Second International Symposium on Infections in the Immunocompromised Host

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Two years ago at Veldhoven, Netherlands, over 300 medical investigators attended the first International Symposium on Infections in the Immunocompromised Host. The meeting was a great success and the Organizing Committee therefore decided to hold a second meeting, this time in Stirling, Scotland.

In planning this meeting we were, of course, able to draw on the lessons learnt at Veldhoven. We felt it important to attract participation from medical disciplines other than microbiology and infectious diseases; and in particular from surgery, oncology and haematology. The plenary sessions were planned with this in mind.

The first part of each morning was taken up by a plenary session with four or five speakers followed by discussion. Summaries of these plenary session papers make up the first part of this volume, together with a special lecture by Donald Armstrong on acquired immunodeficiency in homosexuals and drug addicts, a topic which came to the fore after the plenary sessions had been planned.

The rest of the meeting consisted of posters and workshops. The posters were selected for brief oral presentation during the afternoon workshops. These presentations were limited to five minutes and designed to provide a framework for more general discussion. They are included in the form of extended extracts in the latter part of the book.

We thank all those who have contributed to this volume. We also thank our fellow members of the Organizing Committee: Donald Armstrong, Arne Forsgren, John I. Gallin, Jean Petersky, Shuzo Matsumoto, Phillip K. Peterson, Paul G. Lasky, Jack Remington, L.D. Sabath, Dick van der Waaij, Ralph Furth, Jan Verhoef and Lowell S. Young, many of whom gave papers during the meeting and all of whom helped greatly by chairing plenary sessions and workshops. The workshop chairmen had perhaps the hardest task in organizing the content of their sessions and leading the discussion. The success of these sessions was due largely to their hard work.

Amongst the multitude to whom we owe our thanks for the
success of the meeting we must single out the following: Dr Curtis Gemmell for sterling help in organizing both the scientific and social aspects of the Symposium; Mr Tom Dunn, FIMLS, for invaluable help in every aspect of the organization from the initial planning stages onwards, and his colleagues and staff of the MSL Division of Upjohn (UK and The Netherlands) for staffing the secretariat and ensuring the smooth running of the Symposium; Mr Harry Joyce and Mr Warren Snow, together with their colleagues in the Upjohn Company's International and USA MSL Division for their generous and unstinting help, and in particular for ensuring the financial viability of the Symposium.

Charles S.F. Easmon
Harold Gaya

1983
The symposium was planned and developed to be a format for exchange of information about problems of serious infections in patients with compromised host defences and to expand and update topics discussed two years ago at Veldhoven, The Netherlands. At the conclusion of that First Symposium I tried to summarize the highlights of the programme and define some of the areas where research was producing new and practical results. We believed that advances in these areas could make the Second Symposium even more exciting than the first; I believe that expectation came true.

The programme had a different format this year: instead of simultaneous sessions for oral presentation of abstract material, we had all of the abstracts presented as posters and abbreviated formal presentations were made in workshops. Scottish weather kept nearly everyone inside and there was vigorous participation around the posters and in workshops. Delegates and guests at the symposium were able to become involved in discussion about all of the posters and most will be published in this volume as extended abstracts.

Credit for the success of this year's programme must be given to Drs Harold Gaya and Charles Easmon in London and Artis Gemmell in Scotland. An enormous amount of the responsibility and effort by these leaders provided the atmosphere and substance of the scientific programme. The Medical Sciences Liaison Division of the Upjohn Company made a generous contribution for the development of this programme in Stirling, as well as the Veldhoven programme two years ago, and for that we are very grateful. An even greater contribution was the tireless, skilled, and detailed management of Mr Thomas Dunn who was responsible for the logistical part of the scientific programme and the social programme that added so much to the value and enjoyment of this symposium.

The susceptible patient was the central theme of all the plenary speakers and the workshops. The immunological basis for susceptibility, the aetiology of infectious problems and
advances in therapy of patients with infection occupied everyone for the three and one half days of the symposium. We hope that readers of this volume will receive much of the information and stimulation that all of us enjoyed in Stirling.
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We are experiencing an alarming epidemic of an acquired immunodeficiency syndrome (AIDS) in certain cities in the United States. It is affecting homosexual men, intravenous drug abusers of either sex and Haitian refugees [1, 2]. The immunodeficiency is primarily of the thymus derived lymphocyte-mononuclear phagocyte arm of the immune system and the infecting organisms are those that take advantage of such defects (Table 1). Victims develop opportunistic infections (OI), Kaposi's sarcoma (KS), or other malignancies.

We are seeing such cases on a regular basis in New York City. Statistics from the New York City (NYC) Department of Health record almost one new case every other day. This epidemic reached sufficient proportions by 1981 for the Centers for Disease Control (CDC) to establish a task force specifically to investigate the problem. Table 2 summarizes the cases of AIDS reported to the CDC as of early June, 1982. The NYC Department of Health established a working group and has arranged for physicians caring for such patients and clinical investigators to meet on a monthly basis to share information. At these meetings updated reports (Table 3) from NYC and CDC are distributed and specific problems such as protocols for immunological evaluation and treatment are discussed. AIDS patients are regularly seen in Los Angeles, San Francisco and other large cities in the United States and cases have also been reported from Europe. In addition to
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<td><strong>Bacteria</strong></td>
</tr>
<tr>
<td><em>Mycobacterium tuberculosis</em></td>
</tr>
<tr>
<td><em>Mycobacterium avium-intracellulare</em></td>
</tr>
<tr>
<td><em>Mycobacterium fortuitum</em></td>
</tr>
<tr>
<td><strong>TO BE ANTICIPATED</strong></td>
</tr>
<tr>
<td><em>Other atypical mycobacteria</em></td>
</tr>
<tr>
<td><em>Legionella spp.</em></td>
</tr>
<tr>
<td><em>Nocardia asteroides</em></td>
</tr>
<tr>
<td><em>Listeria monocytogenes</em></td>
</tr>
<tr>
<td><em>Salmonella spp.</em></td>
</tr>
<tr>
<td><em>Brucella spp.</em></td>
</tr>
</tbody>
</table>

* Reported or to be anticipated with increased frequency or severity in AIDS patients.
+ Progressive multifocal leukoencephalopathy.
TABLE 2  Acquired immunodeficiency syndrome (CDC data, June 4, 1982)

<table>
<thead>
<tr>
<th>Disease</th>
<th>As primary diagnosis</th>
<th>(April figures)</th>
<th>Total diagnosed</th>
<th>(April figures)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kaposi's sarcoma</td>
<td>140</td>
<td>38.2%</td>
<td>100</td>
<td>(87)</td>
</tr>
<tr>
<td>Pneumocystis carinii pneumonia</td>
<td>169</td>
<td>46.0%</td>
<td>82</td>
<td>(70)</td>
</tr>
<tr>
<td>K.S. + PCP</td>
<td>28</td>
<td>7.6%</td>
<td>46</td>
<td>(Not including Candida)</td>
</tr>
<tr>
<td>Other opportunist infections</td>
<td>30</td>
<td>8.2%</td>
<td>46</td>
<td>(Not including Candida)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>189**</td>
<td>(137)</td>
<td><strong>Total cases NYC 199</strong></td>
<td></td>
</tr>
</tbody>
</table>

TABLE 3  New York City surveillance (May 24, 1982)

<table>
<thead>
<tr>
<th>Disease</th>
<th>As first diagnosis</th>
<th>Secondary diagnosis</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>P C P alone</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P C P and other O I</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other O I</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>10</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Opportunistic infections

<table>
<thead>
<tr>
<th>Disease</th>
<th>As first diagnosis</th>
<th>Secondary diagnosis</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>P C P</td>
<td>68</td>
<td>14</td>
<td>82</td>
</tr>
<tr>
<td>C M V</td>
<td>7</td>
<td>5</td>
<td>12</td>
</tr>
<tr>
<td>P H S</td>
<td>6</td>
<td>5</td>
<td>11</td>
</tr>
<tr>
<td>T B</td>
<td>3</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Atyp. mycob.</td>
<td>-</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Histo.</td>
<td>2</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>Crypto.</td>
<td>1</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Toxo.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Candida</td>
<td>5</td>
<td>not tallied</td>
<td>-</td>
</tr>
<tr>
<td>P M L</td>
<td>1</td>
<td>-</td>
<td>1</td>
</tr>
</tbody>
</table>

**New cases in May = 15.**
AIDS with its complications, another syndrome, lymphadenopathy of unknown aetiology, has been recognized in the same population [3]. This has been noted by clinicians in drug addicts for years and as far as we know, in homosexual men since 1979. Extensive evaluations, including multiple lymph node biopsies, have not revealed aetiology. Many have evidence of a T-cell defect. A few of these individuals have subsequently developed OI or KS.

Another clinical manifestation of AIDS is persistent weight loss called "The Wasting Syndrome". This may be associated with intermittent fever, lymphadenopathy or diarrhoea and the latter may be due to cytomegalovirus, cryptosporidiosis, giardiasis or of undocumented aetiology. The most striking aspect of these patients is the persistent weight loss and inexorable downhill course accompanied by multiple opportunistic infections such as severe rectal herpes, Pneumocystis carinii pneumonia and disseminated infection with cytomegalovirus, atypical mycobacteria or other organisms. Many of these patients, during the period of persistent weight loss are thought to have lymphomas and many have exploratory laparotomies for biopsies. Since the "wasting" may be due to different, undetected opportunistic infection, it is difficult to call this a syndrome at present.

By history most, but not all, of the homosexual men with AIDS are extraordinarily promiscuous and use recreational drugs such as amyl or butyl nitrite. Some intravenous drug users have denied recent use (within two years), but family members or friends contradicted this, and histories from such individuals may be unreliable. Haitians, when histories have been available, usually report no drug use or homosexuality.

The immunological abnormalities observed so far are listed in Table 4; our findings have been similar to those reported elsewhere [4, 5]. The abnormalities regularly include lymphopenia, cutaneous anergy to recall antigens and dinitrochlorobenzene (DNCB) sensitization and decreased in vitro proliferative responses of lymphocytes to antigens and mitogens. T-cell subset analyses show reduced or absent helper T-cells and an increased percentage of suppressor T-cells. This is usually expressed as a decreased helper/suppressor T-cell ratio. Depressed natural killer cell activity and decreased interferon production have been observed in some patients. In others interferon levels are normal or elevated. Many patients have circulating immune complexes.

In contrast to depressed cellular immunity, immunoglobulin levels are normal or elevated and antibody responses appear normal. Many of our patients, both early and late in their disease have developed leucopenia including both lymphopenia and neutropenia. Infections caused by organisms which take
TABLE 4 Presently recognized immunological defects in people with acquired immunodeficiency

<table>
<thead>
<tr>
<th>Defect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cutaneous anergy.</td>
</tr>
<tr>
<td>Lymphopenia.</td>
</tr>
<tr>
<td>Decreased lymphocyte proliferative responses to mitogens and antigens.</td>
</tr>
<tr>
<td>Reduced or absent helper T-cells</td>
</tr>
<tr>
<td>Increased percentage of suppressor T-cells</td>
</tr>
<tr>
<td>Depressed natural killer cell activity.</td>
</tr>
<tr>
<td>Depressed interferon production by peripheral blood leukocytes.</td>
</tr>
<tr>
<td>Immunoglobulin levels and antibody responses to antigens apparently normal.</td>
</tr>
<tr>
<td>Phagocytic function apparently normal.</td>
</tr>
</tbody>
</table>

The advantage of defects in humoral immunity or neutropenia do not appear to be significantly increased in these patients. Most of the immunological evaluations have been done on patients who were severely ill. We will learn more about early events in this disease as we prospectively follow patients at risk of developing it.

Table 5 summarizes the opportunistic infections we have seen in 28 patients with Kaposi's sarcoma, 12 who did not have KS and two intravenous drug abusers. Fourteen patients had Pneumocystis carinii pneumonia, 10 had disseminated cytomegalovirus infections, 11 had severe oral or rectal herpes infections, 2 had proven central nervous system toxoplasmosis. Nearly all patients have had candida infections of the mouth and candida oesophagitis is very common. We have recently admitted a patient with cryptosporidiosis and CMV colitis. Treatment with furadaxone was unsuccessful. Some patients have become progressively withdrawn and unresponsive and appeared to have encephalitis. In one case, no diagnosis was made despite brain biopsy and postmortem examination.

We have isolated CMV and adenovirus from a number of patients. Many of the patients from whom CMV was isolated have remained well, and we have not yet seen a case of disseminated adenovirus infection.

Acquired immunodeficiency disease has a high mortality rate. Thirteen of 42 patients in our series have already died. Nationwide, half of the patients have died. The typical course is one of continuing fever, weight loss, diarrhoea and recurrent infection. Pneumocystis carinii pneumonia (PCP), the most common infection, responded to cotrimoxazole in half of our patients. However, excluding the three who are still...
### TABLE 5  Infections in patients with acquired immunodeficiency syndrome at Memorial Sloan-Kettering Cancer Center

<table>
<thead>
<tr>
<th></th>
<th>PCP</th>
<th>CMV</th>
<th>HSV</th>
<th>Toxo</th>
<th>Invasive candidiasis</th>
<th>TB</th>
<th>Mycobacterium avium complex</th>
<th>Cryptosporidium</th>
<th>Salmonella</th>
<th>Encephalitis cause unknown</th>
</tr>
</thead>
<tbody>
<tr>
<td>K S</td>
<td>28</td>
<td>5</td>
<td>3</td>
<td>5</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>No K S</td>
<td>12</td>
<td>8</td>
<td>7</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Addicts</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>42</td>
<td>15</td>
<td>10</td>
<td>11</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

CMV has been isolated from the urine of 7 and buffy coat of 1 patient.

Adenoviruses have been isolated from the urine of 3 and stool of 4 patients.
IMMUNODEFICIENCY IN HOMOSEXUALS

being treated, only two patients who had PCP are presently alive, even though six recovered from their initial infection. Eight of the ten patients who had disseminated CMV infection have died. Six were treated with Fluro-iodo-arabinofuranosylcytosine (FIAAC) and only one, a 22-year-old man with CMV pneumonia, has recovered.

Treatment of infections in these patients is hampered by the severity and apparent irreversibility of the immunodeficiency. Attempts to restore some degree of immunocompetence with agents such as thymosin, interferon, or transfer factor or leukocyte dialysate factor have been undertaken in a few patients. At Memorial Sloan-Kettering Cancer Centre recombinant human leukocyte interferon induced good partial responses in 5 of 12 patients with KS. In some cases, the responder lymphocytes had subnormal PHA responses which returned to normal with interferon which suggested that there was an improvement in immune function. In some patients, NK activity was boosted, but increased NK activity did not predict clinical response. Other modalities which have been tried in a few patients include plasmapheresis, bone marrow transplantation and administration of mouse monoclonal anti-T suppressor cell antibody. The results of these efforts are preliminary, but not too promising. Treatment remains a knotty problem.

The aetiology of this acquired immunodeficiency disease is not known. Cytomegalovirus has been suggested as a possible agent. It has been associated with Kaposi's sarcoma; it can cause prolonged immunosuppression and it is very common among homosexuals and is transmissible by semen, excreta and blood. In one often cited study, 14% of homosexuals under 29 excreted it in their urine and 94% of patients had serological evidence of infection [6]. Prolonged seminal fluid excretion occurs and some cases of acquired immunosuppression start as illnesses which are compatible with CMV [4]. A current hypothesis is that repeated exposure to CMV in individuals with a hereditary predisposition (perhaps related to the HLA-DR5 locus) and perhaps made susceptible by amyl nitrite might lead to prolonged immunosuppression [7]. However, homosexuality and CMV (and the other candidate viruses like EBV) have been around a long time and this disease is clearly new. If CMV or any other known virus is causing this disease, why is it happening now? And why primarily in homosexual men and intravenous drug addicts and not in heterosexuals, half of whom have serological evidence of CMV infection and many of whom receive transfusions.

A role for an infectious agent is suggested by the fact that the disease occurs in people in whom infections are readily spread. Blood or body secretions would appear to be
potential vehicles of infection, but since many people are exposed and only a few people develop clinical symptoms, factors such as differences in host resistance and inoculum size may be important.

A group of patients who may help further our understanding of this acquired immunodeficiency syndrome are the gay men with lymphadenopathy. These patients have enlarged lymph glands which cannot be explained by clinical evaluation. On biopsy they show nonspecific hyperplasia. A few of these patients have progressed to acquired immunodeficiency disease. Although most are asymptomatic, and some have had enlarged nodes for a number of years. In a group of patients whom we have followed, lymphopenia was a common finding, and half of those tested had in vitro lymphocyte abnormalities, including lymphopenia, decreased NK, decreased responses to mitogens or antigens and decreased helper/suppressor T-cell ratios. We have also studied a group of healthy male homosexuals at an upstate New York campus located in an area where the current epidemic had not been encountered. Although these men were healthy, and there was no lymphopenia or anergy, immunological abnormalities including low and high H/S ratios, abnormal responses to mitogens and low NK activity were present in a significant number. The clinical significance of these observations can only be determined by follow-up.

Those who take care of these patients realize how devastating this illness is. The early events need to be identified by prospective studies of high risk groups. Viral isolates need to be studied for virulence and differences from known strains. The effects of recreational drugs on immunity must be studied. Pending recognition of an aetiological agent which might lead to specific therapy we need better ways to reverse these immunological defects. We need to try to prevent this illness and apply existing therapies more effectively and develop and evaluate new ones.

REFERENCES
OPPORTUNIST INFECTIONS IN HOMOSEXUAL MEN WITH ACQUIRED IMMUNOLOGICAL DEFICIENCY

J.W.M. Gold, C.L. Sears, D. Armstrong, A.E. Brown, B. Wi
S. Henry, H. Donnelly, B. Safai, P. Myskowski, C. Urmac
M. Tapper, B. Koziner, M. Pollack and S. Cunningham-Rund

Memorial Sloan-Kettering Cancer Center and Lenox Hill Hospital New York, New York, USA.

At the end of March 1982, more than 300 cases of Kaposi's sarcoma (KS) and opportunistic infections had been reported to the Centers for Disease Control, Atlanta, Georgia. Most were in young, previously healthy homosexual men in New York, Los Angeles and San Francisco. A few cases have been reported in heterosexuals, a number of whom are intravenous drug abusers.

Nearly half of the patients in this outbreak have died. We have seen 34 patients with this acquired immunological deficiency, 24 of whom had KS. Eight have died of opportunistic infections. We have also seen 15 homosexual men with unexplained lymphadenopathy, one of whom developed KS after a year. We present here some of the currently available immunological, serological and microbiological data from these patients.

Table 1 summarizes the proven opportunistic infections we encountered in these patients.

Three men with KS died of opportunistic infections. All had disseminated CMV infections. Two had toxoplasma encephalitis. One who had previously been treated successfully for Pneumocystis carinii pneumonia had toxoplasmosis, disseminated candidiasis and disseminated M. avium-intracellulare and Fortuitum infections. Five patients who did not have KS developed opportunistic infections. All had disseminated CMV three had severe Pneumocystis carinii pneumonia despite treatment with pentamidine after failure of trimethoprim-sulphamethoxazole. Three had severe ulcerative perirectal herpes simplex infections and one had scrofula due to M.
TABLE 1  Proven opportunist infections in homosexual men with acquired immunodeficiency

<table>
<thead>
<tr>
<th></th>
<th>CMV</th>
<th>P. carinii</th>
<th>HSV</th>
<th>Dissem.</th>
<th>Candida: Thrush or oesophagitis</th>
<th>Salmonella</th>
<th>M. tuberculosis</th>
<th>M. avium</th>
<th>M. fortuitum</th>
<th>T. gondii</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1*</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Group 2 + 3**</td>
<td>5</td>
<td>6</td>
<td>5</td>
<td>0</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>8</td>
<td>7</td>
<td>7</td>
<td>1</td>
<td>7</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

* Group 1: 24 patients with Kaposi's sarcoma (KS).
**Groups 2 and 3: 10 patients with opportunist infections but without KS.

TABLE 2  Antibodies in homosexual men with Kaposi's sarcoma or opportunist infections

<table>
<thead>
<tr>
<th></th>
<th>CMV</th>
<th>HSV</th>
<th>EBV</th>
<th>VZ</th>
<th>VDRL</th>
<th>MHA-TP</th>
<th>TOXO</th>
<th>HBab</th>
<th>HbAg</th>
<th>Serameba</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kaposi's (17)</td>
<td>17/17</td>
<td>17/17</td>
<td>17/17</td>
<td>15/17</td>
<td>4/18</td>
<td>11/17</td>
<td>7/17</td>
<td>7/13</td>
<td>1/12</td>
<td>0/12</td>
</tr>
<tr>
<td>Opportunistic infections (6)</td>
<td>6/6</td>
<td>6/6</td>
<td>6/6</td>
<td>6/6</td>
<td>0/6</td>
<td>0/6</td>
<td>0/4</td>
<td>6/7</td>
<td>0/7</td>
<td>0/7</td>
</tr>
<tr>
<td>Total</td>
<td>23/23</td>
<td>22/23</td>
<td>23/23</td>
<td>20/23</td>
<td>4/24</td>
<td>11/23</td>
<td>7/21</td>
<td>13/20</td>
<td>1/19</td>
<td>0/19</td>
</tr>
</tbody>
</table>
tuberculosis.

Serological, microbiological and immunological evaluations were performed in many of these patients. The results of serological testing are summarized in Table 2.

CMV was isolated from the urine of five patients with KS and from the urine and buffy coat of one patient with disseminated CMV. Adenoviruses have been isolated from the urine of two patients with KS and from the stool and urine of a patient with opportunistic infections.

Serum immunoglobulin levels were normal or elevated in these patients. Cutaneous anergy to recall antigens (PPD, SKS, mumps and candida) was present in all but three of the patients and all patients with opportunistic infections. Eleven patients were lymphopenic. Reversal of the normal helper-suppressor T-cell ratio as determined using monoclonal antibodies to Leu-3 and Leu-2 antigen was observed in all 15 patients tested and four of the five patients with opportunistic infection who were tested. Decreased in vitro response of lymphocytes to mitogens were observed in all 15 KS and five patients with opportunistic infections tested. Nine of 15 patients tested were DR5 positive.

We have followed 15 homosexual men with persistent unexplained lymphadenopathy for up to two years. Most are asymptomatic. A few complain of malaise and easy fatigability. Cutaneous anergy and lymphopenia were present in those patients. Six of 10 tested were DR5 positive. Reversal of the helper-suppressor ratio was present in eight of nine patients, and there was decreased natural killer cell activity against virus infected cells.

An illness of unknown cause characterized by a profound acquired defect of cellular immunity is occurring in homosexual men. Patients develop multiple severe opportunistic infections which are difficult to treat and have a high mortality rate. Cases are also appearing among heterosexuals, including women, many of whom are intravenous drug abusers.