prooxidative effect of white wine in vivo is associated, at least in part, with the effect of alcohol, along with the low concentration of the antioxidant polyphenols. Wine consumption may also affect LDL oxidation secondary to changes in the lipoprotein-associated antioxidants.

Whereas plasma vitamin E concentrations were not significantly affected by red wine consumption (107 ± 9 compared with 112 ± 9 μmol/L, before and 2 wk after red wine consumption, respectively), concentration of white wine was associated with a reduction in plasma vitamin E (from 132 ± 9 to 118 ± 7 μmol/L, n = 10; P < 0.05). It is thus possible that the consumption of white wine increases LDL oxidizability in vivo secondary to its effect on LDL vitamin E (the major antioxidant in LDL, ~6 mol vitamin E/mol LDL) content, whereas red wine polyphenols protected LDL-associated vitamin E from oxidation. Reduction in plasma vitamin E concentration after white wine consumption can thus contribute to the in vivo stimulatory effect of this wine on LDL susceptibility to oxidation.

In the in vitro study, the addition of increasing concentrations of white wine, up to 1% (by vol, equivalent to 0.7 μmol quercetin/L) had no effect on CuSO₄-induced LDL oxidation. This polyphenol concentration is much below the concentration used by Caldú et al in their study (4 μmol gaelic acid equivalents/L). In agreement with Caldú et al we also found that on raising the white wine concentration to 4 μmol quercetin/L, an inhibitory effect could be shown in vitro. Because the purpose of our in vivo study was to analyze the effect of dietary products without any additional processing the comparison was made on equal volumes of wine and not on equal polyphenol concentrations.

We also studied the antioxidative effect of other natural polyphenol-rich nutrients. We (8) and others (9) have shown the antioxidative effect on LDL oxidation in vitro and in vivo of olive oil, which is also rich in polyphenols with antioxidative properties. An ethanolic extract from licorice, an Asian plant rich in polyphenols, also proved to act as a powerful antioxidant in vitro and in vivo (Table 1).

Note that the in vitro effect of red wine, olive oil, and licorice on LDL oxidation was significantly higher than that found in vivo, suggesting that interaction between polyphenols and plasma constituents reduces the antioxidative potency of the polyphenols. We thus conclude that natural food constituents rich in polyphenols exhibit antioxidative properties against LDL lipid peroxidation and may thus prove beneficial to attenuate atherosclerosis.

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The dairy industry protects milk from photodegradation; why not protect total parenteral nutrition solutions also?

Dear Sir:

One of the neglected problems in the application of total parenteral nutrition (TPN) is the potentially deleterious consequences of photodegradation products of some of its components. In most instances the contents are delivered to the patients from containers exposed to ambient light conditions. The fact that the containers and the whole system of delivery are not protected from light is in contrast with the experience of the dairy industry, which, for a long time, has delivered
products like milk in opaque containers. The main reason for
the use of opaque containers is to prevent the adverse effects of
light on the flavor development of these products. These effects
were researched by dairy scientists and were reviewed several
decades ago (1). Although the phenomenon of photodegrada-
tion of certain components of TPN solutions has been recog-
nized by experts working on the guidelines for clinical practice
of TPN, no suggestions have been made to minimize the effects
of photodegradation by protecting the containers and possibly
the whole delivery system from light (2).

We would like to reexamine the possible deleterious effects
of ambient light on the components of TPN and suggest
strongly that efforts should be given to at least covering the
containers. It is certainly of interest that little value has been
given to this problem even in the unit where the losses of a
component by ambient light have been experimentally corrobo-
rated (3). As of this writing, no provision has been made to
prevent these losses by shielding the containers.

In addition, the effect of oxygen should be taken into con-
sideration as an additional factor that could accentuate the
effect of light. These actions may be intensified because in
most cases the solutions are delivered after small droplets are
formed and consequently more surface is exposed to light and
oxygen.

The problem of photodegradation may be of special impor-
tance in intensive care nurseries because of their highly intense
light conditions that facilitate delicate handling of the neonates,
especially those who were born prematurely. Some photodeg-
radation products were shown to be toxic (4) and they may
pose serious problems to premature neonates who may be
particularly sensitive. Such effects, together with the fact that
the knowledge of all nutritional, hormonal, and growth factors
transmitted to the fetus from the mother during the last third of
pregnancy is incomplete and such factors are therefore not
present in the TPN solutions, may contribute to the only partial
success of the treatment (5). In neonates, obviously TPN has an
additional function when compared with its use in adults.
Because organogenesis has not been completed in prematurely
born babies, the function of TPN must be to promote organ
maturation and growth (ie, the pulmonary tree and/or gastro-
intestinal tract); therefore, TPN has a different function when
used to support premature babies than when used in adults.

Quite a few components of TPN solutions have been shown
to undergo photodegradation, and the chemical mechanism of
this phenomenon has been characterized for some of them. A
few components are as follows:

1) There is common knowledge that retinoids (vitamin
A-retinol and its derivatives) are a [sic] group of com-
ponents that require special handling, storage and analy-
sis. The naturally occurring compounds carrying five or
more conjugated double bonds and are therefore easily
attacked by oxygen (air), isomerized by light, and con-
verted by heat to compounds that are biologically inac-
tive or less active than the parent molecules” (6). In
addition, it is possible that these degradation products
may have a toxic effect on the development of prematu-
rely born neonates.

2) Another component of TPN solutions, riboflavin, has
been known for a long time to be very sensitive to
photodegradation and some of the degradation products
have been characterized (7). In addition, this vitamin can
augment photodegradation of tryptophan (8). This pro-
cess is accompanied by generation of highly reactive
oxygen species, which in turn may attack other com-
ponents of TPN solutions.

3) Parenteral lipid emulsions are used to support prema-
turely born children (9). Quite recently, the oxidation of
these solutions under ambient light conditions was de-
scribed (9). During this process, cytotoxic lipid peroxides
are formed that constitute a serious warning that light-
affected rancid lipids could add to numerous problems
encountered in premature neonates (4).

It can be argued that more detailed evidence about the
fetotoxicity of photodegradation products of TPN components
is necessary. Generation of such experimental data would re-
quire an enormously time-consuming effort to identify, isolate,
and characterize these compounds. In addition, the eventual
fetotoxicity would have to be tested on experimental animals.

Consequently, would it not be more practical to shield the
devices used to deliver TPN by following the example and
experience of the dairy industry?

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