

the conservation and maintenance of highways, improve, and strengthen road safety measures.

**4) Strengthening statistical analysis** of highways traffic accidents, to grasp the rules and characteristics of traffic accidents, is conducive to early prevention and targeted treatment.

**Key words:** mountainous expressway, traffic accident, prevention measures. ■

## **C**ompensating age related physical and cognitive impairments of older drivers by technological measures and training

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In many countries in Europe, America and Asia, the proportion of older persons in the population is rapidly increasing. Safe traffic participation is very important for the independent functioning and quality of life of older persons and they are increasingly dependent on private cars. In principle, driving a car is very userfriendly for older persons because it allows transport from door to door in a relatively protected cocoon. However, with increasing age the body becomes more vulnerable and the prevalence of impaired sensory, motor and cognitive functions caused by aging related neurological and ocular diseases, does increase, reducing fitness to drive.

To a certain degree, technological measures in the traffic system can compensate these impairments. Adaptations of the infrastructure as proposed in "sustainable safe", a European policy for making the traffic infrastructure forgiving with regard to human error and frailty, are generally favorable for older drivers because they increase predictability of the road environment, separate opposing traffic streams and reduce speed differences. Care has to be taken, however, that infrastructural characteristics intended to reduce speed in general, do not make the driving task so difficult for impaired older drivers that they drive too slow or otherwise hinder the flow of traffic. Advanced invehicle driver assistance systems (ADAS) may suffer less from this problem because they

can be adjusted to the individual needs and preferences.

Some frequently occurring older driver impairments (MCI, AD, PD) will be discussed in the light of developments in Intelligent Transport Systems (ITS) and ADAS, and it will be considered what existing and future to be further developed systems appear to be important for sustainable sage mobility in impaired older drivers. It is proposed that ITS and ADAS interventions should be designed and applied in such a way that potential mobility and safety effects are not regulated away by social and behavioral adaptation. This issue is currently the subject of research going on in the EU funded Marie Curie Initial Training Network "Adaption", also with a special emphasis on older drivers. One expectation is that speed regulation and warning systems which young drivers consider as a nuisance, are viewed as helpful and pleasant by older drivers and that the positive safety and mobility effects will not be regulated away by undesired behavioral changes.

Even with optimally (older) userfriendly infrastructure and incar technology, the driver remains an essential element in the loop and opportunities must be provided to allow older drivers to compare their functioning with what is required ("calibration") and to improve their functioning by driver education and training in the use of new technology. Advanced driving simulators can play an important role there as will be illustrated by ongoing research in the "Adaptation" network and on visual strategy training in drivers with visual impairments. Finally, consequences of the new technological development for the assessment of fitness to drive will be briefly discussed. ■

## **D**ifferent effect of codeine/paracetamol on driving performance in a monotomous surrounding as a function of age

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**Introduction** Epidemiological

studies revealed that drug consumption is suspected to increase the risk of driving accidents. Among drugs, the association of codeine/paracetamol who is considered one of the most efficient to ease pain as compared to other analgesics of level II in the WHO classification, could decrease vigilance and thus impair driving performance. However, few experimental study evaluated codeine effects on driving, and they only tested these effects on young healthy drivers whereas elderly people represent a large part of drivers and are used to consume this type of drugs. The objective of the present communication is to compare the behavioural effect of therapeutic dose of codeine/paracetamol on simulated driving in subjects of different age.

**Methods** The effects were evaluated in two groups of 16 subjects, young (2030 years) and aged (55 to 65 years). One hour of monotonous driving performance was evaluated after 1 dose of codeine/paracetamol (20mg/400mg) intake and compared to a placebo in a double blind and balanced design. Pills were taken at 8AM, monotonous driving task was performed with a monoscreen driving simulator one hour after at the theoretical plasma peak concentration of the drug. Participants had to keep a constant speed of 110km/h and a stable trajectory in the center of the right place. Standard deviation of both the lateral position and the speed, the number of road exits were analysed. Plasmatic concentration of codeine, morphine and paracetamol were determined at the beginning and at the end of the experiment.

**Results** They showed that the minimal therapeutic dose of codeine/paracetamol used here differently affect driving performance in function of age. Young subjects performances did not vary after drug intake whereas aged subjects performance were impaired. In particular aged subjects standard deviation of lateral position on the lane (SDLP), which is considered as the most sensitive parameter to investigate durgs effects, increased after the minimal therapeutic dose of codeine/paracetamol. Moreover, aged subjects seemed to eliminate the drug more slowly than young subjects. These results are in agreement with our past study on the effects of zolpidem revealing that this hypnotic which did not appear at risk for driving in healthy young subjects could be at risk for aged subjects. These results underline the necessity to evaluate the effects of drugs in several aged range. ■