a multicellular organism using a resonant acoustic and/or acousto-EM field probe. For example, as shown in Figure 23, a hand-held probe is fitted with an EM radiation generating device, as currently known to those skilled in the art. A predetermined EM radiation field (frequencies, harmonics, amplitude, mode, shape, etc.) replicating the acousto- EM signature representing the intrinsic dissipation pattern of a particular virus, is delivered to a predetermined portion of the organism, from the hand-held probe. For example, in a person afflicted with an upper respiratory tract infection (a "cold"), the treatment is delivered through the skin over the nose, throat, and sinuses, reversing the intrinsic energy dissipation pathway of the rhinovirus and inducing resonant acoustic oscillations which disrupt the rhinovirus.

Example 2

Disruption, Augmentation, Detection and/or Identification of Micro-organisms

Any micro-organism, such as bacteria, as well as structure and molecules contained or associated herewith, may be augmented, disrupted, detected and/or identified *in vitro* or *in vivo* using the methods of the present invention. Bacteria include, but are not limited to, those associated with animals, man, avians, reptiles, amphibians, insects, aquatic like, plants, fruit, soil, water, oil, fermentation processes for food production, and the like. In one embodiment the bacteria include but are not limited to *Streptococcus sps., Staphylococcus sps., Hemophilus sps., Neisseria sps., Treponema sps., Salmonella sps, Shigella sps, Escherichia coli strains, Corynebacteria sps., Bordetella* sps., *Chlostridrium sps., Rickettsia sps., Chlamydia sps, Brucella sps., Mycobacterium sps.,Borrelia sps., Mycoplasma sps., Lactobacillus sps.,* strains thereof and the like. Human illnesses caused by bacteria include pneumonia, skin and wound infections, heart valve infections, gastroenteritis, syphilis, gonorrhea, the plague, urinary tract infections, lyme disease, tuberculosis, cholera, typhoid fever, anthrax, tetanus, and gangrene.

Fungal infections include athlete's foot, ringworm, vaginal yeast infections, oral thrush, histoplasmosis, and cryptococcus.

Diseases in animals caused by bacteria, fungi, protozoa and worms are similar to those in humans. Similarly, a wide range of micro-organisms infect plants, and even other micro-organisms are deemed to be beneficial (i.e. bakers yeast.).

Bacteria are first classified by staining characteristics as either Gram positive, or Gram negative. Bacterial response to staining is determined by the structure of the cell wall. Next bacteria are further classified by shape as either cocci (spherical) or rods (cylindrical.) Beyond that, the classification schemes generally involve various biochemical reactions.

Bacterial cell walls are composed of rigid peptidoglycan (mucopeptide or murien), a mixed polymer of hexose sugars (N-acetylglucosamine and N-acetyl muramic acid) and amino acids (the structural units of proteins, see below). As such, the cell walls are crystalline structures and are subject to vibrational effects from the use of acoustic energy. Thus bacteria are susceptible to augmentation, identification and detection, or disruption by resonant acoustic frequencies matched to their shape (sphere or cylinder), size, and composition. In addition, various organelles contained within the bacteria structure are also susceptible to specific resonant acoustic frequencies (i.e., pili, plasma membrane, flagellum, cytoplasmic inclusion bodies, basal bodies, capsule, spores, etc.). Finally, the compounds comprising the structure itself (crystalline proteins, etc.) also have unique resonant frequencies.

Fungi, protozoa, parasites, and worms are similar to bacteria in that the organisms are susceptible to the effects of specific resonant frequencies based on the size and shape of the entire organism, the size and shape of organelles making up a part of the organism, and the resonant characteristics of specific biochemical compounds making up the organism.

Any fungus, including yeasts, molds and mushrooms, protozoan, parasites or worms, as well as structures and molecules contained or associated therewith, may be augmented, disrupted and/or detected *in vitro* or *in vivo* using the methods of the present invention. These organisms include, but are not limited to those associated with animals, man, avians, reptiles, amphibians, insects, aquatic life, plants, fruit, soil, water, oil, fermentation possesses for food production, and the like. In one embodiment, these organisms include but are not limited to *Crypto sporidia sps., Aspergillus sps, Trichophyton sps., Saccharomyces sps, Blastomyces sps., Coccidioides sps., Paracoccidioides sps., Penicillium sps., Rhizopus sps., Mucor sps., Neurospora sps., Microsporum sps, Streptomyces sps., Epidermophyton sps., Toxicara sps., Ascaris sps., Echinococcus sps., Giardia sps., Plasmodium sps., Trypanosoma sps., Schistosoma sps., Bruglia sps.,* strains thereof and the like.

At low acoustic and/or acousto-EM power inputs such as below 1×10^{-5} W/m^2, the micro-organisms will be augmented in function and will emit a characteristic acoustic and/or acousto-EM signature which can be used to detect and diagnose the presence of the micro-organisms. At higher power inputs, the organisms will be disrupted and killed. In addition to the structures of bacteria, fungi, protozoa, and worms being susceptible to the vibrational resonant effects of acoustic and/or acousto-EM energy, they may also function as piezoelectric structures, intrinsic dissipation, acoustoelectric, and magnetoacoustic structures.

The present invention takes advantage of the composing parts of structures, or the entire organism of bacteria, fungi, protozoa, and worms for the purpose of augmentation, identification, and/or physical disruption of the micro-organism structures using acoustic and/or acousto-EM energy at specific resonant frequencies, and the piezoelectric, intrinsic dissipation, acoustoelectric and/or magnetoacoustic properties of any and all structures involved, either alone or in combination with a resonant acoustic field.

Unlike treatment in the prior art using ultrasound, the present invention uses specific resonant frequencies, which can be used to treat a multilayer organism. The invention also has the potential to augment the functional activity of micro-organisms deemed beneficial such as baker's yeast, wine yeast, lactic acid bacteria (wine and cheese,) petroleum yeast, and microbes producing specific amino acids, antibiotics, enzymes, or other chemicals. The functional activities may include growth, metabolism, oxidation or reduction activity and the like.

In one embodiment, the present invention allows the resonant acoustic and/or acousto-EM frequencies of micro-organisms to be determined *in vitro* as shown by the apparatus described in Figures **12** and **24 A & B**, including any and all embodiments, with transducers designed for lower frequencies in the MHZ range (as provided commercially by Matec Instruments). For example, in a meat packing plant concerned with the contamination of beef by bacteria, in particular, *E. coli*, a similar device can be used to screen the meat for bacteria, in a relatively short time span when compared to conventional culturing methods. First a swab of the meat surface is taken, and placed into a sterile test tube containing sterile saline at physiologic pH. A predetermined amount of the solution is pipetted onto a standard test disc, which is clamped between two transducers. Resonant or resonant harmonic acoustic frequencies are scanned for in the test sample, thereby screening for the presence or absence of potentially harmful *E coli* bacteria. Inspection of meat is done more efficiently and reliably than by current methods.

The present invention also allows the resonant acoustic and/or acousto-EM fields of micro-organisms to be used to augment these biologic organisms or their structures. For example, as shown in Figure 25, the bottom of a beer fermentation vat is fitted with acoustic transducers of appropriate frequency and power output to augment the function of the special strains of *Saccharomyces cerevisiae* yeast. This yeast is currently used to ferment beer for a period of 5 to 10 days, however, with resonant acoustic augmentation, the fermentation time is reduced. The most efficient power output level can be determined by quantitatively detecting concentration of yeast and conversion of starch and/or sugar molecules to alcohol compound.

The present invention also allows the resonant acoustic and/or acousto-EM fields of micro-organisms to be used to disrupt these biologic organisms or their structures. For example, as shown in Figure 26, a commercial kitchen microwave is fitted with two (2) EM radiation horns - one for cooking and one for the resonant acoustic and/or acousto-EM frequencies of the common food pathogens such as *E. coli* and *Salmonella sps.* Prior to roasting, grilling, or such other food preparation method as may be desired, the home chef may decontaminate the meat or other food product of any potential pathogens by using the decontaminate cycle on the microwave oven.

Acoustic resonance measurements were conducted on several types of bacteria to determine the resonant acoustic frequency of the bacteria. A Matec high frequency 7000 pulse modulator and receiver was used in conjunction with a Matec automated data acquisition system and an oscilloscope. *Klebsiella pneumoniae* (American Type Culture Collection #13883) was grown on standard growth media. A Matec 90 MHz, 3/8" diameter transducer surface was cleaned and sterilized with alcohol. Live *Klebsiella* was placed on the surface of the transducer. Resonant acoustic spectroscopy was performed in the acoustic range of 100-200 MHz. A resonant acoustic frequency was detected for the *Klebsiella* at 125-130 MHz with a centered frequency at 127.5 MHz. This was presumed to be a resonant subharmonic frequency.

The same measurements were performed on *E. coli* bacteria (American Type Culture Collection # 25922) using the same equipment. A resonant acoustic frequency was detected for the *E. coli* with a centered frequency of 113 MHz. This too was presumed to be a resonant subharmonic frequency.

Example 3

Detection and Disruption of Infectious Arthropods

Arthropods include a diverse group of insects that infest and feed on the blood of humans and animals. Examples include lice, fleas, ticks, mosquitoes, mites, sandflies, and tsetse flies. Aside from the general discomfort and annoyance that these arthropods produce when they infest a human or animal, the true danger of infestation lies in the diseases transmitted by the arthropods. These diseases, in general, cost the world economy billions of dollars a year. The overall health status of the victims is impaired and they suffer loss of time, quality of life, and sometimes life itself.

Mosquitoes transmit dengue fever, yellow fever, encephalitis, hemorrhagic fever, malaria, and lymphatic filariasis. Ticks transmit encephalitis, Lyme disease, relapsing fever, and Rocky Mountain spotted fever. Fleas transmit the plague (Yersinia) and typhus. Lice transmit typhus. Mites transmit rickettsial pox. Flies transmit African sleeping sickness, leishmaniasis, and Chagas disease.

The distinguishing feature of arthropods is the chitinous exoskeleton, which covers the body and legs. Chitin is a long, unbranched molecule consisting of repeating units of N-acetyl-D-glucosamine. It is found abundantly in nature and forms the hard shell of insects, arthropods, crustaceans, mollusks, and even the cell walls of certain fungi. As such, chitin is a crystalline structure and is subject to the effects of acoustic and/or acousto-EM energy. Thus arthropods are susceptible to detection and disruption by resonant acoustic frequencies matched to their shape (sphere or cylinder), and size. In addition, various organs or appendages contained within the arthropod structure are also susceptible to specific resonant acoustic frequencies. Finally, the compounds comprising the structure itself (chitin, crystalline proteins, etc.) also have unique resonant frequencies.

At low acoustic power inputs, the infectious arthropods will emit a characteristic acoustic and/or acousto-EM signature which can be used to detect and diagnose their presence. At higher power inputs, the arthropods will be disrupted and killed. The specific range of intensities used for detection or disruption will be determinant on the structure and the intensity can be determined using standard methods known to those skilled in the art such