CORONAVIRUS COVID-19
HEALTH CARE AND TCM CONSIDERATIONS

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Coronavirus as Cause of Acute Respiratory Distress Syndrome (ARDS)

ARDS is a major cause of death among the elderly. It is a rapid onset, progressive pulmonary edema causing difficulty breathing, reduced oxygen to the blood, and potential respiratory failure. This disorder is one of the main reasons for use of ventilators in the Intensive Care Unit (ICU), usually accounting for about one-quarter of all ventilator applications. ARDS in the older population is primarily caused by pathogens associated with pneumonia, and when ARDS is severe, it has a high mortality rate, about 50%. Risk factors for ARDS include older age and underlying chronic health problems. Pneumonias are more common among those who have limited physical activity (thus not circulating the fluids in the lungs and allowing for infections to flourish) and those in community settings where spread of pathogens is easy, such as in group living (e.g., nursing homes).

There are three known Coronavirus-caused pneumonias that lead to ARDS. They have been designated SARS (Severe Acute Respiratory Syndrome), MERS (Middle Eastern Respiratory Syndrome), and Covid-19 (Corona Virus Disease of 2019). The latter has caused a large number of deaths among those aged 69 and above who have chronic health problems such as obesity, diabetes, and cardiovascular disease. At time of this writing, deaths in the U.S. attributed to Covid-19 for a five month period from March 10-August 10 total 163,000 with a daily increase of about 500 at this point. There have been two major spikes in the disease incidence and mortality in the U.S.: April and July.

In 2014, well after SARS faded away (2003) and well before Covid-19 appeared in the U.S. (2020), a retrospective study indicated that ARDS (of all causes, pneumonias, lung injuries, etc.) occurred in about 600,000 people per year in the U.S.); that figure would increase gradually as the population increases and ages; a substantial portion of the so-called baby boom population is now in the age range for experiencing ARDS. Based on statistics for Covid-19 thus far, cumulative hospitalizations from early March to early August point to an annual rate of Covid-19 induced ARDS at least as high as those 2014 numbers; put another way, the case load in hospitals approximately double as a result of the new virus. Not all hospitalizations for Covid-19 involve ARDS, but that is the most common cause of hospitalization as a result of Coronoavirus infection. While a doubling of cases spread over time would be easily manageable for most hospitals, the sudden increase in ARDS starting in March, coupled with absence of sufficient Personal Protective Equipment (PPE) for hospital workers needed for this infectious disease, stressed many hospitals. The second rise in cases was not as difficult to manage due to experience with this new cause of ARDS, development of some drug therapies, and increased production of PPE; in addition, many health care workers were infected by the Coronavirus in March-May, and are now presumably immune to reinfection, at least for a while.

Current Coronavirus Prevention Strategies: Masks and Hygiene

The wearing of masks or use of other face coverings has become the primary recommendation for trying to prevent spread of Covid-19. This wasn't always the case: initially, leading authorities discouraged this method, including the Surgeon General of the U.S. and the head of the NIH Infectious Disease section, Dr. Anthony Fauci. More recently, the World Health Organization had suggested that wearing masks was mainly of use for those who are treating Covid patients. There was, instead, considerable emphasis on the process of indirect transmission of the Coronavirus: an infected individual expels virus-containing particles, such as by coughing or sneezing, those particles land on surfaces or go to the hands of the infected person, from there they are picked up by others. Hence, initial emphasis was on prolonged hand washing (20 seconds) and use of sanitizer products (with high alcohol content), not touching the face (as a means of transferring virus from surfaces to points of entry), and avoiding contact with surfaces (wear gloves; don't touch delivered packages

for several days; touchless delivery methods, wipe down places where people have been sitting, etc.). Social distancing would prevent most direct transmission due to the fact that expelled particles tend to fall to the ground or a surface within that distance. A study pointing to prolonged viability of this Coronavirus on surfaces, from one to three days, was considered illustrative of this focus. While this concern about virus transfer by this route is not alleviated, it is now considered that a primary transmission method is breathing in virus-containing particles that are usually not being expelled by coughing and sneezing (those two causes still are important) but are expelled during such activities as talking, singing, shouting, laughing, breathing hard during exercise (e.g., mouth breathing), etc. A study showing persistence of viable virus in the air for a prolonged period has been considered a support for this concern. To avoid expelling these virus-containing particles, people are told to wear masks, as the mask or other face covering is intended to capture such particles. Although somewhat less effective at preventing breathing in the particles than preventing expelling them into the air, another person wearing a mask will have less chance to breathe them in. Thus "universal mask wearing" has been recommended. The exception is being outdoors where social distancing is possible, since expelled viral particles are less likely to reach another person at that distance and as a consequence of natural air flow that occurs in outdoor settings, diverting most of them. Nonetheless, some recommendations are for wearing masks from the time of leaving home until getting back into the home.

The great increase in wearing of masks and other face coverings has not been accompanied by a major decrease in cases. Most likely, this is not a failure of the strategy when it is in place, but mask wearing is an unnatural way for individuals to interact, and is not suitable while eating. What tends to happen is that people who desire a break from the restrictive and unnatural condition gather in trusted groups to undertake various activities without masks, thus spreading the virus from one infected person to a few others, and then those infected individuals bring the virus home, where masks are not worn all the time. Thus, mask-wearing may cut down somewhat on casual spread among people who encounter each other as strangers, such as in a store, but fails to halt the spread of the disease at other times. The high level of spread among people who gather together for various purposes is illustrated by the very high Coronavirus infection rates detected amongst otherwise healthy members of professional sports teams who are shown to be infected only because it is a requirement of the job in the current circumstance. Otherwise, they would not know that they have the viral infection. Likewise, high rates of asymptomatic Covid-19 are now detected more frequently in young adults.

A mask wearing strategy has been accompanied by requirements of local governments to develop contact tracing. The concept is that if one person is diagnosed with the virus, that it is then likely that the point of origin can be identified (such as a party that was attended), and then the other people who were in attendance can also be tested, based on the idea that some of them were also infected at the same location. In absence of testing for those contacts, self-quarantine of all those present can be recommended, but that is difficult to enforce among people who are not showing symptoms, partly because of the duration of quarantine, still at about 10-14 days. Ideally, this tracing readily points to a particular "hot spot." Unfortunately, this procedure has been found to be relatively ineffective, as numerous cases could not be traced back to any known source or hot spot. The authorities emphasizing contact tracing are distressed that so many cases can't be traced anywhere, but that is most likely because there are too many opportunities for viral spread. The concept that universal mask wearing would limit the instances of spread to a very few spots that could then be pinpointed, and the individuals tested and quarantined, did not prove reasonable.

Young people, teens and young adults, have socializing as part of their natural process of mental development. By promoting "stay home" strategies that prevent individuals from gathering together and suggesting that any such physical presence between two or more people be at a distance and each with a mask is very unnatural, especially when carried out over a period of several months. The result is that gatherings do occur, and without either the distancing or the mask-wearing rules followed, as has been reported numerous times in the press coverage. Such behavior, that is, acting contrary to authorities' recommendations, is ordinary in this age group (not limited to this age group). Teens and young adults then bring the virus to older individuals, some of whom are susceptible to ARDS, which is deemed the most dangerous outcome. Likewise, older individuals with mild symptoms, can come into a group and spread the disease to younger ones.

Age Dependency of Coronavirus ARDS

Severe consequences of the Wuhan Coronavirus infection primarily involves ARDS, though post-infection stroke and heart attack also appear to contribute to the death toll. The reason for a strong age dependence, with very few instances of severe disease below age 50 and most of the severe disease occurring among those over age 69, may be that the Coronavirus spike, which serves as the attachment site of the virus to cells, connects to ACE2 cellular site (Angiotensin Converting Enzyme). It appears that ACE2 attachment sites are rare in the first decades of life, and then begin to increase, becoming substantial in the elderly. While this is certainly not the only explanation, it is one part of the process that has been suggested to be responsible for the correlation of severe disease with aging. The fact that the severe disease mainly occurs in people with existing health problems, such as diabetes, hypertension, and obesity, also puts the burden of Covid-19 on older people who tend to develop these conditions partly as a result of decreased physical activity with middle age and then in subsequent years. In fact, a large portion of the deaths attributed to Covid-19 have taken place among the elderly in various assisted living situations, including nursing homes and other such institutions, and people living at home cared for by family members and sometimes also by visiting nurses or other care givers. These individuals usually have limited physical activity, and display multiple disorders that seem to turn the coronavirus deadly. Children, teens, and young adults who suffer the severe symptoms of Covid might have a genetic background leading to higher ACE2 levels as well as certain underlying health problems.

One of the primary causes of death is a respiratory inflammation that involves intensive immune attack against Coronavirus infected cells; the inflammation produces a fluid congestion. The result is difficulty breathing due to both impaired rhythmic expansion of the lungs and impaired passage of oxygen through the inflamed tissues. An invasive procedure, using a ventilator, can improve the passage of oxygen, but unless the inflammatory process begins to recede, the outcome is unfavorable. Drugs used to treat the condition include steroids, which reduce the inflammation somewhat, and viral inhibitors, which reduce the virus activity so as to yield a lesser inflammatory response.

At time of this writing, the average rate of death per *confirmed* case of Covid has dropped markedly from 9% worldwide and 6% in the U.S. to just under 4% worldwide and just over 3% in the U.S. The estimates remain as before that for every confirmed case there are about 10 total cases, the other 9 not involving hospitalization and/or not getting tested or testing negative, which puts the deaths per total cases at around 0.3-0.4%, a figure that is increasingly used. This number is still about 4 times higher than for influenza, which is also a major cause of fatality in the elderly, but which has a vaccine widely used in that population; influenza deaths are estimated at about 0.1% of total cases and may be lower. The flu season as determined by the CDC was October 1, 2019-April 4,2020, and in the U.S. there were relatively few identified cases of Covid-19 and deaths from it recorded by April 4. During the 6 month period it was estimated that anywhere from 24,000 to 62,000 deaths occurred in response to acquiring the influenza virus.

Although ARDS is one of the main severe manifestations of Wuhan Coronavirus disease, it appears that there are symptoms that are not life threatening but which are characteristic of the disease. In particular, there are noted to be instances of loss of taste and smell for a period of time, often with headaches; gastro-intestinal symptoms may occur with diarrhea, nausea, and vomiting; when not progressing to ARDS, the respiratory manifestations include coughing and shortness of breath. Numerous strange symptoms have been attributed to the virus that are rare, yet occur often enough to suggest a direct causation from the viral infection.

Immune System

The immune system is extraordinarily complex. There are a wide range of immunological responses to a pathogen getting into the body. Whether a person has a strong or somewhat weakened immune system, the response of it is not very potent when the pathogen is a new one. This is because one of the immune system mechanisms of importance is its ability to maintain a "memory" of a past infection so that when the same pathogen returns the immune system springs into action with a set of responses that had to be worked out over time during the first exposure. This immune system memory is the basis for the success of vaccinations. A

vaccine gives a part of the infectious agent, enough for the immune system to develop a response, without giving the disease (vaccines can have parts of a virus, killed virus, or impaired live virus). A vaccine is keyed to the disease pathogen, so that when the virus comes along it is attacked rapidly, and the disease that the pathogen could cause does not arrive, even though the virus got into the body.

There are a wide range of substances claimed to "boost" the immune system, things like vitamins (especially C and D), antioxidants, and many herbs, including ginseng, ashwaganda, echinacea, garlic, and elderberry. While these may have an effect on susceptibility, the experience of a virus infection is dependent on whether or not one is exposed to the virus and whether or not there is an immune memory. The idea that a person won't get sick from these viruses because of taking some supplements remains unproven; however, continued use of these supplements may help reduce severity of disease if the infecting virus is more quickly or strongly inhibited at the outset. Initial research suggests that vitamin D may help protect against serious consequences of the Coronavirus infection and there are suggestions that zinc may aid in preventing the virus from attaching to cells (use of zinc is one strategy applied to prevention of common cold). The key to a successful immune response is to be found *primarily* among the fundamentals of being healthy. These include: a healthy respiratory system that is maintained by adequate physical activities to keep the mucous membranes working well; a nutritious diet that provides essential nutrients so as to have a full functioning immune response; minimizing disease-promoting conditions, such as having diabetes, heart disease, lung disease, etc., and when those are present, keeping them under good control; and having stress control regimens to respond to ongoing or newly arising stressful situations. Supplements and herbs may provide an additional protection but do not substitute for other means; their use may be especially valuable for the elderly, who have reduced immune functions as part of the aging process, but immune promoting herbs should probably be avoided after acquiring the disease so as to not further stimulate the immune attack producing impaired breathing.

Vaccines are as effective as they are successful getting an immune attack that disables the virus. Some viruses escape elimination by the immune system by integrating into cells in such a way that they can't be reached, and others mutate sufficiently to alter the surface structure to escape immune attack while maintaining capability to enter cells. Despite more than 30 years intensive work to get an effective HIV vaccine, that effort remains unsuccessful; the Coronavirus that causes the common cold, as well as other viruses that produce the same set of symptoms, have not been controlled by vaccination. Even where vaccines have been effective, such as influenza, they are only partially effective. Recently, Dr. Fauci cautioned that a vaccine for the Wuhan Coronavirus might be only about 50% effective; hopefully 60%. While highly effective vaccines can eliminate a disease if used widely enough, as in the cases of small pox and polio, and near elimination of chicken pox and measles, not all vaccines reach that level.

Chinese Medicine

As has occurred previously with epidemics in China, such as with SARS, traditional Chinese medicine (TCM), especially herbal medicine, has come into the picture. The level of effectiveness is not readily assessed, but the ideas about which herbs to try have been publicized. There are two dominant approaches:

1) Relying on well-known traditional prescriptions in their traditional form with slight modifications: this is the same method as used for most diseases identified by modern medical investigation, in which traditional formulas that address similar conditions are tried first. Thus, traditional doctors could not know about coronaviruses, but they are familiar with feverish diseases, lung disorders with shortness of breath, and any other symptoms presented by those with coronavirus infection. Sometimes new formulas are designed but they have the same appearance in terms of formulation strategy as more ancient formulas.

2) Relying on modern research into herbs which demonstrates that some of them have broad spectrum anti-bacterial and/or anti-viral action: often, but not always, these herbs have had some use in treating infectious diseases since earlier centuries, even though the physicians of the time did not have a full understanding of the pathogens involved, but sometimes the herbs were mostly used for other conditions and were revealed in the laboratory to have potential for anti-pathogenic activity.

The first method is represented in a paper compiled by John Chen and Lori Hsu with formula recommendations from China. The formulas reflect work done previously on pneumonia treatment. For example, in a 1989 report on Chinese herb prescriptions for senile pneumonia, a basic formula was described:

1989 Published Pneumonia Formula

Pin Yin	Common Name	Therapeutic Contributions
Huang Qi	Astragalus	Tonify qi to eliminate pathogens
Bai Zhu	Atractylodes	Tonify qi to eliminate pathogens
Yu Xing Cao	Houttuynia	Anti-pneumonia activity
Guan Zhong	Dryopteris	Anti-cold/flu activity
Zao Xiu	Paris	Anti-viral activity, reduces fever, resolves phlegm
Shi Gao	Gypsum	For fever
Ma Huang	Ma-huang	To ventilate lungs
Sang Bai Pi	Morus bark	Alleviate coughing/wheezing
Zi Su Zi	Perilla seed	Alleviate coughing/wheezing
Gua Lou Pi	Trichosanthes fruit	Moisten lungs, resolve sticky phlegm
Mai Men Dong	Ophiopogon	Moisten lungs, resolve sticky phlegm

Below are formulas from Chen and Hsu; these are decoctions of crude dried herbs; gram quantities are for a one day dose. The ingredients list, ingredient dosing, and formula designation is from the provided report; common names and comments from the current author, plus notations in brackets, have been added.

Prevention Phase, Pneumonia Prevention #1 [modified Jade Screen Formula]

Pin Yin	Common Name	Grams	Comments
Huang Qi	Astragalus	15	
Bai Zhu	Atractylodes	10	prefer dry fried
Fang Feng	Siler	10	
Guan Zhong	Dryopteris	10	not available in original form
Jin Yin Hua	Lonicera	10	
Chen Pi	Citrus	6	
Pei Lan	Eupatorium	10	contains pyrrolizidine alkaloids

[Note: by "prevention phase" this does *not* mean taking the formula long term to avoid getting the disease. This is intended for high risk situations and for initial exposure with early symptoms]

Influenza Phase, Flu Formula #1 [disease onset is evident; modified Pueraria Combination]

Pin Yin	Common Name	Grams	Comments
Ge Gen	Pueraria	15	
Ma Huang	Ma-huang	10	limited availability
Gui Zhi	Cinnamon twig	6	
Bai Shao	Peony	15	
Sheng Jiang	Ginger (fresh)	10	
Gan Cao	Licorice	10	
Da Zao	Jujube	10	
Jin Yin Hua	Lonicera	20	

[Note: according to the text provided, with headache, add Bai Zhi, Angelica, 15 grams; with dry scratchy throat, add She Gan, Belamcanda, 15 grams]

Influenza Phase, Flu Formula #2 [lungs are affected; modified Lonicera and Forsythia Formula]

Pin Yin	Common Name	Grams	Comments
Jin Yin Hua	Lonicera	10	
Lian Qiao	Forsythia	10	
Jing Jie	Schizonepeta	10	
Niu Bang Zi	Arctium	10	
Bo He	Mentha	10	
Gan Cao	Licorice	10	
Dan Zhu Ye	Lophatherum	10	
Lu Gen	Phragmites	15	
Huang Lian	Coptis	6	

Symptom Alleviation Damp Cold Formula #1 [Modified Magnolia and Ginger Formula]

Pin Yin	Common Name	Grams	Comments
Cang Zhu	Atractylodes, red	15	
Chen Pi	Citrus	10	
Hou Po	Magnolia bark	10	
Huo Xiang	Pogostemon/Agastache	10	
Cao Guo	Tsao-ko	6	
Ma Huang	Ma-huang	6	limited availability
Qiang Huo	Chiang-huo	10	
Sheng Jiang	Ginger, fresh	10	
Bing Lang	Areca seed	10	

Pneumonia Phase, Pneumonia Formula 1 [Modified Minor Bupleurum Combination]

Pin Yin	Common Name	Grams	Comments
Chai Hu	Bupleurum	24	
Huang Qin	Scute	9	
Sheng Jiang	Ginger, fresh	10	
Ban Xia	Pinellia	12	
Ku Xing Ren	Apricot seed	15	
Bai Dou Kou	Cluster	10	
Yi Yi Ren	Coix	30	
Dan Zhu Ye	Lophatherum	15	
Hua Shi	Talc	15	
Tu Fu Ling	Smilax	30	
Gan Cao	Licorice	10	

Pneumonia Formula 2 [Blended traditional prescriptions; more severe or advanced pneumonia]

Pin Yin	Common Name	Grams	Comments
Ma Huang	Ma-huang	10	limited availability
Ku Xing Ren	Apricot seed	10	
Yi Yi Ren	Coix	30	
Huang Lian	Coptis	6	
Ban Xia	Pinellia	10	
Gua Lou Pi	Trichosanthes fruit rind	10	
Cao Guo	Tsao-ko	10	
Zhi Mu	Anemarrhena	10	
Yu Xing Cao	Houttuynia	15	
Gan Cao	Licorice	10	
Bai Dou Kou	Cluster	9	

The document from Chen and Hsu list three more pneumonia formulas, not so practical to use here, so are not conveyed. I received a personal communication indicating that an accomplished TCM doctor in Beijing said that he has had some success with this disease using the traditional formula Ren Shen Bai Du San (Ginseng and Mentha Formula), presumably for the treatment of initial symptoms. This formula is traditionally applied to patients of weaker constitution (hence the inclusion of Ren Shen, ginseng, along with Gan Cao, licorice, to tonify qi) who are experiencing an acute respiratory disease. It has herbs that "dispel wind and regulate the surface," including Qiang Huo, Du Huo, Chuan Xiong, and Chai Hu (chiang-huo, tu-huo, cnidium, bupleurum, respectively) and herbs for phlegm-damp accumulation: Jie Geng, Zhi Ke, Qian Hu, and Fu Ling (platycodon, chih-ko, peucedanum, and hoelen, respectively).

The formula Shuang Huang Lian has been the subject of inquiries to ITM, so is presumably mentioned as a potential therapy elsewhere. This formula is described by an ITM article produced several years ago. The formula contains three herbs: Jin Yin Hua (lonicera), Huang Qin (scute), and Lian Qiao (forsythia), two of these herbs being central anti-infection agents in Yin Qiao San. Herbs and formulas that were recommended in China for SARS should be equally applicable for Covid-19. Differences between the recommendations above and those for SARS (http://www.itmonline.org/arts/sars.htm) may simply reflect the natural development of TCM in the modern era over the 17 years since that time. The new recommendations are not necessarily more effective, but reflect the input of different herbal specialists.

The second approach is illustrated by the following table that presents herbs that are deemed established antipathogenic agents by laboratory studies. The table below, which is taken from the article "Utilizing Traditional Chinese Herbal Medicine to Treat Infections," is posted at: https://www.itmonline-updates.org/uploads/1/0/0/8/100827748/infections.pdf

Pinyin	Common Name	Scientific Name	Part	TCM Herb Category
Bai Hua She She Cao	Oldenlandia	*Oldenlandia diffusa*	top	clear heat
Bai Jiang Cao	Patrinia or Thlaspi	*Patrinia villosa*	whole	clear heat
Ban Lan Gen	Isatis Root	*Baphicacanthus cusia*	root	clear heat
Chuan Xin Lian	Andrographis	*Andrographis paniculata*	rhizome	clear heat
Da Qing Ye	Isatis Leaf	*Isatis tinctoria*	leaf	clear heat
Hu Zhang	Hu-chang	*Polygonum cuspidatum*	rhizome	clear heat

Pinyin	Common Name	Scientific Name	Part	TCM Herb Category
Huang Bai	Phellodendron	*Phellodendron amurense*	bark	clear heat
Huang Lian	Coptis	*Coptis chinensis*	rhizome	clear heat, dry damp
Huang Qin	Scute	*Scutellaria baicalensis*	root	clear heat, dry damp
Jin Yin Hua	Lonicera	*Lonicera japonica*	flower	clear heat
Ku Shen	Sophora	*Sophora angustifolia*	root	clear heat, dry damp
Lian Qiao	Forsythia	*Forsythia suspensa*	fruit	clear heat
Pu Gong Ying	Taraxacum	*Taraxacum mongolicus*	whole	clear heat
Qing Hao	Ching-hao	*Artemisia apiaceae or annua*	top	clear heat
Xia Ku Cao	Prunella	*Prunella vulgaris*	top	clear heat
Yu Xing Cao	Houttuynia	*Houttuynia cordata*	fruit	clear heat, dry damp
Zi Hua Di Ding	Viola	*Viola yedoensis*	whole	clear heat

Only very few of these herbs appeared in the formulas listed above, mainly Jin Yin Hua and Huang Lian, also Lian Qiao, Yu Xing Cao, and Huang Qin. This list is hardly comprehensive, but illustrates some herbs considered to have broad spectrum of action.

ITM Formulations

ITM formulas are not intended for wide scale usage. They are produced in small amounts, intended for direct prescription by practitioners to their patients, mainly practitioners who have studied ITM literature, and they are accompanied by no consumer level information. Rather, they are intended to aid practitioners in the study of herbs and formulation strategies. Patients seeking herbs for prevention purposes should be encouraged when possible to use commercially available products that might be in large supply from numerous outlets. The formulas relayed by Chen and Hsu, minus unavailable items, which might be substituted, can be made from single herb extracts as well as from crude herbs made into decoction as done in China.

Nonetheless, for full disclosure, ITM formulations with anti-pathogenic herbs such as those listed in the table above include: Bidens 6, Isatis 6, Paris 7, and Patrinia 7 (these are Seven Forests formulas); Baicalcumin and Myrolea-B (these are White Tiger formulas); and Yin Qiao Jie Du Pian (Pine Mountain). Other formulas may be suited to treating pneumonia symptoms without having significant amounts of the anti-infection herbs listed above, such as Belamcanda 15 and Stemona Tablets (Seven Forests) and Qing Qi Hua Tan Pian (Pine Mountain). Immune enhancing formulas used for weakened patients include Astragalus 10+ and Viola 12.

Herb Formula for Prevention via Immune Enhancement

My recommendation for using herbs as a preventive for respiratory viral infections, including Covid-19, is based on the astragalus-atractylodes pair (Chinese: Huang Qi, Bai Zhu) that has been relied upon for centuries in the practice of Chinese herbal medicine. At the time of the development of the formulas, viruses were unknown and the immune system was also unknown, but the weakness that leads to easy susceptibility to pathogenic influences was recognized. Thus, this pair is included in the prescription relayed above for senile pneumonia. The conceptual framework is that astragalus controls the "surface" to protect against invasion of pathogen and atractylodes strengthens the interior, specifically the spleen, to bolster the defenses. Physicians of ancient times sometimes depicted this approach in military terms, with an outer guard to seek out incoming invaders and reserves held behind for replacement and supply, potentially a major reinforcement. While astragalus and atractylodes are both deemed tonics for the spleen qi, the key role of astragalus is its influence on superficial defenses; the role of atractylodes is to unencumber the spleen that may suffer from stifling dampness, as often occurs in the modern setting (high level of food/beverage intake, low level of physical labor). This dampness does not necessarily cause symptoms of fluid accumulation and discharge, but, rather a hesitancy in the spleen's functional responsiveness.

There are numerous existing TCM formulations that can be chosen which include this herbal pair, and I recommend three selected from among those, based on their applications in modern practice of TCM and Kampo (the Japanese version of the traditional Chinese medical system). These can be used for preventive strategies in their original form or modified by the practitioner: **Bu Zhong Yi Qi Tang, Shi Quan Da Bu Tang, Yu Ping Feng San**. These are well established as formulations effective for conditions corresponding to weak immune functions.

My recommendation for the current concerns about Covid-19, but also during the influenza season, is to utilize these in the form of decoctions (the two "Tang" formulas are normally produced that way; Yu Ping Feng San is traditionally first ground to powder and then boiled for a short time, this is the meaning of San). However, the decoction method of herb administration is impractical for most people in the west, so given the circumstances, I recommend to replace those with dried decoctions ("granules" or "powders" as they are often depicted). The reason for recommending this form (the decoction, fresh or dried) is that one wishes a rapid effect, a strong effect, and the duration of therapy is hopefully not prolonged (this will depend on the course of the epidemic and the development of a vaccine), so reliance of convenient but lower dose pills, capsules, and tablets can be deferred for other uses, such as recuperation after becoming ill. The taste of this mixture is not unpleasant for most users.

Here is the formula that I have designed for this prevention method:

Astragalus-Houttuynia Combination (Qi Huan Bao Hu Zhe Tang)
Huang Qi; Astragalus: 30
Bai Zhu; Atractylodes: 20
He Huan Pi; Albizzia: 20
Yu Xing Cao; Houttuynia: 20
Gan Cao; Licorice: 6
Chen Pi; Citrus: 4

Because Yu Ping Feng San is such a small formula with the two key ingredients, this new formula can be viewed as a modification of that traditional prescription. The deleted herb, siler, aka ledebouriella, Fang Feng, is not essential for this application. The basis for the original inclusion of the herb in the traditional formula is to counterbalance the action of astragalus. Astragalus is viewed as an aid to closing the pores that serve as entry points for evil, while siler is utilized to open pores, to let out the pathogenic influence. When the person has not yet developed the disease, siler is not necessary. As Qing Bowei commented: "if there are no superficial pathogens at all, administration of siler will actually provide an opportunity for pathogens to attack the body." After illness develops, the situation will be different. While Qing's explanation is somewhat exaggerated, it reflects the concept that the pore opening activity gives the pathogen an entry point.

Albizzia is traditionally administered for anxiety, and this formula is especially suited to the "worried well" who are not sick, but are quite worried about potential exposure to the disease and development of an infection. In modern studies, albizzia is known as an immune enhancing herb with increasing investigation for use to potentiate vaccine-induced immune response against a virus. This is the essentially the same as the initial response of the immune system to invasion of a pathogen.

Houttuynia is an herb traditionally used for lung infections. It has been researched recently for effects on influenza (including the swine flu, H1N1 variant), Zika virus, Norovirus, Herpes virus, and others. The reason for inclusion here, in a formula for those without the virus, is that it may help *prevent* viral entry into cells, in case an exposure occurs but has not yet taken hold.

Licorice, often used in formulas to harmonize diverse ingredients, also serves here to boost the qi along with atractylodes and astragalus, and to enhance the virus inhibiting effect of houttuynia. Citrus is added to address concerns about qi tonification that may be administered when there is some central stagnation.

An essential aspect of using this formula for a protective action is to get an adequate dosage of all the herbs. The figures given, which serve as percent units, are also approximately correct for grams per day. For most granule lines, these amounts will then translate to about an 18 grams per day quantity, and I would suggest a minimum of 6 grams per day. In the range of 6-18 grams per day, I would recommend the higher doses when there is deemed a higher risk of infection due to possible exposure, a higher body weight, and/or a more debilitated immune system (weakness as a result of prior illness, injury, or with age). It is understood that some people will prefer the minimum dose out of concerns for cost, unfamiliarity with taking Chinese herbs, and prior experience of being "very sensitive" to herbs.

Formula for non-hospitalized symptomatic patients

The estimate that 80% of those infected with Covid-19 do not require hospitalization, in fact, may have no symptoms, indicates that hospital resources can be reserved for the 20% having severe symptoms. For those with symptoms such as fever, congestion, and some shortness of breath, even chest tightness, treatment with Chinese herbs may be helpful. The formulas described by Chen and Hsu (they have since relayed additional examples) can be chosen. I have designed a formula for the disease condition where it has not progressed to pneumonia (shortness of breath can indicate a mild pneumonia, often called "walking pneumonia" in the non-Covid cases, and such mild cases can resolve within a few days or weeks).

The main principle of therapy for this treatment phase is aptly described as "to ventilate the lungs." One of the favored herbs for this purpose is Ma Huang. This herb has been taken out of use by abuse of it in non-TCM applications. However, there are other approaches to this strategy that I think are more suitable. Specifically, I am recommending the herbal pair Chai Hu (bupleurum) and Jie Geng (platycodon). This pair is found in certain traditional prescriptions such as Chai Ge Jie Ji Wan, which is used for a disease constrained in the muscle layer, and in Xiao Chai Hu Tang to which Jie Geng is added to treat acute bronchitis. This pair is in Zhu Run Wen Dan Tang, for feverish disease with discomfort in the chest.

Bupleurum-Platycodon Combination (Chai Jie Shi Fei Tong Qi Tang)

Chai Hu, Bupleurum: 20
Jie Geng, Platycodon: 20
Gua Lou, Trichosanthes fruit: 20
Huang Qin, Scute: 20
Bo He, Mentha: 10
Sheng Jiang, Fresh Ginger: 6
Gan Cao: 4

Dosing information is the same as for Astragalus-Houttuynia Combination except that it is recommended that the higher dosage range be used, which would be 12-18 grams. Gua Lou (or Gua Lou Pi) is frequently utilized by Chinese physicians for lung disease with sticky phlegm.

Post-Infection Recovery

For many Covid-19 patients, recovery proceeds naturally, but depending on severity of the disease symptoms, the recuperation period can be prolonged. Herbal therapies may aid recovery. The main concern is any persisting damage or irritation to the lungs, especially if there is the potential to develop lasting effects on lung elasticity. The herbs are directed at alleviating coughing, soothing the lungs, and avoiding heat and dryness that may be secondary to the disease effects.

Fritillaria-Loquat Combination (Bei Mu Pi Pa Ning Sou Tang)

Bei Mu, Fritillaria: 15
Pi Pa Ye, Loquat: 15
Sang Bai Pi, Morus bark: 15
Zhe Mu, Anemarrhena: 15
Wu Wei Zi, Schizandra: 10
Mu Xiang, Saussurea: 10

Fu Ling, Hoelen: 10
Ju Pi, Citrus rind: 5
Gan Cao, Licorice: 5

In cases where there is prolonged fatigue, a pill formulation with tonifying properties, can be additionally applied in accordance with individual patient needs. The disruptive effect of severe lung disease can result in qi deficiency as a primary concern, but this disease especially affects the elderly who may benefit from liver/kidney tonification strategy.

Treating Patients at the Clinic

It is advised here that patients with suspected or known coronavirus infection (Covid-19) not be brought into the typical acupuncture or natural health care center due to potential for the virus to infect the practitioner(s), staff, and other patients, especially patients having significant disorders that could make the viral infection especially harmful. The situation may change if there is widespread occurrence of the virus, as is the case with influenza (still, cautions should be in place for patients with known influenza), but while Covid-19 remains a serious infection for a small percent of the population, it is better to have the patients go to a standard medical facility which has capabilities for managing transmission of infections. Patients with coronavirus should be encouraged to self-quarantine if it is not necessary to seek professional medical attention.

Appendix 1. Coronaviruses: 50 years of investigations

Viruses were discovered about 130 years ago and found to infect bacteria, plants, and animals, including humans. Coronaviruses first became a subject of intensive attention by researchers about fifty years ago, primarily because these viruses were responsible for disease in livestock, including cattle, pigs, chickens, and turkeys; the primary manifestation was diarrhea (viral enteritis), mainly in young animals; these viruses were also found to affect dogs and humans. It appears that the primary reservoir of corona viruses, that is, the animal population that harbors a wide range of them, is bats. Most recently, five new corona viruses were discovered in African bats.

One of the viruses that cause the common cold is a corona virus, manifesting as an upper respiratory infection rather than an intestinal disorder. Coronaviruses mutate easily, but the one of concern today, a betacoronavirus, has shown limited mutations since the epidemic began, which provides hope for an effective single vaccine. There have been two outbreaks of new coronaviruses in humans in recent years: SARS (Severe Acute Respiratory Syndrome) and MERS (Middle East Respiratory Syndrome). These both cause life-threatening lung distress. SARS is believed to have originated in bats, transferred to a civet that infected a human; MERS is thought to have originated in bats, transferred to a camel that infected a human. Although alarming, these two epidemics came under control and are not a cause of immediate concern at this time, but they do demonstrate the potential for emergence of new ("novel") coronaviruses from animals that affect humans (zoonotic disease). The SARS epidemic of 2002-2003 raised considerable concerns and resulted in research efforts to find various strains that might become a threat.

Emergence of Viral Diseases in Livestock and Humans

A major route for development of new diseases of livestock and humans is from wild animals, and especially birds and other flying animals, like bats, which are increasingly leaving natural habitats due to deforestation and interacting with domesticated animals as humans push closer to previously remote ecosystems. Some viruses have emerged, faded out, and re-emerged as the environmental conditions shift. The pursuit of wild animals as food and medicine puts humans and domesticated animals into contact with such viruses. Some wild animals are brought into specialty food markets, often referred to as wet markets, which further expose humans to viruses. In an article about such viruses, author Jagadeesh Bayry observes the range of recent animal to human viral events and gives their dates:

> Last few decades have witnessed a sharp rise in the number of emerging and reemerging viral diseases of livestock and human. Some of the examples include hemorrhagic fevers caused by diverse viruses such as Marburg (1967), Lassa (1969), Hanta (1970), and Ebola (1976); encephalitis and respiratory diseases caused by Henipaviruses (Hendra in 1994 and Nipah in 1999); respiratory diseases caused by severe acute respiratory syndrome (SARS 2002), Hanta (1993), middle-east respiratory syndrome (MERS 2012) and influenza (A/H5N1 in 2005, A/H1N1 in 2009 and A/H7N9 in 2012) viruses; reproductive syndromes caused by Schmallenburg virus (2011); acquired immunodeficiency syndrome caused by HIV (1981) as well as hepatitis C virus (1989) and a bunyavirus associated with fever and thrombocytopenia (2009). Importantly, many of these viruses, including influenza, Hendra, Nipah and corona are of zoonotic importance. In addition, several historically well-known viral diseases such as foot and mouth disease, rabies, chikungunya, dengue, Rift Valley fever, yellow fever, West Nile fever and enteroviral encephalitis are reemerging and certain other viral diseases such as bluetongue and peste des petits ruminants are crossing their traditional boundaries and expanding their territory. Emergence of new serotypes and variant forms of viruses add additional level of complexity

With regard to corona viruses and bats, a researcher in Myanmar observed:

> The recent emergence of bat-borne zoonotic viruses warrants vigilant surveillance in their natural hosts. Of particular concern is the family of coronaviruses, which includes the causative agents of severe acute respiratory syndrome (SARS), Middle East respiratory syndrome (MERS), and most recently, Coronavirus Disease 2019 (COVID-19), an epidemic of acute respiratory illness originating from Wuhan, China in December 2019. Viral detection, discovery, and surveillance activities were undertaken in Myanmar to identify viruses in animals at high risk contact interfaces with people. Free-ranging bats were captured, and rectal and oral swabs and guano samples collected for coronaviral screening using broadly reactive consensus conventional polymerase chain reaction. Sequences from positives were compared to known coronaviruses. Three novel alphacoronaviruses, three novel betacoronaviruses, and one known alphacoronavirus previously identified in other southeast Asian countries were detected for the first time in bats in Myanmar. Ongoing land use change remains a prominent driver of zoonotic disease emergence in Myanmar, bringing humans into ever closer contact with wildlife, and justifying continued surveillance and vigilance at broad scales.

Appendix 2. Wuhan, China Outbreak

During autumn 2019, probably in late November, a new coronavirus for the human population appears to have been transmitted from a wild animal held in captivity. A connection to a seafood market that serves Wuhan City of Hubei Province, China, has been determined to rely predominantly on one worker who had what she thought was the flu, and who continued working while being sick, transmitting the virus to dozens of people over a period of about three weeks. She is not considered patient "zero" (the first person to have been infected). One suspicion is that a wild animal being sold at the market was the source of the Coronavirus. However, Chinese investigators also pointed to a Chinese Centers for Disease Control research center and another research center devoted specifically to study of viruses, Institute of Virology, as a possible starting point. In an earlier version of this article, I indicated that origination from one of the labs was not impossible but unlikely, as will be explained below. Reported efforts of the Chinese government to eliminate viral samples that can be used in tracing the origin of this outbreak gives some support to the idea that a laboratory transfer to humans took place, since a controlled environment origin, like a virus lab, would imply greater liability and raise the specter of technological dysfunction. An ophthalmologist working in Wuhan observed several individuals displaying the disease symptoms and provided an alert at the end of December (he later succumbed to the disease). About 2/3 of the patients showing this new disease, manifesting in the most severe form as pneumonia, had been to the wet market. However, it took several more days before authorities in China acknowledged that there was an epidemic developing and by that time several thousand individuals had become infected, some traveling to other parts of China. Due to the high level of international travel,

infected persons went to other countries and served as the starting point for new outbreaks. Based on statistics for *known* cases of this coronavirus there are at this time close to seven million people worldwide who have already been infected, reflecitng a fraction of the total cases. Good resources for tracking cases and other relevant data is: https://www.worldometers.info/coronavirus/ and https://coronavirus.jhu.edu/map.html. The crude death rate (number of deaths divided number of confirmed cases) has stabilized at about 3-4%.

Based on analysis of the virus RNA, the origin of this virus is confirmed to be a bat; there is about a 96% correlation of the nucleotide strand with a bat virus. It has been suggested that there may have been an intermediate animal vector, thus from a bat to another animal to humans; one suggestion for the intermediary was a pangolin (armadillo). The virus is similar to the one that caused SARS, though only about 80% of the RNA matches the virus of the 2002 SARS emergence. Once the virus is transmissible from one human to anoter by ordinary means, mainly droplets of mucus that contain virus particles, the virus can spread rapidly. The virus transmits from human to human by the same means as the common cold virus, which is also by the same means as influenza. It appears that the virus that emerged from Wuhan has somewhat easier transmissibility that the prior respiratory corona viruses.

The Wuhan coronavirus, originally dubbed 2019-nCoV and then as SARS-CoV-2, produces the disease designated Covid-19, which characteristically yields a fever (in about 80% of hospitalized cases) and tightness of the chest, progressing in some to a severe pneumonia. Pneumonias are potentially fatal, as they impair lung function by filling alveoli with fluid, reducing oxygenation of the blood. Although only a small fraction of those infected develop pneumonia, with Covid-19, the severity of pneumonia symptoms can be extreme. The mechanism of lung inflammation appears to be primarily through stimulation of IL-6 (interleukin 6, one of many cytokines, this one being pro-inflammatory), an immune response to the infection.

The presence of comorbidities (other serious health problems) is what usually turns an acute and temporary infection by the coronavirus into a fatal outcome; this is the same situation as occurs with influenza, a disease that causes unpleasant symptoms most of the time, but in people with other health problems can cause death. However, Covid-19 may be especially damaging to people with metabolic syndrome, a condition characterized by a combination of obesity, diabetes or prediabetes, and hypertension.

To put the Covid-19 epidemic in perspective, statistics for influenza are often applied: in the U.S. influenza strains in the 2018-2019 season were estimated by Centers for Disease Control to infect about 34 million, with over 34,000 deaths, and some influenza seasons yield double those figures. The influenza death rate would be much higher were it not for a reasonably effective vaccine that is especially given to individuals at risk for fatal outcome, such as the elderly. A major difference between managing influenza patients and Covid-19 patients is that while hospital personnel are vaccinated annually against flu, they are completely susceptible to the new corona virus; further, the pneumonia affiliated with Covid-19 can lead to death quickly, in two to three days, despite life-saving attempts that can extend that time to two to three weeks. This situation forces health care providers to spend extra time and put extra attention to avoiding becoming ill themselves, and thus unable to treat patients (or worse, becoming one of the fatalities), and also involves a very high demand for intensive care with use of ventilators to save patients. As of this writing, the Wuhan corona virus has killed about 160,000 Americans.

Wet Markets and Virology Labs

When we, in the west, go to a market to buy food, the market is "dry." The "wet work" if present at all, is done in the butcher's section where animals already killed elsewhere, such as cows, pigs, sheep, and poultry, are cut up into different cuts of meat. A lot of modern markets, though, just get deliveries of packaged products from elsewhere. There are some wet markets in the U.S., which are seafood markets. The place is literally wet, with melting ice, and it is common for the seafood to be chopped up right there, especially in the small markets that are located along the boat docks. The sea food may still be live or recently killed. But, the wet markets of East Asia, are a different thing altogether. Aside from the seafood section, there are other sections, and the one of special concern here is the exotic animals section. These exotic animals may be

brought into the market live, slaughtered onsite, and, if need be, cut up, skinned, or otherwise made ready for the customer. Some of these exotic animals are endangered species, and although there has been a major crackdown in recent years, it was common to find ocean turtles in such markets as an example of contraband. Some of the exotic animals are raised at ranches; others come from wild collection; these may appear side by side. For a long time in the development of communist China, people would be encouraged to gather certain animals from the environment if they were thought to be present in too large an amount, so people became used to seeing a variety of wild life utilized for food. But, most of the exotics in these wet markets are there because people think they have special health benefits. This concept has an overlap with TCM, more on the dietary and folk medicine side, but these animals are not being consumed because their taste is so wonderful. To the contrary, taste isn't the issue, it's the purported health benefits. Whether these claims of benefit could be verified remains unknown, but this is not just the idea that wild animals compared to raised ones or even the raised ones that are "free range" are healthier because they have a better balance of fats; this is about the lore of medicinal values attributed to hundreds of animals. Bat droppings, called Wu Ling Zhi, have been a frequently employed medicinal agent in treatment blood stasis syndrome.

An argument against the wet market being an origin point for the Wuhan corona virus is that people don't recall seeing any bats for sale; the counter argument is that there could have been an intermediary animal source; further, the virus may have been transmitted somewhat earlier, with people not aware of animals present previously, and the infection could have been brought by a person, such as someone who handles wild animals, who became infected elsewhere, and went to the market to present other animals for sale. So, this type of origin from humans interacting with animals used for food and health values, is a possibility.

Virology laboratories have been under development for decades and depend upon a highly refined containment strategy. The Institute of Virology in Wuhan is sometimes referred to as the State Key Laboratory of Virology, part of the Academy of Sciences. It is reported to be a level IV facility, which has the strictest containment methods of any such research facility, because of working on very dangerous pathogens. Investigation of corona viruses can be among the subjects, especially because of what happened with SARS. Such labs are present in several countries, and this particular lab has had interaction with virologists working in the U.S. and France. A report in 2018 indicated concern about the dangerous work done there as well as the small number of well-trained experts; the latter was presumably resolved, though there is no public documentation one way or the other. The people who work in such virology facilities are in danger of being personally infected and the facility itself presents a danger of having a virus get out into the population, as may have happened here. The technologies involved for containment have been available for decades. Still, failures can occur, and such failures usually result from a multiplicity of careless actions. If, for example, a lab worker became infected, that could cause the epidemic just the same as if someone picked up an infection at a wet market or in collecting wild animals. A laboratory failure would display an inability to control dangerous situations, much as occurred with the nuclear accident at Chernobyl. The Director of the Virology Lab and the researcher who specializes in bat viruses (the "bat woman", Shi Zhangli) have strongly denied that this laboratory could have been a source of the pandemic virus.

The virology labs perform important functions, in that they catalogue existing viruses, which are numerous, produce DNA or RNA sequences, computer images of the virus surface structure, and evaluations of how to produce vaccines. A concern that always needs attention is the possibility of researchers pursuing technologies that are newly developed without adequate analysis of potential adverse consequences. While new viruses are not routinely generated at such virology labs, one of the new technological advances is utilizing a virus (in this case, not a corona virus) that has been modified to attack human cancer cells, such as those that cause brain cancer, for therapeutic purposes.

This Wuhan Virology lab has been involved in the study of the current pandemic. Ordinary research labs following more limited precautions have been able to obtain viable virus samples for testing of drugs, herbs, and physical impacts on viruses, such as the one that caused SARS. Level IV labs are especially involved in analysis of new viruses.

How Covid-19 Got into the U.S. community

Action was taken early on to block entry into the U.S. of people who had been to Wuhan, or to Hubei Province, or to China generally as the location of the primary infection site enlarged. Some individuals were brought under careful quarantine conditions to the U.S. for care here, and those patients were known, monitored, and contained. Up until end of February, all the known U.S. cases were either those brought here intentionally or those who were determined to be infected at time of arrival to the U.S., with a couple of exceptions of spousal transmission (e.g., a woman came from the Wuhan area to the U.S. and was known to be infected, but her husband, who had not been to China, became infected by contact with her). Then, end of February, a number of instances of viral infection with no known connection to being at a location where the virus was established (such as China) or to being with one of the known or suspected infected persons were detected. How did people get into the U.S. with the virus so as to infect others? Entries of people exposed to the virus in China likely continued throughout January and then, at a slower pace, into February. As importantly, while restrictions for people coming from China came early, visitors from Italy, which was developing as an infection hot spot, continued to arrive, especially to New York City. Thus, a few infected individuals, without fever at the time, got by the barriers that were quickly put in place, and they were then able to infect others who could then infect others. Since the disease condition can be very mild, these individuals might have no knowledge that they have Covid-19, and would not have gotten tested. Further, testing got off to a late start in the U.S. due to procedures for test development and deployment that were unsuitable; these included unnecessary regulatory barriers and a failed initial manufacturing process whereby the first batches of tests couldn't be used. A rapid test was not developed until end of March. At time of this writing, testing has become far more routine, but the initial delay made it difficult to monitor the transmission of the disease.

Appendix 3. Transmitting the Virus among Humans

Viruses are not living organisms. They are relatively small segments of genetic material (DNA or RNA; SARS-CoV-2 is an RNA virus) encased in a protective and an exoskeleton of proteins (glycoproteins), often with a lipid coating. Viruses are entirely dependent on living organisms to reproduce. The exterior portion of the virus particle has not only a protective action for the encased genetic strand, but also contributes to aiding the genetic material getting into certain cells. Coronaviruses are so named because they have an appearance that is likened to a "crown," the type that has spikes. It is proposed that in SARS-CoV-2, the spike attaches to an ACE2 (angiotensin converting enzyme) receptor in respiratory cells (the receptor is also found in intestinal cells and that may account for some of the reported cases of diarrhea). Once inside a cell, the genetic material can be reproduced with the help of the cell's own machinery for making its required substances: copies of the gene strands and encasing proteins. After making lots of replicas of the virus, these are ejected from the cell, often just exploding the cell, picking up lipids on the way out, and then those replicas can repeat that pattern upon encountering another cell of the same individual or a separate individual. An immune system response eventually controls the virus, at least, if the virus and immune attack does not kill the host.

Respiratory system viruses are often transmitted by a common route: the viruses are shed into the mucus and emitted into the air and/or onto a surface, then transferred to another person. To gain entry into the body to begin an infection and generate the disease, the respiratory virus gains entry into the nose, eyes, or mouth, though oral transmission may be less effective due to protective activities within the oral cavity.

The two principle routes for infection are direct transfer and secondary transfer. A direct exposure is exemplified by sneezes and coughs that spread tiny droplets of mucus into the air and those may be breathed in directly (a consideration for wearing of masks) or may land on a person who then transfers it to a site of entry into the body. An indirect exposure is where such droplets land upon a surface from which the virus can gain access to the next individual. For example, the hand of an infected person touches their nose or eyes or face, picks up some virus containing mucus; this is then transferred to another person (for example, by shaking hands) or to a surface such as a door handle, which is then touched by another person, and from the hand of the recipient of the virus, it may then go to the nose, eyes, or face, and make its way through natural processes to the mucous membranes, and begin its reproductive cycle. A person can sneeze into a tissue or

handkerchief, but if any of the mucus gets onto the hand in this process, the virus can then be transferred. The ordinary activity of talking can transmit some virus into the air from an infected person.

Most viruses need to have a moist condition to be viable. Therefore, once some virus-containing bit of mucus dries out completely, the virus is no longer a threat. So, surfaces are temporarily infected and if left alone to dry, become safe to contact. The survivability of respiratory virus on surfaces varies depending on the nature of the surface, temperature, light exposure, ambient moisture, and the particular viral characteristics. For most of the viruses, they will become non-viable within hours of drying out. Tests of Covid-19 indicate survivability on surfaces for 1-3 days.

A program of "social distancing" has been developed, in which people are asked to remain at least six feet apart. The benefit of this is often misunderstood. If people stand six feet apart, but stay in place for a long time, the virus can still be transmitted. The six foot rule works for short term interactions. It is the distance at which most expulsion of virus-containing mucus does not quite reach.

So, here are the instructions for not getting an infection (common cold, influenza, Covid-19):

- If you are sick, don't go out in public, stay home. If you can't catch a sneeze or cough in a tissue, handkerchief, etc. because you don't have the chance to do so, try to catch it in your elbow: that is, try to not allow what comes from your mouth and nose to go to the air or to your hand.
- If you are not sick, and want to avoid getting sick, minimize being in crowded places (where an infected person is likely to be among the people present) and be careful about touching surfaces that you can avoid.

These two recommendations, which are a limited type of quarantine, are accompanied by the primary rules:

- Wash your hands frequently, and use soap and water. Anti-infection solutions, such as made with a high concentration of alcohol, can also be used with good effect.
- Don't touch your face. It is normal to touch one's face for a variety of reasons and often done without thinking about it. Attention must be given to avoid doing so. If necessary to do so, wash up first or use a clean cloth or other material to intervene between hands and face.
- As described below, a mask may be used to avoid breathing in viral-laced droplets, but only if used properly for a short duration (otherwise, it can make the situation worse rather than better).

The skin of your face is not going to be permeable to the virus; the concern is that if there is any moisture present, the virus can migrate to its main entry points, such as nose and eyes, even if those areas are not touched directly, though inadvertent hand movements are still a major cause of transference to the body.

This advice is intended both for protecting oneself but especially for protecting others. Your consideration of the impact on others should be very important. A virus like Covid-19 may have minimal impact on you, but could have a major impact on another person who gets the virus from you and who has other health problems that turn this infection into a life and death struggle. Also, you do not need to be sick to transmit the virus: virus containing fluid can get onto you and you can transfer it to someone else, and you might never get the infection.

As described in the main text of this article, the wearing of masks has become a major part of the effort to control the virus, but while the method has a certain effectiveness while masks are worn, because they are not worn consistently, they have limited overall impact on disease spread. The combination of methods can help slow the spread of the virus while not stopping it entirely as had been hoped earlier in the experience of the pandemic.

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