

# An alternative to meta?

**Prawns are normally treated with sodium metabisulphite (meta) to prevent black spot. A new compound called HQ Bacterol F has been approved for use by the National Food Authority. Steve Slattery, Allan Bremner and Dave Williams examine some of the manufacturer's recommended application levels of this chemical.**

The National Food Authority has recently approved the use of a mixture of sodium bisulphite, sodium chloride and dextrose on prawns for protection against black spot (Anon. 1992).

This matches the composition of a chemical mixture called HQ Bacterol F which has been on 12 months trial by the Australian fishing industry (Anon. 1991). The manufacturer (Hispano Quimica SA, Barcelona, Spain) has stated that 'sodium bisulphite is advantageous over sodium metabisulphite (meta) because it limits sulphur dioxide residues, since a lower dosage can produce the same effect'.

The manufacturer recommends a number of types of application including dusting onto layers of prawns interspersed with ice. This method of applying sulphite can result in uneven treatment and is not recommended (Finne and Miget 1985, Nickelson and Cos 1977, Smith 1980).

A variety of concentrations and times for application of the chemical by immersion have been recommended in promotional material released by the manufacturer and Australian distributor; a dip in a 5 per cent solution for 15 minutes, 4 per cent for five or 10 minutes, 3 per cent for 15 minutes, 2 per cent for an unstated period, and two 3 per cent dips and two 1 per cent dips combined with sprinkling.

There are no sulphite residue data available from the literature. Otwell and others (1988) describe the effectiveness of HQ Bacterol F against black spot when compared with sodium bisulphite and other alternative chemical treatments. They found HQ Bacterol F provided protection from black spot but they did not report any data on residues.

## What was done to the prawns

Two concentrations of HQ Bacterol F (3 and 5 per cent) have been evaluated to help determine a suitable dip for use. A 3 per cent concentration of HQ Bacterol F contains the same amount of sulphur dioxide (SO<sub>2</sub>) as the 1 per cent meta dip recommended for use in the Australian industry (Slattery and others 1991).

Freshly harvested prawns (*Penaeus*

*monodon*) from a local aquaculture farm were treated in dips of HQ Bacterol F as follows:

- 3 per cent solution for 30 seconds;
- 3 per cent solution for 15 minutes; and
- 5 per cent solution for 15 minutes.

As comparison, prawns were also dipped in 1 per cent meta for 30 seconds or left untreated. After draining for five minutes, all these prawns were: (a) stored on ice for up to nine days; or (b) frozen for 14 days at -20°C, then thawed and stored on ice.

The amount of black spot present, expressed as the percentage of prawns from the batch with pigment present on both the head and the body, was noted and samples of tail meat from four prawns from the same batch were taken for analysis of SO<sub>2</sub> residues by the method of DeVries and others (1986).

The experiments were repeated with the exception of the dip in 3 per cent HQ Bacterol F for 30 seconds. The results for both experiments were similar and were combined.

## How the prawns performed

### (A) PRAWNS STORED ON ICE

All dip treatments gave good protection against black spot for four days storage (Table 1). As anticipated from the calculated SO<sub>2</sub> levels the dip in 3 per cent HQ Bacterol F for 30 seconds gave similar results to the dip in 1 per cent meta for 30 seconds. The longer immersion times in HQ Bacterol F proved more effective

during further storage than these brief treatments. This protection was achieved with levels of SO<sub>2</sub> below the 30 mg/kg maximum permitted concentration (MPC) for domestic consumption.

### (B) PRAWNS FROZEN, THEN THAWED AND STORED ON ICE

Most uncooked prawns available on the Australian market are frozen and this part of the experiment reflects what may occur in the marketplace. Table 2 shows the development of black spot on prawns from all treatments during storage. No black spot was present when the prawns were thawed. Half the untreated prawns went black within one day. After two days on ice there was considerable black spot in those prawns dipped in 1 per cent meta for 30 seconds but little on those treated with HQ Bacterol F. After four days storage, black spot was quite evident even on those prawns dipped in 5 per cent HQ Bacterol F and the 3 per cent Bacterol treated prawns were similar to those dipped in meta. After six days black spot was extensive in all groups. This occurred despite the presence of reasonably high levels of SO<sub>2</sub> in the prawn flesh (Table 3).

Treatment with 5 per cent HQ Bacterol F for 15 minutes resulted in mean residues close to or above the MPC for export prawns (100 mg/kg) in prawns frozen, thawed and then stored on ice for up to seven days storage. After such a long storage time the SO<sub>2</sub> residue of fresh prawns is normally quite low (Finne and Miget 1986). High residues after freezing and thawing have been reported previously (Slattery and others 1991). The levels of SO<sub>2</sub> found in the tissue depend on the drain time used after the dip. The authors have recommended a drain time of five minutes but not more than 10 minutes to help overcome this problem. The United States Food and Drug Authority (Finne and Miget 1985) and other authors (Tsukuda and Amano 1972) have recommended a wash after treatment for prawns to keep the concentrations of SO<sub>2</sub> in the flesh low.

Towards the end of the ice storage

Table 1

Percentage of prawns exhibiting black spot\* during storage on ice

Treatment	Storage time (days)					
	1	4	5	6	7	8
No dip	0	15	78	98	100	100
1 per cent Meta for 30 seconds	0	2	26	65	83	89
3 per cent Bacterol for 30 seconds	0	5	53	83	93	97
3 per cent Bacterol for 15 minutes	0	2	14	34	71	85
5 per cent Bacterol for 15 minutes	0	0	2	18	41	76

\*Percentage pigmented on head and body.

Table 2

Percentage of prawns exhibiting black spot\* during storage on ice after being frozen (-20°C) for 14 days

Treatment	Storage time (days)						
	1	2	3	4	5	6	7
No dip	55	83	92	100	100	100	100
1 per cent Meta for 30 seconds	0	40	44	55	86	90	100
3 per cent Bacterol for 30 seconds	0	—	27	66	91	100	100
3 per cent Bacterol for 15 minutes	0	6	23	54	76	96	100
5 per cent Bacterol for 15 minutes	0	0	4	18	42	81	100

\*Percentage pigmented on head and body.

period the thawed prawns treated with 5 per cent HQ Bacterol F, for both trials, contained some which were completely free from black spot. No black spot was seen when residue levels were near 150 mg/kg while at a level of 50 mg/kg black spot was extensive. Smith (1980) found for fresh prawns that black spot occurred when the residue dropped to between 2 and 8 SO<sub>2</sub> mg/kg. Black spot occurs on the integument under the shell whereas SO<sub>2</sub> levels are determined on the tail meat. It therefore appears that high levels in the meat may afford little protection at the site where it is required. To avoid high residues a drain time longer than five minutes should be used. There would seem little point in dipping the prawns for

such a long time in so high a concentration. A dip for 15 minutes in 3 per cent HQ Bacterol F gives adequate protection and results in levels of SO<sub>2</sub> within the MPC for both export and domestic requirements. Prawns originally destined for export often find their way onto the domestic market (Burford 1986) and any recommended usage level for SO<sub>2</sub> must take this into account.

**Guidelines**

As an alternative to dipping prawns in one per cent sodium metabisulphite for 30 seconds, a dip in a 3 per cent concentration of HQ Bacterol F applied for 15 minutes will provide protection against black spot and give SO<sub>2</sub> residues near

Table 3

Residual SO<sub>2</sub> levels (mg/kg) in the tail meat of thawed prawns stored on ice after being frozen (-20°C) for 14 days

Treatment	Storage time			
	1 hour	1 day	4 days	7 days
1 per cent Meta for 30 seconds	10	19	26	13
3 per cent Bacterol for 30 seconds	14	19	15	18
3 per cent Bacterol for 15 minutes	23	23	39	31
5 per cent Bacterol for 15 minutes	68	46	98	107

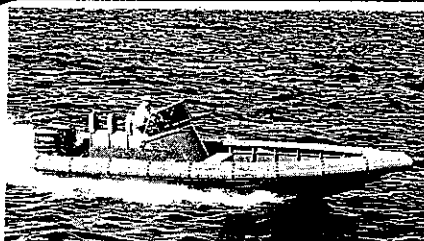
the 30 mg/kg maximum permitted for domestic product.



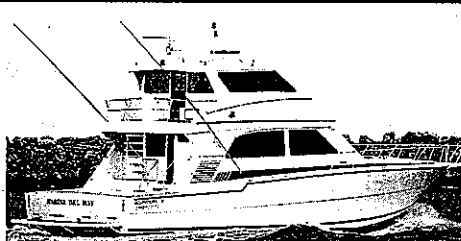
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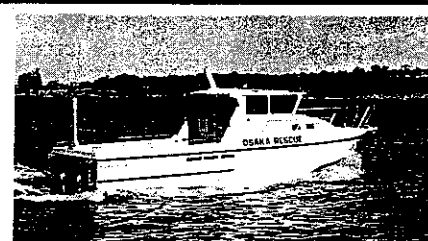
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