

Lower Percentage of CD56+ Cells Associated with Long Working Hours

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Abstract: In a study of 142 Japanese men from a cross-section of the workforce of a technology development company, we found that the percentage of CD56+ cells was inversely correlated with the number of hours worked per week. A low CD56+ cell percentage was associated with longer weekly working hours and shorter daily sleeping hours.

Key words: Working hours, Sleeping hours, CD56, immunological parameters, psychosocial factors

In Japan, there is a problem of health disorders associated with work overload, and long working hours are thought to be one of the main factors causing work overload^{1,2}. Long working hours are thought to be one of main factors in work overload^{3–5}, and seem to be able to be readily evaluated and managed by quantity. Therefore, the health management of long hour workers is valuable and effective. Because the effect of long working hours depends greatly on individual differences such as physical strength and lifestyle, effect markers of long working hours are necessary. But, at present, they are not adequately provided for. In order to examine the usefulness of some immunological parameters as effect markers of long working hours, we investigated the association between immunological parameters and working hours or sleeping hours which are closely related to working hours^{4,5}. The relationships between occupational stress quantified by self-reported questionnaires and immunological functions were reported^{6–8}, but not those between working hours and immunological functions.

Blood samples were collected from 197 Japanese male engineers in a technology development company after their annual workplace medical health check. Lymphocyte

subpopulations were measured by SRL Inc. (Tokyo, Japan) and comprised CD4 (T helper cells), CD8 (T suppressor/killer cells) and CD56 (mostly NK cells). On the day before blood collection, each worker filled out one questionnaire regarding mean weekly working hours, mean daily sleeping hours, health conditions and lifestyle during the last full month. Those who were undergoing medical treatment and/or took medicines on the survey day (n=24), and those who did not fill out the questionnaire completely (n=31), were excluded from the study. The final number of subjects for the analysis was 142. Their mean age was 36.6 (SD 9.6) years (range 21–64 years).

The number of weekly working hours was defined⁴) as follows: working hours = (hours at workplace over one week) + (half the commuting time over one week), where 'hours at workplace' was calculated from time of arrival to time of leaving the workplace. We divided the subjects into three 'working-hour' (or 'WH') subgroups according to the tertile of working hours (54.2 and 64.6 h/week): short (SWH < 55 h/week), medium (55 ≤ MWH < 65 h/week) and long (LWH ≥ 65 h/week). The subjects were divided into three 'sleeping-hour' (or 'SH') subgroups according to the tertile of sleeping hours (5.7 and 7.3 h/day): short (SSH < 6 h/day), medium (6 ≤ MSH < 8 h/day) and long (LSH ≥ 8 h/day). The

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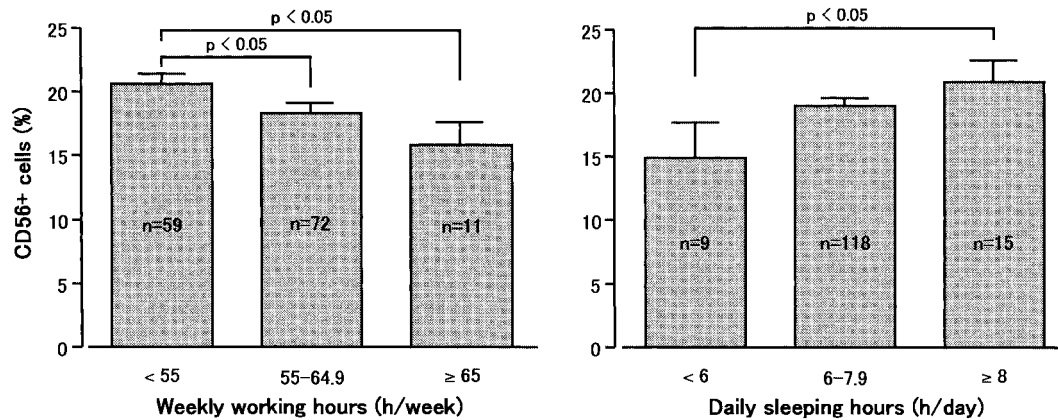


Fig. 1. Relationship between the percentage of CD56+ cells and the number of weekly working hours or daily sleeping hours.

relationships between these working/sleeping hours and immunological parameters were analyzed by one-way ANOVA.

Among the three immunological parameters (including the number and the percentage), we found that the percentage of CD56+ cells had a significant relationship with both weekly working and daily sleeping hours but that the number of CD56+ cells had not. The percentage of CD56+ cells was inversely correlated with the number of weekly working hours ($r = -0.201$, $p < 0.05$), and the percentages of CD56+ cells in the LWH and MWH subgroups were significantly lower than that in the SWH subgroup ($p < 0.05$, see Fig. 1). Subjects in the LSH group had a significantly higher percentage of CD56+ cells than those in the SSH group. It is known that cigarette smoking is associated with a number of alterations in the cellular immune system, including elevated leukocyte counts, decreased numbers of NK cells, and reduced NK cell activities^{9, 10}. So we confirmed these associations by multiple regression analyses of weekly working hours, sleeping hours, age and current smoking status. Weekly working hours, daily sleeping hours and smoking were significantly associated with reduced percentages of CD56+ cells ($p < 0.05$), but age was not.

Our findings are the first to show a relationship between working hours and CD56+ cells; they indicate that the percentage of CD56+ cells, mostly NK cells, is affected by working/sleeping hours more sensitively than those of CD4+ or CD8+. The percentage of CD56+ cells might serve as one of prognostic markers for monitoring the effects of long working hours on the immune system.

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