

## HDFx, a New Stress Induced Protective Protein that May Ameliorate Infections Caused by Coronaviruses Like COVID-19, SARS and MERS: Importance of Immuno-Competent NK Cells, Macrophages, and T-Lymphocytes

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### Introduction

Since 2003, there has been an ever-increasing number of corona viral diseases [1-6], with the most recent one coming from Wuhan, China, labeled COVID-19 [7]. All of these corona viral diseases present like a bad case of influenza. They characteristically show “cytokine storms”, depletion of immune-competent macrophages, depletion of numbers of “natural killer cells” (NK cells), loss of immune-competence of CD4 T-lymphocytes and CD8 T-lymphocytes [1-7]. These cell types are normally “geared” to produce diverse antiviral molecules (i.e. interferons, tumor necrosis factor-alpha, and a number of interleukins) [8-12]. These viral diseases present with inflammation of the lungs, sometimes leading to systemic sepsis. The corona viruses not only severely hamper the production of naturally-occurring bodily antiviral protectants but can lead to reduction of critical protective cell types in the liver (e.g. Kupffer cells; pit cells). So, in our opinion, any effective therapeutic ameliorative against corona viral molecules, and the sequelae of events leading to morbidity and mortality, should focus on restoring the production and physiological immunological competence of macrophages, NK cells, CD4 and CD8T- lymphocytes, at the very least. In addition, since these corona viruses must perforce lead to critical reductions in transcapillary blood flows resulting in ischemic areas and cellular damage, it would be helpful if any antiviral molecule could restore capillary blood flows toward normalcy.

### Discovery of HDFx and its potential as an ameliorative in coronal viral diseases

For the past several decades, our laboratories have been looking for and investigating peptides/proteins, steroids and lipids that have unique host-defense attributes [13-27]. These studies have led us to discover a conserved protein in mice, rats, guinea-pigs, rabbits, dogs, pigs, and sub-human primates that we have termed host defense factor-x (HDFx) [14,15]. So far, through thousands of experiments, we have found and reported that crude extracts of “HDFx” are protective or ameliorative against experimental lethal hemorrhage, experimental lethal intestinal ischemic shock, a variety of endotoxins, multiple gram-negative and gram-positive bacteria, experimental

trauma, several fungal microorganisms, experimental NASH animal models, several experimental forms of pulmonary hypertension and liver cancer, and possibly certain hemorrhagic fever viruses [14-16,28-42]. In addition, crude extracts of HDFx stimulate production of immunocompetent macrophages, NK cells, immunocompetent CD4 and CD8 T-lymphocytes, Kupffer cells and “pit cells” [13]. HDFx, most importantly, can prevent “cytokine storms”, at least in experimental animals [32]. Interestingly, HDFx causes regeneration of lung tissues damaged by endotoxins and fungal microorganisms [31,43]. This appears to be due, in part, to HDFx’s ability to restore transcapillary blood flows toward normal, since it can prevent sticking and adhesion of leukocytes, monocytes and macrophages to the endothelial linings of microvessel-venular walls [14-16]. HDFx clearly possesses anti-inflammatory and unique microvascular-healing properties.

## Conclusion and Future Thoughts

We have discovered a new host-defense biologic immune-stimulant which may provide unique ways to ameliorate and prevent morbidity and mortality from corona and other emerging deadly new viral agents. Crude extracts of HDFx can accelerate wound healing and increase transcapillary blood flows and thus prevent transudation of blood formed elements into parenchymal tissues (e.g. lungs). Use of HDFx in high-risk patients could eventuate in markedly reduced hospitalizations, reduced hospital costs, and reduction in coronal viral-induced deaths worldwide. With adequate funding, we hope to elucidate the complete chemical structure of HDFx, a possibility that is long-overdue.

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