A COMPARISON OF ANTI-FOGGING AGENTS

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Sports and activities that require the usage of goggles or protective eyewear are numerous in this country. Racketball, handball, tennis, woodworking, and countless other events need adequate eye protection to insure the safety of the participants. Unfortunately, the eyewear has performance problems, one of which is fogging of the lenses. Fogging impairs the acuity and restricts the peripheral view of the wearer, thus decreasing performance. Several different companies have come up with anti-fogging agents to combat this problem, but no records of their relative performance are available.(1) This study's purpose is to make that comparison.

Inquiries with all known companies that produce anti-fogging agents were contacted to be included in the study. The companies that did not respond were not included. Six different agents were obtained, with two controls for a total of eight (Saliva and nothing being the chosen controls).

Initial testing was done under controlled conditions. An attempt to simulate both rapid temperature and humidity changes was the goal. Lenses of the same power (-1), size, and thickness were cleaned and covered per printed instructions with the different materials. Polycarbonate, CR-39, and glass all were used.

The first testing addressed a cold to normal temperature change. All covered lenses were refrigerated for several hours,

then removed into room temperature. After removal, a subjective recording was made of the first NOTICEABLE blur for each lens. Two trials gave the results listed below:

AGENT	TIME TO FOG IN SECONDS		
	CR-39	POLYCARBONATE	GLASS
1) Nothing	<10	<10	<10
2) Saliva	10-20	<10	<10
3) Shinize	20-30	<10	<10
4) Anti-Fog Blue	<10	>60	<10
5) Safe Clean	<10	20-30	<10
6) Clear Stick	<10	20-30	<10
7) Anti-Fog LC	<10	<10	<10
8) Kleer-o-Fog	20-30	20-30	20-30

*Times are the average of the two trials.

The data shows no definite conclusions, and indeed a few contradictions. Only Kleer-o-fog showed a consistency with all three materials. It is interesting to note that the saliva control outperformed one of the brands when applied to CR-39. No agents worked well on glass in this trial, but there was moderate success with polycarbonate. The short duration of effectiveness may have been due to the exceedingly rapid change in temperature.

The second test situation was a bit more selective. Since safety goggles are polycarbonate due to its strength, we chose to use this material only (2). Again, all the agents were applied to

clean lenses. From room temperature, the lenses were inserted into a steam filled room five feet from a hot, closed shower. Using subjective viewing, times were recorded for first noticeable fogging (the recorder had no knowledge of which agents were applied to the lenses in either of the testing situations). Two trials gave the results below:

AGENTS	TIME TO FOG IN SECONDS
1) Nothing	<10
2) Saliva	<20
3) Shinize	180 (3 min.)
4) Anti-Fog blue	420 (7 min.)
5) Safe Clean	300 (5 min.)
6) Clear Stick	300 (5 min.)
7) Anti-Fog LC	480 (8 min.)
8) Kleer-o-fog	360 (6 min.)

The two controls fogged completely as they were placed in the room. Anti-fog LC (lens cleaner) lasted eight minutes, with Anti-Fog blue at seven. All six of the agents lasted considerably longer than the controls, but the times are still not impressive. This could, again, possibly be explained by the sharp temperature change.

The third and final testing was a racketball tournament. Racketball was chosen because of easy accessability to the needed facilities, and a ready group of volunteers. Two subjects competed

with standard protective eyewear (furnished by the racketball center) for one hour periods. Each wore a different agent on their left and right eyes. Both wore exactly the same two agents as their opponent. Again, the participants had no knowledge of which agents had been applied. Six subjects in all were used.

While playing, the participants made recordings of the first subjectively noticed blur. Also, at the end of the hour, they gave a 1-5 rating of impairment to each lens, with a 1 being severely impaired, and 5 being no impairment at all.

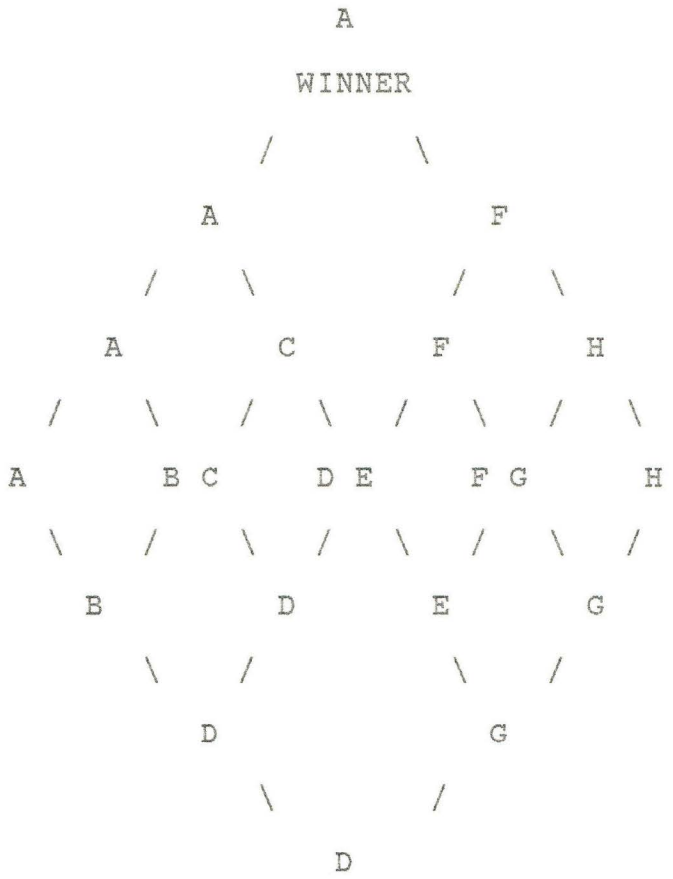
A play-off system was used to determine the best and worst agents. Superior agents moved on to face other superior agents, and inferior agents were placed in the "loser's bracket". For example: Agent A on O.S. outperforms Agent B on O.D.,and Agent C on O.S. outperforms agent D on O.D. in the first round. Agent A and C move on to face each other, while B and D move BACKWARDS to face each other (See appendix). Determining an overall winner and overall loser was done this way, while an intermediate ranking was obtained by comparing recorded trial times. Each round in the eight agent field was repeated twice, for a total of twenty rounds. Shown in the table on the following page is the rank, rating, and time to fog of each agent.

RANKING OF AGENTS/RACKETBALL

AGENT	RANK	RATING	TIME TO FOG (MIN)
Anti-fog LC	1	4.5	55
Anti-fog blue	2	4.5	54
Clear Stick	3	4.0	51
Safe clean	4	4.0	49
Shinize	5	3.5	18
Kleer-o-fog	6	3.0	22
Nothing	7	1.0	8
Saliva	8	1.0	7

The results show four of the eight to be very effective in actual practice. Due to the limited testing, it would be difficult to draw a clear conclusion as to which one is the superior agent. Many more trials would be needed. However, it can be said that definite differences exist between them, and that all are superior to the controls. This is important, not just because of increased performance, but because the players are more likely to wear the protective gear if they are not hindered by it. The biggest complaint of the participants before the study was trouble with fogging. Many times during the study players in adjacent courts were seen removing their protective goggles. When asked why, "clouding up","foggy", and "I can't see bleep!" were common responses.

In 1983, Racketball, Squash, and Paddle ball accounted for 6.7% of the sports related eye injuries. In 1986, it was 11.3%. This shows that the sports are gaining in popularity, and unfortunately, the injuries rise with it. The injuries also tend to be more serious than other sports because the projectiles (ball and racket) will easily force their way into the protective bone socket around the eye (3). This situation makes the usage of goggles all the more critical, and having anti-fogging agents that work makes it that much more probable.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1) Literature search April 10, 1990.

2) Perspectives on Impact Resistance and Polycarbonate Lenses
International Opthalmology, Fall 1988 pp 215-218.

3) Vision and Sports
1987. James P. Gregg ppll4-ll6.