The seroprevalence of Hepatitis E virus (HEV) antibodies was investigated in employees from Styria/Austria, who belonged to occupational groups with different intensity of exposure to swine. The highest seropositivity rate was found among swine farmers and swine slaughterhouse employees (IgM: 25.49 % and 28.42 %, IgG: 36.60 % and 27.37 % respectively), while the lowest seropositivity was identified in poultry slaughterhouse workers and townspeople (IgM: 8.70 % and 11.43 %; IgG: 15.22 % and 11.43 %, respectively). Hunters exhibited a medium positivity rate (IgM: 14.77 %; IgG: 22.82 %). These results support the theory that swine may represent reservoir hosts for HEV, and suggest that HEV may in certain cases be transmitted zoonotically to human beings.

Introduction

A novel, non-A non-B type of infectious hepatitis was first described in 1983 by Balayan et al. The causative virus and the disease was named “Hepatitis E” according to its “epidemic”, “endemic” and “entirely transmitted” characters (Parents of Kids with Infectious Diseases, 2003). Hepatitis E virus (HEV) is a non-enveloped, positive-sense, single-stranded RNA virus with icosahedral symmetry; it belongs to the unassigned genus Hepatovirus (Fauquet et al., 2005). The infection in humans is associated mainly with an acute, self-limiting, icteric hepatitis with a mortality rate of approx. 1%, however up to 20% in pregnant women (Figure 1) (Raksh and Kwaczyński, 2000). Antibodies to HEV were found in different animal species, in which, however, the HEV infection remained asymptomatic. HEV strains isolated from animals are genetically related to human HEV strains, suggesting a zoonotic transmission (Reuter and Szucs, 2004). Hepatitis E is considered to be endemic in several Asian and central-American developing countries with more than 100 reported human cases per year. Besides imported cases from endemic countries, hepatitis E has been reported recently also in many “non-endemic” industrialized countries including the USA, European countries, Japan and New Zealand, and HEV antibodies have been diagnosed in up to 3.3% of these populations (Figure 2) (Router and Szucs, 2004).

The aim of this study was to determine the seroprevalence of HEV antibodies in occupational groups with different intensity of exposure to swine, the suspected main animal reservoir species. The study was carried out in Austria, a country considered non-endemic for HEV infection.

Discussion

The seroprevalence of HEV in the Austrian human population was first surveyed 12 years ago by Hoffmann and Holzmann, 1995. At that time 8.3% positivity was found in hepatitis patients and 2.3% in the control population, using an enzyme immunoassay. A few years later a novel HEV strain was identified in an Austrian patient; this virus strain proved to be serologically more related to the “US-type” (genotype 3) HEV antigens, and at that time available commercial serological tests could not detect HEV antibodies in late-stage convalescent sera (Worm et al., 1998b). The HEV patient lived in Graz and did not travel outside Austria.

In the current study, individuals from Graz and its surroundings were surveyed by one of the to-date available most sensitive serological assays. The majority of the investigated samples were found HEV-antibody negative (IgM: 71.13 %; IgG: 65.90 %), but the positivity - even in the "control" group of townspeople (11.43 % both IgM and IgG) – proved to be much higher than previously reported and expected. The applied serological test, however, is much more sensitive than the one used in the previous study. So far Austria is considered as a HEV “non-endemic” country, and indeed human disease associated with HEV has been reported in Austria only sporadically. Genotype 3 HEV strains were frequently detected in industrialized swine and in wild animals (Reuter and Szucs, 2004). This genotype also infects humans, but the majority of the infections remain clinically inapparent (Meng et al., 1998). The results of this study support new idea of scientists that the categorization “endemic” and “non-endemic” should be revisited and new categories should be introduced to describe the epidemiological status of countries.

HEV is spread mainly by the fecal-oral route through feces-contaminated water and raw meat. Swine farmers and swine slaughterhouse employees are occupational groups that are in everyday contact with swine feces and raw swine meat. In these two occupational groups both anti-HEV IgM and IgG antibodies were detected at the highest percentages of all investigated sera (IgM: 25.49 % and 28.42 %, IgG: 36.60 % and 27.37 %, respectively). On the other hand, the group of townspeople, who may in contact with possibly HEV-infected raw swine meat only during household meat processing, showed together with poultry slaughterhouse workers the lowest percentages of positivity (IgM: 11.43 % and 8.70 %; IgG: 11.43 % and 15.22 %, respectively). Poultry seems to be therefore no significant source of HEV infection. Hunters exhibited medium-level positivity (IgM: 14.77 %; IgG: 22.82 %).

The results of this study indicate a connection between the HEV seroprevalence rate and the occupation of the investigated subjects, which supports the theory of a partly zoonotic transmission of HEV to human beings, especially from swine.

Materials and Methods

Sera were collected from 478 individuals of each of the following professions: farmers, swine- and poultry slaughterhouse employees, and hunters; people from the city of Graz (Styria) served as control group. The recomblot HEV IgM/IgG0 (Mikrogen, Neuried, Germany) was employed for the serological investigations (Figure 3 a, b). In all sera both HEV IgM and IgG antibodies were determined. The sera were coded, and the investigations were carried out in a blinded manner.

Results

The distribution of HEV seropositivity in people with different professions is presented in Figure 4. The results of this study support new idea of scientists that the categorization “endemic” and “non-endemic” should be revisited and new categories should be introduced to describe the epidemiological status of countries.

Nonetheless, the high HEV seropositivity rate in the Austrian population was surprising to us. Therefore, ongoing investigations are aimed to reveal whether the high seropositivity rate is due to relatively frequent, but asymptomatic, human infections, or due to unspecific reactions which may disturb the accuracy of the immunoblot assay. Positive results will be validated by independent serological assays, and specific RT-PCR assays are being performed on the IgM positive sera in order to investigate whether in certain cases of recent infections HEV-specific PCR amplification products can be achieved. The generally high seropositivity rate may also reflect the rather subjective reading of the test results (the diagnostic samples are compared to weak positive and negative controls visually which obviously results in a small grey zone of individual interpretation). Despite the generally high HEV seropositivity rate a clear conclusion of this study can be drawn. Professions with frequent contact to swine (swine farmers and swine slaughterhouse employees) exhibited the highest HEV seropositivity rate, while individuals with infrequent contact to swine or raw swine products such as townspeople and poultry slaughterhouse employees showed the lowest seropositivity rate. It can be concluded that occupations with frequent contact to swine or raw swine products are at risk to acquire zoonotically HEV from swine.