The Immune Status of Patients in a General Orthomolecular Medical Practice

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The recent epidemic of AIDS in this country has underscored the fact that immune deficiency is a major cause of morbidity and mortality. Many patients with malignancy, allergy syndromes, chronic infection and other conditions exhibit immune system abnormalities (depression and hyperactivity) which may play a causative role in these diseases or impair prognosis.

Recently, it has been shown that nutritional status is extremely important in maintaining optimal immune performance and that nutritional immunotherapy can be used to normalize and boost immune status. Working with Dr. Joseph Portaro of SmithKline Clinical Laboratories, we have been conducting studies over the past 12 months to determine if Orthomolecular immunotherapy could be used to improve clinical status and immune function in patients with immune impairments.

The human immune system is composed of several basic mechanisms: T cells, B cells, Phagocytic cells, Natural Killer Cells, and Complement. T cells are produced from stem cells originating in the bone marrow that migrate to the thymus gland where they mature and develop the capacity to protect the body from viral, fungal, intracellular (mycobacterium, etc.) bacterial and parasite infection. T cells also provide protection from malignancies. In addition, these cells play a major role in regulating the overall activity of the immune system. This regulation is performed by two distinct subsets of T cells called Helper T and Suppressor T cells. Helper T cells turn on immune reactions and Suppressor T cells turn off immune reactions after a challenge has been neutralized, and they also prevent the development of immune reactions against normal body tissues, a phenomenon known as auto-immune disease.

B cells are a subset of lymphocytes that produce the immune chemicals found in the serum known as antibodies or immunoglobulins. There are five different types of antibodies which are designated as: IgG, IgA, IgM, IgD and IgE. IgM is the first type of antibody produced in a B cell response. After this initial response, the antibody response matures, producing either IgG, IgA, or IgE. IgG, IgA and IgM protect the body from bacterial infection, reinfection with viruses and toxic chemicals and drugs.

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The function of IgD is not known, although it may play a key role in the membrane recognition process necessary for B cell activation. IgE is mainly a pathological antibody that is responsible for type 1 (immediate) hypersensitivity responses. The origin of B cells is not known. However it is known that they must differentiate into plasma cells after activation in order to produce significant quantities of circulating antibodies.

There are two different types of phagocytic cells: neutrophils and monocytes or macrophages. Neutrophils provide major first line protection against viral and bacterial agents and they also are involved in removing and neutralizing toxic chemicals. Monocytes and macrophages (the mature form of the former) also provide protection from bacterial agents and they play a protective role in the control of certain malignancies. These cells also help T and B cells perform their varied functions.

Natural Killer cells are at present poorly defined. Although some evidence indicates they may be a subset of T cells, this has not been confirmed. It is known that they do not have classical B or T cell markers on their surface and that they are members of a third lymphocyte population known as Null cells. The Null cell population also contains another subset of undefined cells known as K (Killer) cells, as well as precursors (stem cells) for T cells, B cells and monocytes and macrophages. Natural Killer cells and K cells demonstrate activity against viral-infected cells and tumors and it is believed they provide a major defense against these disease agents.

Complement is an enzyme system found in the serum that is composed of at least 20 different subunits. The components of this enzyme system are mainly produced by macrophages found in the liver, and after activation, the complement system cooperates with antibodies (IgG and IgM) to destroy bacteria and virus. The complement system also plays a role in initiating the inflammatory reactions of neutrophils and monocytes.

In our practice we have been using a standard immune system evaluation to measure the immune competence of patients. This evaluation assesses the status of T cells, B cells, IgG, IgA and IgM antibodies, neutrophils, monocytes and the complement components, C3 and C4. This standard immune survey also includes a SMAC 25 for detecting metabolic abnormalities that can cause immune malfunction and a WBC and differential which permits the detection of atypical lymphocytes and quantitation of the absolute number of the various leukocyte subsets (T cells, B cells, Null cells, neutrophils, monocytes, eosinophils and basophils). The results of this immune survey are used to define the precise nature of a patient's immune defects and to develop patient specific Orthomolecular immunotherapy protocols for boosting and normalizing immune status.

Orthomolecular immunotherapy is based mainly on basic and clinical data derived from the new science of nutritional immunology. Work in this field has shown that each component of the immune system has specific nutritional requirements and that an excess and deficit of essential nutrients can cause immune failure. At present, human studies indicate that vitamin A, B6, folic acid, iron and zinc are essential for normal T cell function and that a deficit, excess or imbalance of these nutrients can cause T cell deficiency. It has also been shown that protein-calorie malnutrition is a major cause of T cell failure and that imbalances of carbohydrates and essential fatty acids can cause T cell malfunction. The specific nutrient requirements of the major T cell subsets has not been completely defined, but at present it is known that Helper T function is dependent on copper, selenium, vitamin C and protein and that Suppressor T cell function is highly dependent on normal vitamin A metabolism. Nutritional immunologists and others have also shown that T cell function is highly dependent on nutrients with antioxidant properties, because of the fact that excessive free radical activity (superoxide anion, singlet oxygen, hydrogen peroxide, OH radicals, etc.) produced following excess caloric intake or chronic inflammatory processes is highly detrimental to normal T cell function.

The nutrient requirements for antibody production by B cells are less defined than those for T cells. However, it is known that the production of IgG, IgA and IgM is dependent on magnesium, vitamin B5 and

B6 and possibly B12. In addition, it has been shown that vitamin C can boost the production of these major antibody classes.

The nutritional requirements of the Null cell compartment is certainly diverse because of the many cell types comprising this subset. At present we know that the Natural Killer cell component requires vitamin A for normal function and cells of the monocyte/macrophage series require vitamin C and iron and zinc. The nutritional requirements of eosinophils and basophils are undefined but it is likely that these cells also require vitamin C, iron and zinc for normal metabolism.

The production of the components of the complement system require protein balance, vitamin C, iron, zinc, and the function of the complement system is highly dependent on magnesium and calcium.

In contrast to human studies, animal studies on rats and mice have shown that in addition to the above nutrients, the following may also be necessary for normal immune performance: T cells (vitamin B12, E and selenium); B cells (thiamine, riboflavin, biotin, folic acid, D, E, niacin, trypothan, iron); macrophages (E, selenium, copper); neutrophils (B6, D, copper). In developing Orthomolecular immunotherapy protocols, we have relied mainly on human data because animal experimentation does not always reflect human requirements.

Before reviewing the data obtained at our center, an example of how Orthomolecular immunotherapy protocols are developed using immune status testing is in order. Because AIDS patients exhibit a variety of immune abnormalities, we will discuss the development of Orthomolecular immunotherapy for these patients. The major immune abnormalities observed in AIDS include: monocytosis, eosinophilia, depressed helper T cells and elevated levels of IgG, IgA and IgM. Although not every AIDS patient exhibits all these abnormalities, we will consider a patient who exhibits all of the above immune aberrancies to demonstrate the application of Orthomolecular immunotherapy.

Clinically, monocytosis suggests chronic inflammation possibly secondary to the viral, parasitic and fungal agents observed in AIDS. Since monocytes also play a major role in the control of malignancies, their increase may indicate an inflammatory reaction to the lymphomas and Kaposi's sarcoma characteristic of AIDS. Monocytes require vitamin C, iron and zinc for their normal immune functions, and their increase may indicate an increased demand for these nutrients. Antioxidant therapy is also indicated by monocytosis since when activated these cells release free radicals. In this case the antioxidants of choice include methionine, quanine, cyto-sine, uracil, formate and reduced PUFA. The eosinophilia observed in AIDS probably reflects the parasitic infections (Giardia, Amoeba, etc.) common in this condition and possibly an inflammatory response to the malignancies of AIDS. Although the nutrient requirements of eosinophils are not precisely defined, their increase may indicate a need for magnesium, vitamin C, iron and zinc. In addition, since activated eosinophils release super-oxide anions, the following antioxidants may be indicated: vitamin C and reduced glutathione. Helper T cell deficiency is considered the central lesion of AIDS and the deficit of these cells, which turn on most immune reactions, is believed to explain the increased susceptibility to opportunistic infection and malignancy observed in AIDS patients. Helper T cell deficiency is considered an indication for an increased demand for copper, selenium and vitamin C. The increase in IgG and IgM and IgA probably reflects a runaway immune response to viral infection, especially herpes, cytomegalovirus, Epstein-Barr virus and Hepatitis B, and an increase in these antibodies signals an increased demand for magnesium, vitamin A, B5, B6 and possibly vitamin B12. The CBC and differential has consistently shown that AIDS patients have a hemoglobin deficiency, and since iron deficiency is associated with T cell malfunction, the AIDS Orthomolecular immunotherapy protocol must also consider the problem of balancing iron metabolism. When the SMA 25 indicates abnormalities of protein-carbohydrate and fatty acid metabolism, intervention must be directed at correcting these abnormalities because imbalances of these factors have been firmly linked with immune deficiency. It must be remembered that vitamins, minerals, amino acids, antioxidants and other nutrients, when used in metabolic medicine as corrective factors, become pharmacologic

agents. If used properly they will restore and boost immune competence. However, when used in large doses they might cause toxic effects that will exacerbate immune abnormalities and increase disease susceptibility.

Thus in the future, Orthomolecular medicine will have to address itself to proper dosages in a patient specific manner that considers the reality of biochemical individuality. Some dose response curves are already known for Orthomolecular immuno-therapeutics. For example, it is known that modest increases in vitamin A can enhance T cell function and Natural Killer Cell activity, but that an excess of vitamin A depresses these immune responses. Similarly, modest increases of vitamin E can boost T cell activity and the functional activity of monocytes and macrophages. However, massive doses of this agent cause T cell depression and a failure of the bacterial killing function of neutrophils. Additionally, from a clinical standpoint, we know that very low levels of selenium can increase cancer risk, whereas a medium range enhances resistance to malignancy and overload can cause cancer. These facts underscore the fact that excesses as well as deficits of essential nutrients can cause disease and depress immune function and that to be effective, dose-response studies are mandatory to achieve the beneficial effects of Orthomolecular immune intervention.

Now regarding our specific experience. In order to obtain information about the type of immune abnormalities seen in a general nutritional and metabolic practice, we examined the records of patients seen in my office over a one year period. In general, our studies were restricted to patients with a diagnosis of cancer, autoimmune disease, unexplained low white blood cell counts, possible and definite AIDS and multiple allergies.

The cancer patients and those with auto-immune diseases were chosen because immune abnormalities have been extensively documented in these conditions. However, there is still great debate about whether these impairments are secondary to these diseases or a primary cause. Patients with unexplained white blood counts (4500 or less) were chosen for study because it was thought the impairment could be related to AIDS or a sign of predisposition to this condition. This decision is recognized as totally arbitrary by our practice, and was made in the interest of basic investigation. Patients with multiple allergies were selected for study if they were difficult to neutralize or had unstable endpoints. In the latter group, all of the patients had varying degrees of allergy to Candida, dust, mold mixes, Alter-naria, Hormodendrum, mites, Cephalospor-ium, and cotton linters. The multiple allergic patient might be expected, on theoretical grounds, to show immune depression, espe-cially of IgA production or of Suppressor T cell function, and Dr. Orian Truss and others have shown that longstanding yeast allergies appear to depress immune function. Curiously, data recently released by the Center for Disease Control in Atlanta, has shown that Aids patients are infected with a fungal agent (Thermoascus crustaceus) that produces a drug similar to Cyclosporin A, a potent inhibitor of Helper T cell function.

The total number of patients studied im-munologically was 89 since July, 1982. Of these, 40 had diagnosed cancer. The remaining 49 could be divided into 10 with a diagnosis of AIDS (and exhibiting a Helper/ Suppressor T cell ratio of 0.9 or less; normal range 0.9 to 2.3) and nine patients suffering from various autoimmune diseases. There were 27 multiple allergic patients who had high reactions to yeast and associated organisms or particles known to be carriers of molds. Many of these patients had associated hypoglycemia. All of the patients in this latter group exhibited significant cerebral symptoms such as depression, lethargy, inability to concentrate, etc.. Data on three patients are also included here who did not fit into our original three categories, but who had an immune evaluation performed as part of an investigation of the immunological effects of cysts, hyperplasia and benign tumors.

The first question we were interested in was what percentage of the patients exhibited a normal immune system. We expected to find abnormal immune systems as a rule, but deviations from this expectation were also likely to occur, and an examination of the diagnosis and findings in these cases might yield interesting results. Fourteen patients, in all, had normal immune systems

(12 percent). Ten of these patients had as a diagnosis allergy and hypoglycemia. Their ages are between 21 and 52, and all had a relatively short history of symptoms with no past histories of allergies to pollen, grasses and trees. Eight of the ten patients had high lead levels in the hair mineral analysis screen — but I shall discuss that later. The remaining four patients all had a diagnosis of cancer. Two of these patients were six years past having been diagnosed, one after excision of a melanoma, and another after apparently successful treatment with chemotherapy for Hodgkin's Disease. The third patient had an excisional biopsy for breast cancer, while the fourth had a radical mastectomy. It would seem that the normal immune profiles were associated with patients having a short history of allergy and long term survival from cancer for two of our four cancer patients. The remaining two cancer patients need further follow-up work. One additional patient, not included in this sample, but worth mentioning is a 30 year old male with a basal cell carcinoma of the eyelid who at first showed a significant elevation of Null cells. With judicious attention to nutrition and supplementation, he reverted to normal within a two month period. The local lesion, however, showed no signs of regression. He is now considering Mohs chemosurgery.

The second question we tried to investigate on our data was the importance of the total white count. Diagnostic significance could only be attributed to the group with diagnosed AIDS and some others who are in danger or at risk for this disease. This group alone showed a significant leukopenia of under 4000/cumm. Amongst the other patients, a low white count was too often correlated with low values of hemoglobin and RBC so that little information about the relative value of leukopenias could be obtained. Among these patients, all blood forming elements tended to be depressed. Usually they were the cancer patients who had been extensively treated with radiation or chemotherapy.

The assessment of relative lymphopenias or lymphocytosis from the differential counts proved to be a far more valuable endeavor. We arbitrarily chose 30-40 percent as the acceptable normal range in this study. We encountered a relative lymphocytosis, i.e., values above 40 percent in 19 patients or 17.5 percent of the sample. Nine of these patients had diagnosed cancers and ten had multiple allergies.

Among the cancer patients, three were diagnosed leukemias where high levels of lymphocytes would be expected. The remaining six patients, exhibiting relatively high lymphocyte counts, were interpreted as one feature which indicated stress on the immune system. None of the patients in this group had been treated with chemotherapy or radiation at the time of testing. This stands markedly in opposition to those patients treated with chemotherapy where lymphopenias were frequently encountered. Among the ten patients in the allergy group with a relative lymphocytosis were three homosexuals not identified with patients having been diagnosed as having AIDS. All three admitted to frequent sexual contacts with many partners and extensive past histories of diseases and treatments for gonorrhea, syphilis, herpes, hepatitis, etc. None of these men had abnormal Helper/Suppressor cell ratios, though all had WBC's below 4200.

Relative lymphopenias in the differential counts were seen much more frequently. Among the cancer patients, 21 had lymphocyte counts below 30 percent. All belonged to a group of 24 patients who had been treated with chemotherapy. Considering some of the more specific immune indicators, Null cell elevation was observed in 50 percent of the cancer patients and in about 1/3 of the remaining patients. The elevation was restricted to a rise in the percentage of Null cells; an absolute increase in these cells was not observed. Null cell increase could signify technical artifacts caused by the fragility of the E rosette technique used to mark T cells, an increase in K cell or NK cell activity secondary to viral infection or tumor challenge, a decrease in the production of thymic hormones which control T cell maturity, and other causes.

Among the cancer patients we studied, the relative Null cell increase was not associated with lymphocytosis, lymphopenia, or treatment with chemotherapy or radiation. This latter fact suggests the relative increase was indicative of thymic hormone deficiency or possibly increased K or NK activity. In terms of other immune parameters, the

relative Null cell elevations detected were associated with defects in C3 and C4 complement status and with abnormalities in the levels of IgG, IgA and IgM. The absolute and relative numbers of T cells were within the normal range in patients with relative Null cell elevations except for those cancer patients with leukemia (three cases) where T cell numbers were markedly depressed.

In five other patients with cancer exhibiting a relative Null cell increase, we found seriously high levels of lead in the hair. We have found in our practice, that hair lead levels are highly correlated with abnormal urine lead levels following provocative lead testing with EDTA.

We have been interested in lead levels since the work of Dr. Walter Blumer in Switzerland was published. He showed a high correlation between elevated lead levels and cancer. In the sample of our patients, no definitive correlation could be established since elevated lead levels (above 5 pts pro Mil) occurred 25 times, some as high as 26 ppM! While some of these exceedingly high lead levels occurred in a variety of patients, they were also seen in patients who had normal or only minimal dysfunction of their immune systems. Perhaps these elevations of lead in the hair mineral analysis are peculiar to the greater New York area and serve only as an indictment of our polluted surroundings.

Concerning the assessment of B cells, we found that four cancer patients exhibited a depression of these lymphocytes and one exhibited an elevation of these cells. All five patients had or were receiving chemotherapy. Many patients exhibited abnormalities of the major immunoglobulins, IgG, IgA and IgM. Increases and decreases were frequently observed, suggesting deficiencies and hyperactivity, respectively. Complement deficiencies (low levels of C3 and C4 or both) were frequently observed, suggesting the presence of immune complexes in the blood of many of our patients and elevations of C3 and C4 were also observed in other patients, suggesting acute or chronic inflammatory processes.

Although this study must be considered a preliminary investigation, it does illustrate graphically that Orthomolecular practitioners will encounter many patients with immunological abnormalities.

At present, there is no definitive therapy for these impairments, but substantial evidence does suggest they may respond to specific nutritional intervention. At present, it is possible to interpret a given patient's immune survey in terms of potential nutrient needs and this may help the health care provider in developing an Orthomolecular regimen that will boost or normalize immune status.

It is too early to tell from our studies whether such action will prove curative, but it does seem likely that Orthomolecular immunotherapy will prove useful for improving or stabilizing prognosis for patients with chronic diseases by maintaining sufficient immune capacity to ward off the development of additional infectious and possibly malignant diseases. This optimism stems from results we have had with two patients exhibiting the basic immunological lesions of AIDS (depressed Helper T cells and elevated immunoglobulin levels). One of these patients was a woman who lived with a bisexual male who died of Pneumocystis carinii and neither of them exhibited Kaposi's sarcoma, Pneumocystis or generalized lymphadenopathy. However, these subjects now show normal immune function after being treated with high IV doses of ascorbic acid, BCG vaccination, Regenerson RN 13, GH3 and the nutrients required for normal Helper T cell function (copper, selenium and adequate amino acids) and those nutrients whose demand is increased by hyperimmunoglobu-lin production (vitamin B5, B6, B12 and magnesium).

Of course this finding is open to the criticism that depressed Helper T cell levels and hypergammaglobulinemia are not specifically diagnostic for AIDS since these aberrations occur in a number of other diseases. Thus, we are not making any claims that AIDS or AIDS-like syndromes can be reversed by nutritional immunotherapy. However, we will continue to monitor these patients and others immunologically, and treat them using conventional and Orthomolecular immunotherapy regimens, and perhaps we will be able to present a more definitive follow-up at a future date.

References

BEISEL, W.R. et al.: Single Nutrient Effects on Immunological Functions. JAMA 245,1, 53-58,1981.

CHANDRA, R.K.: Immunodeficiency in Undernutrition and Overnutrition. Nutrition Reviews 39,6,225-231, 1981.

LANE, H.C. et al.: Abnormalities of B Cell Activation and Immuno-regulation in Patients with the Acquired Immunodeficiency Syndrome. New England Journal of Medicine 309, 8, 453-458,1983.

LEVY, J.A.: Nutrition and the Immune System. In: Basic and Clinical Immunology. D.P. Stites et al. (Eds.). Lang Medical Publications, Los Altos, CA, 94022, pp. 297-305,1982.

REPORT OF INTERAGENCY RECOMMENDATIONS: Prevention of Acquired Immune Deficiency Syndrome (AIDS). Morbid. Mortal. Weekly Rep. 32, 101-103,1983.

Book Reviews

Eating Right to Live Sober K. Ketcham and L. Ann Mueller, M.D. Madrona Publishing, Inc., (1983) P.O. Box 22667, Seattle, WA 98122

About thirty years ago Roger Williams demonstrated a close relationship between nutrition and alcoholism. This is not surprising, for alcohol is one of the best examples of a technologically-produced food artifact devoid of every known nutrient; it supplies empty calories. It would be surprising if there were no relationship. But Williams' work remained unrecognized by the medical profession.

By 1945 alcoholism had achieved respectability as a medical disease due to the inspired work of Bill W and Dr. Bob who co-founded Alcoholics Anonymous. One of the basic beliefs of AA is its absolute rule against drinking. They do not agree that an alcoholic can become a social drinker. They are well aware that every alcoholic was a social drinker first and only after a period of time which varies from days (rare) to years became alcoholic. They have already proven they can not be social drinkers. Each alcoholic is living proof that there is no reversal from alcoholic to social drinker. The studies purporting to prove that social drinking is a reasonable therapeutic goal have been flawed and have been rejected by almost every person familiar with alcoholism. The only proponents are a few psychologists who have not been responsible for treating them and so can afford to play around with the lives of alcoholics. I wonder how many alcoholics have been lost because they were encouraged to become social drinkers.

Bill W was the first person to introduce nutrition into alcoholism on a massive scale. He encountered vigorous resistance from the medical members of the International AA headquarters, a committee he had created. These doctors told Bill he was not an M.D. and had no business messing around with vitamins. He therefore did his work outside of this group. Bill knew of the work Humphry Osmond and I had done using Vitamin B3 and Vitamin C to treat schizophrenics and later alcoholic schizophrenics. Dr. Osmond and I began to use these vitamins for treating delirium tremens in 1952. But before Bill W felt ready to tell AA about this he tried these vitamins on himself and his friends in AA. After Bill W gave up alcohol he remained very anxious, tense, and often tired. His insomnia was so severe he. would often walk up and down Manhattan's Fifth Avenue, up to forty blocks. This would create enough additional exhaustion so he could sleep. Two weeks after starting niacin, one gram three times a day, he was normal. Several years later thirty of his AA friends started to take niacin. Within one month ten were well. After another month another ten were well. The remaining ten did not respond. After this Bill W released three communications to alcoholic physicians, all members of AA. An enormous number of copies were reproduced in nearly every English-speaking country. In one U.S. state alone one dedicated member of AA distributed over 1,000 copies.

These three elements of treatment, i.e. Alcoholics Anonymous, nutrition and supplements are all used in a treatment program described by Ketcham and Mueller in this excellent book. I know of no other book written for alcoholics with the same orientation.

In Part One they review the evidence that alcoholism is a genetic nutritional disease. One test of sugar intolerance, i.e. relative hypoglycemia, is present in 90 percent of all alcoholics.

In a large series of several hundred tested I found no normal sugar tolerance curves. Hypoglycemia, not to be confused with the extremely rare pancreatic tumor variety, is a function of excessive consumption of sugar, alcohol and foods one is allergic to. It is

present even in alcoholics who have been abstinent, probably because so many switch over to sugar and caffeine when they give up alcohol.

Part Two describes the resistance of the medical profession against this concept. This resistance is illogical, as is usually the case when doctors are confronted with a new treatment paradigm. It usually takes about forty years before new ideas are accepted, i.e. two generations of physicians enslaved by their medical colleges must die.

than I do, but they use a more comprehensive multivitamin approach than Osmond and I and Bill Wilson used many years ago. I think this is a very useful book. It ought to be used by every professional concerned about alcoholism, including our psychosocial colleagues, and of course by every alcoholic and anyone associated with them.

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How Safe are Silver (Mercury) Fillings?
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It is difficult to believe that treatment whose only objective is to help people can be detrimental to them, especially when it has been used for many years. Medical science continues to advance by finding newer ways of helping, using treatment which is more effective and less hazardous. The toxicity of a treatment is never by itself a contraindication if the threat to life by the disease being treated is even greater than the toxicity of the treatment. Insulin is not one of our safest treatments but must be used since diabetes mellitus uncontrolled is even more dangerous. So we continue to search for safer and more effective treatments.

Dentists have been filling our teeth with plastic or metals for many years, using material generally thought of as safe. One of the most commonly used dental filling materials is a variety of silver amalgams. They are better called mercury amalgams since there is usually more mercury than silver. As the amalgams grow older the mercury is slowly released into the mouth as a gas and by diffusion into the tissue closest to the filling. There is a gradual invasion of the body. Most people apparently can tolerate this burden of mercury, but a number cannot.

Treatment is described in the third section. These authors use smaller doses of Vitamin B3

The Journal of Orthomolecular Psychiatry has carried several reports which describe what mercury can do because Orthomolecular physicians are concerned about every factor which can influence metabolism adversely. Recently Betsy Russell-Manning sent me her book, **How Safe Are Silver (Mercury) Fillings?**

Russell-Manning has gathered into one volume an amazing amount of information about the connection between metallic fillings and disease. For many years this will remain the definitive book and will be used by dentists and physicians who can not find time to do their own literature search and must have this material in a readily available volume.

I will not review this book in detail. The only reason for a review is to excite the reader that here is a book worth having. I hope that my view that this is a good book will excite such interest. If you have mercury in your mouth and if you are healthy you do not need to know any more, but if you suffer from a variety of symptoms which have not been helped, perhaps you ought to think mercury. Is the problem in your teeth, rather than in your psychology? Up-to-date Orthomolecular physicians and clinical ecologists are, of course, already aware of the potential toxicity of mercury amalgams.

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