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## Lithium: A Promising Anticancer Agent

Edgar Yebrán Villegas-Vázquez <sup>1</sup>, Laura Itzel Quintas-Granados <sup>2</sup>, Hernán Cortés <sup>3</sup>,  
Manuel González-Del Carmen <sup>4</sup>, Gerardo Leyva-Gómez <sup>5</sup>, Miguel Rodríguez-Morales <sup>6 7</sup>,  
Lilia Patricia Bustamante-Montes <sup>8</sup>, Daniela Silva-Adaya <sup>9</sup>, Carlos Pérez-Plasencia <sup>10 11</sup>,  
Nadia Jacobo-Herrera <sup>12</sup>, Octavio Daniel Reyes-Hernández <sup>13</sup>, Gabriela Figueroa-González <sup>14</sup>

Affiliations

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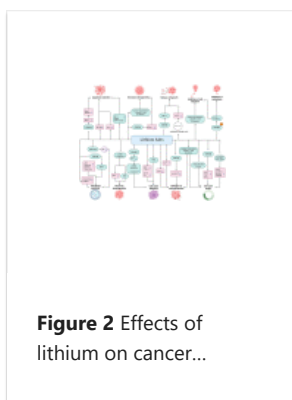
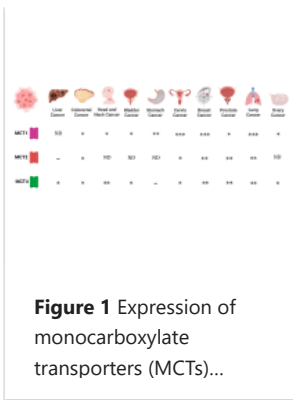
### Abstract

Lithium is a therapeutic cation used to treat bipolar disorders but also has some important features as an anti-cancer agent. In this review, we provide a general overview of lithium, from its transport into cells, to its innovative administration forms, and based on genomic, transcriptomic, and proteomic data. Lithium formulations such as lithium acetoacetate (LiAcAc), lithium chloride (LiCl), lithium citrate ( $\text{Li}_3\text{C}_6\text{H}_5\text{O}_7$ ), and lithium carbonate ( $\text{Li}_2\text{CO}_3$ ) induce apoptosis, autophagy, and inhibition of tumor growth and also participate in the regulation of tumor proliferation, tumor invasion, and metastasis and cell cycle arrest. Moreover, lithium is synergistic with standard cancer therapies, enhancing their anti-tumor effects. In addition, lithium has a neuroprotective role in cancer patients, by improving their quality of life. Interestingly, nano-sized lithium enhances its anti-tumor activities and protects vital organs from the damage caused by lipid peroxidation during tumor development. However, these potential therapeutic activities of lithium depend on various factors, such as the nature and aggressiveness of the tumor, the type of lithium salt, and its form of administration and dosage. Since lithium has been used to treat bipolar disorder, the current study provides an overview of its role in medicine and how this has changed. This review also highlights the importance of this repurposed drug, which appears to have therapeutic cancer potential, and underlines its molecular mechanisms.

**Keywords:** anti-cancer effects; apoptosis; autophagy; cancer; lithium; nano-delivery.

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