a 1% halothane concentration is given to a tube containing
Hanks' buffer and blood both at 37° C, the respective
volume/volume % concentration of halothane in the two
tubes would be ~0.8 and 2.4. To achieve a higher con-
centration of halothane in Hanks' buffer, one that would
be comparable to blood levels seen in vivo in patients given
a therapeutic exposure of halothane, a higher concentra-
tion of vaporized halothane would have to be used. The
blood thus serves as a "carrier" of the anesthetic.
The solubility of the "carrier" for the particular anesthetic
will profoundly effect the concentration of the anesthetic
in the "carrier".

Dr. Eger states that the "increase in temperature de-
creased the solubility of the anesthetic and thereby in-
creased the partial pressure of anesthetic." Thus, if the
solubility of the anesthetic is less at higher temperatures
(an increase from 4° C to 37° C in the experiments of
Nakagawara et al.,), there would be less of the anesthetic
(because of a decreased solubility at the elevated tem-
perature) in the liquid reaction mixture (containing neu-
rophils and Hanks' buffer) and more in the atmosphere
above the reaction mixture, resulting in a higher partial
pressure of the anesthetic. What is more important, the

concentration (partial pressure) of the anesthetic used to
treat or expose the reaction mixture, or the actual con-
centration of the anesthetic in the reaction mixture? If
one is trying to assess the effect of an anesthetic on neu-
rophil function in a liquid medium, it would appear that
the concentration of the anesthetic in the particular ex-
perimental liquid medium is critical for such an evalua-
tion.

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More Problems with the Arrow-Racz Epidural Catheter

To the Editor.—We have noted a number of problems
with the Arrow-Racz Spring Wire reinforced Continuous
Epidural Catheter, product no. EC-02220. We placed the
catheter in three patients for administration of epidural
local anesthetics and narcotics. We used 17-gauge Touhy
needles to place the catheters, and we took care to follow
the instructions contained in the package insert for place-
ment and removal of the catheters. Two of our patients
developed leaks at the catheter–skin interface, requiring
replacement of the catheter after 5 days of use. At least
one of these catheters appeared to have minute cracks in
the fluoropolymer coat, which developed some time after
catheter insertion.

In our third patient, the catheter worked well for 5
days. When we removed the catheter, a large amount of
resistance was noted, and as we pulled with more force,
the catheter began to unravel and the fluoropolymer coat
fractured into pieces of various sizes (fig. 1). The metal
portions of the catheter were retrieved intact, but we were
unable to determine with certainty that we retrieved all
of the fluoropolymer coat. Lingenfelter described un-
raveling of the Racz epidural catheter, but his report was
attributed to use of the lateral flexed position for removal.
We used the lateral neutral position and grasped the cath-
eter at skin level several times without any success in pre-
venting or halting the unraveling process. One possible
explanation for this phenomenon is that the open-spring
coils of the catheter tip could allow tissue adherence or
permit the catheter actually to "corkscrew" its way into
soft tissues. Figure 2 shows the tip of our catheter. At the
time of removal, a small amount of tissue was adherent
to the catheter, but this tissue fell from the catheter prior
to the taking of these photographs.

Other investigators have also reported similar problems
with the Racz catheter concerning leakage at the catheter–
skin interface.2 We feel that nylon catheters, with good
care, give good results for administration of epidural nar-
cotics with less chance of catheter leakage and breakage
and much less expense.

* Reigler R, Hammerle AF, Albright GA, Neumark J: The Racz
epidural catheter: first clinical experiences. Regional Anesthesia 7:109–
In reply—It is unfortunate that the letter only described remote incidents associated with early production models of Arrow's Spring Wire Epidural Catheters. The Arrow Spring Wire Epidural Catheter has been in the marketplace now for nearly 5 years. The product has been outstandingly received by anesthesiologists all over the world for the important improvements to epidural catheterization relative to insertion reliability, prolonged utilization, and use for narcotic analgesia.1,2,3

As with all new product developments, it is possible for unforeseen problems to occur that are a result of a combination of underdesign and misuse in exceptional circumstances. The authors refer to problems with the fluoropolymer coating of the catheter developing minute cracks. They also describe a problem with the spring wire unraveling while attempting to remove it.

Arrow can only assure your readers that these incidents as reported are remote and associated only with the original "Racz Catheter" version of Arrow's Spring Wire

† Racz GB, Heavner J, Haynsworth: Repeat epidural phenol injec-

Fig. 1. Unraveled and normal (upper) Racz catheters.

Fig. 2. Tip of unraveled (upper) and normal catheters.

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