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   Sommario/riassunto   Long description: Many complex chemical processes are responsible for
                         the proper functioning of the human body. A prime example is the
                         finely structured endoplasmic reticulum, which plays an important role
                         in the metabolisms of human cells. To handle mathematical models
                         that account for this fine structure, periodic homogenization methods
                         are derived and applied. Previous results on homogenization of partial
                         differential equations on finely structured manifolds are extended:
                         Using the periodic unfolding method, diffusion terms on manifolds with
                         different scalings with powers of the homogenization parameter, in
                         particular in case of fast diffusion, are homogenized and are applied in
                         three different biological systems: a linear model of carcinogenesis of
                         cells, a nonlinear extension of the linear carcinogenesis model and a
                         model considering T-cell signaling.   Simulations and interpretations of
                         the homogeneous T-cell signaling model give an insight into the
                         related biological mechanisms.