must be accomplished in an obligatory manner, these activities are not always carried out by the medical sta [11].

Isolation has shown to be e ective in controlling the infection [12], but also, large reductions of HCV transmission in HD have been observed after strict enforcement of standard precautions [13,14].

The question still remains: should we invest our resources in isolating the patients who are infected by the HCV? Or should we perhaps use our economic resources in the permanent updating of the personnel about the importance to systematically applying preventive measures to reduce the incidence of the infection of the HCV with limited expenses?

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The e ect of alpha interferon therapy and short-interval intradermal administration on response to hepatitis B vaccine in haemodialysis patients

Sir,

Infection with hepatitis B virus (HBV) is one of the major threats for patients on long-term haemodialysis (HD). The risk to develop chronic disease following HBV infection varies between 3 and 10% among HD patients [1]. Although the e cacy of hepatitis B vaccine measured as antibody response to hepatitis B surface antigen (HBsAg) is reported to be 90% among healthy individuals, it is substantially lower among haemodialysis patients and varies between 50 and 70% [2,3]. Unresponsiveness to hepatitis B vaccine in HD patients was shown to be related to factors such as older age, the presence of DR3, DR7, and DQ2, and the absence of A2 alleles while sex, time on HD, nutritional status, erythropoietin therapy or hepatitis C virus infection did not significantly influence antibody response to hepatitis B immunization [4].

Various methods have been used in attempt to increase antibody response to hepatitis B vaccine among this group including the doubling of the dose scheduling, use of additional doses and co-administration of various agents (interferons, interleukin-2, granulocyte-macrophage colony-stimulating factor, thymopentin) designed to potentiate immune response to the vaccine [5–9]. In this study we evaluated the e ect of repeated intradermal vaccination with recombinant hepatitis B vaccine administered simultaneously with interferon-α therapy in the group of haemodialysis patients who failed to develop immunologic response after conventional vaccination.

Twenty nine chronic haemodialysis patients were included in the study. All patients were previously vaccinated with recombinant hepatitis B vaccine (GenHevac B Pasteur, Pasteur Merieux Connaught) using conventional method (three IM doses of 20 mcg given at 0, 1 and 2 months) and failed to develop antibody response within 6 months following vaccination.

Patients were randomized into two study groups. Patients from each study group were vaccinated four times at 2-week intervals with 20 mcg hepatitis B vaccine (S, Pre-S1 and Pre-S2 recombinant DNA vaccine, GenHevac B Pasteur, Pasteur Merieux Connaught) administrated intradermally at left deltoid region. All patients from the group 2 additionally received 5 million units of α-interferon administrated subcutaneously at the time of each vaccination. Patients from group 1 received saline as placebo administrated subcutaneously at the time of each vaccination. Both interferon and saline were administrated in the identical syringe and amount, and the patients were blind as to the contents of the syringe. Antibody levels were estimated at 2, 4, 6, 8, 12 and 24 weeks following the administration of the first vaccine. HBsAg and Anti-HBs antibody were estimated using commercially available ELISA kits (Axsym System, Abbott Laboratories, Illinois, USA). Anti-HBs antibody level was measured in IU/l and levels equal or higher than 10 IU/l were accepted as appropriate immunologic response. Antibody levels were calculated as geometric mean titers (GMT). Statistical analysis was performed using unpaired Student's t-test and χ-squared test as indicated.

Twenty nine chronic haemodialysis patients (17 male and 12 female, mean age 38 ± 12 years) were included in study. All of the patients were on chronic haemodialysis programme for the average of 22 ± 9 months (range 6–72 months). Seventy six per cent of patients from group 1 (13/17) and 59% from group 2 (7/12) developed protective antibody response ($\geqslant$10 IU/l) but the di erence between groups did not reach statistical significance ($P > 0.05$). Antibody titers at 4 weeks were significantly higher in group 2 than group 1 ($P < 0.05$). There were no significant di erence between the titers obtained at the other study points. Peak geometric titers (230 IU/l in group 1 and 251 IU/l in group 2) were reached at 8th week. GMTs at 6 month were 176 IU/l and 150 IU/l in groups 1 and 2, respectively.

The defect in immune response to hepatitis B vaccine among HD patients is considered to be of multifactorial origin and is already present before initiation of chronic haemodialysis therapy [10,11]. Several impaired immune functions mainly of the cellular immune system, including impaired monocyte function, reduced T-cell proliferation and decreased IL-2 production have been described [7,12,13].

Limited data exist regarding the e ect of interferon-α on healthy individual hepatitis B vaccine non-responders [14,15]. Groß *et al.* reported in their pilot study the success of adjuvant interferon-α therapy only in the group of low-responder patients in which the interferon-α was added to all three initial hepatitis B vaccines but not in the group of non-responders in which the interferon-α was added only to the fifth vaccine injection [15]. In the controlled, randomized trials performed among healthy adult non-responders by Goldwater *et al.* interferon-α was shown to increase the likelihood of seroconversion to a fifth HBV vaccine dose in non-responders but when compared with placebo, its e ect did not reach statistical significance [14].

Our study is the first one that evaluates the e ect of adjuvant interferon-α therapy on the antibody response among the non-responding haemodialysis patients. The results of this study support the value of additional fourth dose of vaccine. One possible beneficial e ect of interferon was an accelerated anti-HBs antibody response. Significantly higher antibody response was achieved as early as at the 4th week in the group of patients receiving interferon-α. Antibody titers tended to be higher among the patients receiving interferon-α at the other study points although this di erence did not reach statistical significance. This results are in agreement with the report of Goldwater *et al.* who reported higher antibody titers and earlier seroconversion among healthy adult non-responders receiving one additional doses of interferon-α [14].

In conclusion, intradermal vaccination with HBV vaccine at short intervals is an e ective method of increasing the response to vaccine in chronic haemodialysis patients. This study does not support the value of concomitant interferon-α therapy in the augmentation of the antibody response rate among this group of patients. In order to further evaluate the response to concomitant interferon-α administration larger controlled studies with di erent doses and dosing frequency are required.

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Target haematocrit during erythropoietin treatment in dialysis patients. Which value is 'true-functional haematocrit'?

Sir,

Correction of anaemia in dialysis patients by recombinant erythropoietin is an established treatment. This results in better life quality, brain function, working capacity, physical activity, remission of cardiac hypertrophy and better cardiac function [1–8,10]. However, upper target haematocrit (Ht) is still controversial as the above mentioned improvement starts at Ht levels above 30% and continues up to a certain limit [1,5]. It has been also shown that morbidity decreases by 18% for every additional 1 g of haemoglobin (Hb) [5,9,10].

On the other hand, as studies supporting Ht normalization appear, treatment complications are expected to rise; these include aggravation of hypertension and cardiac ischaemia in the transitional phase of the reversal of hypoxia [1,2,5,7], accelerated vascular access thrombosis [2,4,7] and lower dialyser clearances for two compartment distribution substances [4].

All studies related to anaemia and its treatment in CRF are using pre-dialysis values. These values are lower compared to the post-dialysis ones, due to overhydration. Post-dialysis increased values (due to hypovolaemia) are expected to equilibrate within the following 12–24 h [6,11]. However, we have been unable to find any data available to us in the literature concerning Ht and Hb variations during the whole inter-dialytic period.

Therefore, we measured Ht and Hb in 15 stable dialysis patients throughout a 72 h period, that is, in the longer inter-