CARBON MONOXIDE AND THE IMPAIRED DRIVER

A Medico-Legal commentary on carbon monoxide including its interactions with alcohol and human factors in affecting driving performance

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"The Impaired Driver" was the title of a paper delivered to the Medico-Legal Society of Victoria in 1970 by Dr. John H. W. Birrell and the late Mr. Ray Dunn LL.M., and both authors were primarily concerned with alcohol as a cause of driver impairment. However, Dr. Birrell glanced in passing at another contributory factor (an under-estimated factor, in our submission) when he said

> "The role of carbon monoxide, I regret, seems to be important only as a legal defence. The Melbourne City Coroner estimated carbon monoxide routinely in his crash deaths for many months some years ago. He gave it away when he found only two positive both of whom had burnt to death".

Recent enquiry from the Government Pathologist establishes that the present practice in Victoria is not to include in post mortem examinations tests for possible carbon monoxide (CO) poisoning, unless police request such tests by reason of suspicious circumstances such as in cases of suspected suicide by inhalation of CO.

Alcohol is of undeniable importance as a contributing factor to many traffic accidents (*Birrell*, 1974; *Current Affairs Bulletin*, 1970; *Department of Health, Victoria*, 1974; *Drew et al.*, 1974; *Santamaria*, 1974) but there are other toxic substances and agents which may interact with alcohol or dangerously impair driving performance in their own right (*Kaempe*, 1976; *Mayron & Winterhalter*, 1976; *Sunshine et al.*, 1968). Because of the importance of alcohol, the other agents have been largely neglected, we submit, and we would draw attention to some of these, in particular carbon monoxide (CO) which may have directly and severely impaired driving performance (*Rockwell et al.*, 1974; *Mayron & Winterhalter*, 1976), caused motor vehicle accidents, and yet lurked undetected as a factor in their cause (*Baker et al.*, 1972). The outstanding feature of CO in this connection is that it is colourless, odourless, tasteless and the onset of its toxicity is cumulative and insidious.

A monograph by *Beaty* (1969) emphasises the adverse interactions of factors such as fatigue, anoxia, alcohol and other drugs in producing errors in decision-making and impairing performance by pilots, leading to aircraft accidents in a number of instances. *Yanowitch* (1975) confirms the importance of such biomedical factors which are causal in eighty to ninety per cent of six hundred aircraft accidents each year. Studies of driver-performance in London (*Crosby*, 1977) similar to those of Gerhardt (cited by Beaty) are in progress and the adverse interactions of various prescription drugs (tranquillisers, antihistamines and sedatives, etc.) with alcohol have recently been publicised Australia-wide by the Foundation of Alcoholism and Drug Dependence, the Pharmacy Guild of Australia and Commonwealth Department of Health (*Pharmacy Gazette*, 1977). These bodies are to be congratulated on their initiative in promoting the "Medication and alcohol don't mix" campaign; but much more community awareness of these and other dangerous toxicants must yet be aroused. This paper will therefore highlight some aspects of CO as a less well recognised but important toxic synergist of alcohol (*Fazekas & Rengei*, 1969; *Pankow et al.*, 1974; *Rockwell & Weir*, 1975) and a dangerous toxicant in itself (*Rose & Rose*, 1971).

CO and Urban Pollution

It is the contention of many authors, and ours, that increasing urban pollution by CO, oxides of nitrogen, lead and other combustion products of the petrol engine in the growing volume of motor traffic presents an urgent problem for environmental protection agencies and citizens in general (*Burgess et al.*, 1973; *Godin et al.*, 1972; *Hickey et al.*, 1975). This problem is further exacerbated by the fact that self-inflicted "personal" pollution by tobacco smoking has been recognised as a serious hazard in which CO plays a major role (*Astrup*, 1972).

In heavy city traffic levels of twenty to thirty ppm CO are common and peak values up to three hundred ppm have been recorded. By contrast, mainstream cigarette smoke contains 40,000-50,000 ppm of CO and mixed in the mouth and pharynx is inhaled in concentrations averaging about five hundred ppm. As a consequence the percentage of the oxygen-carrying pigment haemoglobin in the blood of smokers which is bound to CO (i.e. CO-Hb) may commonly range from 5.6 per cent up to 16 per cent. Even second-hand or passive inhalation of smoky atmosphere by non-smokers may raise their CO-Hb levels to a mean 1.6-2.6 per cent. Although the findings of *Bisby et al.* (1977) for Sydney traffic policemen are more reassuring in regard to Sydney's ambient CO levels, the dangers of lead in the environ-

ment are emphasised. *Cooper's bibliography of CO* (1966) cites over one thousand references, and the USPHS reviews on *air quality criteria for CO* (1970) and by *Lawther* (1975) usefully emphasise the sources, distribution and fate of CO, its physiological effects and ambient air quality criteria. Because of the social prevalence of ethyl alcohol ingestion, *Rockwell & Weirs* (1975) study of the interactive effects of carbon monoxide and ethyl alcohol on performance in normal driving tasks is of the utmost importance in establishing bench marks of performance and equivalence levels for comparing carboxyhaemoglobin (per cent of Hb combined with CO) effects to corresponding blood alcohol effects on driving performance.

In summarising the extent of the risk we would agree with *Godin et al.*, (1972) that the city dweller is always close to the point of impaired psychomotor performance, and in some situations (e.g. with defective vehicles or heavy smoking, or heavy urban exposure as in Los Angeles, or with combinations of these factors) may have passed this threshold. In addition to the psychomotor effects there is a considerably increased risk of severe heart attacks through exposure to high levels of CO with urban pollution or smoking (*Radford*, 1976). All of these thresholds are lowered and the attendant risks are increased if ethyl alcohol ingestion is added.

The Absorption, Uptake and Excretion of CO

Data in man (*Haldane*, 1912; *Roughton*, 1964, 1970; *Lawther*, 1975) indicate that the blood oxygen-carrying pigment haemoglobin has a very much higher affinity for CO than for oxygen. Lawther's fig. two and Roughton's fig. nine, ten, provide clear quantitative evidence of the degree of haemoglobin inactivation by combination with CO. This combination is slowly reversible when the exposure to CO ceases, and more rapidly in the presence of high oxygen. Such studies in which equilibrium blood concentrations of CO-haemoglobin are reached after breathing various concentrations of CO-contaminated air indicate that exposure to CO in town air could in some circumstances, give "unwelcome and potentially dangerous blood levels" (*Lawther*, 1975).

What are Dangerous Levels of CO in the Environment?

Although varying from country to country, the schedule of recommended maximum concentrations of atmospheric contaminants for occupational exposures published by the National Health & Medical Research Council (1961) stipulates fifty ppm as the twenty-four hour safe maximum level. The criteria for recommended

standard in the U.S.A. as proposed by *Utidjian* (1973) and *Grut* (1973) agree with the 1961 NHMRC recommended level for Australia but the U.S.A. Environment Protection Authority standard maximum allowable concentration for an eight hour exposure is nine ppm (*USPHS Dept. of Health Education & Welfare*, 1970; *Johnson et al.*, 1975). This ambient level is frequently exceeded in any major urban environment (*Burgess et al.*, 1973; *Godin et al.*, 1972; *Hickey et al.*, 1975). Although the results of recent research would not seem to justify any change in the threshold limit value of fifty ppm, several studies have indicated a decrease in vigilance at very low CO exposures (*Horvath et al.*, 1971; *Rockwell et al.*, 1974; *Wilson*, 1973). *Grut* (1973) has made the logical recommendation that in jobs such as the control of semi-automatic work, smoking at the work place should be prohibited, particularly when the safety of others is involved e.g. pilots, and drivers in congested city traffic.

What are the general effects of CO exposure in man?

The physiological effects of various fractional concentrations of CO in inspired air (usually expressed as ppm) and the blood levels of CO-haemoglobin which these inspired concentrations produce have been described by many authors and are well presented by *Lawther* (1975). The effects of lower levels of intoxication (up to fifty per cent CO-haemoglobin) in the Roman population is well described by *Del Vecchio et al.* (1956) as are the symptoms of mild CO exposure in automobile repair shops by *Cabal* (1972). These include headache, irritability, vertigo or dizziness, psychomotor and visual disturbances, unsteadiness, weakness, mental confusion and fainting. It should be noted in particular that visual motor co-ordination, visual search behaviour and attention are affected early (*Wilson*, 1973; *Harvath et al.*, 1971; *Rockwell et al.*, 1973). Unconsciousness and death result from more prolonged or severe exposure (*Lawther*, 1975). The symptoms of exposure to high concentrations are classically described in the noted physiologist Haldane's own account of his experiments on himself in 1895. He breathed 2100 ppm (0.21 per cent) of CO in air continuously and after thirty-four minutes when his CO-Hb would have been about twenty-five per cent recorded "a feeling of fulness and throbbing in the head." After forty-three minutes with a saturation of CO-Hb over thirty-nine per cent he reported feeling "decidedly abnormal". After an hour he stopped the experiment when his blood was forty-nine per cent saturated with CO, recording "vision dim, limbs very weak. Had some difficulty in getting up or walking without assistance, movements being very uncertain". He reported

that during the whole of the evening after the experiment he suffered from headache, which persisted during the next day. Had Haldane persisted for a further hour and continued to inspire 2100 ppm (equal to 0.21 per cent) of CO in air, he would doubtless have expired in the act.

Remembering these stealthy characteristics of CO, colourless, odourless, tasteless, the insidious onset of its toxic symptoms can be better understood. These symptoms are brought on by anoxia, or oxygen lack, in the blood, which CO induces, yet the symptoms are not incompatible to the subject, rather the reverse. A pleasant euphoria is frequently reported in subjects suffering moderately severe oxygen lack as would occur with blood levels of forty per cent to fifty per cent CO-Hb.

The intoxication produced by CO and that produced by the alcohol preferably imbibed by man (ethyl alcohol) appear to the lay observer to be quite strikingly similar, even to the cherry pink complexion frequently remarked as typical of both forms of intoxication. But *McBay* (1965) reports cases of CO intoxication where the classic cherry pink did not suffuse the complexion of the subjects.

According to *Boura* (1977) the experiments of Steinberg H., currently in progress, show that the intoxicant effects of ethyl alcohol and oxygen deprivation are synergic and additive as do the results of *Hansen & Claybaugh* (1975). Their interaction would enhance the impairing effects of each agent on a driver exposed to some of each. A similar synergy is seen for the intoxicant effect of combined exposure to both ethanol and carbon monoxide (*Fazekas & Rengei*, 1969; *Pankow et al.*, 1974; *Rose & Rose*, 1971).

Impairment of driver performance of CO.

Adverse effects of CO on driver performance are described and discussed by *McFarland* (1973) and his results delineate the threshold of impairment of drivers exposed to moderate CO levels. Further discussion occurs in *Todorovici* (1974), *Eye Ear Nose Throat Monthly* (1973) and *Beard* (1967) and statistically significant differences suggesting decrement in performance as a result of low level CO exposure (seventeen per cent CO-Hb) are described. This level could be reached by a heavy cigarette smoker affected by cigarettes alone. *Pankow et al.* (1975) confirms that this moderate level of CO produces sustained adverse effects, notably slowed nerve conduction velocity, lasting up to four weeks after exposure. Consequential prolongation of motor reaction time and slowed motor responses result.

Baker et al. (1972) point to the potential hazard created by sublethal concentrations in the atmosphere of CO from automobile

exhausts and these authors present sixty-eight deaths by CO poisoning inside motor vehicles. In none of these cases was there any indication that death was deliberate. Although many such deaths occur in non-moving vehicles and are therefore not classed as motor vehicle accidents, *Ury et al.* (1972) found a positive association between CO levels in Los Angeles and the motor vehicle accident rate, and they point out that not only drivers are at risk, but also passengers, pedestrians, cyclists, and other road users. *McFarland et al.* (1964) describes toxic CO levels in trucks and buses, and *Johnson et al.* (1975) in school buses. In a more graphic article in Public Health (*Johannesburg*, 1963) it is stated that many victims of death from carbon monoxide fumes are included in that group of persons dying from injuries sustained in car accidents commonly attributed to driver fatigue, drowsiness, or inattention. The verdict is usually phrased as "failure to drive in a careful and prudent manner". A research project on deaths and injuries from CO, undertaken by a near-victim of gas, revealed that neither the automobile insurance companies nor the safety organisations had any statistical breakdown of numbers of deaths or accidents from this cause. But he also found that his own experience was not unique.

Incidents in Canada and the U.S.A. of deaths from CO in automobiles are cited including one where the medical examiner judged that the driver in a fatal accident may have breathed the gas coming into his car from vehicles ahead of himself in the heavy traffic, since blood tests indicated a CO-Hb saturation of thirty-five per cent. Individuals respond in various ways to CO, sometimes acting drunkenly or hilariously. This author suggests that the blood of such drivers be tested for both alcohol and CO content. We would concur. Such tests may well save many lives. Regular checks of cars, for corrosion of the muffler and exhaust pipe, should be made and the driver should be sure that the car trunk closes tightly. When following another car within sixty feet the car ventilator should be closed. The ventilators should also be closed in heavy traffic, in tunnels, and when parked behind a car with its motor running. It should be a policy also never to sit, for any length of time in a parked car with the motor running and the windows closed. Talking to motorists will evoke many anecdotes of accidents or near-accidents in relation to CO inhalation in motor vehicles and an article by *Johnson* (1961) provides examples of such instances. This is a report of automobile accidents, fatal or near-fatal, possibly caused by the inhalation of CO. This author relates her own experience of CO asphyxiation, and describes the symptoms before she was overcome by CO fumes and crashed into another automobile. When she felt a strong sensation of drowsiness she wanted to pull off the road but was unable to see the side due to,

as she found out later, the narrowing of the field of vision caused by the CO. In being overpowered by the drowsiness she lost judgement, control and consciousness, due to the fact that the inhaled lethal CO combines more than two hundred times faster with the blood than oxygen. Thus the saturated blood cannot absorb enough life-giving oxygen. Deprived of oxygen the brain is affected sometimes severely and sometimes permanently. Johnson in quoting case histories makes a plea for more research. Blood tests which are made routinely for the presence of alcohol, should be done just as routinely for the presence of CO in accident cases. In the U.S.A. only the city of Philadelphia is known to be doing these tests routinely when someone dies in a traffic accident. Philadelphia's medical examiner states that an appreciable percentage of drivers who die in automobile accidents have significant levels of CO in their blood. Johnson cautions drivers to beware that CO is odourless and to keep the car in good running condition and well ventilated. The significance of CO as a contributing or causative factor in industrial or automobile accidents is enhanced by its prevalence as a pollutant, the increasing atmospheric concentrations and the insidious effect of low atmospheric concentrations of CO in producing or accelerating chronic ailments (*Rose*, 1971). An additional susceptibility to CO is imposed by pregnancy, altitude, alcohol or drugs, or reduced cardiac and pulmonary function. Low concentrations of CO decrease visual and auditory acuity, affect judgement of time intervals and diminish coordination and mechanical judgement. Physicians and police examining persons who are alleged to have been drunken drivers should consider the alternate possibility of CO intoxication. The effects of alcohol are aggravated by the effects of CO, for both influence the human mind and impair muscular coordination and control.

We have several such case histories personally known to us. In one the driver of a station wagon had his vehicle checked before commencing a long drive, yet found that he and his passenger were being overpowered by drowsiness despite driving with windows down, stopping frequently for "breathers" outside the vehicle, keeping the radio turned up etc. Alcohol was not a factor, yet the driver's and passenger's drowsiness soon recurred after each "breather". On the return journey the driver was impelled to have the vehicle re-checked and found that its exhaust pipe was pitted by corrosion and escaping exhaust fumes were seeping and being sucked into the vehicle in dangerous quantities. The corrosion had occurred despite the vehicle's age being only eighteen months.

In another instance known to the authors a veterinary scientist involved in a minor traffic incident was subsequently charged with driving offences, including driving under the influence of alcohol, and

refusing to undergo a breath analysis test. The stipendiary magistrate at the hearing accepted expert evidence from a senior engineer of the Gas and Fuel Corporation of Victoria and from an eminent physician and biochemist as establishing CO intoxication of the veterinary scientist by leakage from a faulty gas-heated autoclave in his laboratory in which he had been preparing animal serum for many hours prior to his homeward journey, during which the traffic mishap had occurred. The laboratory was found to be inadequately ventilated and this inadequacy had been further accentuated by an assistant having masked part of a ventilator to reduce the winter chill. After inhaling CO during his day's work in the laboratory the veterinarian's behaviour following the mishap appeared to police officers to be due to alcohol, yet his sworn prior alcohol intake during the day in question was accepted by the magistrate as minimal and insufficient to account for the impaired driver's unsteady gait, slurred speech etc. The magistrate accepted that the CO impairment of the driver had evidently simulated some of the indicia of impairment by alcohol, and the charges were dismissed.

Experiences of your medical author in an altitude-simulating decompression chamber are noteworthy, if we remember that the intoxication of CO closely resembling ethyl alcohol intoxication, is not produced directly, but only indirectly as a consequence of hypoxia. That is, reduction of the blood oxygen level, consequent upon the inhaled CO binding to the Hb is the real intoxicant. Your medical author was himself first subjected to a level of decompressive oxygen lack, a little more severe than that described by Haldane when breathing CO, and can personally confirm all the symptomatology of Haldane's description. Then, after "descent" and recovery, he observed and recorded the responses of an experienced pilot of his acquaintance subjected to the same oxygen lack. After eight to ten minutes at a barometric pressure equivalent to 25,000 feet, the pilot was unable to perform childishly simple tasks requiring visual-motor discrimination and coordination, matching and fitting blocks and pegs of assorted shapes to their correct holes in a pegboard. The pilot was also unable to mentally calculate serial seven subtractions from one hundred, which he could execute unhesitatingly at "sea level". The pilot had previously handwritten without mistake "the quick brown fox jumped over the lazy dog"; but, under the influence of oxygen lack, he produced only the following perseverative nonsense, almost illegibly scrawled: "the quick brown fox jumped over the dozy . . . dozy . . . dozy . . . dozy . . .". This pilot's evident gross impairment of psycho-motor performance extended more insidiously, and dangerously, to the area of judgement and cognition. When told by

the medical observer that "You must now fit this mask and breathe oxygen" he resisted indignantly and irrationally "I'm alright. I feel fine, take that bloody mask away!" The pilot's mental ability, on my observation, was impaired to a degree which could have endangered his life if his flight had been real, not simulated.

Vehicle Defects, Roadworthiness, CO and Road Safety

In a searching evaluation by *McFarland & Moseley* (1964) of the hazards of CO in trucks and buses, data were presented concerning the frequency and severity of CO-caused accidents in passenger and cargo operation in interstate commerce. Approximately 1.3 per cent of mechanical defects accidents, under review between 1947 and 1951, were stated to be due to CO. The total of all accidents, fatal and otherwise, was higher for freight carrying vehicles than for passenger carrying vehicles, but the total of injuries suffered was higher for the passenger vehicles. Some fatalities had occurred while vehicles were stopped but, obviously, injuries had been higher in collisions and other accidents occurring to vehicles in motion. Both fatality and injury rates were disproportionately high in relation to the total of mechanical defects accidents. Sources of CO within vehicles were traced primarily to engine exhaust fumes and secondarily to combustion of lubricating oils and to sources in other vehicles. CO access to the passenger cabin was traced through the breather, manifold, head gaskets, muffler, tail pipe, air tank and air-operated devices and their couplings, fittings and exhausts. In some vehicles an extra source of CO was traced to the heating system or the anti-freeze system. This study emphasises the accessibility of the passenger cabins of motor vehicles of all types to CO from various sources, and supports the contention of *Dunn & Birrell* (1970) that the most dangerous vehicles are used cars in unroadworthy condition. The pity is that current roadworthiness certification procedures are not programmed to detect and remedy many of these dangerous emissions of CO. In spite of persistent attacks by Ralph Nader and his disciples on U.S.A. motor vehicle design, and consequent improvements in new vehicle safety, there remains a steeply rising rate of motor vehicle accidents involving drivers in the younger age groups and the frequency of either driver or vehicle impairment (Victoria Police Accident Appreciation Squad data in the second annual report of the consultative council on road accident mortality quoted in *Dunn & Birrell*, 1970).

Defects in the heating or exhaust system of light aircraft leading to carbon monoxide contamination of cabin air are reviewed in *Air Safety Digest* (1974). In a fatal Victorian air collision in 1970, one pilot was

found to have been affected by CO poisoning brought about by the defective heating system in the aircraft, which was operated by exhaust fumes. The result of the enquiries led to the inspection of all aircraft of the type involved and their heating systems were modified to guard against any recurrence of the trouble.

The "landlubber" might scoff at the likelihood of CO poisoning occurring in small craft at sea, where the motion of the vessel could be thought sufficient to dispel exhaust fumes, from inboard as well as outboard engines, leaving the CO safely astern. But enquiry amongst yachtsmen and small motor vessel skippers and crew has elicited accounts of many incidents in which exhaust fumes have adversely affected crew and passengers. Examples include cases of outboard-engined craft moving with a following breeze blowing CO fumes back over the stern, to the discomfort, and in some instances, the peril of those aboard. An example of CO poisoning is recorded in a Victorian yacht whose auxiliary inboard engine was positioned in a badly ventilated cabin, giving rise to a build-up of CO to a level leading to the death of a crew member. In larger vessels the practice of engine room personnel going up on deck for the periodic "breather" may well have arisen from numerous occupational discomforts and fatalities since sail gave way to steam, thereby adding CO to the hazards of those in peril on the sea.

Enquiries by the authors have not yet plumbed the depths of the experience of submariners, but, at the other extreme, amongst mountaineers there are many recorded instances of anoxia leading, through states of hilarity and elation and consequent carelessness in leaving safety harness unbuckled or faultily buckled, to euphoria, delusions and zombie-like automation, ending not always on the pinnacle, but sometimes in the crevasse (*Pugh & Ward*, 1956).

The dangers of CO on the heights, in the depths, at sea and in flight serve to highlight CO's dangers of impairment to drivers and their passengers on the roads. As Walls and Brownlie comment on CO in *Drink, Drugs and Driving* (1970):

> This notoriously poisonous gas is not of course a drug, but it is convenient to mention it here. It may form up to about 6 per cent of car exhaust gases; it may therefore constitute a hazard in a closed car, coming either from a leaky exhaust system of the car itself, or (more probably) by being sucked in by a heater fan from the exhaust of the car in front in a stationary line of traffic, and this reason is sometimes advanced as a cause of apparent intoxication in a driver. Carbon monoxide can easily be determined in quite small blood specimens provided that they are taken within a short time of the exposure to the gas and that they are tightly sealed. It is

doubtful however whether the specimens taken under the Road Safety Act 1967 would be large enough, and in any case no laboratory would make this examination unless specifically requested, as the method of analysis is totally different from those used for alcohol or drugs.

It is not the purpose of the authors to minimise or palliate the danger of the drunk driver, or to disparage the present utility of the breathalyser as a weapon in the fight against the mounting road toll. Rather we would call attention to the dangers of another intoxicant, which, combined with alcohol or alone, has caused and can continue to cause a number of road fatalities and injuries. The understandable animus against the drinking driver which may affect those called upon to cope with his victims, whether medically or legally, even analytically in accident appreciation, has led, in our submission, to a relative neglect of intoxicants other than alcohol, which also contribute, in smaller measure, to the road toll (*Law Reform Commission*, 1976).

If the impaired driver (whether his impairment is alcoholic or anoxic, or a dash of each) is seen at the wheel of the impaired vehicle (whether impaired by faulty design or want of repair) there you have the greatest pair of perils on the road.

Postscript

This paper came to be written by reason of five informations, for alleged traffic offences, brought against a Monash University law student in July 1975 in the Magistrates' Court at Richmond in which your medical co-author was called as an expert witness by your legal co-author, who was acting as the defendant's solicitor.

The law student was charged with driving under the influence of intoxicating liquor, driving across an intersection in disregard of a "stop" sign, entering and driving down a one-way street in disregard of a sign reading "do not enter", refusing to give his name and address to the police officers who luckily pulled him up, and refusing to undergo a "breathalyser" test. His speech and general behaviour on the night in question were undeniably incoherent, irrational, indelicate, inappropriately jocular, and seemingly, impermissibly inebriated. He admittedly had consumed some alcohol some hours before he came under the attention of the police officers. He looked eminently likely to qualify as a compulsory pedestrian.

But he was driving on the winter's night in question an old model Volkswagen sedan with its heating system circulating air heated in a "transfer box", the outer surface of which was exposed to the hot ex-

haust fumes. Expert evidence was given by a Monash University postgraduate science researcher who had examined this vehicle, albeit some months after the night, and found the heating system defective. This witness stated (*inter alia*):

> "I used a gas chromatograph to test the carbon monoxide levels with the heating system inoperative and operative and with the vehicle idling and the vehicle in motion . . . I found that there was a significant level of carbon monoxide in the cabin both while the car was in motion and while it was idling, stationary with the heating system operating. Summarising the readings of my instrument under the three tests I conducted, I can state my findings as follows:
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> |---|---|---|
> | (a) | vehicle stationary all windows up, engine idling half an hour, heating system operating | 0.26% of carbon monoxide in cabin air |
> | (b) | vehicle in motion all windows up, half an hour, heating system operating | 0.19% of carbon monoxide in cabin air |
> | (c) | vehicle in motion all windows open half an hour, heating system inoperative. | 0.01% of carbon monoxide in cabin air". |

Your medical co-author was called to give his opinion of the results of those tests and of the defendant's behaviour as described by the two police officers. He testified to the effect (*inter alia*):

> ". . . the driver of a vehicle who was inhaling carbon monoxide in the quantities recorded would be characterised by euphoria, inappropriate levity (treating it all as a joke) incongruity of mood, thought disorder and disturbed reasoning ability, illogicality and irrationality, impaired motor (movement) performance, impaired performance of any movement task requiring co-ordination, slurred speech, central nervous system depression, reduced awareness, drowsiness, headache and nausea resembling alcoholic hangover. Having heard the evidence given by Constable Smith I can say that not only is his description of the defendant's behaviour in many particulars consistent with carbon monoxide poisoning but it is more consistent with the defendant having been affected by carbon monoxide than with his being affected by alcohol. The effect of carbon monoxide is insidious and cumulative because carbon monoxide is not detectable by any odour and the carbon monoxide binds almost irreversibly to the haemoglobin in the blood. This reduces the oxygen carrying capacity in the blood. The subject suffers oxygen

deprivation or hypoxia . . . The subject would not be aware of his condition. He would probably look and feel well. His complexion could be a healthy looking pink or a ruddy complexion. He might switch from elation to an argumentative or combative mood. In my opinion having heard the evidence given by Constable Smith the defendant was suffering from carbon monoxide poisoning when intercepted. He was probably lucky the police intercepted him. If he had gone on driving the cumulative effect of the carbon monoxide poisoning might have been fatal. I think the police are to be congratulated on stopping him . . ."

The remainder of the medical evidence comprised in tabloid form, the gist of the paper. All technical evidence for the defendant was offered to be made available in full to the Victoria Police Force for further investigation by its forensic experts and advisers, as it seemed then to both co-authors that the extent of carbon monoxide impairment of driver's efficiency posed certain questions of public safety not as yet fully appreciated in Victoria.

The Stipendiary Magistrate dismissed the charges of driving under the influence, refusal to give name and address and refusal to undergo the breathalyser test, and found the other two charges proved, but he imposed no penalty. He also stated that he thought the prosecution should accept the offer to make available the defendant's full technical evidence.

The prosecution sought orders to review all three dismissals but were refused an order to review the dismissal of the driving under the influence charge. Orders nisi to review the other two dismissals were granted, and they eventually came on for hearing in the Supreme Court of Victoria by His Honour Mr. Justice Dunn, whose previously unreported reasons for judgment (making both orders absolute and referring the two dismissals back to the Stipendiary Magistrate) follow this postscript, omitting only its formal heading in order to preserve the defendant's anonymity. A list of the cases cited and argued by Mr. Richard Gorrie of Counsel for the informants and Mr. Michael O'Sullivan of Counsel (now Q.C.) for the defendant is also annexed.

When the two informations came back to the Stipendiary Magistrate an earlier draft of this paper (omitting this postscript as the two cases were still *sub judice*) was presented as part of the defendant's case. The magistrate in deference to the reasons of His Honour Mr. Justice Dunn found the two informations formally proven, but intimated that, if he decided (as he did decide) to impose no penalty he would consider that the course of justice would not be impaired.

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APPENDIX

IN THE SUPREME COURT
OF VICTORIA Nos O/R 7235/6

MELBOURNE
BEFORE HIS HONOUR MR. JUSTICE DUNN

JUDGMENT
(Delivered 8th November, 1976)

HIS HONOUR: This is the return of the two orders nisi to review the dismissal of two informations in the Magistrates' Court at Richmond. These matters were heard together by consent.

The information in which the informant was Frank Malvern Smith alleged that on 15th July, 1975 the defendant refused to undergo a preliminary breath test contrary to the provisions of s.80E sub-section 3 of the Motor Car Act 1958.

The grounds on which the order nisi to review the dismissal of that information was granted are:

1. The Stipendiary Magistrate ought to have held on the evidence that the defendant refused to undergo a preliminary breath test having been required to do so in accordance with the provisions of sub-section 1 of s.80E of the Motor Car Act 1958 (as amended) and that he ought to have convicted the defendant accordingly.
2. The Stipendiary Magistrate should have held that each of his findings of fact—
   (a) that the defendant had become affected by carbon monoxide poisoning in a manner not intended by him;
   (b) that the defendant was not responsible for his conduct in refusing to perform the required preliminary breath test;

(if such findings of fact were made by him) was not relevant to the question whether the defendant was guilty of the offence for which he was charged.

3. The Stipendiary Magistrate should have held that the evidence of the witnesses called on behalf of the defendant did not disclose a defence.

The information in which the informant was Eriks Ilmars Krauklis alleged that on 15th July, 1975 the defendant refused to state his name and address contrary to the provisions of s.29 of the Motor Car Act 1958.

The grounds on which the order nisi to review the dismissal of that information were granted are, with the necessary change in the first ground to set out the second alleged offence, the same as those on which the first order nisi was granted.

There was no dispute as to the accuracy of the evidence given on behalf of the informants. That evidence established that the requisite formalities were complied with and that the defendant "refused" to undergo a preliminary breath test in the one case and "refused" to state his name and address in the other. The defence was that the defendant had been so affected by carbon monoxide poisoning, innocently inhaled by him, that he was not answerable for his actions.

The defendant was also charged with failing to stop at a stop sign and entering a "do not enter" carriageway on the same date and during the time the informants were following him prior to intercepting him. The learned Stipendiary Magistrate found these charges proved and placed the defendant on a bond of $50 to be of good behaviour and appear at the Magistrates' Court at Richmond on 26th April, 1976.

There was no dispute that the defendant had consumed intoxicating liquor on the night in which the events leading to those charges occurred. At the relevant time the defendant was driving a V.W. motor car. On 5th November, 1975 the defendant's car was examined by a Mr. Harmon, a qualified chemist and a faculty head of the Chemistry Department at Monash University. He tested the car, with the heater operating, for carbon monoxide. The first test could not have any relevance on the evidence in this case. On the second test, with the car in the moving position and the windows closed for half an hour and the heater operating, he found 0.19 percentage carbon monoxide present. On the third test, with the vehicle moving and with the windows open and the heater not operating, he found 0.01 percentage or less carbon monoxide present. The presence of the carbon monoxide was attributable to the fact that the heating system works off the exhaust, and with a defect in the system the carbon monoxide gets into the ducts and so into the car.

Although, according to the answering affidavit, the defendant said in evidence that he kept his windows shut, the burden of his evidence was that he had no recollection of the relevant events of this night at all, and the evidence of the informant was that the driver's side window was partly open at the time he approached the car, and the defendant was still attempting to restart it. This evidence was not in dispute, and the evidence on behalf of the in-

formant was accepted by the learned Stipendiary Magistrate and by the defence.

Dr. Westerman, a Fellow of the Royal Australian College of General Practitioners, a faculty member of the School of Medicine at Monash University, and a designated medical examiner for airline pilots, was called to give expert evidence on behalf of the defendant. His evidence was to the effect that having heard the evidence of the informant, Constable Smith, as to the defendant's driving and behaviour, and having examined the findings of the carbon monoxide found in the defendant's car by Mr. Harmon, it was his opinion that the defendant's condition on 15th July, 1975, was more consistent with carbon monoxide poisoning than with being affected by alcohol. He based his opinion that the defendant had been suffering from carbon monoxide poisoning on an assumed concentration of 0.1 percentage of carbon monoxide for periods of exposure to a total of one hour, e.g. two half-hour periods. There was no evidence before the learned Stipendiary Magistrate which would justify those assumptions.

The Stipendiary Magistrate accepted the evidence of Mr. Harmon and Dr. Westerman. He found the defendant was suffering from carbon monoxide poisoning and, in consequence, the defendant "was not in a proper state of mind to do the test", that is, the preliminary breath test. The principle relied upon in *Barker v. Burke*, [1970] V.R. 884 was said on behalf of the defendant to be inapplicable on the ground of the differences in the facts and the absence of any expert evidence in that case of the kind given in the present one.

It was argued before me that each of these orders nisi raises four questions:

1. Is the offence an absolute one, in the sense that *mens rea* was not a specific requirement?
2. If it is, (a) is automatism a defence;
   (b) did the stipendiary Magistrate find that the defendant was in a state of automatism; and
   (c) if he did, was there evidence on which he could so find?

Sub-section 3 of s.80E of the Motor Car Act 1958 is in these terms:

"(3) Any person who, when required by a member of the Police Force to undergo a preliminary breath test pursuant to the provisions of sub-s.1, refuses or fails to undergo such a test shall be guilty of an offence against this section."

Section 29 of the Act is as follows:

"29 (1) Any person driving a motor car upon any highway shall, when requested so to do by any member of the Police Force, produce his permit or licence to drive a motor car for inspection and state his name and address.

(2) If such a person fails to produce his permit or licence or refuses to state his name and address or states a false name or address he shall be guilty of an offence against this section".

And then follows a proviso to excuse a failure to produce a permit or licence if it is produced to a police station within seven days. In each of the informations the charge against the defendant was that he "refused" to do what was required. The word "refused" involves a mental element to this extent, that the mind of a person must be directed to what is required: Re *Edwards*, [1910] 1 Ch. 541; Re *Quinton Dick*, [1926] 1 Ch. 992; but, in my opinion, a specific intent to commit either offence is not required. It would be no defence for a person to assert that he did not know or realise that the request was made by a member of the Police Force. In each case there is an absolute obligation to comply, if the mind is capable of doing so. It is not clear what the learned Stipendiary Magistrate meant by his finding that the defendant "was not in a proper state of mind to do the test". If, by that, he meant the defendant's state of mind was not normal, although he had sufficient comprehension to know he was required to do the breath test, then that finding is not sufficient to justify dismissal of the information. Such an approach would defeat the whole purpose of the Act and make it ineffective. See *Regina v. Nicholls* (1972) 1 W.L.R. 502 at p. 505.

In my opinion, if a defendant was in such a condition from causes for which he is not responsible, that at the relevant time he had no appreciation or understanding of what was being requested of him, that would be a defence to each of these charges. I think this follows inevitably from the principle enunciated in *Regina v. Carter*, [1959] V.R. 105. The word "automatism" is applicable to acts done when in a state in which the mind does not control the body. In *Watmore v. Jenkins*, [1962] 2 Q.B. 572 at p. 586; , [1962] 3 W.L.R. 463 at p. 473, Winn J., delivering the judgment of a Divisional Court of five members said:

> "It is equally a question of law what constitutes a state of automatism. It is salutory to recall that this expression is no more than a modern catchphrase which the courts have not accepted as connoting any wider or looser concept than involuntary movement of the body or limbs of a person".

The word was used with the same significance in *Regina v. Carter*, ante; and in *Hill v. Baxter*, [1958] 1 Q.B. 277; , [1958] 2 W.L.R. 76. In *Regina v. Quick*, [1973] Q.B. 910 at p. 919; , [1973] 3 W.L.R. 26 at p. 32, Lawton J., speaking for the Court of Appeal, referred to "such

a complete destruction of voluntary control as constitutes, in law, automatism". The word "automatism" is not appropriate to the facts applicable to either of the offences with which these orders nisi are concerned, but because the word "refused" connotes a mental decision, in my opinion a mental condition which results in the complete destruction of the power of decision—to adopt the words of Lawton J.—would provide a defence.

The defendant was also charged with driving under the influence of intoxicating liquor. Because the learned Stipendiary Magistrate's reasons also dealt with the charges which he dismissed, it is not easy to determine what all his precise findings were. He accepted the evidence of Mr. Harmon and Dr. Westerman, and was not satisfied that the charge of driving under the influence of intoxicating liquor had been proved. He gave no specific reasons that have been recorded for dismissing the charges of the defendant refusing to give his name and address. In respect to the charge of refusing to undergo a preliminary breath test, the learned Stipendiary Magistrate said, "He", that is the defendant, "was not in a proper state of mind to do the test". That is not a finding that the defendant was in such a state of mind that he did not know he was requested to do the test.

In any event, in reviewing the evidence that was before the learned Stipendiary Magistrate there is no sufficient evidence on which he could find, if he did, that there was the necessary destruction of the defendant's power of decision which could excuse the refusals. The defendant did specifically refuse by answer to undergo the breath test and to give his name and address. Dr. Westerman's evidence, once it was accepted, established no more than the carbon monoxide poisoning and not alcohol was probably the cause of his condition. In my opinion, the defendant should have been convicted on each of these charges.

For these reasons, the orders nisi will be made absolute. The orders dismissing the informations will be set aside. The informations will be remitted to the Magistrates' Court at Richmond to be further dealt with in accordance with these reasons.

There will be an order that the defendant pay $200 costs in the case in which Frank Malvern Smith was the informant. No order for costs in the other information. There will be a certificate under the Appeal Costs Fund Act.