

TIME COURSE OF SLEEP INERTIA AFTER NIGHTTIME AND DAYTIME SLEEP EPISODES

P. ACHERMANN, E. WERTH, D.-J. DIJK AND A. A. BORBÉLY

Institute of Pharmacology, University of Zürich, Winterthurerstrasse 190, CH-8057 Zürich, Switzerland

INTRODUCTION

The transitions between the sleeping and waking state has been the object of interest in physiology. Moruzzi (23; p. 136) concluded that “[a] critical but moderate level of reticular deactivation must be slowly attained in order to permit the onset of the instinctive behavior of sleep. If the fall of the reticular tone occurs abruptly, and/or is too strong, the behavioral result will not be physiological sleep, but coma”. The onset of sleep has received much more attention than the emergence from sleep. The present study addresses the latter aspect.

The two factors exerting a major influence on the level of vigilance and performance are the duration of prior waking and sleep, and the phase of the circadian rhythm (20). The constant level of daytime vigilance and performance during the major part of the waking episode has been attributed to the compensation of the declining homeostatic (e.g. sleep/wake dependent) trend by the rising circadian trend (2, 8, 15, 18).

If the duration of waking is extended (e.g. during emergency operations), or if waking and sleep episodes are shifted to a different circadian phase (e.g. during shift work), vigilance and performance may deteriorate. In such circumstances napping can be an effective countermeasure (see 31). However, the immediate benefit of a nap or a regular sleep episode may be reduced by sleep inertia. This term (22) denotes the reduced vigilance and impaired performance during the period that follows upon awakening. It was already evident in early studies that complete behavioral and functional wakefulness may lag behind the sleep/wake transition as reflected by the EEG (21, 34). Sleep inertia and the effects of napping have been mainly investigated in the context of sustained operations involving sleep deprivation and shift work (10, 12, 26, 30). The duration of sleep inertia differed widely ranging from 1 minute (34) to more than 3 hours (16). Although only few attempts were made to quantify its time course (18), sleep inertia has been incorporated in several models of sleep and vigilance (1, 2, 3, 16, 17, 18). A principal aim of the present study was to document its time course in more detail using a protocol that included both nighttime sleep episodes and a daytime nap.

