

# EPITOME

## • ANTIVIRAL •

### Inhalation therapy with Green Tea Extract inhibits NF-kB, reduces lung inflammation

Green tea extract (GTE) is a powerful effector which is widely studied; there are 22,000 papers listed in PubMed since 1975, with over 1,400 in 2024. It has antioxidant, anti-viral and anti-bacterial activity, binds many proteins and improves intestinal microflora.

GTE inhibits all viruses tested including SARS-CoV-2 <sup>1-3</sup>, influenza A & B <sup>4</sup>, papilloma virus, rotavirus and enterovirus, <sup>5</sup> at concentrations of 10 PPM. <sup>6</sup> These results were obtained in vitro and in vivo; tests in mice showed survival after doses of virus lethal in controls. <sup>7</sup> Animal viruses Pseudorabies virus, bovine herpes virus 1, porcine transmissible gastroenteritis virus and porcine epidemic diarrhea virus are also inactivated in vitro. <sup>6</sup> GTE inhibited influenza infection in pigs when delivered as a mist at 300 PPM for 20 seconds every half hour and in their drinking water. Control animals had a 4x increase in H antigen, those treated with GTE had far less. <sup>6,8</sup>

GTE and its principal component EGCG inhibit NF-kB activation in vitro and in animal models in dozens of studies. <sup>9-13</sup> EGCG, the principal component of GTE, binds the NF-kB-p65 protein covalently and prevents it from binding DNA. <sup>14</sup> NF-kB activation is the main trigger of inflammation by the innate immune system, see diagram below from <sup>15</sup>.

Respiratory failure requiring ventilation affects 455 per 100,000 people a year in the US. The death rate is 23% and survivors have many morbidities; treatment cost was \$181 billion in 2017. <sup>16</sup> The many manifestations of respiratory failure, called ARDS, ALI, ARF, and SARS, share commonalities. The SARS-CoV-2 pandemic gave new impetus to research in this field. A striking finding of Rouhani et al at, 2021, at University of Chicago was that in patients who had died of SARS, the cytokines IL-6 and CCL2 of the cytokine storm were being generated by the lung type II pneumocytes, not the circulating immune cells. <sup>17</sup> These cells have activated Nf-kB, the classic driver of inflammation.

In 2020 Dr. Saverio Bettuzzi, Professor Emeritus of University of Parma Medical School, and colleagues tested inhalation and oral therapy with GTE in 10 COVID-positive subjects; half were over 50 years old and had CT-confirmed lung involvement. Patients, including all lung-involved, recovered at median of 9 days, range 7 – 15 days and 7 of 10 had a negative COVID test. The result was highly significant compared to the neighboring province, where the mean time to a negative test was 21 days,  $P < 0.003$ . All subjects completed two weeks of treatment with no adverse events at all. <sup>18</sup>

Intellectual property rights are very strong. The NDA for the green tea extract Polyphenon E (sin catechin) was FDA-approved as the active ingredient in Veregen ointment to treat genital warts in 2006. The US FDA defines a botanical API as the product of a cGMP process, not chemically. The process begins with the Good Agricultural Process on the farms growing the tea and ends with the packaged product; all these steps are specific and proprietary. <sup>19</sup>

There are no botanical generics. Every competitor must duplicate the pre-clinical toxicology and Phase I trials, which cost \$60 million and took 7 years.

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