City Council Meeting, April 10, 2020
eComments

Submitted by: Larry Murakami
Position: Oppose
Received: 04-09-2020 10:47 AM

Agenda Item:

2. Discuss and Consider Limiting All Construction to Five Days a Week (Closing Monday or Saturday) Residential, Commercial, Public Projects, Including School District Projects.

Comment:

Banning work on Monday in exchange for work on Saturdays is a bad deal for everyone, shorter hours-parking issues-more residents home. Although we use Saturday work to make up for delays...like rain, it needs to remain in place. This agenda item does not make our jobs safer for everyone...it will only prolong the projects. Our construction projects are safer than Ocean Ave...now that the Strand is closed

City Council Meeting, April 10, 2020
eComments

Submitted by: David Shaw
Position: (Not Provided)
Received: 04-09-2020 10:02 AM

Agenda Item:

2. Discuss and Consider Limiting All Construction to Five Days a Week (Closing Monday or Saturday) Residential, Commercial, Public Projects, Including School District Projects.

Comment:

Assuming this is Covid temporary only. The idea of not working Mondays is an unprecedented, impractical and unjustified burden on Contractors and their Subs. I find no logic in that. As far as Saturday work i would say the same thing but we only work on Saturdays when it's an emergency so i would leave that up to those that do. All cities allow work on Saturdays and the hours are restricted already in MB. The virus doesn't discriminate by what day it is so i don't see the point.

City Council Meeting, April 10, 2020
eComments

Submitted by: Brian Rush
Position: Neutral
Received: 04-09-2020 09:33 AM

Agenda Item:

2. Discuss and Consider Limiting All Construction to Five Days a Week (Closing Monday or Saturday) Residential, Commercial, Public Projects, Including School District Projects.

Comment:

We have successfully implemented the Covid-19 Jobsite Exposure Control Plan at our MB project. There is a productivity loss associated with social distancing work plans that has become our new normal. We are currently working a 5 day/week. The option of the 6th day is needed as a make-up for lost workdays due to rain (like today). We ask the Council consider not changing allowable work days. If the 5-day week is adopted we request those days be Mon-Fri and leave weekends as family time.

City Council Meeting, April 10, 2020
eComments

Submitted by: Mark Cermak
Position: Neutral
Received: 04-09-2020 08:36 AM

Agenda Item:

2. Discuss and Consider Limiting All Construction to Five Days a Week (Closing Monday or Saturday) Residential, Commercial, Public Projects, Including School District Projects.

Comment:

(Development Mgr. at MV Mall) - Our contractor has implemented a detailed and comprehensive social distancing policy, which is being strictly enforced. As of April 8, 2020, our project has not received any complaints or citations from the public regarding social distancing. We are not currently working Saturdays, and politely request that at a minimum, M-F be maintained as available work days for our project. Progress has already been slowed due to smaller crew sizes / social distancing.

City Council Meeting, April 10, 2020
eComments

Submitted by: Rachel Judson
Position: Oppose
Received: 04-09-2020 07:09 AM

Agenda Item:

2. Discuss and Consider Limiting All Construction to Five Days a Week (Closing Monday or Saturday) Residential, Commercial, Public Projects, Including School District Projects.

Comment:

I strongly oppose.Please listen closely to the professionals who have commented;do not underestimate the huge impact losing work days can cause for owners/builders. I am very much in agreement with the comment: "This doesn't solve the problem, it creates more problems. Also, doesn't seem right to limit employment opportunities given our present situation." I find noise of the 2 projects near my house, and the many projects on my walks to be joyful, that we haven't completely killed our economy.

City Council Meeting, April 10, 2020
eComments

Submitted by: Peter Cutler
Position: (Not Provided)
Received: 04-09-2020 06:49 AM

Agenda Item:

2. Discuss and Consider Limiting All Construction to Five Days a Week (Closing Monday or Saturday) Residential, Commercial, Public Projects, Including School District Projects.

Comment:

I want to thank the City Council for being proactive in their decisions on residential (non-essential) construction. At your meeting today can it be considered to change construction hours so they begin every day after 9:00. With the population staying at home, every day is like a weekend. People either want to sleep in (this is especially true with children) or they are working. A later start time would be beneficial for our population's well being.

City Council Meeting, April 10, 2020
eComments

Submitted by: Tony ORourke
Position: Oppose
Received: 04-08-2020 10:51 PM

Agenda Item:

2. Discuss and Consider Limiting All Construction to Five Days a Week (Closing Monday or Saturday) Residential, Commercial, Public Projects, Including School District Projects.

Comment:

I own a subcontracting business that works in the City of Manhattan Beach. Under the circumstances with the Covid-19 pandemic and the economic toll it will take on our economy, individuals, and businesses for the unforeseeable future, the city council should be finding ways to help all of their fellow Americans, not cause them further harm. This is time for all of us to pull together! If you pass this agenda item under these circumstances, you should be ashamed!

City Council Meeting, April 10, 2020
eComments

Submitted by: Paul Mullin
Position: Neutral
Received: 04-08-2020 09:49 PM

Agenda Item:

2. Discuss and Consider Limiting All Construction to Five Days a Week (Closing Monday or Saturday) Residential, Commercial, Public Projects, Including School District Projects.

Comment:

I am a resident and residential property owner in Manhattan Beach. I am in favor of eliminating construction on Saturdays, while the "shelter at home" orders are in place -- it would be great to have the weekend to enjoy without the noise and chaos of nearby projects in play. I am opposed to eliminating construction projects on Mondays, as it would concentrate the amount of activity into fewer net hours, adding to congestion on some of our narrower streets and alleys, like Ocean Ave.

City Council Meeting, April 10, 2020
eComments

Submitted by: Steve Miyasaki
Position: Oppose
Received: 04-08-2020 07:29 PM

Agenda Item:

2. Discuss and Consider Limiting All Construction to Five Days a Week (Closing Monday or Saturday) Residential, Commercial, Public Projects, Including School District Projects.

Comment:

I am a Resident and Business owner in the CMB. I am opposed to losing any work Days. Limiting Const, to only 5 days a week will put a financial burden on many employees who count on those hours on Sat and on many homeowners who will now not complete their Homes for and addtnl 52 days a year, some of these project go for 2 years +. In 2 years you are talking about 104 days more in Interest that Owners will be exposed to. The workers they will be out of min$12,480.00 for those 104 days not worked.

City Council Meeting, April 10, 2020
eComments

Submitted by: Joyce Moller
Position: (Not Provided)
Received: 04-08-2020 05:39 PM

Agenda Item:

2. Discuss and Consider Limiting All Construction to Five Days a Week (Closing Monday or Saturday) Residential, Commercial, Public Projects, Including School District Projects.

Comment:

My husband and I own a subcontracting company that works in Manhattan Beach. We oppose limiting all construction to five days a week in the city. This will affect our livelihood as well as the livelihood of other GCs, subs and employees. By reducing available work hours by over 15%, you will slow the progress of all projects, costing homeowners more money and time. This change could also result in reduction of employee's work hours or layoffs. Now is NOT the time to limit work.

City Council Meeting, April 10, 2020
eComments

Submitted by: Kevin Pratt
Position: Oppose
Received: 04-08-2020 05:02 PM

Agenda Item:

2. Discuss and Consider Limiting All Construction to Five Days a Week (Closing Monday or Saturday) Residential, Commercial, Public Projects, Including School District Projects.

Comment:

The city should not limit all construction to five days. Longer project time frames and various delays due to this limit create new issues for both the neighborhood and the builders. Saturdays are typical work days for most industries as well. This doesn't solve the problem, it creates more problems. Also doesn't seem right to limit employment opportunities given our present situation.

City Council Meeting, April 10, 2020
eComments

Submitted by: Kim Komick
Position: Oppose
Received: 04-08-2020 04:09 PM

Agenda Item:

2. Discuss and Consider Limiting All Construction to Five Days a Week (Closing Monday or Saturday) Residential, Commercial, Public Projects, Including School District Projects.

Comment:

That is a minimum 52 days longer that there will be an unfinished construction site in the city. Additional days will likely happen due to the limited number of days to get inspected and the limited amount of people that can safely work on a job given a shorter workweek. So instead of helping, this regulation just drags all projects out a minimum of 4-6 months. This is a terrible time to be cutting back on employment and hours for the hundreds of workers that need these construction jobs.

City Council Meeting, April 10, 2020
eComments

Submitted by: Benjamin Holm
Position: Oppose
Received: 04-08-2020 02:35 PM

Agenda Item:

2. Discuss and Consider Limiting All Construction to Five Days a Week (Closing Monday or Saturday) Residential, Commercial, Public Projects, Including School District Projects.

Comment:

General Contractor with 3 projects in MB. This will just put more workers packed into fewer days on other projects and cause more problems. If you do this then next week it will be put a limit on the number of workers on a job site. Please consider the job type and size if you limit the number of workers on a property. 2 of my projects are very large and 3 stories. I can easily keep over10 workers on the project with over 15' separation. 4 working outside 2 on each floor inside. Easy.

City Council Meeting, April 10, 2020
eComments

Submitted by: Jeff Drandell
Position: Oppose
Received: 04-08-2020 01:38 PM

Agenda Item:

2. Discuss and Consider Limiting All Construction to Five Days a Week (Closing Monday or Saturday) Residential, Commercial, Public Projects, Including School District Projects.

Comment:

The resulting negative consequence will be the concentrating of more workers into fewer days. This will be an effect opposite of what was intended. To achieve distancing, projects should be allowed to schedule workers for the least concentration.

City Council Meeting, April 10, 2020
eComments

Submitted by: Ben Burkhalter
Position: Neutral
Received: 04-07-2020 03:22 PM

Agenda Item:

2. Discuss and Consider Limiting All Construction to Five Days a Week (Closing Monday or Saturday) Residential, Commercial, Public Projects, Including School District Projects.

Comment:

Notwithstanding the limitations that the County and State have placed on the City's ability to locally define essential and nonessential activities or temporarily ban non-essential construction outright during the current emergency, it might achieve the same net result if permitted hours and days are so restrictive that it becomes virtually impossible to conduct business as usual.

City Council Meeting, April 10, 2020
eComments

Submitted by: Jay Patrick
Position: Oppose
Received: 04-09-2020 11:27 AM

Agenda Item:

3. City Council to consider additional measures to address COVID-19.

Comment:

please see attached letter

(See Attachment)

4/9/2020

Dear Council,
I'm a Building Contractor who builds custom homes; my family & I have lived and worked in Manhattan Beach for 35 years. We are still recovering from the recession of 2008-2011, when I had NO work.

We need 6 days of work for construction, so we can continue to stagger the work hours for the trades. The pandemic restrictions have already slowed down construction considerably, leading to decreased hours and pay for workers, increased time for job completion, and increased costs to homeowners, especially those with construction loans (and bank deadlines).

We are also serving as Trustees for the property of First Lutheran Church and Preschool, of Manhattan Beach. Due to laws which pertain to preschools, we can currently schedule maintenance work only on Saturdays.

I would like to enlist the support of the council in the following ways;
Please give us respectful notice of changes to work practices: a few days advance notice, to allow us to prepare for compliance.
As an essential business, assist us with information leading to a consistent supply chain for PPE, sanitizers, antibacterial hand soap, and essential signs to post at job sites.

Recognition at job sites for proper compliance, to put the public at ease: similar to restaurants with small signs of A-B-C & date.

Thank you for your continuing work for our City.

Respectfully,
Jay Patrick

City Council Meeting, April 10, 2020
eComments

Submitted by: Rachel Judson
Position: (Not Provided)
Received: 04-09-2020 07:23 AM

Agenda Item:

3. City Council to consider additional measures to address COVID-19.

Comment:

Where are the details on this agenda item?

City Council Meeting, April 10, 2020
eComments

Submitted by: Paul Mullin
Position: (Not Provided)
Received: 04-08-2020 09:53 PM

Agenda Item:

3. City Council to consider additional measures to address COVID-19.

Comment:

Where are the details on this agenda item?

City Council Meeting, April 10, 2020
eComments

Submitted by: Drew Giblin
Position: Oppose
Received: 04-09-2020 08:10 PM

Agenda Item:

2. Discuss and Consider Limiting All Construction to Five Days a Week (Closing Monday or Saturday) Residential, Commercial, Public Projects, Including School District Projects.

Comment:

As a general contractor with a project currently working in Manhattan Beach I oppose the proposed reduction in days when which work is allowed. Our firm, our employees, our subcontractors and suppliers all take the Covid-19 pandemic very seriously. We are strictly abiding by (and in fact exceeding) all construction site regulations in order to assure the the safety of everyone on our site, our immediate neighbors and the residents of the City. If a day is eliminated, make it Saturday

City Council Meeting, April 10, 2020
eComments

Submitted by: Matt Knight
Position: Oppose
Received: 04-09-2020 07:41 PM

Agenda Item:

2. Discuss and Consider Limiting All Construction to Five Days a Week (Closing Monday or Saturday) Residential, Commercial, Public Projects, Including School District Projects.

Comment:

Please exempt the MB School District from any restrictions. Limiting work on the new gym will delay its opening in the Fall, and after the stress students have endured from home schooling, a new gym will be a welcome sight for all of them.

City Council Meeting, April 10, 2020
eComments

Submitted by: Michael Levine
Position: Oppose
Received: 04-09-2020 06:55 PM

Agenda Item:

2. Discuss and Consider Limiting All Construction to Five Days a Week (Closing Monday or Saturday) Residential, Commercial, Public Projects, Including School District Projects.

Comment:

The CDC and State of California have already set mandates for public health in construction. The city of MB certainly isn't more equipped than the state or federal government to make a decision like this. The mandates have been made and the city is enforcing them. What is the reason for discussing instituting further measures? The economy is already being hurt and you're discussing hurting the people that are already being impacted the most.

City Council Meeting, April 10, 2020
eComments

Submitted by: Charles Southey
Position: Oppose
Received: 04-09-2020 06:04 AM

Agenda Item:

2. Discuss and Consider Limiting All Construction to Five Days a Week (Closing Monday or Saturday) Residential, Commercial, Public Projects, Including School District Projects.

Comment:

Strongly oppose. The economy is already a mess, schools are short funds, homeowners are struggling. Implementing more limits only hurts workers, home builders, home owners and the our whole school system. Rumor has it that residents around Costa are complaining about hearing noise while they are home. I have lived next to three construction projects over the last 10 years and work from home. I would never consider asking the city to limit others rights because I am being inconvenienced.

City Council Meeting, April 10, 2020
eComments

Submitted by: Brian De Garceau
Position: Oppose
Received: 04-09-2020 05:30 PM

Agenda Item:

2. Discuss and Consider Limiting All Construction to Five Days a Week (Closing Monday or Saturday) Residential, Commercial, Public Projects, Including School District Projects.

Comment:

You made COVID rules for construction. Can we treat our hardworking contractors and GC's and their employees like adults and allow them to follow the protocol. There will always be a select few where the rules don't apply. Punish them. Do we really need more people out of work, construction taking longer and leaving homeowners in the lurch should we limit construction time? My mom is 80 years old and is in the middle of a remodel without a kitchen, living areas and half of her house. I oppose.

City Council Meeting, April 10, 2020
eComments

Submitted by: Mariel Waller
Position: Oppose
Received: 04-09-2020 04:35 PM

Agenda Item:

2. Discuss and Consider Limiting All Construction to Five Days a Week (Closing Monday or Saturday) Residential, Commercial, Public Projects, Including School District Projects.

Comment:

I am asking you to exempt the MB School District from the proposed construction limitations. Limiting construction to five days a week will increase cost and delay in Fall opening of Mira Costa Gym and completion of Summer Elementary School Construction. MCHS students have been without a gym for a year and a half, and will have been without a school campus for months. To prevent them from having a gym when they return would further extend the negative impact on their school experience.

City Council Meeting, April 10, 2020
eComments

Submitted by: Robert Freedman
Position: Oppose
Received: 04-08-2020 04:33 PM

Agenda Item:

2. Discuss and Consider Limiting All Construction to Five Days a Week (Closing Monday or Saturday) Residential, Commercial, Public Projects, Including School District Projects.

Comment:

The benefit of Saturday hours even if limited, is in getting projects done faster with less impact to the neighbors. Many of the trades don't work Saturday as it is, but it is a great catch up day for those that do. Any Saturday regulations should be around noise - meaning no jack-hammers, drilling, coring, etc. Interior work is hardly noticeable. I hope Monday is not being considered in order to make Saturday look more palatable to outlaw.

City Council Meeting, April 10, 2020
eComments

Submitted by: Denise Hall
Position: Oppose
Received: 04-08-2020 04:08 PM

Agenda Item:

2. Discuss and Consider Limiting All Construction to Five Days a Week (Closing Monday or Saturday) Residential, Commercial, Public Projects, Including School District Projects.

Comment:

As a local GC, we oppose - especially closing on Monday. It is our expectation that every citizen has the freedom to choose to work on Saturday in MB or anywhere in the US.

City Council Meeting, April 10, 2020
eComments

Submitted by: Kevin Neal
Position: Support
Received: 04-08-2020 03:24 PM

Agenda Item:

2. Discuss and Consider Limiting All Construction to Five Days a Week (Closing Monday or Saturday) Residential, Commercial, Public Projects, Including School District Projects.

Comment:

As a third generation resident of Manhattan Beach (my grandfather, Phil Reardon, moved here in 1947) I support the limiting of construction on Saturdays; not just during the Covid19 crisis, but a general change to the rules moving forward. The consistent construction on Saturdays degrades the quality of life in Manhattan Beach. Weekends should be for family and friends to enjoy their homes, yards, public spaces without the construction noise and parking congestion.

City Council Meeting, April 10, 2020
eComments

Submitted by: Robert Osborn
Position: Oppose
Received: 04-09-2020 02:11 PM

Agenda Item:

2. Discuss and Consider Limiting All Construction to Five Days a Week (Closing Monday or Saturday) Residential, Commercial, Public Projects, Including School District Projects.

Comment:

My husband and I own a subcontracting company that works in Manhattan Beach. We oppose limiting all construction to five days a week in the city. This will affect our livelihood as well as the livelihood of other GCs, subs and employees. By reducing available work hours by over 15%, you will slow the progress of all projects, costing homeowners more money and time. This change could also result in reduction of employee's work hours or layoffs. Now is NOT the time to limit work.

City Council Meeting, April 10, 2020
eComments

Submitted by: Charles Southey
Position: Oppose
Received: 04-09-2020 06:13 PM

Agenda Item:

3. City Council to consider additional measures to address COVID-19.

Comment:

The city continues to jam people into smaller spaces. How many people can we fit onto the green belt and Ocean? Exercise and fresh air is critical to mental health and strengthening the immune system. MB rules already make it very challenging to build . Help the builders get the jobs done safely. Help our schools finish their upgrades, don't hinder them. Ask yourselves, what can we do to help during this challenging time.

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5893257/

www.oncotarget.com Oncotarget, 2018, Vol. 9, (No. 23), pp: 16501-16511

Research Paper

Health effects of a forest environment on natural killer cells in humans: an observational pilot study

Tsung-Ming Tsao[1], Ming-Jer Tsai[1,2], Jing-Shiang Hwang[3], Wen-Fang Cheng[4], Chang-Fu Wu[5], Charles-C.K. Chou[6] and Ta-Chen Su[5,7]

[1]The Experimental Forest, National Taiwan University, Nantou, Taiwan

[2]School of Forestry and Resource Conservation, National Taiwan University, Taipei, Taiwan

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[4]Department of Obstetrics and Gynecology, National Taiwan University Hospital, Taipei, Taiwan

[5]Institute of Occupational Medicine and Industrial Hygiene, College of Public Health, National Taiwan University, Taipei, Taiwan

[6]Research Center for Environmental Changes, Academia Sinica, Taipei, Taiwan

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Correspondence to: *Ta-Chen Su*, ***email***: *tachensu@gmail.com*

Keywords: natural killer cells; activating NK cells; forest trip; forest environment; urban environment

Received: *January 05, 2017* ***Accepted***: *March 01, 2018* ***Published***: *March 27, 2018*

ABSTRACT

Health effect assessments based on natural killer (NK) cells are an important emerging area of human health. We recruited 90 forest staff members in Xitou, Taiwan and 110 urban staff members in Taipei to investigate the health effects of forest environment exposure on NK cells ($CD3^-/CD56^+$) and activating NK cells ($CD3^-/CD56^+/CD69^+$) in humans. We also invited 11 middle-aged volunteers in a pilot study to participate in a five-day/four-night forest trip to Xitou forest to investigate the health effects of a forest trip on NK cells and activating NK cells. Results showed that NK cells were higher in the forest group (19.5 ± 9.1%) than in the urban group (16.4 ± 8.4%). In particular, the percentage of NK cells was significantly higher in the forest group than in the urban group among the subgroups of male, a higher body mass index (≥ 25 kg/m²), without hypertension, lower high-sensitivity C-reactive protein, hyperglycemia, without smoking habit, and with tea drinking habit. After the five-day trip in Xitou forest, the percentage of activating NK cells of the invited participants from Taipei increased significantly after the trip to Xitou forest (0.83 ± 0.39% vs. 1.72 ± 0.1%). The percentage of activating NK cells was 1.13 ± 0.43%, which was higher than the baseline value of 0.77 ± 0.38% before the forest trip among the seven subjects who participated in the follow-up study four days after returning to Taipei. This study suggests that exposure to forest environments might enhance the immune response of NK cells and activating NK cells in humans.

INTRODUCTION

Natural killer (NK) cells are a subset of lymphocytes with a distinct morphology and the ability to directly kill certain target cells via one or more cytolytic mechanisms. They are important in the human endocrine and immune systems to induce tumor or virus-infected targeted cell death [1, 2]. Activating NK cells produce anti-cancer proteins, such as perforin and granzyme, in host anti-cancer defense mechanisms, where the targeting of cancer cells is known to be of critical importance [2]. Among the cytolytic effector lymphocytes in the innate immune system, NK cells are especially critical for immune surveillance of tumors [2–4]. Studies have shown that immunosuppression is common after standard anti-cancer treatments and that NK cells are particularly suppressed. For example, peripheral blood natural cytotoxicity is diminished significantly in breast cancer patients [3–5].

Human immune systems are highly diverse and not completely understood at present, but recent studies indicate that environmental and non-heritable factors make much larger contributions than heritable factors [6, 7]. Considerable evidence indicates that forest environments can enhance the percentage and function of NK cells and intracellular anti-cancer proteins in lymphocytes [8–12]. Thus, exposure to a forest environment can have health-promoting effects.

Forest environments may have some positive health effects on physiological and psychological activities. In particular, the beneficial physiological health effects of a forest environment enhance immune functions, including human NK cells [8–10], decrease sympathetic nerve activity, enhance parasympathetic nerve activity, and lower blood pressure, pulse rate, heart rate variability, and cholesterol concentration [13–20]. Forest environments are more greatly associated with positive health effects on subclinical cardiovascular disease and health-related quality of life compared with urban environments [21]. Exposure to a forest environment significantly suppressed sympathetic activity and increased parasympathetic activity in young Japanese male adults who participated in a three-day/two-night field experiment compared with an urban environment according to a heart rate variability analysis [14]. Phytoncides from wood essential oils, such as α-pinene and limonene, have been shown to induce human NK cells, as well as the expression levels of perforin, granzyme A, and granulysin [22]. Studies have reported that a forest trip enhanced human NK cells and intracellular anti-cancer protein levels in lymphocytes; moreover, the increased NK cell activity lasted for more than seven days after the forest trip [8–11]. However, these previous studies investigated only the experimental effects of a short-term forest trip on human NK cells. More studies are required to evaluate the health effects of exposure to a forest environment on human NK cells.

The objectives of this pilot study were the following: (1) to determine the percentage of NK cells ($CD3^-/CD56^+$) and activating NK cells ($CD3^-/CD56^+/CD69^+$) in people who live in a forest environment compared with those who live in an urban environment; and (2) to determine the health effects of a forest trip on NK cells and activating NK cells in participants who stayed for five days and four nights in a forest environment.

RESULTS

The mean ages in the urban and forest groups were 44.8 and 45.2 years, respectively (Table 1). The forest group contained more male participants (66.7%) than the urban group (53.6%). The systolic and diastolic blood pressure readings in the forest group were higher (130.3 and 83.2 mmHg, respectively) than in the urban group. Lifestyle habits in terms of alcohol consumption, smoking, coffee, and tea differed significantly among the two groups. In particular, habitual tea drinking was higher in the forest group (87.8%) than in the urban group (62.7%). However, habitual coffee consumption was higher in the urban group (70.9%) than in the forest group (53.3%).

The mean environmental monitoring results are presented in Table 2, including air pollutants, temperature, and relative humidity. The SO_2, NO, NO_2, NO_x, CO, and temperature levels were significantly lower in the forest environment compared with those in Taipei (indoors and outdoors). However, the levels of O_3 and relative humidity were higher in Xitou than those in Taipei. The complete blood cell counts are presented in Table 3. The red blood cell, hemoglobin, hematocrit, and white blood cell counts (e.g., lymphocyte and monocyte) were significantly higher in the forest group than those in the urban group.

Table 4 shows that the percentage of NK cells was positively correlated with male, age, systolic and diastolic blood pressure, high-sensitivity C-reactive protein, and fasting glucose levels. However, the percentage of activating NK cells was not correlated with all cardiovascular characteristics.

Table 5 shows that the percentage of NK cells was higher in the forest group (19.5 ± 9.1%) than in the urban group (16.4 ± 8.4%). After adjusting for age and gender, the regression estimates indicated that the percentage of NK cells, but not activating NK cells, were significantly higher in the forest group than in the urban group. Subgroup analyses for NK cells differences between two groups are also shown in Table 5. The percentage of NK cells was significantly higher in the forest group than in the urban group among subgroups of male, higher BMI (≥ 25 kg/m^2), without hypertension, lower hs-CRP levels, hyperglycemia (fasting glucose ≥ 100 mg/dL), without smoking habit, and with tea drinking habit. However, all subgroups did not differ significantly in terms of the percentage of activating NK cells between the two groups.

Table 6 shows that among the 11 participants, 27.3% were male and the average age was 60.4 years. The participants from Taipei were invited to attend a forest trip (five-day/four-night) to the Xitou Nature Education Area from January 6 to 10, 2014. No event of skin wound or bee bites was reported by the participants during the forest trip. Compared with the measurements obtained in Taipei one day before the forest trip, the percentage of activating NK cells increased significantly among the 11 participants after the forest trip ($p = 0.002$). However, no significant difference in their percentage of NK cells was observed after the forest trip, as shown in Table 6A. Although the percentage of activating NK cells in the participants decreased after the participants left the forest, the forest trip significantly increased the percentage of activating NK cells compared with pre-forest trip levels. This change lasted for at least four days, as shown in Table 6B. The percentage of activating NK cells was 1.13 ± 0.43%, which was higher than the baseline value of 0.77 ± 0.38% before the forest trip among the seven subjects who completed in the follow-up study.

Table 1: General characteristics of staff members living in urban and forest environments

	Environment		
	Urban	Forest	
	N = 110	*N* = 90	*p*-value[d]
Age (year)	44.8 ± 6.6	45.2 ± 10.6	0.704
Male sex (%)	53.64	66.67	0.062
Body mass index (kg/m^2)	23.8 ± 3.48	24.59 ± 3.54	0.113
Waist (cm)	81.52 ± 9.61	84.15 ± 8.80	0.049
Systolic blood pressure (mmHg)	125.06 ± 14.01	130.34 ± 15.28	0.012
Diastolic blood pressure (mmHg)	80.07 ± 10.75	83.19 ± 10.17	0.039
Hypertension (%)	26.36	24.44	0.757
Hypertension with medication (%)	9.09	10.0	0.827
Fasting glucose (mg/dL)	85.83 ± 9.28	91.60 ± 10.92	< .001
Cholesterol (mg/dL)	188.84 ± 35.25	191.87 ± 38.69	0.563
Triglycerides (mg/dL)	106.40 ± 52.21	122.34 ± 85.22	0.123
HDL-cholesterol (mg/dL)	56.57 ± 14.65	54.81 ± 11.78	0.347
LDL-cholesterol (mg/dL)	113.08 ± 30.19	118.30 ± 34.71	0.257
hs-CRP (mg/dL)	0.14 ± 0.18	0.21 ± 0.45	0.169
Alcohol drinking [a] (%)	18.18	36.67	0.003
Smoking habit [b] (%)	20.91	34.44	0.032
Exercise habit [c] (%)	54.72	59.55	0.497
Coffee (%)	70.91	53.33	0.010
Tea (%)	62.73	87.78	< .001

HDL and LDL cholesterol: high-density and low-density lipoprotein cholesterol; hs-CRP: high-sensitivity C-reactive protein; [a]drinking habit: drinking alcohol once or more per week; [b]smoking habit: current smoker and ex-smoker; [c]exercise habit: three times with at least 30 min each per week; [d]Continuous variables were expressed as mean ± SD, and *t*-test was used to perform comparisons.

DISCUSSION

This study is the first to demonstrate the health effects of a forest environment on human NK cells by comparing subjects who live in a forest environment with those who live in an urban environment. The effects were more significant in subjects of overweight, male, and with hyperglycemia. This finding indicates that the immune response of people with specific cardiovascular risk factors may be improved by living in a forest environment. In this study, we further demonstrated the health effects of a forest trip on immune function in terms of activating NK cells. For health effects of a forest environment on natural killer cells, studies in which 13 healthy nurses and 12 healthy males took a three-day/two-night forest trip showed that the increased NK cell activation could last for more than seven days after the forest trip [9, 10]. Our finding is consistent with Li's finding [9, 10] that a forest trip can enhance immune response in terms of activating NK cells and the effects can last for more than four days.

Maintaining enough NK cells is essential for healthy aging. In general, the NK cells increased with age [23]. Our results showed that study subjects in the forest trip group had a higher NK cell percentage than the forest and urban groups, which might be due to the older age of the subjects of the forest trip group than the other two groups (60 vs. 45 years). NK cells ($CD56^+$) are divided into $CD56^{bright}$ and $CD56^{dim}$ major subsets that have both different receptor profiles and functions [24]. Lutz et al. [25] reported that NK ($CD56^{bright}$) cells proliferated rapidly but died relatively slowly. Aging has differential effects on NK ($CD56^{bright}$) and NK ($CD56^{dim}$) cell subsets. Older individuals presented with a significantly higher percentage of NK ($CD56^{dim}$) cells but a significantly lower proportion of NK ($CD56^{bright}$) cells, thus resulting in an increased NK ($CD56^{dim}$) to NK ($CD56^{bright}$) ratio [25, 26]. The age-related increase in the NK cell percentage in older adults may be the result of an accumulation of long-lived NK cells [27].

NK cells are important in the human endocrine and immune systems as first-line effectors to induce tumor or virus-infected targeted cell death [1–2]. Activating NK cells have the ability to directly kill certain target cells. Many studies have demonstrated that NK cell subset distribution and the change in the expression of early activation antigen, $CD3^-/CD56^+/CD69^+$ NK cells

Table 2: Comparisons of the air quality and meteorological data in the forest and urban environments

	Forest	Urban		P_1 value	P_2 value
	[a]*N* = 96	Indoor *N* = 94	outdoor *N* = 96		
SO_2 (ppb)	0.45 ± 0.46	0.17 ± 0.18	3.04 ± 1.43	< .001	< .001
NO (ppb)	0.27 ± 0.24	39.22 ± 22.97	12.45 ± 11.6	< .001	< .001
NO_2 (ppb)	2.61 ± 2.19	4.45 ± 1.61	30.34 ± 9.02	< .001	< .001
NO_x (ppb)	2.44 ± 2.17	43.67 ± 22.14	42.79 ± 18.4	< .001	< .001
CO (ppm)	0.37 ± 0.19	1.09 ± 0.51	0.87 ± 0.31	< .001	< .001
O_3 (ppb)	27.48 ± 16.15	6.65 ± 0.73	13.56 ± 10.4	< .001	< .001
Temperature (°C)	13.05 ± 1.91	17.94 ± 1.03	17.35 ± 1.69	< .001	< .001
Relative humidity	91.36 ± 5.60	67.86 ± 2.86	82.33 ± 6.45	< .001	< .001

P_1 value corresponds to *t*-test comparisons of the Xitou and urban sites (indoor). P_2 value corresponds to *t*-test comparisons of the Xitou and Wanhua sites (outdoor) of the Environmental Protection Agency, Taipei, Taiwan. [a]*N* corresponds to the sample size for the hourly average data.

with respect to clinical response [5, 28–30]. Although the activating NK cells have been established to have the ability to attack the target cells, we still have to actually carry out the activity assay of killing target cells for understanding NK cell activity. In general, NK cell activity was assayed according to the standard microtiter ^{51}Cr-release assay [28, 31]. Consistent evidence from both epidemiological and experimental studies have demonstrated that alcohol consumption [32–33], physical exercise [34], circadian variation [35], menstruation [36], cancer [37–38], age [26, 39], smoking habits [40–41], and environment [10] can affect NK cell activity in human. Furthermore, many studies have demonstrated that a forest environment can enhance the immune response as measured by NK cell activity, and the percentage and absolute numbers of NK cells [8–10].

NK cells in humans are dependent on environmental factors, alcohol consumption, physical exercise, circadian variation, and food [28, 31, 35, 42–43]. Previous studies also suggest that exposure to phytoncides and decreased stress hormone levels may have partially contributed to the increases in human NK cells after the forest trip. In particular, both the environmental factors related to the forest and cardiovascular characteristics were the major factors that affected human NK cells. The specific features of the Xitou forest comprise the biogenic volatile organic compounds emitted by the leaves of *Cryptomeria japonica* trees, including phytoncides such as α-pinene, limonene, and cedrol [44]. A previous study in Japan showed that subjects with healthy lifestyles, such as nonsmokers and those who exercised regularly, had significantly higher NK cells and more perforin, granulysin, and granzyme A/B-expressing cells than subjects with poor lifestyles [45]. Effects of phytoncides from wood essential oils significantly increased NK cell, and perforin, granulysin, and granzyme A/B-expressing cells, whereas they significantly decreased the percentage of T cells, thereby indicating that phytoncide exposure may affect human immune function [46].

We also measured the phytoncides and negative ions during outdoor monitoring of forest and urban environments and indoor monitoring of a wooden house made of Western red cedar (*Thuja plicata*) during the forest trip (Supplementary Tables 1 and 2). We detected several phytoncides such as α-pinene, limonene, and (1R)-(-)-Myrtenol in the outdoor forest fields and α-pinene, limonene, (1R)-(-)-Myrtenol, camphor, and β-caryophllene in the indoor wood house. Studies suggested that phytoncides may partially contribute to the enhanced activating NK cells during the forest trip [8–11]. Our study also demonstrated that most cardiovascular characteristics (age, male gender, SBP, and triglyceride, hs-CRP, fasting glucose levels, and smoking and tea drinking habits) affected NK cell percentage, thereby indicating the potentially confounding factors of NK cell measurements.

Furthermore, we detected significantly lower concentrations of gaseous air pollutants, such as NO, NO_2, NO_x, SO_2, and CO, in the forest environment compared with the urban environment during the study period. Thus, the beneficial effects on immune function suggest a potential link between the better air quality in the forest environment and human health. Ambient air pollution can affect child and perinatal health on immune function by low-dose insults as compared with adult health [47–50]. Exposure to air pollutant toxicity may cause immunosuppression and result in increased expression of aberrant immune responses [47].

The strength of this study was the consistent detection of health effects in terms of increased percentage of NK cells in the observation study among workers living in forest environment and activating NK cells among middle-aged adults who went on the short-term forest trip. The results of air quality monitoring

Table 3: Comparisons of complete blood cell counts for the urban and forest groups

	Urban $N = 110$	Forest $N = 90$	p-value[a]
Red blood cell (10^6/μL)	4.97 ± 0.61	5.18 ± 0.60	0.014
Hemoglobin (g/dL)	14.18 ± 1.83	15.03 ± 1.57	0.001
Hematocrit (%)	42.4 ± 4.48	44.19 ± 3.89	0.003
White blood cell (10^3/μL)	5.76 ± 1.43	6.29 ± 1.54	0.013
Neutrophil (10^3/μL)	3.36 ± 1.05	3.63 ± 1.20	0.093
Lymphocyte (10^3/μL)	1.93 ± 0.56	2.10 ± 0.59	0.034
Monocyte (10^3/μL)	0.30 ± 0.11	0.35 ± 0.11	0.005
Eosinophil (10^3/μL)	0.13 ± 0.10	0.16 ± 0.11	0.066
Basophil (10^3/μL)	0.03 ± 0.02	0.03 ± 0.02	0.439
Platelet (10^3/μL)	258.17 ± 51.62	251.48 ± 47.41	0.345

[a]Continuous variables were expressed as mean ± SD, and t-tests were used to perform comparisons.

in Xitou forest are better than those in Taipei in this study and our previous study [21]. However, this study has several limitations. First, the differences in NK cell percentage between the two groups are associated with the cardiovascular characteristics of participants, such as hypertension status, hs-CRP levels, male, hyperglycemia, and being overweight. Thus, the results may overestimate the difference between two groups. However, controlling all confounding factors would result in over-adjustment. These factors may have attenuated the health effects of the forest environment on the percentage of NK cells. Second, although our study indicated the health effects of a forest trip on activating NK cells, we could not infer that the actual benefits were due to phytoncides in Xitou forest. The specific health effects of biogenic volatile organic compounds from tree leaves in forest environments were not investigated during this study, however the real measurements of phytoncides in the major tree of Xitou forest have been demonstrated in this study site [44]. Third, we did not compare the same study group in the urban trip with the group who went on the forest trip in terms of the percentage of NK cells and activating NK cells. Fourth, the sample size of the forest trip group is relatively small, which may cause the results to be overestimated or underestimated. Fifth, the small difference in the percentage of NK cells and activation NK cells cannot provide strong evidence that will allow us to infer the beneficial effects of exposure to a forest environment.

In conclusion, this study suggests that exposure to forest environments might enhance the immune response of NK cells and activating NK cells in humans. The health effects of a forest environment are important areas of research. Further studies are anticipated to understand the mechanisms that mediate the health effects of forest environments. Such studies should consider not only the phenomenological observations but also the potential influencing factors of NK cells and activating NK cells in humans.

MATERIALS AND METHODS

Study design and population

The study design aimed to determine the health effects on NK cells among staff members who live in a forest environment compared with those of who live in an urban environment. We recruited 90 staff members who live in the forest and 110 urban staff members who live in Taipei for an observational pilot study, which was conducted in the forest or urban environment for more than one year (Supplementary Figure 1). All participants provided informed consent before being subjected to cardiovascular health and biochemical examinations and NK cell measurements. The health examinations of forest participants were conducted from January 6 to 10, 2014 in Xitou, NTU Experimental Forest, Nantou County, and from January 14 to 17, 2014 for urban participants in Taipei.

To demonstrate the health effects of a forest trip on middle-aged subjects, we recruited 15 middle-aged volunteers who had been living in Taipei for more than one year in a small pilot study (Supplementary Figure 2). Subjects with clinical diabetes, major diseases, and documented cardiovascular diseases were excluded. All participants had to undergo cardiovascular health and biochemical examinations, and their NK cells had to be measured before the forest trip. A total of 11 participants with a mean age of 60.4 years were selected. To prevent interference by dietary habits, each subject had to be subjected to dietary control (limited dietary fat and calorie intake according to the National Cholesterol Education Program Step 1 diet) [51] for at least 10 days before leaving for Xitou forest.

These 11 subjects joined a five-day/four-night forest trip in Xitou Experimental Forest from January 6 to 10, 2014. During the forest trip, all participants had to maintain dietary control and walking exercise. On the first

Table 4: Correlation coefficients between NK cell, activating NK cell, and cardiovascular characteristics among staff members living in urban and forest environments ($N = 200$)

	NK cell		Activating NK cell	
	Correlation coefficient	*P*-value	Correlation coefficient	*P*-value
Male	0.192	0.007	0.056	0.428
Age	0.260	< .001	–0.011	0.879
Body mass index	0.073	0.308	0.128	0.072
Systolic blood pressure	0.315	< .001	0.056	0.435
Diastolic blood pressure	0.353	< .001	0.081	0.256
Triglycerides	0.135	0.057	0.062	0.385
Cholesterol	0.123	0.083	–0.092	0.194
High-sensitivity C-reactive protein	0.144	0.042	0.034	0.631
Fasting glucose	0.174	0.014	–0.051	0.475
Smoking	0.057	0.424	0.054	0.450
Alcohol	0.126	0.075	–0.038	0.594
Coffee	–0.136	0.056	0.049	0.487
Tea	0.064	0.366	0.027	0.697

day, the participants walked for 1.5 hours (approximately 1.8 km) in the afternoon in a forest field and then stayed in a wooden house in the forest. In the next three days, the participants walked in two different forest fields for 1.5 hours in the morning and afternoon, respectively. On the fifth day, after their blood was drawn and a health examination was completed, all participants finished the forest trip and returned to Taipei. We took blood samples prior to the forest trip as a control sample on January 3. Overnight fasting blood was also sampled for each participant on the final day (January 10, 2014) of the forest trip and on the fourth day (January 14, 2014) after the forest trip. All blood samples were obtained at 9:00 a.m. on the study day and were placed in an ice/water box at 4°C. Assays were performed within four hours from the blood being drawn to measure the white blood cell counts, percentage of activating NK cells, and proportions of NK cells in peripheral blood. To prevent the potential bias of NK cells due to skin injury or bee bites during the forest trip, every participant had to record any skin injury or bee bites if they occurred.

This study was approved on the thirty-seventh meeting (January 30, 2013) of the Research Ethics Committee of the NTU Hospital. All participants provided their written informed consent before receiving a series of detailed examinations and questionnaires.

Site descriptions of the forest and urban environments

The NTU Experimental Forest in Xitou and the interior office of a commercial building in Taipei served as the forest and urban environment sites, respectively. The Xitou Experimental Forest covers approximately 2,349 ha and is mainly a natural hardwood forest with some plantations that predominantly contain conifers. The annual rainfall was 2,590 mm between 1941 and 2010, where 80% of the rainfall occurred between May and September. The mean relative humidity and temperature from 2011 to 2015 were 88% and 18°C, respectively, according to the Xitou monitoring station of the NTU Experimental Forest. Our environmental monitoring site was located at an elevation of 1150 m near the meteorological station (23°40N 120°47E) of Xitou Experimental Forest. The commercial building was a financial building located near the Taipei main station in Taipei. Our study subjects worked for a financial securities corporation. Interior office air quality monitoring was conducted on the twenty-first floors of the commercial building. The mean relative humidity and temperature were 73% and 24°C, respectively, according to the Taipei monitoring station of the Central Weather Bureau [52].

Exposure assessments

The instruments were set up in the Xitou Experimental Forest and in the interior office of the commercial building (indoor environment) in Taipei. The monitoring system was composed of a nitrogen oxide (NO_x) analyzer (Model CLD 88YP, ECO Physics, Switzerland), a sulfur dioxide (SO_2) analyzer (Model 43i-TLE, Thermo Scientific Inc., USA), a carbon monoxide (CO) analyzer (Model 48i-TLE, Thermo Scientific Inc., USA), an ozone (O_3) analyzer (Model 49i, Thermo Scientific Inc., USA), and a temperature and relative humidity probe (Metone 083C, Met One Inc.,

Table 5: Comparisons of NK cell and activating NK cell between staff members living in urban and forest environments

		NK cell (%)			Activating NK cell (%)		
	N	Urban *N* = 110	Forest *N* = 90	*P* value	Urban *N* = 110	Forest *N* = 90	*P* value
Crude value		16.4 ± 8.4	19.5 ± 9.1	0.01	1.81 ± 2.85	1.55 ± 1.14	0.37
Adjusted value[a]		16.7 ± 0.8	19.2 ± 0.9	0.03	1.83 ± 0.22	1.53 ± 0.24	0.35
Age, years							
< 50	143	15.9 ± 7.7	17.4 ± 8.1	0.27	1.96 ± 3.17	1.5 ± 1.03	0.22
≥ 50	57	18.4 ± 10.7	23.0 ± 9.7	0.10	1.28 ± 0.73	1.63 ± 1.31	0.21
Gender							
Female	81	15.2 ± 8.5	16.7 ± 8.3	0.44	1.52 ± 2.47	1.57 ± 1.51	0.91
Male	119	17.5 ± 8.3	20.9 ± 9.2	0.04	2.07 ± 3.14	1.54 ± 0.92	0.22
Body mass index (g/m^2)							
< 25	131	16.4 ± 8.4	18.0 ± 8.6	0.29	1.63 ± 2.20	1.58 ± 1.27	0.88
≥ 25	69	16.5 ± 8.7	21.6 ± 9.4	0.02	2.29 ± 4.07	1.50 ± 0.95	0.30
Hypertension (%)							
No	149	15.6 ± 7.5	18.4 ± 8.8	0.04	1.74 ± 2.72	1.57 ± 1.19	0.61
Yes	51	18.8 ± 10.3	23.1 ± 9.2	0.13	2.02 ± 3.23	1.48 ± 1.01	0.41
High-sensitivity C-reactive protein (mg/dL)							
< 50th	100	14.7 ± 6.9	19.1 ± 9.0	0.01	1.33 ± 1.05	1.48 ± 0.88	0.44
≥ 50th	100	18.5 ± 9.6	19.8 ± 9.2	0.48	2.40 ± 4.01	1.60 ± 1.32	0.19
Fasting glucose (mg/dL)							
< 100	167	16.8 ± 8.7	19.1 ± 9.4	0.11	1.87 ± 3.0	1.49 ± 1.14	0.26
≥ 100	33	13.4 ± 5.5	20.9 ± 7.9	0.01	1.38 ± 0.97	1.74 ± 1.14	0.37
Smoking habit							
Yes	146	17.2 ± 10.3	19.7 ± 9.0	0.33	2.57 ± 4.67	1.39 ± 0.77	0.24
No	54	16.2 ± 7.9	19.4 ± 9.2	0.03	1.61 ± 1.16	1.63 ± 1.29	0.95
Alcohol habit							
Yes	53	17.2 ± 8.7	21.2 ± 8.4	0.10	1.67 ± 1.07	1.48 ± 0.93	0.52
No	147	16.3 ± 8.4	18.5 ± 9.4	0.13	1.85 ± 3.11	1.58 ± 1.25	0.48
Coffee							
Yes	126	16.0 ± 8.4	18.3 ± 8.4	0.13	1.88 ± 3.32	1.62 ± 1.17	0.52
No	74	17.4 ± 8.4	20.9 ± 9.8	0.12	16.5 ± 10.7	14.7 ± 11.2	0.48
Tea							
Yes	148	16.4 ± 8.0	19.7 ± 8.6	0.02	1.98 ± 3.49	1.51 ± 1.0	0.28
No	52	16.5 ± 9.1	18.1 ± 12.4	0.64	15.3 ± 11.5	18.2 ± 19.0	0.63

[a] Regression model estimates adjusting for age and gender, and data are expressed as mean ± standard deviation in subgroup analyses.

Oregon, USA). Forest environment monitoring data were collected by the environmental monitoring system from January 6 to 10, 2014. The SO_2, NO_x, CO, O_3, temperature, and relative humidity measurements were recorded daily every minute throughout the examination period.

The air conditioning in this building is a central control system. To obtain the indoor monitoring data of the urban environment, the same environmental monitoring system was set up in the commercial building to record daily data every minute from January 14 to 17, 2014. For each hour, air quality data were extracted from a monitoring data system and averaged to one result for each air pollutant. In addition, daily measurements of outdoor monitoring data of the urban environment from the Taipei air quality monitoring stations operated by the Taiwan Environmental Protection Administration were applied during the study period from January 14 to 17, 2014. The monitoring stations were fully automated and provided hourly readings of SO_2 (Ecotech 9850B, Australia) and NO_x (Ecotech 9841B, Australia) by ultraviolet fluorescence, CO (Horiba APMA360, Japan) by non-dispersive infrared photometry, O_3 (Ecotech 9810B, Australia) by ultraviolet photometry, temperature, and relative humidity (083C, Met One Inc., Oregon, USA).

For each participant, blood pressure was measured twice after at least 5 min of rest in a sitting position. The

Table 6: Effects of exposure to a forest environment on NK cell and activating NK cell

(A) Comparisons before and after the forest trip in Xitou for five days				
***N* = 11**	**Pre-forest trip**	**Post-forest trip**	**Paired-difference**	***p*-value[a]**
NK cell level (%)	22.49 ± 11.76	23.72 ± 15.05	1.23	0.411
Activating NK cell (%)	0.83 ± 0.39	1.72 ± 0.1	0.89	0.002
(B) Comparisons before and after the forest trip and four days after returning to Taipei				
***N* = 7**	**Pre-forest trip**	**Four days after**	**Paired-difference**	***p*-value**
NK cell level (%)	20.51 ± 11.27	20.98 ± 10.99	0.47	0.746
Activating NK cell (%)	0.77 ± 0.38	1.13 ± 0.43	0.36	0.004

[a]*P*-value by using paired *t*-tests.

Participant characteristics: data was shown in average.

(A) group: age, 60.4 years; body mass index, 23.54 kg/m^2; male, 27.3%; high-sensitivity C-reactive protein, 0.12 mg/L; systolic blood pressure, 113 mmHg.

(B) group: age, 61.8 years; body mass index, 23.57 kg/m^2; male, 14.3%; high-sensitivity C-reactive protein, 0.13 mg/L; systolic blood pressure, 106 mmHg.

blood samples were obtained after overnight fasting for 10–14 hours via the antecubital vein for each participant. Low- and high-density lipoprotein cholesterol (LDL-C and HDL-C), plasma glucose and serum levels of cholesterol, and triglycerides were measured using an auto-analyzer (Toshiba, TBA-200FR; Toshiba, Tokyo, Japan). Serum high-sensitivity C-reactive protein (hs-CRP) was measured using chemiluminescent enzyme-labeled immunometric assay (Immulite C-Reactive Protein, Diagnostic Products Co., Los Angeles, USA).

Blood sample preparation and flow cytometry analysis

The samples were prepared according to the method described by Jackson et al. 1986 [31]. Freshly isolated peripheral blood lymphocytes (PBLs) were stained with immunomodulatory agents by following combinations of directly labeled monoclonal antibodies (mAbs): CD3 piperidinin-chlorophyll conjugate (PerCP)/ CD56 PE/CD69 fluorescein isothyocyanate (FITC) (Becton Dickinson, CA, USA) for 30 minutes at 4°C in the dark. After incubation cells were suspended with 8 mL of a 1/10 dilution FACS Lysing solution (BD Biosciences) in the dark for 20 min at room temperature. Cells were centrifuged at 1500 rpm for 5 minutes for removing the supernatant. Cells were then washed with PBS twice by centrifugation at 1500 rpm for 5 minutes. Finally, the supernatant was discarded and the cells suspended in 200 μL of PBS for flow cytometry analysis. NK cell level was defined as $CD3^-/CD56^+$ population. Activating NK cell was defined as $CD3^-/CD56^+/CD69^+$ population. Surface marker expression was quantified on a FACSVerse flow cytometer (Becton Dickinson). A total of 20,000 gated events verified as lymphocytes according to their physical characteristics (forward scatter and side scatter) were collected per sample. The results were expressed as the percent of a cell subset using CellQUEST software.

Statistical analyses

We compared the general characteristics and percentage of NK cells and activating NK cells in the forest and urban groups. The *t*-test was used to detect differences in the group means for the characteristic variables if they were continuous and normally distributed, whereas the chi-squared test was applied to categorical data. Continuous variables were expressed as the mean ± standard deviation, and binary variables were expressed as percentages.

The environmental conditions were compared based on the air quality and meteorological data collected in the forest and urban environments. The complete blood cell counts were also compared between the forest and urban groups. The percentages of NK cells and activating NK cells in the forest and urban groups were compared using the crude value and regression model adjusted value after adjusting for age and gender.

The percentages of NK cells and activating NK cells in the forest and urban groups were also compared through subgroup analyses, including age, gender, BMI, hypertension, hs-CRP, and fasting glucose. The percentages of NK cells and activating NK cells before and after a short-term forest trip were compared through a paired *t*-test to detect intra-individual differences among participants. All the statistical analyses were performed with SAS statistical software (version 9.2, SAS Institute Inc., Cary, NC, USA).

CONFLICTS OF INTEREST

The authors declare that no conflicts of interest.

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City Council Meeting, April 10, 2020
eComments

Submitted by: J.D. Dykstra
Position: Neutral
Received: 04-09-2020 03:57 PM

Agenda Item:

3. City Council to consider additional measures to address COVID-19.

Comment:

please see attached letter

I would like to recommend opening back up our beach, parks and school fields immediately. Regular exercise is a very important part of strengthening not only our immune systems but also our mental health. This could be done with lifeguards and park employees monitoring these public spaces ensuring that social distancing guidelines are still being followed. Santa Monica is using this approach enabling their residents to get their necessary exercise while still being safe.

City Council Meeting, April 10, 2020
eComments

Submitted by: Gary Osterhout
Position: Oppose
Received: 04-09-2020 12:33 PM

Agenda Item:

3. City Council to consider additional measures to address COVID-19.

Comment:

I'm in a WFH situation, impacted by about 3-4 houses under construction. But I am opposed to the suggested closures--get them done. What s/b reviewed is why MB construction takes much longer than average or necessary, and how long homes go unoccupied, stressing Calif's housing and homeless crises. Maybe smaller homes might result in backyards, affordability, faster builds and less energy use. For noise problems, pls enforce leaf blower bans, particularly during a time of airborne viruses.

City Council Meeting, April 10, 2020
eComments

Submitted by: Larry Kleinberg
Position: Oppose
Received: 04-10-2020 07:12 AM

Agenda Item:

2. Discuss and Consider Limiting All Construction to Five Days a Week (Closing Monday or Saturday) Residential, Commercial, Public Projects, Including School District Projects.

Comment:

I am a member of the BOC's for C & EE. I implore you to not the limit the construction days of these projects. Parents should be concerned how schedule delays and reduced funds for C (as a result of increased costs) will affect learning experiences already impacted by remote learning and next year's layoffs. Declining tax revenues due to Covid-19 will severely impact the budgets for MBUSD, the City and State next year, and to knowingly increase the costs of these projects is a terrible mistake.

City Council Meeting, April 10, 2020
eComments

Submitted by: Fritz Marohn
Position: Oppose
Received: 04-10-2020 06:58 AM

Agenda Item:

2. Discuss and Consider Limiting All Construction to Five Days a Week (Closing Monday or Saturday) Residential, Commercial, Public Projects, Including School District Projects.

Comment:

General Contractor working in the city for 24 years. We tender the city relationship as if it were our own. We have 2 Current Jobs in the City of Manhattan Beach. We have been able to safely adapted to the new COVID-19 protocol and remain working safely. We are now limiting the amount of workers on each site and limited work days should not be considered. We need to set COVID-19 protocols that are viable for the years to come and limiting work days is not a viable solution. Opposed!

City Council Meeting, April 10, 2020
eComments

Submitted by: Jake Rice
Position: Oppose
Received: 04-10-2020 06:07 AM

Agenda Item:

2. Discuss and Consider Limiting All Construction to Five Days a Week (Closing Monday or Saturday) Residential, Commercial, Public Projects, Including School District Projects.

Comment:

As a General Contractor and a resident of the South Bay, working in Manhattan Beach, I oppose any restriction of construction work, and more specifically on Monday-Friday. We have implemented strict onsite protocols, following all state/local requirements & recommendations for PPE & social distancing measures. Restricting work would negatively impact our workers, our clients and the surrounding neighbors by extending project timelines and increasing cost.

City Council Meeting, April 10, 2020
eComments

Submitted by: Jason Giannantonio
Position: Neutral
Received: 04-09-2020 11: PM

Agenda Item:

2. Discuss and Consider Limiting All Construction to Five Days a Week (Closing Monday or Saturday) Residential, Commercial, Public Projects, Including School District Projects.

Comment:

Development Mgr. Manhattan Village – Our Contractor has developed and implemented a detailed social distancing plan that they are managing very diligently and as of April 9th, we have not received any complaints or citations from City Enforcement. Our Construction work is on a 5d/wk schedule M-F but the option of a 6th day is needed to catch up on work or used as a make-up day for rain and inclement weather. We respectfully request that if the Council adopts a 5-day work week, that it be M-F.

City Council Meeting, April 10, 2020
eComments

Submitted by: Shannon Sackley
Position: Oppose
Received: 04-09-2020 10:32 PM

Agenda Item:

2. Discuss and Consider Limiting All Construction to Five Days a Week (Closing Monday or Saturday) Residential, Commercial, Public Projects, Including School District Projects.

Comment:

I strongly oppose the reduction of days/hours of construction. Reducing construction to 5 days a week will only do harm. It will cost homeowners more money/time. It will result in the reduction of workers hours, even layoffs. It will effect CA housing, making it longer to finish projects. Regarding Covid-19 - Our Contractor, subs, and employees are all taking it very seriously and doing everything to make sure the neighbors, residents and themselves are safe.

City Council Meeting, April 10, 2020
eComments

Submitted by: Bill Fournell
Position: Oppose
Received: 04-09-2020 10:05 PM

Agenda Item:

2. Discuss and Consider Limiting All Construction to Five Days a Week (Closing Monday or Saturday) Residential, Commercial, Public Projects, Including School District Projects.

Comment:

As you know, MBUSD has major Measure C & EE bond construction projects underway. Summer is critical for us to complete milestones before school re-opens in the fall. This ordinance may cause us to miss major milestones resulting in delays to the community's use of new and modernized facilities and also significant cost overruns. Our projects are generally fenced in and away from the community and following strict COVID-19 safety protocols. Thank you for the work you are doing. Stay Safe.

City Council Meeting, April 10, 2020
eComments

Submitted by: Christian Carlson
Position: Oppose
Received: 04-09-2020 09:45 PM

Agenda Item:

2. Discuss and Consider Limiting All Construction to Five Days a Week (Closing Monday or Saturday) Residential, Commercial, Public Projects, Including School District Projects.

Comment:

This would only prolong construction in the long run.

It will also hurt a lot of workers who are paid daily or by the job. Not only construction workers but the local businesses and economy that rely on workers buying lunch, gas or anything else everyday. I shouldn't have to explain this but construction increases a homes value which in the end is good for the city and all of it's residents.

I really can't think of one benefit that this would have besides appeasing a handful of residents

City Council Meeting, April 10, 2020
eComments

Submitted by: John Fielder
Position: Support
Received: 04-09-2020 09:34 PM

Agenda Item:

All residential construction should be stopped until the shelter at home order it lifted. It will hurt contractors and builders, but no more than anyone else.We cannot close all stores and public places to convince people to stay home, and then make that home unsafe.There are elderly and vulnerable people living feet from these sites, and stopping it for a month will save lives.There are also kids schooling at home, adults WFH.How can we allow any construction right now when all else is stopped.

City Council Meeting, April 10, 2020
eComments

Submitted by: Christian Carlson
Position: Oppose
Received: 04-09-2020 10:22 PM

Agenda Item:

3. City Council to consider additional measures to address COVID-19.

Comment:

The numbers are dropping, proving the current measures are working. And now there's even more rules starting Friday for LA county.

Seems like everyday there's some new "measure" I'm not dismissing COVID but theres only so many "measures" you can take before it goes too far and maybe it'd be best to wait longer before deciding on more.

City Council Meeting, April 10, 2020
eComments

Submitted by: John Fielder
Position: Support
Received: 04-09-2020 9:45 PM

Agenda Item:

3. City Council to consider additional measures to address COVID-19.

Comment:

We cannot allow residential construction to continue while sheltering at home.Many counties in the North have stopped.We have vulnerable and elderly people feet from sites-contractors coming and going.They can't open windows or go in the yard for air.We have kids all schooling at home, adults WFH. It is illogical that we would allow this to continue.It will end up getting people sick.It is wrong to make homes unsafe while we are being told to stay in them, work in them and learn in them.