



## Paw Paw Cell-Reg

Stock #515-6 (180 capsules)

Paw Paw Cell-Reg is a specialized product designed to support the immune system. Paw Paw Cell-Reg provides a standardized paw paw twig extract, containing substances that have been shown to inhibit the growth of cancerous cells in vitro.

The North American paw paw tree, also known as the Indiana banana because of the large fruit it bears, is native to eastern and central North America. The paw paw tree is usually pest- and disease-resistant, due to the presence of substances in the bark, twigs, seeds and roots that inhibit the feeding of insects and herbivores (plant-eating animals). Research on these pesticidal substances has led to the discovery of other compounds that have made the paw paw tree (*Asimina triloba*) an important medicinal plant.<sup>1-3</sup>

Research has shown that extracts of paw paw contain promising new antitumor and pesticidal agents. Paw paw extracts, derived from the twigs of the tree—the small twigs yield the most potent extract—contain biologically active substances known as “Annonaceous acetogenins,” which are derivatives of long-chain fatty acids. Annonaceous acetogenins have demonstrated antimicrobial, antimalarial, antitumor, antiviral and anthelmintic (parasitic worm-killing) activity. Studies have also shown that several paw paw acetogenins exhibit potent cytotoxicity—a toxic effect on cells that prevents their reproduction or growth—against human breast, colon and lung cancer cells in vitro. In fact, one particular acetogenin, trilobacin, demonstrated inhibitory activity at over a billion times the potency of adriamycin—a standard anticancer drug. Like adriamycin, paw paw acetogenins are also potent antineoplastic agents—substances that prevent the development of abnormal tissue growth. However, paw paw extracts do not cause the serious side-effects associated with andriamycin use.<sup>3-17</sup>

According to recent research, certain paw paw acetogenins show promise as a future new generation of antitumor agents, due to their ability to lower ATP levels via inhibition of the mitochondrial complex I. In simpler terms, paw paw acetogenins inhibit the growth of tumor cells by decreasing cellular ATP (adenosine triphosphate) levels—ATP is the primary form of utilizable energy in the cells. Thus, paw paw acetogenins deprive cancerous cells of their energy supply, which results in apoptosis—programmed cell death, a type of self-destruct response.<sup>1-4,11,12,15,17-22</sup>

Acetogenins also exhibit potential as antitumor agents against multiple-drug resistant (MDR) tumors. Development of multidrug-resistance is a major obstacle in the chemotherapeutic treatment of human cancers. In fact, according to a report published in 2002, resistance exists against every effective anticancer drug, including the newest agents. Drug-resistance is often attributed to the presence of a protein (P-glycoprotein) in the tumor cell membrane that transports harmful substances, including anticancer drugs, out of the cell before they can take effect. P-glycoprotein is known as an ATP-dependent transporter protein—its function is dependent on sufficient levels of ATP. In vitro studies have shown that acetogenins deplete ATP levels, thus effectively inhibiting the growth of MDR tumors that have ATP-dependent mechanisms, including adriamycin-resistant human mammary tumor cells.<sup>2,4,23-32</sup>

In addition, acetogenins appear to selectively inhibit the growth of tumor cells versus normal cells by blocking the activity of a substance (NADH-oxidase) in the plasma membrane of tumor cells that generates ATP and stimulates cellular growth. By inhibiting NADH-oxidase, acetogenins block ATP production and induce apoptosis (cell death). In vitro studies using cancerous and non-cancerous cells found that acetogenins exhibited a dose-dependent inhibition of cancerous cell growth, while non-cancerous cell growth was not inhibited by the same dosages. Additional research found that various acetogenins all showed greater cytotoxic effects toward cancerous versus non-cancerous cells, confirming that acetogenins are not “general cytotoxins.” Furthermore, research has shown that certain acetogenins appear to selectively target specific types of tumor cells.<sup>2,4,8,15, 29,32-34</sup>

Preliminary human studies using a standardized paw paw extract have not yet been published in peer-reviewed journals. However, initial reports indicate that the standardized extract has been effective in certain cancer patients. Reported results from paw paw use include decreases in various tumor sizes and tumor markers (substances in the body that usually indicate the presence of cancer), as well as improved energy levels and the absence of significant adverse effects. Reports also indicate that the paw paw extract may provide synergistic benefits in combination with chemotherapeutic treatment.<sup>16,36</sup>

With regards to toxicity, acetogenins have been proven to induce emesis (vomiting) in pigs, and unpublished reports indicate that ascending oral dosing of paw paw capsules in dogs failed to reach a lethal dose, as there was a gradual increase in signs of emesis and loose stools. This indicates the type of built-in “safety factor” in paw paw extract should an individual mistakenly ingest too much. In fact, a fluid extract of paw paw seeds is reported to have been sold as an emetic (a substance that causes vomiting) by the Eli Lilly company nearly 100 years ago.<sup>2,4,35</sup>

Each capsule of NSP's Paw Paw Cell-Reg contains standardized paw paw (*Asimina triloba*) twig extract. Only those with cellular abnormalities should take Paw Paw Cell-Reg on a regular or daily basis. This product is not recommended for women who are pregnant or nursing or who may become pregnant.

NSP has a patent pending on Paw-Paw Cell Reg.

#### References:

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