Scientific Validations for the Use of Microscope Systems in Health Care for Client Education

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A review of an educational process using microscope technology sometimes referred to as Live Blood Analysis

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Introduction

You may recall or have even seen a Hollywood movie produced in the mid-1960's called Fantastic Voyage where scientists and a special submarine were shrunk down in size and injected into the blood stream of a human being. Here moviegoers got to see - with early Hollywood animation effects - amazing events occurring within the body. Red blood cells, platelets, globin and fat particles whizzing past the screen - and white blood cells attacking foreign invaders. The movie received a lot of attention at the time. Imagine the thrill of that make-believe voyage. What person wouldn't - with even a smidgen of curiosity about the microcosmic world within us - want to take that journey themselves and see first-hand the miracles of life. Well today we can all take that journey of sorts using high technology and the power of specialized video microscopes.

Progressive, client centered health facilities are utilizing unique microscopic video technology to observe their client's blood first hand. Blood from a simple finger stick is put onto a slide in an unchanged/non-stained state and then magnified thousands of times and observed on a video screen. While we don't get shrunk down in size ourselves since that can only happen in a movie, we do get a front row seat to look through a window into living blood that most doctors and nurses themselves are never even exposed to seeing in all of their years of medical training.

For the lucky person who gets to experience this "fantastic voyage" themselves, the view through the window can tell them a lot about their life, their health, and their inner vitality. With a properly trained and knowledgeable tour guide that knows the terrain and how to explain the events unfolding on screen, the educational impact and what it can do for understanding what needs to be done to be healthy is unprecedented.

Auditing Live Blood Under the Microscope

The whole field of hematology is based upon examining microscopic images of blood. When seriously undertaken it can encompass many aspects of biology, biochemistry, physics, biophysics, colloid science, and more.

A great contemporary hematologist, Marcel Bessis, wrote a whole series of textbooks in the academic arena on the study of living blood through microscopy. One of his basic hematology text books, "Living Blood Cells and Their Ultrastructure" is over 750 pages of serious work in this field. But even with a strong foundation in hematology basics, it takes a dedicated and critical mind to begin to connect the dots between what hematology says is the associated issues to what is being seen, to the practical side of applied physiology and ultimately nutrition and what we feed our cells that make it all happen.

As previously mentioned, there are dedicated and serious health care practitioners who have taken the time to study and learn a proper foundation for the utilization of this work as it might apply for patient education. They don't point to the screen and claim to be seeing parasites, or yeast, or claim that all of their patients are too acid. No, these practitioners use a microscope to illustrate scientific principles and facts in an entertaining way to get across important points to their patients. In the process they are empowering their patients to understand at an intimate level the dynamic life processes that are going on in their bodies.

With trained intellect and knowledge of scientific principles, and crossing this over to practical application of what they learned in school studying to be a health care practitioner, these individuals strive to connect the dots for their clients so they can see what it going on in a real world way with their health.

We live in a visual TV world where things move fast and attention spans are short. Are people learning anything about how to live healthy with all the endless TV "sound bites" and internet saturation? As we have the highest levels of obesity, cardio vascular disease, and cancer than at any prior time in history, it would seem the answer is no.

Innovative health care advocates suggest we use the power of the visual medium to impart something of substance so people "get" what health is and what they must do to be healthy.

This is a concern of national importance because if people are healthy, then they're not sick - and that saves money in the personal pocketbook. Plus the corporate pocketbook in the way of less employee sick days, increased productivity and decreased insurance costs. And in the government/taxpayer pocketbook in the way of decreased expenditure for social insurance expenses to cover an increasingly sick population who - in today's health care system - only get on-going treatment and never seem to get fixed and out of the system.

What are the top health care providers doing today to educate their

patients in a creative and dynamic way so their patients "get it" about health? They're using microscopes to take people on a fantastic voyage into one microcosmic part of their anatomy in order to illustrate what health is, and what health does. They put it on a TV screen so people who live in a TV world, now get to see a little part of themselves in an up front and very personal way. In the process, the practitioner will take snap shots of what is seen so the patient can take home the experience, put the pictures on their refrigerator and carry the pictures in their wallet as a continual reminder of the "health" they are working to achieve. This becomes a very powerful tool.

The Power of the Picture

From a USA Today report several years ago: A study involving 210 people - average age 54 - found that the people who carried images of their damaged arteries in their wallets lost more weight, were more likely to exercise and were more likely to stop smoking than those who saw pictures of their damaged arteries only once. Most of the people were sedentary with poor diets.

The participants went through an ultrasound examination to determine the thickness of the wall in the carotid artery, which supplies blood to the brain. A thickened carotid artery serves as a good predictor of heart attack and stroke risk. All participants were shown images of their arteries and given instruction on ways to reduce their disease risks, including dieting to lose weight and lower cholesterol, stopping smoking and starting an exercise plan. Half the participants were given photos of their arteries to carry in their wallets and put on their refrigerators. At the end of the six months, researchers analyzed behavioral changes and found the following:

*In the photo group, 60 people who had not been exercising started an exercise program, compared with 34 people in the non-photo group.

*More people had stopped smoking in the photo group (11) than the non-photo group (1).

*The photo group lost more weight, 17.6 pound apiece, compared with 11 pounds for the others.

*The photo group had a more significant drop in cholesterol.

After a year, participants in the photo group had a ***statistically significant*** greater reduction in the average thickness of their arteries' walls compared with the non-photo group.

The use of a microscope to show people their own living blood, to examine the morphology as it develops over time, to see the dynamic changes occurring and to illustrate important health talking points, is invaluable. It can generate near instantaneous health habit reforms. Why? Because we all have an intimate connection with our blood - and there it is live before our eyes on TV.

Doctors are always trying to get their patient's attention and compliance - well now they have it and get it. And with trained reference points to assimilate what they are seeing and connecting it to a story that explains a scientific health principle that their patients can understand, their patients get an education that few ever receive - and the patients love it.

This is being done today with great success by many practitioners that have a proper and sound approach to this work.

When it comes to the use of a microscope in a clinical environment for patient education and making pictures for clients to get them engaged and playing an active role in their health, the microscope has no equal. To this end, and in response to any individual who might make a statement that this process of using a microscope in a clinic environment for patient education (which they might refer to as live blood analysis) has no scientific evidence to support it, the following scientific references will dispel that statement.

Scientific Basis for Looking at Blood Under the Microscope

The scientific basis of looking at blood under a microscope can be found in the disciplines of hematology and medical pathology. To the trained eye, blood appearance or morphology can relate a host of connections to nutritional and medical facts. The totality of the books that cover these disciplines would, if piled on one desk, probably collapse the desk from the sheer weight of all the texts.

What follows is a very brief synopsis direct from standard hematology and presented in a condensed form. This is core material as used in the Biomedx private training programs on clinical microscope technology as it relates to looking at blood and its elements and associated physiology. Directly below is a summary of hematology basics as expressed in a Position Statement of the Council on Diagnosis and Internal Disorders of the American Chiropractic Association in their publication, "The Internist" in June 1996. The Council body was asked by the American Chiropractic Association to give a statement on the use of microscopy in clinical practice, a use which has come to be known by various names, names which precede the Council's discussion.

You will note the reference to “Darkfield” microscopy. This is simply one mode of lighting that a standard compound laboratory microscope is capable of doing to highlight what would otherwise be invisible under normal brightfield (lightfield) modes. Another common mode used is phase contrast.

We reprint some of the Council’s paper here with some annotation, and ask one simple question at its conclusion to anyone who might propose that what has often been called “Live Blood Analysis” has no scientific basis.

IN RE: The Laboratory Procedure Known as:

- DARK FIELD MICROVIVISCOPIC HEMATOLOGICAL ANALYSIS
- LIVE CELL ANALYSIS
- MORPHOLOGICAL DIFFERENTIAL DARKFIELD STUDY
- HEMATOLOGICAL DARKFIELD MORPHOLOGY ASSESSEMENT
- DARKFIELD MORPHOLOGICAL HEMATOLOGY ANALYSIS

The Council on Diagnosis and Internal Disorders believes the above laboratory procedure (DMHA) is a beneficial diagnostic laboratory modality when employed as a method of screening patients for abnormal cell morphology and for the identification of the presence of abnormal biological contents in blood plasma.

Although some of the findings seen with a darkfield lens can be observed on a stained blood smear sample employing lightfield microscopy, much of the

constituent material observed with a darkfield lens cannot be readily seen with lightfield methods. DMA has its greatest clinical utility in the area of:

1. Identifying bacterial forms.
2. Effects of cell mediated immune response
3. Blood cell morphology

It follows, that the above three findings provide clinical evidence useful in screening for potential pathology and for functional biological abnormalities that often can be evaluated through additional standard laboratory testing.

Some proponents for the DMHA procedure place great emphasis on nutritional assessment. This Council takes exception to this premise and believes to attempt to employ DMHA testing for nutritional assessment alone, can result in misleading and often false assumptions regarding the patients nutritional status, biological effects of dietary habits and life style, and certainly in clinical diagnostic conclusions.

> *[Annotation: We concur. There is no direct correlation that can be ascertained with certainty regarding any defined nutritional component and the particular morphology that might be seen under the microscope. However, there are correlations and dots that can be connected by the thinking clinician in taking and sharing a "look" through the microscopic and then to assimilate that information upon the broad background of scientific disciplines that have been studied in order to begin to think through what is being seen in relationship to the health of their client - who ultimately is paying them to think about these matters. In this process there is no diagnostic event occurring, but there is a lot of education. It is incumbent upon the clinician to understand the education and to not do "stupid" things, like pointing to the screen and saying "Mr. Client, you have parasites, you have yeast, you are too acid, you need xyz nutrition to fix the problems I see in your blood!" This is not what this work is about.]*

Although many of the abnormalities that may appear in a sample can be easily altered or eliminated by oral proteolytic enzyme supplementation, the effect on the blood sample does not necessarily eradicate the cause of the aberrant or deviant DMHA findings. The enzymes merely dissolve the "debris," and typically fail to treat or correct the underlying cause of the abnormalities seen in the plasma.

> *[Annotation: Associated with a form of "dog and pony show", a clinician may easily alter some morphological characteristics*

quite quickly through certain oral supplementation, but the only thing this proves is the blood is a colloidal suspension under the control of zeta potential whose charge characteristics can easily be manipulated through understanding basic colloid science and the chemical/electrical principles of anions and cations. But with that said, the understanding of these very points becomes a huge opportunity to explain and educate about the many events that unfold in the body to provide health as opposed to sickness - and ultimately what we are looking for is healthy clients.]

Further, it should be noted that DMHA methods have a greater accuracy when the blood sample is taken from the ear lobe. Studies have demonstrated that samples obtained from the extremities (fingers and toes) are not diagnostically reproducible whereas blood samples acquired from the lobe of the ear can be duplicated with an accuracy that approaches 100%. This is due to the torpid fluid dynamics in the ear as compared to the variable circulatory fluctuation in the capillary beds of the extremities.

[Annotation: It is true that consistency of results is important in a diagnostic setting for reproducible results, but if the intent of the "live blood analysis" is to empower the patient to understand the dynamic life processes occurring within them, to take them on a fantastic voyage into their blood, to engage them in being proactive with their health and to provide them pictures as a reminder to be healthy think healthy and do healthy, then a simple finger stick typically will suffice for these objectives.]

As stated above, the DMHA has its greatest clinical utility in screening patients to determine the need for additional laboratory test, and perhaps other clinical examinations to locate the specific cause of the anomalous and or aberrant blood picture.

[Annotation: While the Council recognizes the utility of this process to point the clinician to other useful tests to use in the process of "diagnosis" (if such is the objective), it fails to make comment on the utility of this tool to educate the client on important health matters in a way that can teach the client health principles like few other tools can accomplish. And what is a doctor? If we take to the Latin meaning of the word and the intent of our forefathers in the field, it is teacher.]

The following documented findings should be considered when analyzing a darkfield hematological specimen:

THROMBOCYTE AGGREGATION

Severe platelet " thrombocyte" aggregation can be a potentially serious finding. Platelet aggregation can contribute to cardiovascular disease which is the number one cause of death in the western world. Several organic substances may promote platelet clumping which include collagen, ADP, the catecholomines, certain immune complexes and fatty acids. Cigarette smoking often contributes to "hyperactive" platelet formation. Diabetics and patients with hypercholesterolemia usually demonstrate increased platelet aggregation which can predispose them to clotting disorders which may lead to a vascular thrombus and vessel obstruction.

Additional laboratory work should be ordered to determine the cause of the platelet aggregation. The following laboratory tests should be ordered to determine the cause of the thrombocyte aggregation:

Cholesterol, Triglycerides, HDL Cholesterol, Coagulation Time.

ERYTHROCYTE ROULEAU

Peripheral blood erythrocytes often display the phenomenon of rouleau formation. Since it does exhibit a specific role in the pathogenesis of some disease, the cause of rouleau should be determined. Plasma fibrinogen and Immunoglobulins are some of the potent rouleau-inducing agents. Some industrial poisons such as benzene, parathion, carbon tetrachloride not only increase this phenomenon but, also cause thrombotic and hemorrhagic manifestations as well. Patients suffering from allergies, infections and severe trauma may exhibit rouleau.

The presence of massive rouleau can be detrimental to patients suffering from occlusive vascular diseases as it causes impairment of blood flow in the small vessels that can compromise the red blood cells ability to exchange carbon dioxide and oxygen gases. This results in localized hypoxia and acidosis as well as generalized fatigue and less than optimum performance. Severe or massive rouleau is not infrequently found in patients with hyperglobulinemia and may be seen in many disease states ranging from arthritis, multiple myeloma, diabetes, myocardial infarction and in patients with increased alcoholic intake. The erythrocyte sedimentation rate (ESR) is usually increased because of the increased ratio of mass to surface area resulting in rapid rouleau fallout from the plasma. Diagnostic evaluation should be conducted to identify the cause of the severe rouleau.

The following blood tests are recommended:

Cholesterol, Triglycerides,WBC, Erythrocyte Sed Rate (ESR), SGP,T, SCOT, Globulin, A/G Ratio.

ERYTHROCYTE AGGREGATION

Erythrocyte aggregation is a finding similar to rouleau, however, it is more serious as it results in greater impairment in capillary flow and blood gases. There are several pathological causes for increased attraction between the surface of the red cells because of alterations in the plasma environment. Red cell sludging (agglutinated erythrocytes) may form as a result of changes in cell surface membranes which exhibits the tendency to adhere to adjacent red cells. Lipoproteins and sterols have been implicated in the production of blood sludge in addition to an increase in dietary consumption of fat, altered blood lipid chemistry and hypercholesterolemia. Red cell aggregation is absent in a healthy subject and has been reported to be a contributing factor in at least 50 different pathological conditions. Agglutination renders the red cells more susceptible to phagocytic activity by the spleen and liver, thus reducing the number of circulating cells and further impairing the blood's oxygen carrying capacity. The pathogenesis of myocardial infarction, anginal disease, atherosclerotic processes and venous thrombosis has been reliably linked to severe red cell aggregation. Correlation between blood viscosity and erythrocyte aggregation has been found to influence the survival time of patients suffering from malignant melanoma.

The following blood tests should be ordered when red cell aggregation is observed on a DMHA:

Complete multi-channel blood profile, CBC with differential, coagulation time, thyroid profile,and additional blood tests as suggested by the history, symptoms and physical findings: Circulatory studies may be necessary ncluding plethysmographic and doppler evaluation, electrocardiography and phonocardiography.

LEUKOCYTOSIS

Markedly increased numbers of granulocytes or lymphocytes may result from several disease processes that typically fall into two major categories: Granulocytosis due to acute infections and myeloproliferative disorders (leukemias, etc.). Of course, the etiology underlying this finding must be determined. In addition to findings derived from a thorough clinical examination, the following laboratory tests are recommended:

CBC with differential, multi-channel 24blood profile, Immunocompetency survey and dependent on these test results a bone marrow biopsy.

EOSINOPHILIA

Marked elevations of eosinophils are most frequently associated with parasitic disease (round worms and fluke infestation), and in patients with IgE mediated allergic reactions (asthma, hay fever and eczema, etc.). Other common manifestations include chronic skin disease: pemphigus, atopic dermatitis, psoriasis, lymphoproliferative processes, and certain bacterial

infections. Miscellaneous conditions like periarteritis nodosum (20%), sarcoidosis (25%) and Hodgkin's (20%) may be responsible for increased eosinophil populations. Numerous disorders involving the respiratory and gastrointestinal tracts, liver, immune system and urinary tract are reflected in severe eosinophil elevations. Tests beneficial in isolating the cause of marked eosinophilia would include:

CBC with differential, Multi-channel 24 serum profile, Serum IgE and tools studies for parasites.

DECREASED NEUTROPHILIC MOTILITY

Reduced motility of neutrophils may result from immuno suppressive disease processes. A deficiency in specific protein granules that are responsible for chemotactic response is thought to be the cause for decreased viability. Poor motility has been associated with some conditions that may be congenital in nature. Many diseases cause defects in neutrophil activity.

The following associated tests are suggested:

Immuno Competency Survey, CBC with differential, multi-channel 24 blood profile.

NUMEROUS HYPERLOBULATED NEUTROPHILS

Hypersegmented (hyperlobulated) neutrophilic granulocytic leukocytes should not be present in normal blood. Severely elevated numbers of multilobulated nuclei may indicate early signs of bone marrow depletion due to Folic Acid and/or Vitamin B12 deficiency. Additional tests indicated would include:

CBC with differential, MCV, Serum Folic Acid and Vitamin B12 studies.

TARGET CELL (CODOCYTES) POPULATION

Codocytes are erythrocytes that exhibit a dark circular "target" pattern. Marked elevations of target cells is the result of a shift in the exchange equilibrium between the red cells and cholesterol. Conditions that reduce lecithin-cholesterol acetyltransferase production, or interfere with enzymes mechanism of performance results in elevation of red cell cholesterol and serum phospholipid ratios. Further, the bile salts content ratio in the plasma can affect the exchange between cholesterol and the red cell membrane.

Target cells are seen in hypochromic anemia, liver disease and on occasion

following spleenectomy. Erythrocytes with this configuration are cells lacking iron, therefore any disease process which affects red cell iron absorption may produce target cells. Disruption of hepatic lecithin-cholesterol acetyltransferase production in the alteration of bile acid concentrations due to biliary obstruction can account for increased red cell lipid deposition. The spleen also influences the regulation of erythrocyte lipid content. Laboratory tests indicated to monitor and determine the cause of codocytic target cell populations include:

CBC with differential, serum iron, serum transferrin, serum ferritin, and liver profile (SGPT, GGT, SGOT, LDH, Alkaline Phosphatase).

ANISOCYTOSIS

Anisocytosis is nearly always associated with mechanisms involving anemia and displaying either microcytosis, macrocytosis, or the presence of megalocytes. Severe anisocytotic populations are seen only in aplastic type anemias. Additional tests to identify the abnormal variation in red cell diameter would include:

CBC with differential, serum iron, serum ferrritin, serum transferrin.

POIKILOCYTOSIS

Marked elevations in the unusual variation in the shape of the red cells (poikilocytosis) often are the first manifestation of erythrocyte pathologies. Over a hundred genetic molecular pathological changes have been documented which can effect the polymerization of membrane proteins relating to defects of red blood cell composition. Senescent erythrocytes are normally poikilocytotic due to the aging process and are quite susceptible to #hemolysis and removal by the spleen. Severe poikilocytosis is commonly found in pernicious anemia and in most anemias not of the aplastic type. Additional tests would include:

Serum bilirubin and CBC with differential.

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The foregoing was only a very brief synopsis of looking at live blood under the microscope for matters of health. It should be evident that this is a scientific process.

> **Science as defined in most dictionaries:** 1. a branch of knowledge or study dealing with a body of facts or truths systematically arranged and showing the operation of general laws. 2. systematic knowledge of the physical or material world. 3. systematized knowledge of any kind. 4. any skill that reflects a precise application of fact or principles.

As this process is based in science, you might wonder why this practice of live blood microscopy for health has not been widely adopted by general medicine. The answer is simple; medicine today has a different agenda.

Outside of emergency service, medicine is about treating sickness and diseases. It is about moving endless treatment drug options through the vast government supported and protected sickness distribution system which is paid for by taxpayers. In this system, being healthy does not generate a profit to vested interests. Ergo, this is a process likely to be denigrated in those circles.

That notwithstanding, pounds of textbooks constitute a body of evidence to support the science behind live blood microscopy. To that end, we put some references below.

Technical Information and Application
Collective Research Papers

We referenced the work earlier of Marcel Bessis who authored several science text books for the study of blood, all geared to academia. These textbooks, used in college level curricula are all a factually based scientific treatise on the investigation of blood in a living, non-changed, non-stained state.

It was one goal of Bessis to see hematology departments everywhere begin to use the microscope for live blood study. The reasons for this are many, not the least of which is the ability to see the dynamic life processes at the cellular level unfolding in real time to capture events and sequences that are impossible to see from static, dead, stained slides.

Marcel Bessis was a Professor, Faculty of Medicine at the University of Paris, and Director, Institute of Cell Pathology, Hospital of Bicetre, Paris, France. His books were published in the 1960's and 70's by Springer-Verlag, a well known academic publishing house. Among his more notable titles;

Living Blood Cells and their Ultrastructure,

Blood Smears Reinterpreted,

Red Cell Shape, Physiology-Pathology-Ultrastructure,

Atlas of Red Blood Cells,

Cytology of the Blood and Blood-Forming Organs.

The primary tool of Professor Bessis was the phase contrast microscope. Phase contrast microscopy is particularly well suited to the study of living blood due to its unique ability to highlight invisible particles in blood plasma along with giving gradation in tone to better pull out dimensional morphology in living samples.

The phase contrast microscope is used in the observational sciences to a great degree, to wit we cite below a few of the many references to this tool in the scientific literature:

Reference: Francon M: Phase Contrast Microscopy. In *Progress in Microscopy.* New York: Row. Peterson & Co.

Article Synopsis: A technical description of the phase contrast microscope with the theory. equations and configuration of the phase contrast microscope. The phase-contrast method was invented by the Dutch physicist Zemike who was awarded the Nobel prize in *1953.*

Application of Phase Contrast: Phase contrast application in the various branches of Science and Industry are manifold. Only a few such applications are

briefly outlined herein. In cytology, phase-contrast microscopy permits observation of cells, tissue fragments and histological-preparation sections. Cell nuclei and protoplasmic structures are positively identified. Ludin showed that phase contrast microscopes show chiefly the cell nucleus and membrane whereas stain methods evidence the chromatin structure. Extensive phase contrast research has been made in connection with the cytoplasmic structure, mitochondria, fibroplast spindles, the Golgi apparatus, living cells and so forth. Albertini made extensive research with phase-contrast microscopes to investigate and diagnose tumors. In Hematology, extended observation of blood and medulla cells was made by means of phase-contrast microscopy.

Reference: Wilson G: Phase Contrast Microscopy. In *Applied and Experimental Microscopy.* Minn MN: Burgess Pub. Co.

Article Synopsis: A technical description of the phase contrast microscope with the theory and equations for the configuration of the phase contrast microscope.

Application of Phase Contrast: The practical application of phase contrast microscopy enables one to get optical contrast and fairly accurate image object identity. In phase contrast microscopy, the structure of living cells can be identified. In summary, phase contrast microscopy has an advantage over staining in that the cells are alive and the process of cellular activity can be observed. Phase contrast microscopy has not replaced other methods, but makes it easier and less time consuming to observe cellular phenomena.

Reference: Frankel 5, Stanley R., Sonnenwirth AC: Phase Contrast Microscopy. In Gradwohi's Clinical Laboratory Methods and Diagnosis. Saint Louis: The C. V. Mosby Company, 1963.

Article Synopsis: Description of the phase contrast microscope in book on clinical laboratory methods. Discussion of various microscope techniques.

Application of Phase Contrast: A description of the phase contrast microscope compared to other microscope configurations. Phase contrast microscopy permits the examination of living, unstained material, as well as fixed specimens. The technique is valuable as a research tool and is considered the method of choice by many for performing platelet counts. A major advantage of phase contrast is the possibility for immediate microscopic examination. This section also suggests utilization of phase microscopy as an additional technique employed in cancer detection and for hormonal evaluation of gynecologic specimens.

Reference: Henry JB, M.D.: Phase-Contrast and Interference Microscopy. In *Clinical Diagnosis and Management by Laboratory Methods.* Philadelphia: W. B. Saunders Company, 1984

Article Synopsis: Three paragraph description of the phase contrast microscope used by laboratories for the detection of more translucent formed elements.

Application of Phase Contrast: Phase-contrast microscopy has the advantage of hardening the outlines of even the most ephemeral formed elements, making detection simple.

Reference: Lee, G, et al: Phase Contrast Microscopy. In *Wintrobe s Clinical Hematology.* Philadelphia: Lea & Febiger, 1993.

Article Synopsis: Paragraphs in Wintrobe's book describing the phase contrast microscope.

Application of Phase Contrast: The major advantage of phase contrast examinations is the ability to assess fine cellular details in living cells.

Reference: Miale J: Phase contrast microscopy. In *Laboratory Medicine Hematology.* St. Louis: The C. I. Mosby Co.

Article Synopsis: A technical description of the phase contrast microscope with the theory, equations and configuration of the phase contrast microscope.

Application of Phase Contrast: In standard microscopy, differential staining is used to bring out structure, but at the expense of killing the cell and subjecting its components to harsh chemical insults. With phase microscopy on the other hand, the living and undistorted cell can be examined. Prior to phase contrast development, two types of illumination were used, brightfield and darkfield. As darkfield provides little more than the specific granules of the cells to be distinguished, phase microscopy intensifies relatively minute differences in optical density and allows one to see the intimate details of cells and cytoplasmic structures. The chromatin of the nucleus, the mitochondria, the centrosome, and specific granules of the cytoplasm are all clearly visible in the living unstained and undamaged cell. Platelets are seen so distinctly with this illumination that they can be counted directly in a special counting chamber.

Reference: Sanderson JB: Contrast in Light Microscopy: An Overview. Royal Microspical Society 29/4:263, 1994.

Article Synopsis: A descriptive article on the need to view objects through a microscope with differences in refraction. The conclusion in the article is that despite the fact that many of the specimens we wish to study (whether material or biological) inherently lack contrast, it is possible to generate or enhance adequate contrast in a variety of ways. Because microscopists use light to study matter, it is helpful to consider contrast generation of light-matter interactions.

Application of Phase Contrast: An example will serve to illustrate the necessity of contrast. It is easier to see a black cat against a snowy landscape that it is to see a white one; the former will be visible over a greater distance. Very often, particularly in biological microscopy, we are faced with the problem of maximizing both the visibility and detail of specimens inherently lacking in contrast, and yet often have to settle for a partial solution. Contrast, therefore, is an essential characteristic to microscopists.

Reference: Zemike F: How I Discovered Phase Contrast. Science 121:345, 1955.

Article Synopsis: Dr. Zernike's own account of how he discovered the phase contrast microscope.

Application of Phase Contrast: A step by step description of how Zemike discovered the phase contrast and the application in viewing objects compared to bright field.

Viewing Blood Cells

Reference: Ackerman A, Bellios N: A Study of the Morphology of the Living Cells of Blood and Bone Marrow in Vital Films with Phase Contrast Microscope: I. Normal Blood and Bone Marrow. Blood X:3, *1955.*

Article Synopsis: The purpose of this article is to characterize and illustrate the cells of the normal blood and bone marrow on vital films with the phase contrast microscope and to correlate these observations with those employing the supravital staining technique. Although numerous investigators have studied the cells of the hemopoietic system with the phase microscope, few have characterized these cells in sufficient detail to provide an adjunct in the study of the cytochemistry of the cells and their components.

Application of Phase Contrast: The cells of normal human blood and bone marrow have been examined in the living condition by means of the phase contrast microscope employing both supravital and unstained moist films. The morphologic characteristics of the cells studied in this manner have been carefully described and illustrated.

Reference: Ackerman A, Bellios N: A Study of the Morphology of the Living Cells of Blood and Bone Marrow in Vital Films with Phase Contrast Microscope: II. Blood and Bone Marrow from Various Hematologic Dyscrasias. Blood X,l2:l 183, 1955.

Article Synopsis: The morphologic characterization and identification of the pathologic cell forms of the hemopoietic system have served as the basis for the

final diagnosis of many hematologic dyscrasias. For the proper interpretation of the cells observed it is necessary to be acquainted with the minute detail of the normal cell forms and their pathologic deviations. Present methods for the investigation of cellular structure, composition and metabolism emphasize the need of a critical evaluation and understanding of the minute anatomy of the living pathologic cell in relation to the normal cell form. Cellular morphology continues to serve an important function not only in the differential diagnosis of hematologic dyscrasias but also as a guide of the body's response to new modes of therapy and their subsequent evaluation.

Application of Phase Contrast: The cells of the blood and bone marrow from various blood dyscrasias have been studied in the living state and compared with normal cells o f the same lineage by means of vital films and phase contrast and bright field microscope. The precise morphology of the cells of the blood and bone marrow in a normal and diseased condition is most accurately obtained by an examination of the cells in a living condition.

Reference: Bessis M: Examination with Phase Contrast. In *Cytology of the Blood and Blood-Forming Organs.* Ed Eric Ponder. New York: Grune & Stratton, *1956.*

Article Synopsis: Bessis explains the use of the phase contrast microscope in viewing live blood with a number of photographs showing the cells and visible details. This article discusses some of the technical aspects of the microscope but deals primarily with the function and adjustments in actually viewing cells.

Application of Phase Contrast: Phase contrast microscopy has resulted in progress of a fundamental kind in the study of biological objects because it allow living cells to be examined in unprecedented detail. Chromatin, mitochondria, the centrosome and specific granules are clearly visible with phase contrast, and often seen more distinctly than on stained preparations. The phase contrast microscope is also an inestimable aid to those who use the electron microscope. Preliminary studies with phase contrast of the effect of drying, of fixation, and of impregnation on cell morphology allow one to make comparisons between the condition in the fixed and in the living cell, and so to interpret the action of fixatives.

Reference: Bessis M: Phase Contrast Microscopy and Electron Microscopy Applied to the Blood Cells. Blood X,3:272, *1954.*

Article Synopsis: In classical hematology, blood cells are usually examined in films after drying and staining. This kind of examination gives a great deal of information which is invaluable for the making of a diagnosis and for the control of treatment. Nevertheless, there is no disguising the fact that this technique completely alters the appearances seen in the living cell, and it has to be recognized that many of the observations of classical hematology are quite far removed from living reality. It is even astonishing that hematologists, who have

so minutely analyzed cellular morphology, should have ignored almost all the dynamic phenomena exhibited by the blood cells.

Application of Phase Contrast: Phase contrast microscopy has resulted in fundamental progress in the study of biological objects because it allows all the details of living cells to be examined. Previously, one had to be content with the more or less fuzzy and misleading image obtained by shutting down the diaphragm of the substage condenser, with the result that the resolving power of the objective was not fully used. With phase contrast, chromatin, mitochondria, the centrosome, and the specific granules of the cell are all clearly visible, often more distinctly than in stained preparations. Preliminary phase contrast studies of the effects of drying, of fixation, and of impregnation on the morphology of the cell enables comparisons to be made with conditions as they exist in the living cell, and makes the interpretation of the effects of fixatives easier.

Red Blood Cell Morphology

Reference: Allosion N, et al: The cisternae decorating the red blood cell membrane in congenital dyserythropoietic anemia (Type LI) originate from the endoplasmic reticulum. Blood 87,10:4433, 1996.

Article Synopsis: A study of 20 individuals from 17 unrelated families with congenital dyserythropoietic anemia (type LI; CDAll).

Application of Phase Contrast: The phase contrast microscope was used as a comparison with the immunofluorescence microscopy in the observation of the CDAIl red blood cell membrane. Cell differentiation was noted and photographed as shown Fig 3.

Reference: Beutler E. M.D.. et al: Morphology of the erythron. In *Williams Hematology, Fifth Edition.* New York: McGraw-Hill, Inc. 1995.

Article Synopsis: Collectively the progenitor and adult red cells have been termed the erythron to reinforce the idea that they function as an organ. The widely dispersed cells that make up this organ arise from the undifferentiated, pluripotential stem cells. Following commitment. erythroid progenitors progress through several replicative stages, becoming more functionally specialized with maturation. Table 32-2 show the nomenclature of red cell shapes and associated disease states.

Application of Phase Contrast: The study in Williams Hematology uses a number of phase contrast micrographs compared to both stained and electron microscope views. The phase contrast views were done in the living state. Bessis confirmed that many cell shapes could be distinguished using the phase contrast microscope. The views in Table 32-2 are from the electron microscope but these

shape can also be seen by the phase contrast microscope.

Reference: Brecher G, Bessis M: Present status of spiculed red cells and their relationship to the discocyte-echinocyte transformation: A critical review. Blood 50,3:333, 1972.

Article Synopsis: A variety of red cells with one or more spiny projections has been described and some of these spiculed cells have been associated with specific congenital or acquired hemolytic anemia's. It is the purpose of the present paper to define the recognizable cell types morphologically, to discuss their pathogenesis, to define the precautions necessary to avoid artifactual distortion of normal or abnormal cells, and to attempt to reconcile a number of apparently contradictory findings on the origin of these spiculed cells.

Application of Phase Contrast: Once the details of echinocyte and ancanthocyte morphology as seen by the scanning electron microscope are appreciated, the different types of spiculed cells can usually be distinguished in ordinary smears as shown in Fig. 11.

Reference: Feo CJ, Subtil B, Leblond PF: Observation of echinocytosis in eight patients: a phase contrast and SEM study. British Journal of Haematology, 40:5 19, 1978.

Article Synopsis: The authors report eight cases of echinocytosis discovered after screening of stained smears. The presence of echinocytes was exceptional in adults and children but was more frequent in neonates. In all cases they confirmed the presence of abnormal red cells by careful examination of the blood in wet preparations observed in phase contrast and after glutaraldehyde fixation and processing for SEM.

Application of Phase Contrast: The procedure in the research was to first use the phase contrast microscope to identify the echinocytes and then to use the SEM.

Reference: Gedde MM, Yank E. Huetis W: Shape response of human erythrocytes to altered cell pH. Blood *86,4:1595, 1995.*

Article Synopsis: Alteration of red blood cell pH produces stomatocytosis (at low pH) and echinocytosis (at high pH). Many experimental treatments disturb the membrane curvature of usually smooth, discoid human erythrocytes, transforming them into invaginated (stomatocytic) and evaginated (echinocytic) forms.

Application of Phase Contrast: Scanning electron micrographs of RBCs with changes in cell pH showing cell shapes. Once identified by electron micrographs

they can be identified by phase contrast.(Bessis)

Reference: Lovrien RE, Anderson RA: Stoichiometry of wheat germ agglutinin as a morphology controlling agent and as a morphology protective agent for the human erythrocyte. J. Cell Biology *85:534,* 1980.

Article Synopsis: The lectin wheat germ agglutinin (WGA) is an unusually effective agent in controlling both the forward and reverse reactions of the reversible morphology conversion discocyte <> echinocyte from the human erythrocyte. The article examines the reversible morphology with the electron microscope.

Application of Phase Contrast: It has been established once red cell shapes have been identified by the electron microscopy that the phase contrast microscope is a useful resource in identifying these shapes. This article shows the reversible process of the changes in red cell shapes and the identification of these shapes.

Reference: Mohammad KS, et al: Phase contrast microscopic examination of urinary erythrocytes to localize source of bleeding: an overlooked technique?. J. Clin. Pathol 46:642. 1993.

Article Synopsis: Aim: To localize the source of bleeding in the urinary tract in patients presenting with haematuria. Conclusions: The examination of urine for dysmorphic and isomorphic red blood cells by phase contrast microscopy is strongly recommended in routine clinical practice for the detection of glomerular and non-glomerular lesions. This technique may avoid unnecessary investigations for the diagnosis of the site of bleeding in patients with haematuria.

Application of Phase Contrast: Caestecker et al. found that the site of bleeding in patients with microscopic haematuria was more accurately identified by phase contrast microscopy that by the red cell analyzer. The authors noticed that the technique has the potential for automation and standardization and this may the way forward for the wider application of this technique in clinical practice.

Red Blood Cell Aggregation

Reference: Bessis M: Erythrocytes. Examination in the living state. 6. Agglutination of erythrocytes. In *Living Blood Cells and their Ultrastructure.* Ed. RI Weed. New York: Springer-Verlag. 1973.

Article Synopsis: Bessis shows erythrocytes forming rouleaux and explains aggregation and agglutination with various photographs showing the formations.

Application of Phase Contrast: Bessis uses the phase contrast microscope as well as the interference microscope to show rouleaux formations.

Reference: Bessis M: Formation of rouleaux. In *Cytology of the Blood and Blood-Forming Organs.* Ed. E Ponder. New York: Grune & Stratton, 1956.

Article Synopsis: In the fresh state, red cells become arranged in rouleaux. Rouleaux formation does not occur or occurs in an abnormal manner in certain pathological kinds of blood. On the other hand, rouleaux are formed in great number in blood containing a large quantity of fibrinogen or of globulins. They can then be seen in the thick parts of the films. Rouleaux do not form if the blood is diluted with saline, and it does not occur with washed red cells for the same reason.

Application of Phase Contrast: In a fresh state the rouleaux can be seen by the phase contrast microscope as shown in Fig 110.

Reference: Fabry T: Mechanism of erythrocyte aggregation and sedimentation. Blood 70. 5:1572, 1987.

Article Synopsis: The erythrocyte sedimentation rate (ESR) is a useful qualitative empirical index of nonspecific disease activity. The mechanism of rouleau formation has been extensively investigated. The article allows further elaboration of the mechanism of aggregation.

Application of Phase Contrast: In a fresh state the rouleaux can be seen by the phase contrast microscope as shown in Figs 2 - 4.

Reference: Samsel RS. Perelson AS: Kinetics of rouleau formation. I. A mass action approach with geometric features. Biophysicis Journal 37:493, 1982.

Article Synopsis: In the presence of certain macromolecules, such as fibrinogen, immunoglobulin, dextran, and polylysine, erythrocytes ten to aggregate and form cylindrical clusters called "rouleaus" in which cells resemble coins in a stack. The aggregates may remain cylindrical or they may branch, forming tree, and networklike structures. While rouleau formation is interesting as a model system for the study of cellular adhesion and aggregation, it is also physiologically significant in microcirculatory hemodynamics.

Application of Phase Contrast: This article uses equations and graphs to explain the characteristics of rouleau. The photographs in the article are from the phase contrast microscope showing rouleau in fresh blood.

Reference: Sarnsel RS, Perelson AS: Kinetics of rouleau formation. II. Reversible reactions.. Biophysicis Journal *45:805,* 1984.

Article Synopsis: Red blood cells aggregate face-to-face to form long, cylindrical, straight chains and sometimes branched structures called rouleaux. This article extends a kinetic model developed by R. W. Samsel and Perelson to include both the formation and dissociation of rouleaux.

Application of Phase Contrast: This is a continued article with equations and graphs to explain the characteristics of rouleau and reversible reactions. The photographs in the article are from the phase contrast microscope showing rouleau in fresh blood.

Reference: Scherer R. Morarescu A, Ruhenstroth-Bauer G: The significance of plasma lipoproteins on erythrocyte aggregation and sedimentation. British Journal of Haematology *32:235,* 1976.

Article Synopsis: Increases erythrocyte aggregation can be induced by high concentrations of human lipoproteins. The dependence of aggregate formation on lipoprotein concentration was recorded by determination of erythrocyte sedimentation rate, by electrical measurement of erythrocyte aggregation index and by scanning electron microscopy.

Application of Phase Contrast: In this study of the formation of rouleaux, the authors use the electron microscope to show the formation the red blood cells. Although the phase contrast microscope is not used in this study, the study does further the explanation of rouleaux, and as shown in other articles, rouleau can been seen by the phase contrast microscope.

White Blood Cells

Reference: Axline SG: Use of phase contrast microscopy. In *Methods for Studying Mononuclear Phagocytes.* Ed. DO Adams. Academic Press, Inc., 1981.

Article Synopsis: Phase contrast microscopy is a very useful and powerful tool *for* examining the morphology on mononuclear phagocytes. The power of this system lies in the ability of phase contrast illumination to enhance enormously contrast within cell tissue samples. It is particularly useful in the studies of thin unstained samples in which only minimal detail can be seen by standard bright field illumination.

Application of Phase Contrast: This article explains the advantages of viewing the mononuclear phagocytes with the phase contrast microscope and the process and mechanics of observations.

Reference: Cohn ZA, Benson B: The differentiation of mononuclear phagocytes - morphology, cytochemistry, and biochemistry. The Journal of Experimental Medicine *121:153,* 1964.

Article Synopsis: The mononuclear phagocytes comprise a spectrum of cell types ranging from the blood monocyte to the tissue macrophage, epitheliod, and the giant cell. This report deals with the differentiation of monocyte-like cells in both an in vitro and in vivo milieu.

Application of Phase Contrast: The authors used the phase contrast microscope in their study as shown by the micrographs at the end of the article.

Reference: Cohn ZA, Benson B: The in vitro differentiation of mononulcear phagocytes. 1. The influence of inhibitors and the results of autoradiography. The Journal of Experimental Medicine121:279. 1964.

Article Synopsis: This article is concerned with the influence of selected inhibitors of protein and nucleic acid synthesis on the morphological and biochemical aspects of in vitro development. In addition, autoradiographic studies concerning the early localization of incorporated leucine and choline was presented.

Application of Phase Contrast: The micrographs in this study shown at the end of the article were taken with the phase contrast microscope.

Reference: Hartshorn KL, el al: Neutrophil deactivation by influenza A viruses: mechanisms of protection after viral opsonization with collectins and hemagglutinaion-inhibiting antibodies. Blood 87:3450, 1996.

Article Synopsis: Bacterial superinfections are a major cause of morbidity and mortality during influenza A virus (IAV) epidemics. Depression of phagocyte functions resulting from attachment of the IAV hemagglutinin (HA) to cell surface sialo-glycoproteins is a likely contributory cause of these infections. The authors propose that the group of collagenous lectins (termed collectins) present in blood and pulmonary surfactant play a role in initial host defense against IAV.

Application of Phase Contrast: The effect of rasp-D on IAV binding to neutrophils was assessed by phase contrast and fluorescent microscopy. The left panels of Fig 4 show phase contrast microscopy. Results depicted are representative of more than three separate experiments.

Reference: Hendey B, et al: Intracellular calcium and calcineurin regulate neutrophil motility on vitronectin through a receptor identified by antibodies to

integrins ax and b3. Blood 87, 5:203 8, 1996.

Article Synopsis: As neutrophils migrate from the blood stream to sites of infection or inflammation, they are required to penetrate to vascular endothelium and cross the connective tissue stroma. This article report that neutrophils possess a VNR immunologically similar to av and b3.

Application of Phase Contrast: Fig *5* shows a corresponding phase contrast image use in their study.

Reference: Koonch MP, Cloney RA, Berns MW: Laser irradiation of centrosomes in newt eosinophils; evidence of centriole role in motility. The Journal of Cell Biology 98:1999, 1984.

Article Synopsis: Newt eosinophils are motile granulated leukocytes that uniquely display a highly visible centrosomal area. The irregularities in motility due to irradiation are probably related to the damaged centrioles. The results presented in this paper suggest that the centrosome is an important structure in controlling the rate and direction of newt eosinophil motility.

Application of Phase Contrast: The phase contrast microscope micrographs are shown throughout the article (Fig 1, 3, 5, 6, 10, 15, 16) showing their research on this aspect of the eosinophil motility.

Reference: Melly MA. Thomison JB, Rogers DE: Fate of staphylococci within human leukocytes. The Journal of Experimental Medicine 112:1121, 1960.

Article Synopsis: The techniques developed by Dr. Wilson in his studies on the phagocytosis and intracellular behavior of streptococci seem ideally suited to give direct answers to certain questions relating to phagocytosis of staphylococci. The study reported results of direct visual studies of the phagocytic process and partial answers to the questions listed in the introduction.

Application of Phase Contrast: Preparations for slides were place on a slide and observed using a Zeiss photomicroscope. Phase contrast lighting was employed. Magnifications of 1250 were obtained with a 100 x neofluar oil immersion objective. Plates 92 and 93.

Reference: Steinman RM, Moberg CL: A tribute - Zanvil Alexander Cohn, 1926-1993. Journal of Experimental Medicine 179:1, 1994.

Article Synopsis: This article is a tribute to Cohn who was the editor of the Journal of Experimental Medicine since its inception until January 1994. The article outlines his research and scientific contributions.

Application of Phase Contrast: In 1965 Cohn published four papers with Belinda Benson in the journal describing the "in vitro differentiation of mononuclear phagocytes". As was by then the standard fare in the laboratory, high quality phase contrast microscopy spawned and/or supported virtually every experiment. By counting pinocytic vesicles under phase contrast, Zan used the phase contrast microscope in a quantitative manner. The phase contrast was used in permeability studies of endocytic vacuoles. Following uptake by pinocytosis, the enzyme invertase dramatically shrinks vacuoles as shown by the phase contrast (fig 6).

Blood Platelets

Reference: Bessis M: Granular megakaryocytes. In *Cytology of the Blood and Blood-Forming Organs.* Ed. E Ponder. New York: Grune & Stratton, 1956.

Article Synopsis: A study of the megakarocyte.

Application of Phase Contrast: Phase contrast micrographs throughout this section of Bessis book showing the megakaryocites and the mass of platelets examined after being kept for 3 hours between slide and coverslip.

Reference: Bessis M: Ill. Thrombocytes or blood platelets. In *Living Blood Cells and their Untrastructure.* Ed. RI Weed. New York: Springer-Verlag, 1973.

Article Synopsis: This section of Bessis' book examines the formation of thrombocytes or blood platelets in detail.

Application of Phase Contrast: Phase contrast micrographs are used through this section in the study of platelets and thrombocytes.

Reference: Gasic GJ, et al: Platelet interactions in malignancy and cell transformation: functional and biochemical studies. In *Platelets: A Multidisciplinary Approach.* New York: Raven Press. 1978.

Article Synopsis: Several authors have described the capacity of animal and human tumor cells to aggregate platelets in vitro. There is also evidence indicating that tumor cells may also aggregate platelets in vivo as well. This study suggests that cells from certain tumors may trigger release of adenine nucleotide first and aggregation later on.

Application of Phase Contrast: Phase contrast micrographs (Fig 1, 2) comparing normal and transformed embryo cells.

Reference: Jolles G, Legrand YJ, Nurden A: 4. Platelet and fibroblast

interactions with fibronectin and other adhesive proteins. In *Biology and Pathology of Platelet- Vessel Wall Interactions.* London et al: Academic Press, 1986.

Article Synopsis: The glycoprotein fibronectin is presently the most extensively characterized cell adhesion molecule, and current concepts of its mechanism of action appear to provide a paradigm for understanding the functions of other adhesive proteins. In this chapter, the authors describe experiments analyzing its function at the molecular level, compare it mechanisms of interaction with fibroblasts and platelets, and briefly consider other adhesion proteins.

Application of Phase Contrast: Fig 9b shows phase contrast micrograph showing the presence of five thrombocytes and one erythrocyte in not stained solution.

Reference: Levine RF: Isolation and characterization of normal human megakaryocytes. British Journal of Haematology 45:487, 1980.

Article Synopsis: Human megakaryocytes have been isolated from marrow obtained from ribs removed at thoracotomy. All but one of the patients had normal pre-operative platelet and leukocyte counts. The data in this article had a normal distribution and overlapped minimally with the size range of all other marrow cells. The presence of a distinct size threshold implied that size alone may be a sufficient objective criterion for identification of human megakaryocytes.

Application of Phase Contrast: Despite the familiar appearance of marrow megacaryocytes, details of morphology and reliable identification of the smaller, younger megacaryocytes required high magnification. Fig 1 illustrates different maturation stages of megakaryocytes, photographed with a xlOO phase contrast objective. The presence of multiple large nuclear lobes with prominent nucleoli was a distinguishing characteristic of all megakaryocytes.

Is this all Fraud?

We think not. All of the foregoing supports in various ways the ideas behind live blood analysis in a most scientific way.

Support for Live Blood Analysis by United States Health Agencies

Within an agency of the United States government itself, through the CDC (Center for Disease Control) and the U.S. Dept. of Health and Human Services, a basic video tape on how to perform darkfield live blood microscopy along with a review on the morphology and motility of treponema pallidum is sold to the public and those in practice to properly utilize the technology for the identification of this parasite. Why is this? Because live blood and live specimen microscopy using this particular mode of the microscope is a very good way to see and actually identify in real time this little bugger.

CLIA Laws

So as we see, there is great utility in this live blood form or microscopy, but any one doing or considering doing this work must be cognizant of various regulatory agencies of government that have taken dominion and virtual ownership over certain laboratory processes.

In one case, that of CLIA, or the Clinical Laboratory Improvement Amendment Act of the U.S. Congress (1988), which was put under the Department of Health and Human Services, they are deemed to regulate all laboratory processes. This was only supposed to be the case where reimbursement of laboratory tests and analysis have been done for purposes of receiving reimbursement of government insurance funds from the likes of Medicare/Medicaid. This makes sense for if the government is doling out funds from the public purse, accountability should rest with those receiving the funds. Certain regulatory agencies, in this case the CLIA operation, make sure accountability takes place.

Unfortunately, once an administrative agency gets created to manage any function of government, the Constitution most often goes out the window and in application, the regulation gets ever restrictive and the power to control goes overboard with the original intent of the law expanding beyond all reason. Such is the case here and with just about every other administrative agency the government creates. (For an in your face example that everyone is aware, just observe what is occurring with the TSA. Every agency ever created by government ultimately goes unaccountable to anyone and quite often become fascist in operation, which by some accounts is the modus operandi of our government for many years now and is well documented in actual court cases.)

Certain terminology can also be captured by some government agencies. In the case spoken of here, if one proceeds to do or frame what they do as Live Blood Analysis or Dark Field Analysis (a CDC procedure) and they do not have the proper authorization from the government agencies involved - ignoring the fact they may not be submitting reports back to the government for any insurance reimbursement and are only exercising retained rights protected under the U.S. Constitution - these agencies will not take kindly to this activity.

Regulatory agencies in the US are administrative in nature and do not care nor recognize individual rights exercised under protection of the Constitution. Sadly, the Constitution is only a document that is rolled out from time to time and argued about in high profile situations to give the appearance that we still operate under Constitutional Law. It can and has been documented on the record in Federal Courts that we do not.

Nevertheless, when doing work in this area, one can pretend the Constitution still exists, and arrange their operations appropriately and function in a manner that does not infringe on the usurped authority of any agencies involved.

This means, if using a microscope in practice for health advocacy, teaching, training, tutoring, coaching and facilitating information exchange about the dynamic life processes that are occurring in the individual so they may make more intelligent choices about what they can do for their benefit, then one would not claim they are doing live blood analysis or dark field analysis. This is a very important distinction.

And such is the case here. Biomedx does not advocate live blood analysis or dark field analysis be performed unless proper government authority has deemed it permissible and one jumps through their hoops to gain such permission.

Many people are out in the public claiming to do live blood analysis and dark field analysis in ways we do not agree. They are saying things to others in looking at blood that stretches logic, science, and grounded hematological perspective. We referenced this earlier.

Blood is a colloidal suspension under the control of zeta potential. This fact and what it scientifically means for health in the human body is not taught in any mainstream academic environment where health care is concerned. This along with other missing foundational concepts means huge gaps in understanding and misdirection of an entire industry that is under almost total government control in one way or another. That control has meant continuing failure in addressing the pressing health issues of the day along with exponential increasing health care costs for everyone.

The work we do and promote is education and health advocacy. We use the microscope in this process to engage people and impart understanding at a level they would not receive in traditional health channels. This allows them to be a bit smarter in choosing what direction they want to move to be healthy, because bottom line, if they are healthy they can't be sick.

In time, if not fixed, and that time is not too far away, the exponential costs to maintaining the current health system by government will actually collapse that system, and potentially the government itself. If that should occur, people will need to know who to turn to for help with their health in a workable, natural, and realistic way. At Biomedx we prepare individuals to do this. They can be from any health discipline, but the common denominator, is they are not

using this technology in a diagnostic or analytical manner, but simply to impart some logic and science to their client in an actionable manner should the client choose to pursue being healthy.

So what's the point of all this discussion?

The point is, that what might be defined as live blood analysis, can mean different things to different people depending upon previous experience or perceptions which may put the concept into a category of being good or bad, scientific or not. Regarding good or bad, this may all be in the mind of the observer.

Which category a person doing this work may fall, scientific or not, depends solely upon the integrity, training, and intent of that individual, and measured against the standards we have reviewed here, is a guidepost to anyone else on the outside looking in and trying to understand which is which - so ultimately the baby doesn't get thrown out with the bath water and clients desirous of health are best served in a way his or her practitioner deems the best utilizing what they have been trained to use - their heads.

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For further information about high definition microscope systems, tools and training for proactive health advocacy, visit biomedx.com on line.