Gorter, R. W., M. Butorac, and E. P. Cobian. 2004. Examination of the cutaneous absorption of copper after the use of copper-containing ointments. *Am.J.Ther.* 11:453-458.

Abstract: Because copper-containing ointments are frequently used in anthroposophical medicine, a phase I trial to investigate the cutaneous absorption of copper was conducted. Sixty-one volunteers were randomized [group A: 0.4% copper (I) oxide, 13 men and 18 women (19-55 years); group B: 20% elementary copper, 11 men and 19 women (18-70 years)]. The ointment was applied over a 4-week period followed by a 4-week wash-out phase. Serum and urine copper concentrations were measured by atomic absorption spectrometry and hair copper concentration by inductive coupled plasma mass spectrometry. For statistical analysis, the Student t test for related random samples was used; alpha = 0.05 was chosen for the standard error. In group A, an increase of copper in serum and scalp hair and a decrease in urine were found in the study period. The mean serum concentration in all premenopausal women using oral contraceptives was above normal. In group B, the serum copper concentration increased significantly; in urine, it decreased, and in scalp hair, it remained stable. A higher level of serum copper was found in female volunteers using hormonal contraception. Treatment with the 2 different ointments did not cause toxic irritations on the skin, and it can therefore be deduced that the appropriate application of ointment preparations containing copper in concentrations up to 20% do not present a toxic risk.