Centre for Cell Science, Pune, India. The anti-cancer effect of the polysaccharide extract of the *G. lucidum* was investigating using the MTT assay (Lau et al, 2004). The OD value was measured at 570 nm. The $IC_{50}$ value as the concentration of sample which reduced absorbance by 50% relative to the vehicle-treated control.

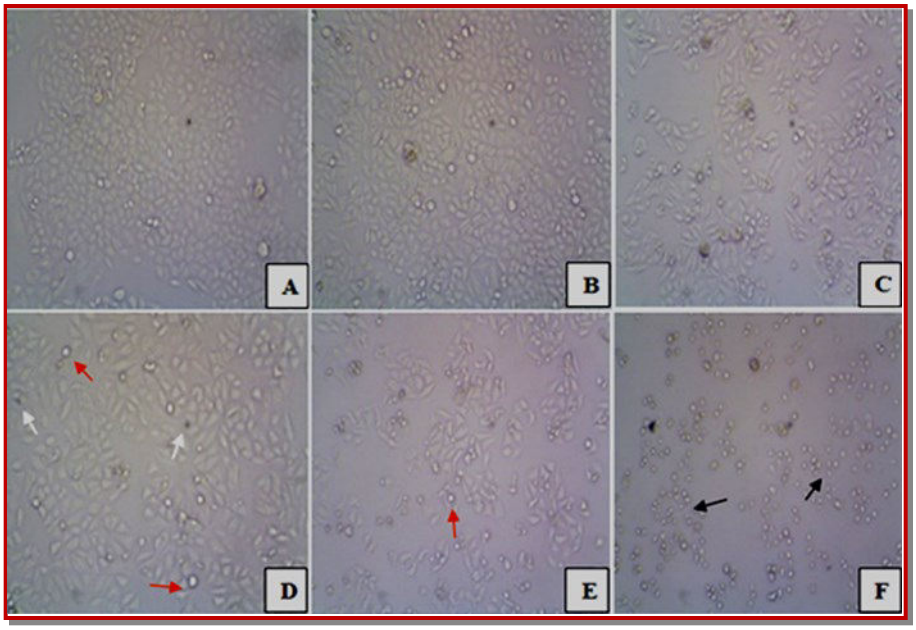


Figure 1: Cytomorphological alternations of HeLa cells treated with *G. lucidum* polysaccharide extract. A) Control (without treatment) indicated accumulation of HeLa cells uniformly. B, C, D, E, F) HeLa cells treated with 12.5, 25, 50, 100, 200 µg/mL polysaccharide extract for 48 hours indicate apoptotic features such has cytoplasmic blebbing (white arrows), round shape (orange arrows) and apoptotic body formation (black arrows), respectively. Magnification = x 400

The proliferation of HeLa cell was significantly inhibited by *G. lucidum* polysaccharide. The Figure 1 and Table I shows the changes of the percentage of cell viability treated with *G. lucidum* polysaccharide extract (12.5, 25, 50, 100, and 200 µg/mL) in HeLa cell. There was 99% cell death at 200 µg/mL concentration was observed. The inhibi-

**Table I**

**Effect of *G. lucidum* polysaccharide on HeLa cell lines**

| Extract (µg/mL) | % Cell inhibition |
|---|---|
| 12.5 | 2.5 |
| 25 | 5.0 |
| 50 | 7.4 |
| 100 | 24.1 |
| 200 | 99.4 |

tory concentration 50% ($IC_{50}$) was fixed as 7.35 µg/mL. It shows a series of changes including cell shrinkage, cytoplasmic blebbing, and apoptotic body formation. *G. lucidum* polysaccharide that showed significant antitumor efficacy *in vitro* against HepG2, HeLa and A549 cancer cell lines, through both direct cytotoxic effects on tumor cells and growth-promoting effects on spleen cells (Li et al., 2010). From the present findings, it can be concluded that the *G. lucidum* polysaccharide extract shows toxicity to the HeLa cells.

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