

an introduction to biological terrain

A core belief of natural medicine is that disease isn't caused by germs that arrive out of the blue, any more than flies cause dustbins. European doctors and scientists continue to explore ways of mapping the state of the internal environment and finding out how therapies affect it. Chartered physiotherapist, registered acupuncturist and naturopath **Han van de Braak, BSc, LicAc, MCSP, MBAcC**, explains.

The term Biological Terrain does little to explain exactly the nature of the gem. Patients returning to their doctor telling them about Biological Terrain run the risk of entering into a brief chat on gardening. This term is an Americanism of what for decades has been referred to in mainland Europe as the milieu intérieur. This article ratiocinates two techniques that particularly refer to "biological terrain" namely Biological Terrain Analysis (BTA) and video microscopy for Live Blood Analysis (LBA). Together they offer a unique tool to a clinician interested in contextual, naturopathic healthcare.

A standard physiology textbook refers to this area as follows: "Therefore all cells live in essentially the same environment, the extracellular fluid, for which reason the extracellular fluid is called the internal environment of the body, the milieu intérieur, a term introduced more than a hundred years ago by the great 19th century French physiologist Claude Bernard. Cells are capable of living, growing and performing their special functions so long as the proper concentrations of oxygen, glucose, different ions, amino acids, fatty substances, and other constituents are available in this internal environment". (1)

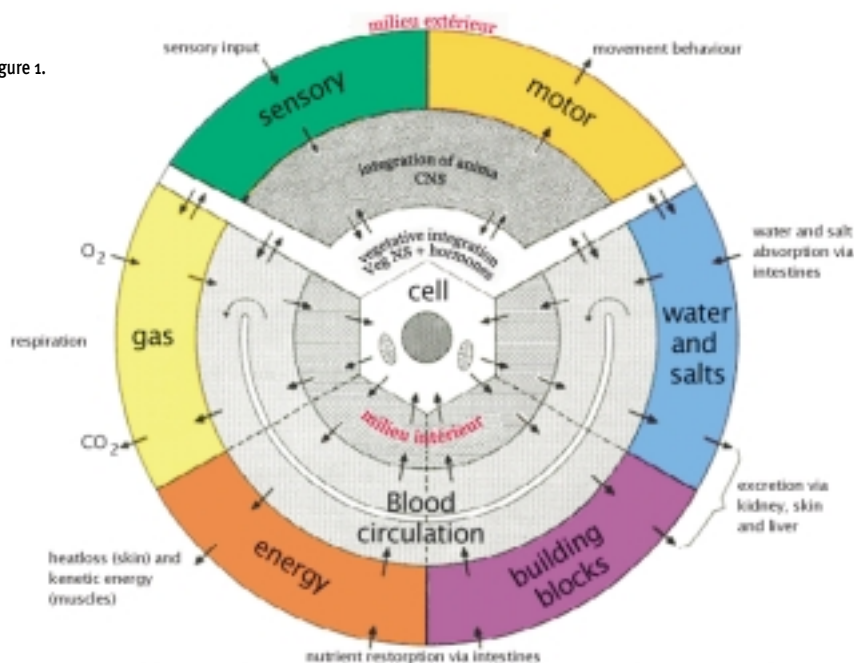
Biological Terrain is possibly best described as the contextual environment of a tissue cell. Figure 1 shows that the milieu intérieur is influenced by a great number of functions. The poignant message of this image lies in the fact that the cell takes the centre position with all other physiological functions subservient to it. This is the way the milieu intérieur is kept in homeostasis.

Modification of this milieu intérieur is done daily by every person on the planet. Following this diagram clockwise: how much daily body movement is enjoyed; how much water is drunk daily – even if this is only recycled surface water; how much sodium is ingested as compared to potassium – and ingestion of other essential minerals; how well are the physiological pathways of detoxification enabled to work; how much absorption of nutrients can occur from the foods one chooses to ingest; how much kinetic energy is utilised each day; how optimum is breathing in rooms with double glazing and/or air conditioning; how balanced is the CNS when frequently stressed; for how long is the circulation stimulated daily to give all-round perfusion. Amid all inhibitors and disruptors a tissue cell is trying to do its best with the tools available to it.

Modification

Modification of a deranged milieu intérieur is done by clinicians every day. This is the SHO applying an oxygenator as well as the nutritionist prescribing magnesium and boron. From a milieu intérieur perspective one may wonder how contextual their clinical approach is. It is clear that not everyone wants a comprehensive, contextual approach. I meet plenty of patients who simply want a quick fix and an unaltered lifestyle. In a similar vein most

Figure 1.



Adapted from Dr. J.A. Bernards en Dr. L.N. Bouzeman, *Physiologie van de mens*, 3e druk, Bohn Scheltema & Holkema, 1979

NHS doctors and staff are simply relieved to survive another day of high patient throughput, so inviting them to broaden their already overburdened workload is asking for pigs to fly.

So for whom is analysing the biological terrain of interest? Two common categories of patients presenting for Biological Terrain Analysis are those who do not find relief from the orthodox medical approach and those who are keen on natural medicine healthcare and prevention. The categories of people studying Biological Terrain Analysis and Live Blood Analysis are predominantly clinicians from the complementary medical professions but also MDs and PhDs who want to broaden their (naturopathic) clinical expertise.

Biological Terrain Analysis (BTA) was invented by professor of hydrology Prof Louis-Claude Vincent, whose Bioelectronimètre was first used in France in 1946. His method forces one to take a contextual, broad-spectrum view beyond any chronic symptomatology a patient presents. Vincent found that the defining triad of pH, rH2 (oxidation-reduction potential at the given pH) and Ohms resistance was as equally appropriate to human health as he had found it to be to testing water quality.

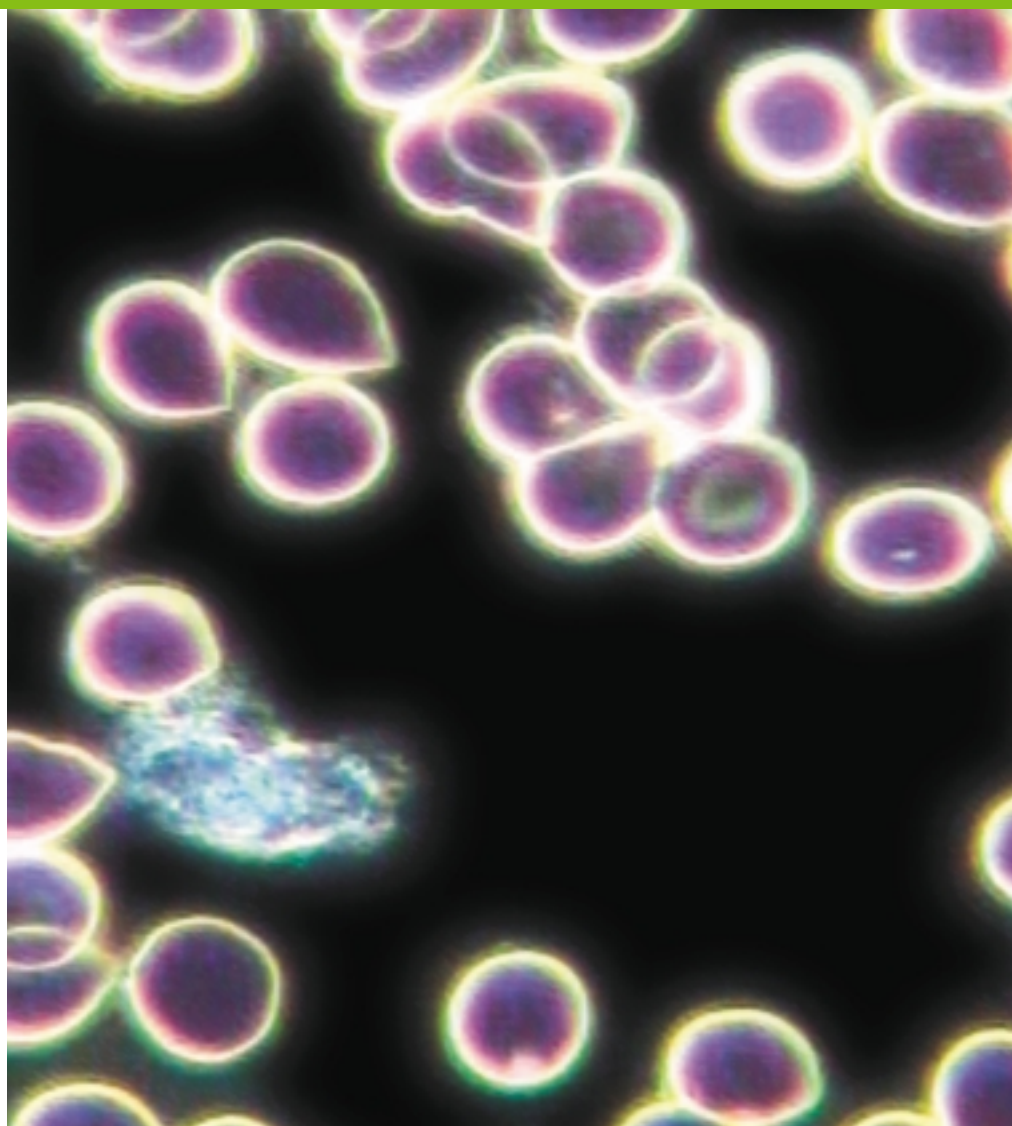
Vincent's research in France – where he established his reference bandwidths (see figure 2) – struck a chord with eminent doctors in Germany like Dr.phil. Dr.med. Bach, Dr.med. Reinhold Voll and Dr.med. Franz Morell. It rapidly became a valued technique in Germany used by medical physicians, dentists, veterinary surgeons, pharmacists and naturopathic physicians alike (2) Since, Vincent's technique has been adopted in many countries around the world most notably in the USA.

Calibration

Vincent devices are first calibrated against industry standard buffer fluids after which measurements are made of two or three fasting urines, saliva and venous whole blood on the test day (there is a test protocol). The Vincent reference bandwidths refer in part to standard physiology and in part to values established by Vincent (see Figure 2).

pH

Measuring the pH of three biological fluids gives insight into the body's pH management. It cannot be overemphasised how important this is. Venous whole blood pH (7.34 in figure 2) is not only important because of the Bohr effect, but also because an abnormal serum pH creates a host environment benign to pathogens.(3) Blood metabolic enzymes like oxidoreductases, transferases, transaminases, hydrolases, lyases, isomerases and ligases will work optimally only under a certain pH, so the general degenerative



trend of venous alkalemia invariably hampers their efficacy. Temperature, availability of coenzymes (265 in figure 2) and absence of enzyme inhibitors (26.6/30.4 in figure 2) are obviously factors too. Directly related to pH is the NaCl cycle which has a bearing on the secretory function of both the liver and the pancreas as well as causing the base flooding important for the connective tissue. (4) Figure 3 demonstrates quite how far-reaching the effect of pH is and therefore how important it is clinically to monitor it into balance again.

With BTA a chronic positive acid balance – wherein more acids are metabolically produced than can be excreted – is easily diagnosed as is the related mesenchyme acidosis.

Alpha-amylase efficacy, especially of Ptyalin

(7.28 in Figure 2) but also those of the pancreas, can be evaluated with the Vincent technique. As such, next to a good medical interview it can pinpoint dysglycaemias early. Another aspect of measuring the pH dynamics is the ability to evaluate protein over-ingestion, protein-amino acid conversion (7.28/30.4/265 in figure 2) and amino acid deficiency (7.12 in figure 2).

An important point about pH measurement is timing. Prof Vincent measured two or three subsequent fasting urine samples at hourly intervals and this is easy to schedule into a working day for most patients. Conversely another pH monitoring test is that of Friedrich Sander (4), testing eight urine samples taken at two-hourly intervals between 06:00 and 20:00. It provides

	pH	rH2	R	pH opt	rH2 opt	R opt
Blood	7.34	26.6	174	7.30 - 7.35	21.5 - 23.5	190 - 210
Saliva	7.28	30.4	265	6.50 - 6.75	21.5 - 23.5	180 - 220
Urine 1	5.29	25.3	93	mod.acid	22.5 - 24.5	30 - 45
Urine 2	7.12	25.3	125	6.50 - 6.80	22.5 - 24.5	30 - 35
Urine 3	6.50 - 6.80	22.5 - 24.5	30 - 45

Figure 2. Vincent reference bandwidths.

main feature: BIOLOGICAL TERRAIN

	Acid orientated metabolism Latent acidosis	Base orientated metabolism
OSIPS nervous system	OS stimulated	PS stimulated
Hormones	adrenaline, thyroxin, FH increased	insulin, corpus luteum hormone, thymus secretions, choline increased
Lecithin	increase	decrease
Cholesterol	decrease	increase
Temperature	fever increase	fever decrease
Blood pressure	increase	decrease
Respiration	inspiration	exhalation
Haematology	left shift, myeloid, leucocytosis	right shift, lymphatic, leucopenia
Blood sugars	increase	decrease
Metabolism	increase	decrease
Sleep	alert	sleep necessity
Inflammation readiness	increase	decrease
Inflammatory predilection	increased	reduced
Lymphatic tissue	increased – enlarged tonsils	decreased
UV radiation sensitivity	increased	decreased
Stamina	quickly tired	greater stamina
Mental disposition	tendency to depression	tendency to joyfulness

Fig 3. (4)

► additional pH information over and beyond Vincent's pH values, but for many working patients the 2-hourly sampling is a problem and most clinicians have little time for the required titration afterwards either. Another point is that the saliva pH alters with emotions.(5) Thanks to psychoneuro (endocrine) immunology we know there are few physiological functions unaffected by mental-emotional state. As much as the patient is asked to fast of food, fluid and exercise for 12 hours, it might be reasonable to ask them to keep calm. If a patient has a row with a traffic warden before sphygmomanometry the values will alter and so it will with BTA. This does not invalidate the test, but it is something to keep in mind. One other thing to bear in mind when testing saliva pH is that oral bacterial putrefaction caused by gram negative anaerobic bacteria uses a salivary factor called redoxin (6) to produce a low oxidation-reduction potential that favours the growth of these pathogens. Such infections alter the oral pH towards acidity and raise the rH2, so it is wise to inspect the gingiva with a pen-light and include a concise dental check in your medical interview. Microscopists can include dental plaque microscopic analysis with a view to bacterial forms, PMNL count etc.

I like to point out that Biological Terrain Analysis certainly in Germany is often accompanied by the video microscopy technique called Live Blood Analysis. This involves taking a finger prick blood sample, allowing some to dry on a slide while "preserving" a one-cell-thick sample with a coverslip. Samples then are viewed in darkfield and phase contrast as well as in brightfield mode. The sample remains unstained, but isopathic

(homeopathic dilutions of fungus-derived remedies) drops are occasionally added to see if these alter the pleomorphic valence for the better. Valence is a term to denote pleomorphic severity.

Earlier I made mention of the ability of BTA to highlight protein over-ingestion, protein-amino acid conversion or amino acid deficiency. Combining BTA with LBA pays off here. Also a good symptom questionnaire, good electro-dermal screening or a laboratory amino acid assay can elaborate on the specific amino acid(s) that is(are) deficient or in excess. Figure 4 is given as an example of BTA/LBA combination and shows a darkfield microscope

field filled with medium sized darkfield bodies (small white dots) after a 12hr fast of food, fluid and exercise. Figure 5 shows the pH values of this particular patient's Biological Terrain Analysis.

With these Vincent values in mind, figure 4 showed that the erythrocyte dispersion is pretty normal as indeed is their narrow light refraction. According to Prof.em.Dr.med.habil. Arno Linke, the latter is indicative of the thickness of the erythrocyte membrane plasma protein film.(7) Conclusion from LBA: we are not looking at an excess erythrocyte membrane protein coating, nor at a loss of dispersing zeta potential. According to research by Ronald Ullmann, PhD, darkfield bodies are nothing other than aggregations of albumin and globin, protein particles in other words.(8) So these darkfield bodies are either chylomicrons or aggregated proteins. The former would mean a lipase deficiency, given a limited dietary lipid intake confirmed by interview; the latter would mean early hyperproteinaemia (advanced hyperproteinaemia would show erythrocyte clumping) with most likely over-ingestion of protein and deprivation of foods containing alkalisating minerals.

Pleomorphic picture

In pleomorphism according to Prof Günter Enderlein and Dr Gaston Naessens, these darkfield bodies would have been called macrosymptotics or somatides and would be treated with isopathic remedies next to pH modification. The pleomorphic concept goes back to Antoine Bechamp's "Microzymas" and developed into the virus-bacteria-fungus transformation theory whereby the environment (notably capillary blood, since that

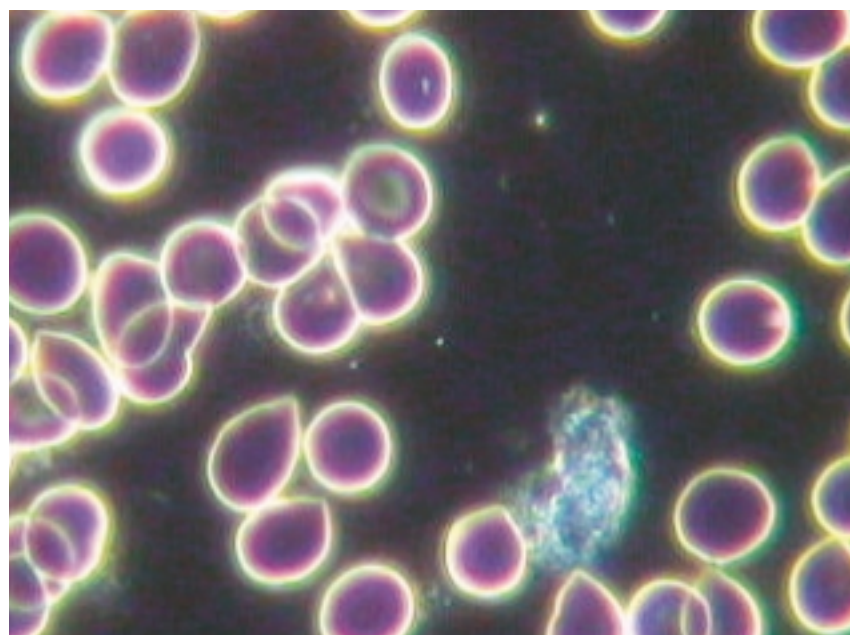


Figure 4. darkfield microscopy view of blood sample after 12 hour fast.

main feature: BIOLOGICAL TERRAIN

	pH	rH2	R
Blood	7.46 = degeneration phase		167
Saliva	6.64 = salivary ptyalin en abled		129 = lymphatic stasis
Urine 1	5.18 = too acid		77
Urine 2	5.01 = mesenchym acidosis		68 = poor renal electrolyte exchange

Figure 5: pH values.

► was where the virus-bacteria transformation was being described), made such a transformation possible. Pleomorphic treatment rests on introducing homeopathic dilutions of low valence darkfield forms into an environment that contains high valence darkfield forms – this encourages the pathogenic state to moderate. Pleomorphism predates knowledge of reactive oxygen species (free radicals) and a nowadays-common prescription of the various antioxidants is unlikely to have happened in Enderlein's and Naessens' time. This is where darkfield microscopists who do not practise beyond pleomorphism may go adrift in clinical management.

The decisive phase contrast image (figure 6) showed codocytosis: a high count of erythrocytes with increased central translucency that is indicative of a poor blood lipid conversion. So lipases it is, and on electro-dermal screening it was re-confirmed that this patient's lipases were markedly deficient. The aciduria in this case did not relate to protein-intake versus proteases but to a high level of toxicity at least due to systemic candidiasis (phase contrast image not shown) and subsequent lymphatic stasis (saliva R = 129 in figure 5). Therapeutic action: acid buffering, eradicating opportunistic yeast overgrowth plus re-establishing a balanced bowel flora, lymph drainage and lipases. Between Biological Terrain Analysis and video microscopy one can accurately observe pH management and forecast from which end any excess acidity is coming. The whole management of protein starts with a review of dietary intake during the medical interview after which BTA, LBA and reagent strip elaborate on the issue.

rH2

By measuring the rH2, which is the oxidation-reduction potential (ORP) at the particular pH of the fluid tested, we get an accurate measurement of the ability of the fluid to give off electrons. The Nernst equation is used for its calculation. Particularly for blood and saliva it gives us a broad sweep measurement of how well the body is able to stand up to reactive oxygen species attack. If blood and/or saliva is burdened by a high free radical load than invariably its capacity to give off electrons to the measuring electrode is diminished, so one will see a high ORP/rH2. Urinary rH2 reflects the ability of the urine to give off (via reduced intermediates like NADH and FADH2)

electrons to the measuring electrode and is indicative of how effectively the Krebs cycle and oxidative phosphorylation are using NADH and FADH2. The clinical management for a low urinary rH2 however is different to that of a high rH2 yet in both cases, albeit to different degrees, the patient will complain of fatigue. In a similar vein a high saliva rH2 requires a different clinical management to a high venous whole blood rH2.

The growing knowledge about reactive oxygen species (ROS) involvement in the aetiology of disease has brought about a challenge test called Oxidative Stress Analysis (OSA). This is a panel which measures whole blood reduced glutathione (nmol/mL), glutathione peroxidase (U/gHgb) and superoxide dismutase (U/gHgb) for the armament to fight ROS on different levels. Urine lipid peroxidase (nmol/mL) obviously indicates lipid peroxidation, while catechol (% recovery) and 2,3 dihydroxybenzoate (% recovery), relate specifically to the hydroxyl radical. By identifying substrates it is more specific than the Vincent test. However OSA never divulges whether this is a temporary free radical issue (serum rH2) or an entrenched oxidative stress (saliva rH2). Why would this be relevant? Long term ROS damage heavily burdens the lymphatic system whereas transient free radical damage, like one will see in, say, viral infections or serum toxicology, does not. Of course if the OSA reports a high incidence of ROS then

about the author

Han van de Braak is a chartered physiotherapist and registered acupuncturist and works as a naturopathic physician in addition to giving courses in Live Blood Microscopy. He developed a multimedia CD-ROM on the Vincent technique which is a complementary part of his live blood microscopy course. His website www.bioterrain.co.uk is abundant in patient examples as well as descriptive of the different techniques used at his Integrated Medicine Practice.
Tel: 01858 465005
(clinic as well as booking for courses)
Fax: 01858 410236
Email: info@bioterrain.co.uk

one should simply assume lymphatic burden.

At this point it might be useful to discuss the rH2 values in figure 2. At 30.4 the ability of the extracellular fluid (a major constituent of saliva) to give off electrons to the measuring electrode is markedly less than the ability of blood at 26.6 to do the same. The conclusion is "yes, supplement with antioxidants and prevent ROS development", but without concurrent lymphatic support (for instance Lymphomyosot® i.m., s.c., i.d., by mouth) you would only address one aspect of this free radical pathology. Figure 2 demonstrates how Vincent forces you to put matters into context. At 25.3 the whole mitochondrial pathway of producing ATP is seriously impaired. Clinical management may be better with a broad-spectrum antioxidant, Krebs cycle nutrients and electron donor (reduced) foods ►

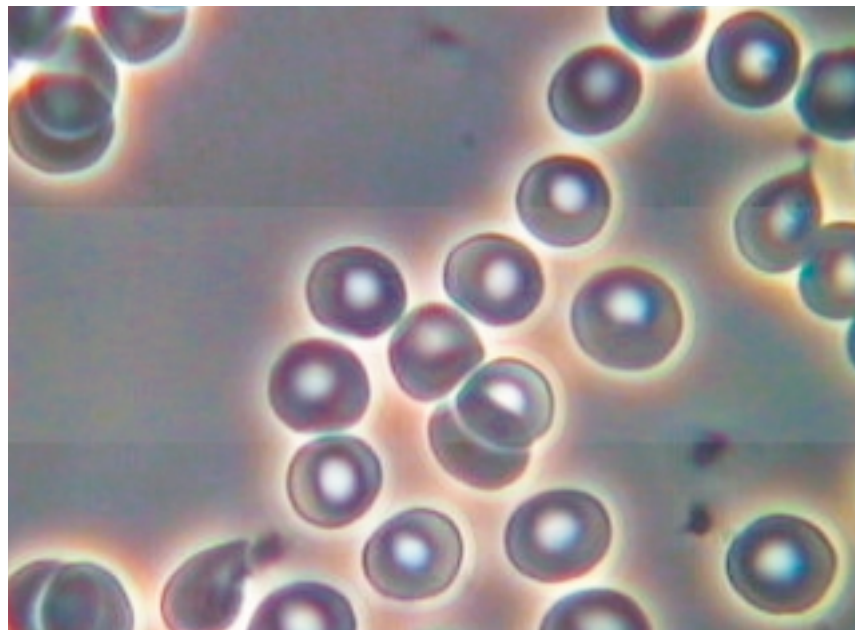


Figure 6: phase contrast view of the same sample.

▶ rather than individual antioxidants (vitamin A, C, E, Se or Zn) and antioxidant prerequisites (Mn, Cu, Glutamic acid, Glycine or Cysteine [NAC] etc). Clinical management should include supplementation of the lipid-soluble vitamin-like ubiquinone, CoQ10. Dietary sources contain only a limited amount of coenzyme Q10 and the 17-step biosynthesis of coenzyme Q10 is easily disrupted.(9) One will often find this to be the case in low urinary rH2, while in high urinary rH2 it is better first to get the citric acid cycle going, monitor the urinary rH2, then when it drops introduce CoQ10.

Figure 7 is a 100x brightfield image with a closed iris of 'dried layered blood' and shows the result of hydrogen peroxide which is a common ROS in itself as well as the end product when different ROS react with one another.(10) Closing the iris allows one to observe inclusions into these polymerised protein puddles (also known as soluble fibrin complexes) such as Heinz bodies or sialic acid.(11) The specific gravity of the ROS dictates where (via centrifugal motion) it is deposited whilst the prep is still wet. I have worked through five live blood courses (worldwide) on this topic, and in the absence of available reference material, some of

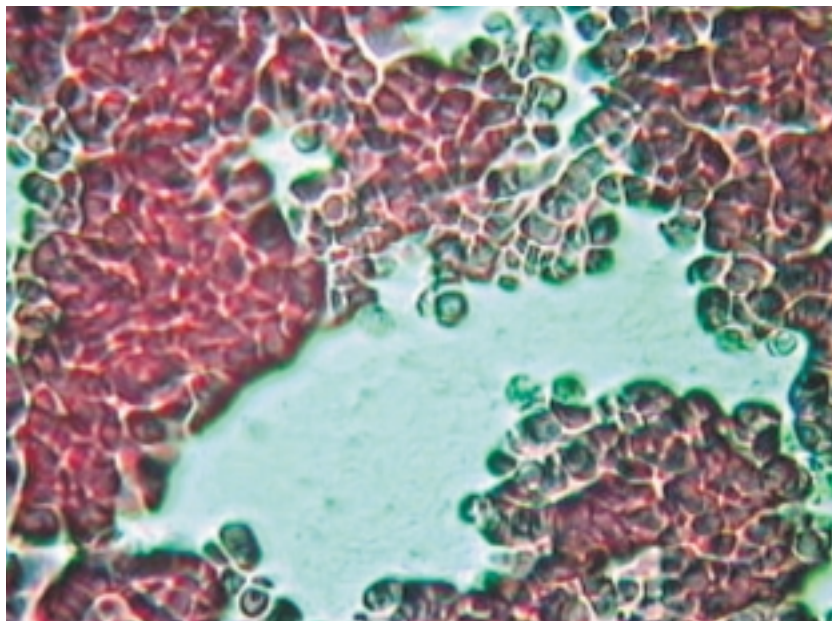


Figure 7: brightfield image (x100) of dried layered blood.

the interpretations given to "dried layered blood" remain anecdotal and students on such occasions are taught pure pattern recognition. The best way to stop microscopists from making overly

enthusiastic interpretations is by asking them to take two dried layered samples, compare their mapping, and to take as true only that which is observed on both slides. Whereas rH2 measures the ability of a fluid to give off its electrons – if many ROS are present in the fluid then that ability will be small and thus that fluid measures as an oxidised fluid – LBA makes such an abstract rH2 value visible for the patient. The size and location of and any inclusions in the polymerised protein puddles help to further the clinician's insight.

Resistance

By measuring the electrical resistance of a fluid, the R in umho/cm, one knows the gross electrolyte status of that fluid. The greater the amount of minerals present, the lower the electrical resistance is ($V = I \times R$). Urine gives information about the electrolyte exchange over the nephrons and by measuring the R value in two urine samples one hour apart it is interesting to study the shift. Empirically it looks as if low morning cortisol levels might coincide with elevated urine¹ resistance but this requires further study. The saliva resistance (R) reflects the sum of mineral waste and nutrient minerals. So the higher the level of oxidative stress, the higher the percentage of saliva R that will be metabolic mineral waste. It gives a good indication of a nutrient deficiency although it is of course totally nutrient-unspecific. Low umho/cm values reflect lymphatic stasis given that saliva is in part made from interstitial fluid. The efficacy of an antihomotoxic remedy like Lymphomyosot® is measured and demonstrated daily at my practice. Measuring this allows one to gauge the rate of lymphatic detoxification against the need for concurrent nutrient mineral supplementation. The

great thing about measuring the electrolytes in venous whole blood, saliva and urine is that one gets an objective early warning signal regarding the renal and hepatic filtration of blood, pure renal electrolyte exchange and salivary hypomineralisation or hypermineralisation. It gives the clinician an opportunity for meaningful, measured intervention long before creatinine clearance or alkaline phosphate return positive from your laboratory.

Vincent's blood and saliva R values have mostly to do with residual electrolyte toxicity, backlog if you like, or an equation wherein supply is greater than the ability to eliminate. Figure 8 is a phase contrast image of live blood and shows heterogenous plaque amidst erythrocytes. Plaque is what Prof. Dr Reckeweg in his Table of Homotoxicosis would refer to as the Deposition – Impregnation Phase, the matrix involvement before intracellular degeneration. Another Live Blood Analysis example of deposition is crystalline formation containing a varying degree of actinomycin or uric acid.

Toxicity in serum can be a transient issue, dealt with by cytochrome p450 isoenzymes, chelated away and thus causing little harm to the body other than raiding the body of detox nutrients. When the total toxic load exceeds the detoxification pathways then what at some point are serum toxins, will become toxins stored in the interstitial matrix and/or adipose tissue and eventually in intracellular space. The beauty of Biological Terrain Analysis and Live Blood Analysis is that they allow the clinician to preview this matrix phase and to act upon it.

The classical Vincent measurements go beyond the better known values of pH, rH2 and R. Vincent made a great number of calculations, some of which are very straightforward. Other "calculations" (undisclosed mathematics) claim to measure the risk of thrombosis, cancer, "Abwehr Factor" (roughly translated as immune status) or calculate biological age. To my knowledge these do not stand up against any science that I am aware of. This prediction of biological age is seen too in electro-dermal screening where one probes against different samples of mesenchym (what has been their reference group?). Mostly, biological age gallops ahead of the patient's calendar age and viewed kindly this helps to persuade a patient to take the clinician seriously. At worst one simply frightens the patient, which I think is unforgivably poor clinicianship.

Interview

One could argue that a disadvantage of the Vincent technique is that it is unspecific, particularly with a view to minerals (which test objectively measures everything), while on the face of it BTA completely overlooks the psycho-emotional aspect of health.

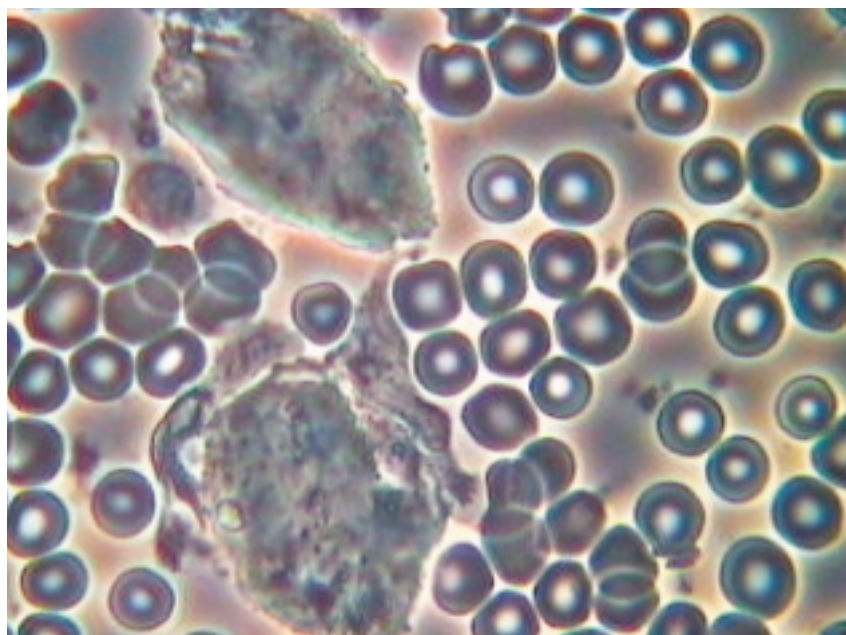



Figure 8: plaque shown in a phase contrast image of live blood.

Oddly enough, in high measurements of oxidative stress with a low blood R one will invariably find patients with shortened emotional fuses and wobbly emotional stability. But it is absolutely correct to say that the mental-emotional aspects of health sit in the medical as well as in the orthomolecular interview. So at this point it is a good idea to reiterate that neither BTA nor LBA should be used as stand-alone tests. If you see codocytes on Live Blood Analysis then consider doing standard LDL / HDL / LDL-HDL ratio / cholesterol / triglycerides, as this can only help your patients. The reality of the situation is that codocytosis on LBA pinpoints that blood fat metabolism is not working well, but it does not quantify it. The best most live blood microscopists can do is to compare the presence of codocytes to the absence of codocytes following an effective treatment protocol. This is great, but is it the best we can do?

Coming back to Vincent, its overwhelming advantage is that one simple objective in-clinic test gets highly contextual information that is directly translatable into optimal clinical management. Most clinicians understand the advantage that the Vincent technique has to offer, but few in the UK have risen to investing into a Vincent device for their clinic. By comparison, darkfield microscopy is much better received, possibly because a cheap microscope is just that, cheap. Next to screening my own patients I do a substantial amount of testing on behalf of other clinicians who then get a short report with relevant images e-mailed to them. The advantage of Live Blood Microscopy is that it tends to captivate the patient into a more active participation into his/her health care while for the clinician it gives moderately objective, visual information. Both Biological Terrain Analysis and Live Blood Analysis are extremely useful tools to help coach the patient into better health. 

References

1. Textbook of Medical Physiology 9th edition – AC Guyton MD, JE Hall PhD, 1996 (WB Saunders Company).
2. Bioelektronik nach Prof. Vincent, Säuren-Basen-, Wasser- und Elektrolyt-Haushalt in Theorie und Praxis, Dr.med. Helmut Elmau, Pro Medicina ewald Häring, 2001.
3. Bacteria Cyclogeny, Prof. Dr. Günter Enderlein, 1999, Enderlein Enterprises Inc.
4. Der Saure-Basenhaushalt des menschlichen Organismus, F.F. Sander, 1999, Hippokrates Verlag GmbH.
5. Correlative Urinalysis: The Body Knows Best, M.T. Mörter Jr. BS, MA, DC, 1987 (BEST Research Inc., Rogers, Arkansas).
6. Israel Kleinberg, DDS, PhD, DSc, Chairman of

- the Department of Oral Biology and Pathology, State University of New York at Stony Brook.
7. Linke A, Der erythrozytemnahe Plasmaproteinfilm (Sammelweis-Verlag, Griefswald 1990).
 8. A Modern Scientific Perspective On Prof. Dr. Enderlein's Concept Of Microbial Life Cycles, Ronald Ullmann PhD, Biochemist: BioResource : Articles: A Modern Scientific Perspective, 2001.
 9. The Nutritional Cost of Prescription Drugs, Ross Pelton RPh, James B. LaValle RPh, Natural Health Resources Inc, Morton Publishing 2000.
 10. Biochemical and Physiological Aspects of Human Nutrition, Martha H. Stipanuk PhD, 2000 (WB Saunders Company).
 11. Oxidology, Second Edition, Robert W. Bradford, DSc (Henry W. Allen).