A key question in considering the habitability of Mars is the availability of energy for metabolism. On Earth life uses sunlight and chemical redox couples as energy sources. On Mars, to use sunlight organisms must be close to the surface exposed to dry, low pressure conditions and high UV. A possible solution is to live below a thin layer of shielding – the hypolithic or endolithic habitat as has been suggested (by Sagan, C. & Pollack, J. 1974. Differential transmission of sunlight on Mars: biological implications. Icarus, 21, 490–495 and many others). Deep subsurface environments are well shielded from surface conditions but must therefore have a source of chemical redox energy. Ferrous iron and perchlorate are one possible redox couple. Organic material if present provides another possible reduced compound to react with perchlorate or other martian oxidants.

If a biologically useable source of energy is available the next question is the rate at which this energy can be used. Studies of polar and desert environments on Earth suggest that there is a lower limit to metabolic rates. In environments that are too cold or too dry such that metabolic rates are too low do not support growth despite the presence of redox couples and occasional liquid water. The life found in these uninhabitable Earth environments is carried in from elsewhere. These environments provide a practical indication of conditions that are too harsh for life and provide a way to assess the habitability of martian environments.