Measles virus and Crohn’s disease: view of a medical virologist

Some recent reports have claimed that persistent measles virus infection is involved in the aetiology or pathogenesis, or both, of Crohn’s disease. Using a variety of techniques, such as direct electron microscopy, immunohistochemistry and in situ hybridisation, these authors report that measles virus particles, protein or RNA were detected in tissues from patients with Crohn’s disease. These observations led to the hypothesis that exposure to measles virus early in life, either during pregnancy, or as a consequence of postnatal infection by wild type measles virus or measles vaccination, predisposes to inflammatory bowel disease (IBD). These claims prompted publication of several critical commentaries and responses and led to a case control study which did not support an association between measles virus and Crohn’s disease. The PCR technique has recently made it possible to amplify nucleic acid sequences from tissue sections and to detect any measles virus RNA in brain tissue of patients with multiple sclerosis. The only reasonable conclusion from these studies is that measles virus can persist in brain tissue of patients with multiple sclerosis.

From a virological point of view, the incrimination of measles virus in Crohn’s disease is most controversial. Whereas one group found measles virus specific IgM antibodies in the majority of patients, others could not detect any immunological evidence of persistence of measles virus or any differences compared with control groups. If the latter observation is correct, it would not support the view of a persistent measles virus infection, but rather an immune reaction in the course of an acute infection. Thus, the observations relating to a possible association of measles virus with Crohn’s disease are very controversial and at present, there is no unequivocal evidence to support this hypothesis.

The discussions about the involvement of measles virus in Crohn’s disease are reminiscent of those taking place for other diseases, such as multiple sclerosis, Paget’s disease, otosclerosis, and various autoimmune disorders. As summarised in table 1, only acute measles with its various complications, measles inclusion body encephalitis (MIBE) and subacute sclerosing panencephalitis (SSPE), can be directly attributed to this morbillivirus infection at the present time. In each of these diseases, measles virus can always be detected using a variety of laboratory tests, and humoral and cell mediated immune reactions against this agent correlate with disease progression. Evidence of measles virus infection in the other diseases listed in table 1 is circumstantial. In multiple sclerosis, the major support for a possible viral aetiology derives from epidemiological studies implicating environmental factors encountered years prior to the onset of disease. Serological studies have revealed slightly higher or normal titres of measles virus antibodies in patients with multiple sclerosis compared with controls. In addition, measles virus specific RNA has been detected occasionally in scattered cells in brain tissue, but this is also true of controls. Other groups have failed to detect any measles virus RNA in brain tissue of patients with multiple sclerosis. It is noteworthy that listeria, Escherichia coli, streptococcus, and human herpes viruses have been found and proposed as causal factors in IBD.

(MIBE) and subacute sclerosing panencephalitis (SSPE), can be directly attributed to this morbillivirus infection at the present time. In each of these diseases, measles virus can always be detected using a variety of laboratory tests, and humoral and cell mediated immune reactions against this agent correlate with disease progression. Evidence of measles virus infection in the other diseases listed in table 1 is circumstantial. In multiple sclerosis, the major support for a possible viral aetiology derives from epidemiological studies implicating environmental factors encountered years prior to the onset of disease. Serological studies have revealed slightly higher or normal titres of measles virus antibodies in patients with multiple sclerosis compared with controls. In addition, measles virus specific RNA has been detected occasionally in scattered cells in brain tissue, but this is also true of controls. Other groups have failed to detect any measles virus RNA in brain tissue of patients with multiple sclerosis. It is noteworthy that listeria, Escherichia coli, streptococcus, and human herpes viruses have been found and proposed as causal factors in IBD.

Table 1  Human diseases associated with measles virus infection

<table>
<thead>
<tr>
<th>Confirmed association</th>
<th>Suggested association</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute measles</td>
<td>Multiple sclerosis</td>
</tr>
<tr>
<td>Complications of acute measles</td>
<td>Otosclerosis</td>
</tr>
<tr>
<td>Measles inclusion body encephalitis</td>
<td>Paget’s disease</td>
</tr>
<tr>
<td>Subacute sclerosing panencephalitis</td>
<td>Various autoimmune disorders</td>
</tr>
</tbody>
</table>

(MIBE) and subacute sclerosing panencephalitis (SSPE), can be directly attributed to this morbillivirus infection at the present time. In each of these diseases, measles virus can always be detected using a variety of laboratory tests, and humoral and cell mediated immune reactions against this agent correlate with disease progression. Evidence of measles virus infection in the other diseases listed in table 1 is circumstantial. In multiple sclerosis, the major support for a possible viral aetiology derives from epidemiological studies implicating environmental factors encountered years prior to the onset of disease. Serological studies have revealed slightly higher or normal titres of measles virus antibodies in patients with multiple sclerosis compared with controls. In addition, measles virus specific RNA has been detected occasionally in scattered cells in brain tissue, but this is also true of controls. Other groups have failed to detect any measles virus RNA in brain tissue of patients with multiple sclerosis. It is noteworthy that listeria, Escherichia coli, streptococcus, and human herpes viruses have been found and proposed as causal factors in IBD. From a virological point of view, the incrimination of measles virus in the aetiology and pathogenesis of a human disease requires both the detection of measles virus and a virus specific immune response that correlates with the disease process. The detection of measles virus depends on the stage of virus–cell interaction. In an acute measles virus infection, virus can be isolated from different organ tissues quite easily. In persistent infections, such as MIBE or SSPE, isolation of infectious virus from brain tissue is the exception rather than the rule. However, viral proteins and viral nucleic acids are always detectable in brain tissue of patients with these two diseases by a variety of methods. Moreover, as measles virus proteins are highly immunogenic specific humoral and/or cell mediated immune reactions are found in both acute and persistent virus infections.
Infections. In Crohn’s disease, as with multiple sclerosis, the detection of measles virus in diseased tissue is not reproducible, maybe as a result of a low copy number of viral genes in infected cells. In such a situation, sequence determination is needed to confirm the presence of measles virus in diseased tissue. This has still to be achieved in IBD. Although Koch’s postulates cannot always be fulfilled in subacute or chronic inflammatory disorders, attempts to link a conventional virus to such diseases requires both the detection of the agent and virus specific immune reactions in each and every case. It will be of interest to see whether this can be achieved in Crohn’s disease.

V TER MEULEN

Institut für Virologie und Immunbiologie,
Universität Würzburg,
Vorbacher Strasse 7,
D-97074 Würzburg, Germany