DISCUSSION

U. Gross[1] (*written discussion*)—Did you perform microradiography to detect the density of bone mineralization?

P. Dallant, A. Meunier, P. Christel, G. Guillemin, and L. Sedel (*authors' closure*)—We performed microradiography on each tested specimen. We have found that the mineral content of the newly formed bone was lower than normal. However, we do not have the equipment necessary to perform accurate densitometry determinations. For this reason, it was not possible to assess any effect of PEMIC on bone mineralization.

Z. R. Glaser[2] (*written discussion*)—It appears from one of your slides that new bone growth occurs at approximately 30° on both sides of the long bone at the location of the coils. A pair of spaces on both sides at 90° relative to the bone growth appears in the slide. Does this indicate loss of bone, resorption, or demineralization?

If the coils are rotated around the long bone so that they are over (on top of) the operated site, is there any change in bone growth?

Have you used more than one pair of coils? Is there any increase in the rate or amount of bone growth?

Is there any indication of altered immunologic parameters in the animals after the electromagnetic field exposure?

P. Dallant, A. Meunier, P. Christel, G. Guillemin, and L. Sedel (*authors' closure*)—The space found at 90° relative to the bone growth has a very regular border and is not related to a resorption process or demineralization but to the initial drilling, which, as performed, was not perfectly circular. However, some resorption cavities are found in the intact cortical bone located in the vicinity of the new bone apposition.

We did not perform the experiment proposed. The rotation of the coils would certainly modify the electromagnetic field, as well as the current induced in the implanted site, and might change the results of this experiment as well. Nevertheless, we do not think that a change in the field orientation would result in a dramatic change in the bone growth process.

We always used a single pair of coils. An increased number of coils would result in a modified electromagnetic field pattern, in a change in the intensity of the induced current, or in both. Considering that almost all our results tend to show that this very type of PEMIC has an insignificant effect, we do not expect to find large modifications of the data by changing only these two parameters.

No immunological evaluation was performed on these animals. The PEMIC investigated in this experiment have been used extensively in clinical situations, and we have found no reports in the literature on altered immunological parameters with this type of PEMIC.We did not observe, during this study, any infection either in the control or in the stimulated group.

J. B. Park[3] (*written discussion*)—It seems to me that the study is not designed correctly since there are no good controls (which should have an equal amount of electrical power as the stimulated group, for obvious reasons) and since it is not known how much induced current is generated in the specimen or adjacent tissues.

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I suggest also that the lateral side of the animal should serve as the control side rather than other animals since the animal-to-animal variations are much greater than those within an animal. It is also profitable to have a sham-operated animal as the starting point to verify the effect of PEMIC first before even trying to use any porous implants.

P. Dallant, A. Meunier, P. Christel, G. Guillemin, and L. Sedel (authors' closure)—The purpose of the experiment was not to determine what the parameters of the electromagnetic field are that result in bone formation (more fundamental research is certainly needed in this case) but to evaluate the effect of an already developed PEMIC on the early bone growth within a porous implant. The use of controls having an equal amount of electrical power within the operated site would not have allowed a true comparison between an electromagnetically stimulated and an actual clinical situation.

The contralateral metatarsus was not used as a control bone for two reasons:

1. Considering the short distance between the two legs of the animals, it might be possible that some residual electromagnetic fields would stimulate the contralateral side.
2. In order to obtain a stable location of the electromagnetic fields, the metatarsus had to be immobilized with a cast. A sheep that has both legs immobilized usually lies down and never gets up. This could certainly affect the experiment's results.

The PEMIC used in the experiment has proved to be efficient in previously published fracture healing experiments in rats.

For practical reasons, it was not possible to repeat a similar experiment on a larger number of sheep.